

# CITY OF CHELAN

CHELAN COUNTY

WASHINGTON



## WATER SYSTEM PLAN

G&O #16018  
MARCH 2020



**Gray & Osborne, Inc.**  
CONSULTING ENGINEERS

# CITY OF CHELAN

CHELAN COUNTY

WASHINGTON



## WATER SYSTEM PLAN



3/30/2020



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G&O #16018  
MARCH 2020



**Gray & Osborne, Inc.**

CONSULTING ENGINEERS





STATE OF WASHINGTON  
DEPARTMENT OF HEALTH  
EASTERN DRINKING WATER REGIONAL OPERATIONS  
16201 E Indiana Avenue, Suite 1500, Spokane Valley, Washington 99216-2830  
TDD Relay 1-800-833-6384

August 12, 2020

Jake Youngren, Public Works Director  
City of Chelan  
50 Chelan Falls Rd  
Chelan, WA 98816

Subject: Chelan Water Dept. City of; PWS ID #12300; Chelan County  
Water System Plan; Submittal #18-0901; **DOH Approval**

Dear Mr. Youngren:

The City of Chelan Water System Plan (WSP) received in this office on September 4, 2018, with revisions submitted on October 23, 2019, May 11, 2020, and July 10, 2020, has been reviewed and in accordance with the provisions of WAC 246-290-100, is hereby **APPROVED**.

An approved update of this WSP is required **on or before August 12, 2029**, unless the Department of Health (DOH) requests an update or plan amendment pursuant to WAC 246-290-100(9). Approval of this WSP is valid as it relates to current standards outlined in Washington Administrative Code (WAC) 246-290, revised January 2017, and is subject to the qualifications herein. Future revisions in the rules and statutes may be more stringent and require facility modification or corrective action.

DOH approved Standard Construction Specifications for distribution main extensions with this WSP. The Chelan Water Department may proceed with the installation of distribution main extensions consistent with the approved plans and specifications in the plan. These projects must be reviewed by the system's consultant that is a Professional Engineer licensed in the State of Washington. DOH considers these projects in good standing, provided the Chelan Water Department completes and keeps on file the enclosed construction completion report form for each project in accordance with WAC 246-290-125(2) and WAC 246-290-120(5), and makes them available for review upon request by DOH.

Disclaimer: The department's approval of your Water System Plan does not confer or guarantee any right to a specific quantity of water. The approved number of service connections is based on your representation of available water quantity. If the Washington Department of Ecology, a local planning agency, or other authority responsible for determining water rights and water system adequacy determines that you have use of less water than you represented, the number of approved connections may be reduced commensurate with the actual amount of water and your legal right to use it.

The WSP includes capacity information that demonstrates the physical and legal ability of this water system to provide water during the period for which the approval of the WSP is valid. Based on the analysis presented in the WSP, the limiting factor in determining the approved number of connections is **source**.

DOH bases the number of approved connections on Worksheet 6-1 included in the WSP and the Water Facilities Inventory (WFI) form information, assuming all new connections are single family connections:

From Worksheet 6-1

Water System Capacity: 4,986 ERUs (limiting component is source)  
Total Existing ERUs: - 2,872 ERUs (based on 2,579 existing connections and DSL)  
Available ERUs: 2,114 ERUs

From WFI Information

Existing number of active service connections: 2,632  
Available connections (= Available ERUs): 2,114  
Approved number of connections: 4,746 connections

Accordingly, the approved number of connections that will be reflected on the WFI form and in DOH records is **4,746**.

The Chelan Water Department is responsible for permitting new service connections in a manner consistent with the water system plan so that the physical capacity and water right limitations are not exceeded. As new water services are requested, the Chelan Water Department must evaluate each connection for the expected water demands and adjust the remaining connection allowance. The water system should keep an updated list that compares the overall ERUs expended against the overall number of connections placed into service. This will allow a better estimate of the system's adequacy.

Pursuant to RCW 90.03.386(2), the "Water Rights Place of Use" identified on Figure 1-5 in the WSP now represents "place of use" for this system's water rights. Future changes in service area should be made through a WSP amendment or update.

The Chelan Water Department has a duty to provide new water service within its retail service area. This WSP includes service policies to describe how your system plans to provide new service within your retail service area.

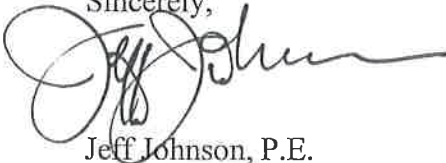
Submittal of the WSP included local government consistency determinations from the City of Chelan Planning Chelan County Planning. This WSP meets local government consistency requirements for WSP approval pursuant to RCW 43.20 for these entities.

The Chelan Water Department is located within Chelan WRIA #47. Ecology has not determined whether the WSP was not inconsistent with an approved watershed plan. DOH encourages the water system to contact Ecology regarding this matter.

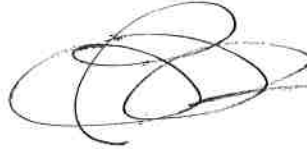
Jake Youngren  
August 12, 2020  
Page 3

Thank you for your cooperation. DOH recognizes the significant effort and resource commitment involved in the preparation of this WSP. If you have any comments or questions concerning our review please contact either of us at (509) 329-2110, [Jeff.Johnson@doh.wa.gov](mailto:Jeff.Johnson@doh.wa.gov) or (509) 329-2122, [Brenda.Smits@doh.wa.gov](mailto:Brenda.Smits@doh.wa.gov), respectively.

Sincerely,



Jeff Johnson, P.E.  
Regional Engineer  
Office of Drinking Water  
Division of Environmental Public Health



Brenda Smits  
Regional Planner  
Office of Drinking Water  
Division of Environmental Public Health

Enclosures: Construction Completion Form

cc: Chelan-Douglas Health District  
Chelan County Planning Department  
Adam J. Miller, PE, Gray & Osborne, Inc.  
Ying Fu, Department of Ecology, Eastern Regional Office  
George Simon, DOH Compliance Program Manager  
Matt Hadorn, DOH WFI Coordinator  
Scott Mallery, PE, Assistant Regional Manager



STATE OF WASHINGTON  
DEPARTMENT OF HEALTH  
EASTERN DRINKING WATER REGIONAL OPERATIONS  
16201 E Indiana Avenue, Suite 1500, Spokane Valley, Washington 99216-2830  
711 Washington Relay Service

January 7, 2020

Jake Youngren, Public Works Director  
City of Chelan  
50 Chelan Falls Rd  
Chelan, WA 98816

Subject: Chelan Water Dept., City of; PWS ID #12300; Chelan County  
Water System Plan; Submittal #18-0901; DOH Comments

Dear Mr. Youngren:

Thank you for providing the draft Water System Plans (WSP) for the City of Chelan received in this office on September 4, 2018, and second draft received on October 23, 2019. The following comments will need to be addressed before the Department of Health (DOH) can approve the document:

**Chapter 1**

1) Figure 1-5, Service Areas.

Figure 5-1 identifies a 'Service Area' and 'Future Service Area'. 'Future Service Area' identification is required for water systems in Critical Water Supply Service Areas. You're welcome to identify this area on your map for your own purposes, keeping in mind that the 'Service Area' includes areas that a water system currently serves and areas where future water service is planned. The 'Service Area' also identifies the water right place of use. Please identify and include the Retail Service Area on the service area map. Refer to DOH publication 331-432 for more information.

**Chapter 2**

2) Various pages. Regarding adjustment of water use records by 10,000 gph 'flow-by factor'.

- a. Provide supporting documentation with narrative for the use of a 10,000 gph 'flow-by factor' to adjust production totals (i.e. explain how the seasonal difference in accuracy, ~99% in summer and ~50% in winter, is accounted for with an overall gallon per hour adjustment factor).
- b. Provide two data sets: one with actual measured values for production and consumption; and one with adjusted values using 'flow-by factor'.
- c. WUE annual reports will need to be updated to align with values that are identified and supported in the WSP.

3) Table 2-2 and 2-7.

These tables include a 10,000 gph 'flow-by factor' or 'flow meter leak-by'. Include an additional table (or column) that shows annual production and DSL values prior to any changes being made (e.g. actual recorded values for production) as stated previously in comment 2)b.

4) Table 2-7 and last paragraph, page 2-11.

DSL is calculated as a 3-year average, excluding negative values. DSL does not require calculation of a 'future leakage rate'. The 3-year average DSL for 2017 is 10.5%  $((12.8+0+18.6)/3)$ . The value shown of 8.9% includes the 2016 negative DSL value. Please update the last paragraph as needed.

5) Page 2-4 and 2-11 regarding water main breaks.

The draft WSP includes this statement on page 2-11: "the large leak values as discussed earlier have been removed from the DSL value as these leaks do not represent a consistent leakage in the distribution system." All water that is not authorized consumption is considered DSL, including water main breaks. Please refer to the WUE Guide, chapter 6, as needed. Recalculate DSL without removing 'large leak values' and update table 2-7 and other tables as needed.

#### **Chapter 4 – Water Use Efficiency Requirements**

6) Page 4-3. As a note - the identified supply side goal of maintaining DSL below 10% for the next 6-years is a requirement for Municipal Water Suppliers to comply with the DSL standard of 10% or less (3-year average).

7) Page 4-5. The two demand-side measures in table 4-3 are identified for (3) customer classes not 5 as stated in the first paragraph of the page. Please update as needed.

#### **Other**

8) Appendix C. Provide an updated Water Quality Monitoring Schedule.

9) Appendix K. The water rate study report is for the period of 2019 through 2028, as a reminder, the WSP approval period will be for the shortest period for which projections are provided.

10) Appendix L. Provide a signed SEPA checklist.

11) Appendix M. Provide signed meeting minutes on WSP adoption.

12) The April 23, 2019, meeting minutes adopting WUE goals were not located in the draft WSP, please include.

#### **END OF COMMENTS**

The department's review of your water system plan does not confer or guarantee any right to a specific quantity of water. Our review is based on your representation of available water quantity. If the Washington Department of Ecology, a local planning agency, or other authority responsible for determining water rights and water system adequacy determines that you have use of less water than you represent, the number of approved connections may be reduced commensurate with the actual amount of water and your legal right to use it.

Jake Youngren  
January 7, 2020  
Page 3

We hope that you have found these comments to be clear, constructive, and helpful in the development of your final WSP. We ask that you submit **two copies** of the revised WSP or amended pages **on or before April 6, 2020**. In order to expedite the review of your revised submittal, please complete the enclosed DOH Comment Response Form summarizing how each of the above comments was addressed in the revised WSP and where each response is located (i.e., page numbers, Appendices, etc.).

Thank you again for submitting your draft Water System Plan for our review. If you have any comments or questions concerning our review please contact either Jeff Johnson at (509) 329-2110, [Jeff.Johnson@doh.wa.gov](mailto:Jeff.Johnson@doh.wa.gov), or Brenda Smits at (509) 329-2122, [Brenda.Smits@doh.wa.gov](mailto:Brenda.Smits@doh.wa.gov).

Sincerely,



Jeff Johnson, P.E.  
Regional Engineer  
Office of Drinking Water  
Division of Environmental Public Health



Brenda Smits  
Regional Planner  
Office of Drinking Water  
Division of Environmental Public Health

Enclosures: Comment Response Form  
Department of Ecology correspondence

cc: Chelan-Douglas Health District  
Chelan County Planning Department  
Adam J. Miller, PE, Gray & Osborne, Inc.  
Ying Fu, Department of Ecology, Eastern Regional Office  
Scott Mallery, PE, DOH Assistant Regional Manager  
George Simon, DOH Compliance Program Manager  
Matt Hadorn, DOH Regional Specialist

# DOH COMMENT RESPONSE FORM – 2<sup>nd</sup> draft WSP

City of Chelan Water Dept.; PWS ID 12300; re: submittal #18-0901

DOH Comment No.	DOH Comment	Water System Response	Page No. of Response	Other Comments
1	<p>Figure 5-1 identifies a 'Service Area' and 'Future Service Area'.</p> <p>'Future Service Area' identification is required for water systems in Critical Water Supply Service Areas. You're welcome to identify this area on your map for your own purposes, keeping in mind that the 'Service Area' includes areas that a water system currently serves and areas where future water service is planned. The 'Service Area' also identifies the water right place of use. Please identify and include the Retail Service Area on the service area map. Refer to DOH publication 331-432 for more information.</p>			
2	<p>Regarding adjustment of water use records by 10,000 gph 'flow-by factor'.</p> <ul style="list-style-type: none"> <li>a) Provide supporting documentation with narrative for the use of a 10,000 gph 'flow-by factor' to adjust production totals (i.e. explain how the seasonal difference in accuracy, ~99% in summer and ~50% in winter, is accounted for with an overall gallon per hour adjustment factor).</li> <li>b) Provide two data sets: one with actual measured values for production and consumption; and one with adjusted values using 'flow-by factor'.</li> <li>c) WUE annual reports will need to be updated to align with values that are identified and supported in the WSP.</li> </ul>			
3	<p>Table 2-2 and 2-7.</p> <p>These tables include a 10,000 gph 'flow-by factor' or 'flow meter leak-by'. Include an additional table (or column) that shows annual production and DSL values prior to any changes being made (e.g. actual recorded values for production) as stated previously in comment 2)b.</p>			
4	<p>Table 2-7 and last paragraph, page 2-11.</p> <p>DSL is calculated as a 3-year average, excluding negative values. DSL does not require calculation of a 'future leakage rate'. The 3-year average DSL for 2017 is 10.5% <math>((12.8+0+18.6)/3)</math>. The value shown of 8.9% includes the 2016 negative DSL value.</p> <p>Please update the last paragraph as needed.</p>			

5	<p>Page 2-4 and 2-11 regarding water main breaks.</p> <p>The draft WSP includes this statement on page 2-11: "the large leak values as discussed earlier have been removed from the DSL value as these leaks do not represent a consistent leakage in the distribution system." All water that is not authorized consumption is considered DSL, including water main breaks. Please refer to the WUE Guide, chapter 6, as needed. Recalculate DSL without removing 'large leak values' and update table 2-7 and other tables as needed.</p>			
6	<p>Page 4-3. As a note - the identified supply side goal of maintaining DSL below 10% for the next 6-years is a requirement for Municipal Water Suppliers to comply with the DSL standard of 10% or less (3-year average).</p>			
7	<p>Page 4-5. The two demand-side measures in table 4-3 are identified for (3) customer classes not 5 as stated in the first paragraph of the page. Please update as needed.</p>			
8	<p>Appendix C. Provide an updated Water Quality Monitoring Schedule.</p>			
9	<p>Appendix K. The water rate study report is for the period of 2019 through 2028, as a reminder, the WSP approval period will be for the shortest period for which projections are provided.</p>			
10	<p>Appendix L. Provide a signed SEPA checklist (page 23 of 25).</p>			
11	<p>Appendix M. Provide signed meeting minutes for the WSP adoption meeting on May 28, 2019.</p>			
12	<p>The April 23, 2019 meeting minutes adopting WUE goals were not located in the draft WSP, please include.</p>			



COPY



STATE OF WASHINGTON  
DEPARTMENT OF ECOLOGY

4601 N Monroe Street • Spokane, Washington 99205-1295 • (509)329-3400

December 4, 2019

RECEIVED

DEC 05 2019

Jake Youngren, Director  
City of Chelan Water Department  
50 Chelan Falls Rd  
Chelan, WA 98816

DEPARTMENT OF ECOLOGY  
EASTERN REGIONAL OFFICE

Re: City of Chelan; PWS ID # 12300; Chelan County  
2<sup>nd</sup> Draft Water System Plan (WSP): DOH Project #18-0901

Dear Mr. Youngren:

I have reviewed the above referenced document in accordance with the 2007 *Memorandum of Understanding* between the Department of Health (DOH) and the Department of Ecology (Ecology), and in accordance with RCW 90.03.386. Ecology's review is focused only on the subject water system's water rights legitimacy, adequacy and related issues affecting the submitted report.

The City of Chelan (City) has four main water rights which are listed in Water Right Status Table 4-5 in the WSP. Other water rights (S4-08093, G4-29044, S4-25651P and SWC 3244) and those approved transfer water rights to the City (S4-28906(A), 709(A)), should all be included in the total count of the City's water right quantity. Projected 10-year and 20-year water use quantities were not included in the Water Right Assessment Table, though the data is available and is listed on Table 3-3. The report indicates the City has adequate water right quantities to meet its current operation, and support both the 10-year and 20-year projected growth.

These are my comments at this time. Please contact me at (509) 329-3451 or by email at [yifu461@ecy.wa.gov](mailto:yifu461@ecy.wa.gov) if you have any questions.

Sincerely,

Ying Fu  
Water Resources Program

cc: Brenda Smits, DOH  
Scott Turner, DOE/CRO





STATE OF WASHINGTON  
DEPARTMENT OF HEALTH  
EASTERN DRINKING WATER REGIONAL OPERATIONS  
16201 E Indiana Avenue, Suite 1500, Spokane Valley, Washington 99216-2830  
TDD Relay 1-800-833-6384

December 4, 2018

Jake Youngren, Public Works Director  
City of Chelan  
50 Chelan Falls Rd  
Chelan, WA 98816

Subject: Chelan Water Dept., City of; PWS ID #12300; Chelan County  
Water System Plan; Submittal #18-0901; DOH Comments

Dear Mr. Youngren:

Thank you for providing the draft Water System Plan (WSP) for the City of Chelan received in this office on September 4, 2018. The following comments will need to be addressed before the Department of Health (DOH) can approve the document:

**Chapter 2**

- 1) Water Use Discrepancies, pages 2-3 and 2-4. On page E-3, Table E-2, the years 2013 and 2014 reported 51,476,063 and 85,138,595 gallons of water consumed in excess of water produced.
  - a. Please verify that the city records/documents the amount of water used for annual hydrant flushing, and provide these values for the years 2011 through 2017.
  - b. Identify when the City implemented a metering policy for water used for fire activities.
  - c. Did the city use its estimated low flow estimates of 10,000 gallons per hour to adjust the annual production estimates? If so, identify the values used for the years 2011 through 2017. If not, explain how the DSL calculated for years 2011 through 2017 are effective estimates if low flow values (estimated at 10,000 gallons per hour) have not been included in water production values.
  - d. Identify any 'large water main breaks' that occurred during the years 2011 through 2017, including the dates, estimated water lost (gallons), how it was calculated, and any written policy the city may have regarding what is included in calculating distribution system losses. Explain why these distribution system losses should not be included in the distribution system loss calculation.
  - e. Describe how the city estimates consumption based on production records for water consumed in November, December, and January. How does the city account for the flow meter inaccuracies of as much as 50% during this period?
  - f. Provide information to support the percentages identified in the second to last paragraph on page 2-4.
  - g. Provide any reductions or additions that were made to the metered annual production and metered annual consumption for the years 2011 through 2017. (e.g. were the known discrepancies in metered production values during low flow periods accounted for?, etc.).
- 2) Average Day Production, page 2-4. To be conservative, the City used 2016 and 2017 average day production values to project future demands. Did the city adjust production values during winter months for 2016 and 2017 when the flow meter readings are less accurate? If so, please identify how

the values were adjusted. If not, how are the 2016 and 2017 values conservative if the measured production values are knowingly up to 50% inaccurate? Aside from positive DSL values for 2015 through 2017, what is different in how production and consumption was measured during these years that makes them accurate and more conservative?

- 3) Tables 2-2 and 2-3. Verify values of 'Service Area Population' and 'Average Day Production' for consistency between these two tables.
- 4) Page 2-9. Please explain how the full-time resident definition of recorded water use for at least 6 of the 7 meter readings in a given year aligns with the full-time residence criteria on page 47 of the Water System Design Manual which states:  
A full-time residence is any single-family dwelling unit that meets two criteria:
  - It houses one or more persons on a regular daily basis for 180 or more days each year.
  - Its occupants regularly use water for indoor use and outdoor irrigation in a manner typical of a single-family household in a residential setting.
- 5) Please provide support for using part-time single family residential as a separate classification for current ERU calculations (e.g. Table 2-8) but including with full time single family residential connections for projected ERU's (Table 2-11).
- 6) Distribution System Leakage, Page 2-11.
  - a. Identify any adjustments to the values provided in table 2-7 for accuracy issues identified on page 2-4 (source meter inaccuracies during low flow periods; large water main breaks, etc.)
  - b. Aside from the DSL for 2015-2017 having a positive value, are there additional reasons these values would have a greater accuracy than the values given for the years 2011 through 2014?
- 7) The service area population values in Tables 2-2 and 2-6 do not match. Please verify and adjust as needed.

### Chapter 3

- 8) Page 3-28: Where the capacity of a zone is limited (such as the South Chelan zone, limited by standby storage) please discuss any administrative controls the City has in place to limit growth in the zone.
- 9) Page 3-34, Worksheet 6-1: The purpose of this worksheet is to identify the current capacity-limiting factor for the water system, and express how many additional ERUs the water system can serve based on that limiting factor. To me, it looks like the treatment capacity of 5268 ERUs is currently the limiting factor, which would result in a capacity for growth of  $5268 - 3312 = 1956$  ERUs. Please update this worksheet in the plan.
- 10) Page 3-30, System Deficiencies: Many of the items listed in this section are fire flow deficits. Please describe how the City water department coordinates with the fire department on this issue.

### Chapter 4 – Water Use Efficiency Requirements

- 11) Water Use Efficiency Goals, Page 4-3. The WUE goals identified in the draft WSP were adopted on November 24, 2009. Water use efficiency goals are required to be evaluated and reestablished as part of updating a water system plan. Please follow the goal setting requirements found in WAC 246-290-830(4) to evaluate and reestablish WUE goals.
- 12) Page 4-5. Regarding subtracting estimated leakage out prior to calculating DSL. Please explain how this allows an accurate calculation of DSL, also see comment #1(d) above.
- 13) A minimum number of supply-side WUE measures that support supply-side goals to reduce leaks are required (WAC 246-290-810(4)(d)(ii)), six measures are required for 2,500-9,999 service connections. Required mandatory measures such as annual education of customers about using water efficiently do not count toward this minimum number of measures. Evaluating a rate structure to increase water demand efficiency and evaluating reclaimed water opportunities do count. Please identify clearly

identify in the WSP where these measures are found. See the DOH WUE Guidebook, section 5.7, for further information.

- 14) Estimation of the water saved through implementation of the WUE program were not found in the WSP. Please include or identify where this information is located in the submitted plan.

#### **Chapter 6**

- 15) Page 6-9. Update the table to remove Mike Wilson, and replace with the general DOH-ODW phone number of 509-329-2100.
- 16) Table 6-13, page 6-17. Is non-revenue water not currently tracked? How does this align with the information included on page 2-3 and 2-4 (e.g. estimation of water used to flush hydrants and water lost from large water main breaks estimated and removed from WUE records)?
- 17) Deficiencies, page 6-18. On pages 2-11 & 2-4, the city identified inaccuracies in production meter readings during low flows and plans to replace with a compound meter capable of registering low flows from the water treatment plant. You may consider adding the production meter to the list of deficiencies.

#### **Chapter 9**

- 18) Provide a balanced operational budget for the desired plan approval period (6-10 years). Include capital, operational, and emergency reserves.

#### **Other**

- 19) Provide information for Appendix K.
- 20) The water system must meet the consumer input process outlined in WAC 246-290-100(8). Please include documentation of a consumer meeting discussing the Water System Plan prior to its approval, include notification and signed minutes.
- 21) Documentation that the SEPA process was completed was not located in the WSP. Please provide or identify location in plan.
- 22) Completed Local Government Consistency form(s) were not located in the WSP. Please provide or identify location in plan.
- 23) The notice to adjacent utilities that the WSP is available for review and comments was not located in the WSP. Please provide or identify location in plan.
- 24) When DOH is ready to approve the document we will notify you. At that time the governing body will need to officially approve the Water System Plan and send DOH documentation of plan approval by the governing body, such as a copy of the signed meeting minutes or a copy of the signed resolution. When the documentation is received we will send a letter documenting DOH approval.
- 25) Please consider adding colored pages or tabs to help identify and separate chapters and appendices.
- 26) The Department of Ecology has issued a comment letter regarding this submittal. A copy of the review letter dated September 17, 2018, from the Department of Ecology is enclosed. Please address the issues, if any, contained in the letter in the second draft submittal.

#### **END OF COMMENTS**

The department's review of your water system plan does not confer or guarantee any right to a specific quantity of water. Our review is based on your representation of available water quantity. If the Washington Department of Ecology, a local planning agency, or other authority responsible for determining water rights and water system adequacy determines that you have use of less water than you represent, the number of approved connections may be reduced commensurate with the actual amount of water and your legal right to use it.

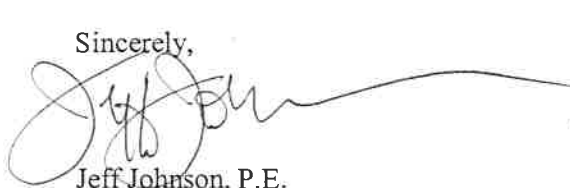
Jake Youngren  
December 4, 2018  
Page 4

We hope that you have found these comments to be clear, constructive, and helpful in the development of your final WSP. We ask that you submit **two copies** of the revised WSP **on or before March 4, 2019**. In order to expedite the review of your revised submittal, please complete the enclosed DOH Comment Response Form summarizing how each of the above comments was addressed in the revised WSP and where each response is located (i.e., page numbers, Appendices, etc.). If you would like this Comments Response Form in Word format, please contact Brenda Smits.

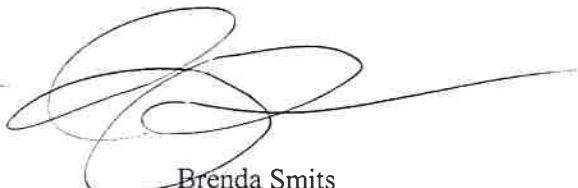
Regulations establishing a schedule for fees for review of planning, engineering, and construction documents have been adopted (WAC 246-290-990). Please note that we have included an invoice for **\$3,705.00** for the review of the Water System Plan. This fee covers our cost for review of the initial submittal, plus the review of one revised document. Please remit your complete payment in the form of a check or money order within thirty days of the date of this letter to: DOH, Revenue Section, P.O. Box 1099, Olympia, WA 98507-1099.

Thank you again for submitting your draft Water System Plan for our review. If you have any comments or questions concerning our review please contact either Jeff Johnson at (509) 329-2110, Jeff.Johnson@doh.wa.gov, or Brenda Smits at (509) 329-2122, Brenda.Smits@doh.wa.gov.

Sincerely,



Jeff Johnson, P.E.  
Regional Engineer  
Office of Drinking Water  
Division of Environmental Public Health



Brenda Smits  
Regional Planner  
Office of Drinking Water  
Division of Environmental Public Health

Enclosures: Invoice  
Comment Response Form  
Department of Ecology correspondence

cc: Chelan-Douglas Health District  
Chelan County Planning Department  
Adam J. Miller, PE, Gray & Osborne, Inc.  
Ying Fu, Department of Ecology, Eastern Regional Office  
Nathan Ikehara, EIT, DOH Regional Engineer  
Scott Mallery, PE, DOH Assistant Regional Manager  
George Simon, DOH Compliance Program Manager

## **DOH COMMENT RESPONSE FORM – 2<sup>nd</sup> draft WSP**

City of Chelan Water Dept.; PWS ID 12300; re: submittal #18-0901

DOH Comment No.	DOH Comment	Water System Response	Page No. of Response	Other Comments
1	Figure 5-1 identifies a 'Service Area' and 'Future Service Area'. 'Future Service Area' identification is required for water systems in Critical Water Supply Service Areas. You're welcome to identify this area on your map for your own purposes, keeping in mind that the 'Service Area' includes areas that a water system currently serves and areas where future water service is planned. The 'Service Area' also identifies the water right place of use. Please identify and include the Retail Service Area on the service area map. Refer to DOH publication 331-432 for more information.	The City's 'City limits' is consistent with its 'Retail Service Area'. The Figure has been updated accordingly.	Figure 1-5	
2	Regarding adjustment of water use records by 10,000 gph 'flow-by factor'. <ul style="list-style-type: none"> <li>a) Provide supporting documentation with narrative for the use of a 10,000 gph 'flow-by factor' to adjust production totals (i.e. explain how the seasonal difference in accuracy, ~99% in summer and ~50% in winter, is accounted for with an overall gallon per hour adjustment factor).</li> <li>b) Provide two data sets: one with actual measured values for production and consumption; and one with adjusted values using 'flow-by factor'.</li> <li>c) WUE annual reports will need to be updated to align with values that are identified and supported in the WSP.</li> </ul>	Additional narrative has been provided. The term 'Leak-by' has been changed to 'Flow-by' to distinguish between unaccounted for usage and leakage. The flow-by factor accounts for the differences in accuracy between seasons. Tables 2-2 and 2-7 have been updated to show the difference the flow-by factor makes. Additional footnotes have been added to tables to reference the flow-by factor. Updated WUE reports will be filed by the City.	2-3 2-4 2-7 2-12	
3	Table 2-2 and 2-7. These tables include a 10,000 gph 'flow-by factor' or 'flow meter leak-by'. Include an additional table (or column) that shows annual production and DSL values prior to any changes being made (e.g. actual recorded values for production) as stated previously in comment 2)b.	Added columns to Tables 2-2 and 2-7 to show the difference between the recorded production volumes and production volumes including the flow-by factor and the effect it has on DSL.	2-4 2-12	
4	Table 2-7 and last paragraph, page 2-11. DSL is calculated as a 3-year average, excluding negative values. DSL does not require calculation of a 'future leakage rate'. The 3-year average DSL for 2017 is 10.5% $((12.8+0+18.6)/3)$ . The value shown of 8.9% includes the 2016 negative DSL value. Please update the last paragraph as needed.	Negative numbers have been excluded from the 3-year DSL average percentage calculation and Table 2-7 has been updated accordingly.	2-12 2-13	

<b>5</b>	Page 2-4 and 2-11 regarding water main breaks. The draft WSP includes this statement on page 2-11: "the large leak values as discussed earlier have been removed from the DSL value as these leaks do not represent a consistent leakage in the distribution system." All water that is not authorized consumption is considered DSL, including water main breaks. Please refer to the WUE Guide, chapter 6, as needed. Recalculate DSL without removing 'large leak values' and update table 2-7 and other tables as needed.	Water Main breaks have been removed from the DSL calculation. Therefore, DSL represents a larger portion of the City's ERU total (i.e. ERUs from DSL = 293 vs 282 without Large Water Main Breaks). Subsequent calculations and tables in the Plan have been updated to this effect.	2-3 2-4 2-12	
<b>6</b>	Page 4-3. As a note - the identified supply side goal of maintaining DSL below 10% for the next 6-years is a requirement for Municipal Water Suppliers to comply with the DSL standard of 10% or less (3-year average).			
<b>7</b>	Page 4-5. The two demand-side measures in table 4-3 are identified for (3) customer classes not 5 as stated in the first paragraph of the page. Please update as needed.	Table 4-3 has been updated to remove ambiguity regarding footnote.	4-4	
<b>8</b>	Appendix C. Provide an updated Water Quality Monitoring Schedule.	An updated Water Quality Report has been added.	Appendix C	
<b>9</b>	Appendix K. The water rate study report is for the period of 2019 through 2028, as a reminder, the WSP approval period will be for the shortest period for which projections are provided.			
<b>10</b>	Appendix L. Provide a signed SEPA checklist (page 23 of 25).	The signed SEPA checklist has been added.	Appendix L	
<b>11</b>	Appendix M. Provide signed meeting minutes for the WSP adoption meeting on May 28, 2019.	Signed meeting minutes for the WSP adoption meeting on May 28, 2019 have been added.	Appendix M	
<b>12</b>	The April 23, 2019 meeting minutes adopting WUE goals were not located in the draft WSP, please include.	The April 23, 2019 meeting minutes adopting WUE goals have been added.	Appendix O	

### **DOH COMMENT RESPONSE FORM**

City of Chelan Water Dept.; PWS ID 12300; re: submittal #18-0901

DOH Comment No.	DOH Comment	Water System Response	Page No. of Response	Other Comments
1	<p>Water Use Discrepancies, pages 2-3 and 2-4. On page E-3, Table E-2, the years 2013 and 2014 reported 51,476,063 and 85,138,595 gallons of water consumed in excess of water produced.</p> <p>a. Please verify that the city records/documents the amount of water used for annual hydrant flushing, and provide these values for the years 2011 through 2017.</p> <p>b. Identify when the City implemented a metering policy for water used for fire activities.</p> <p>c. Did the city use its estimated low flow estimates of 10,000 gallons per hour to adjust the annual production estimates? If so, identify the values used for the years 2011 through 2017. If not, explain how the DSL calculated for years 2011 through 2017 are effective estimates if low flow values (estimated at 10,000 gallons per hour) have not been included in water production values.</p> <p>d. Identify any 'large water main breaks' that occurred during the years 2011 through 2017, including the dates, estimated water lost (gallons), how it was calculated, and any written policy the city may have regarding what is included in calculating distribution system losses. Explain why these distribution system losses should not be included in the distribution system loss calculation.</p> <p>e. Describe how the city estimates consumption based on production records for water consumed in November, December, and January. How does the city account for the flow meter inaccuracies of as much as 50% during this period?</p> <p>f. Provide information to support the percentages identified in the second to last paragraph on page 2-4.</p> <p>g. Provide any reductions or additions that were made to the metered annual production and metered annual consumption for the years 2011 through 2017. (e.g. were the known discrepancies in metered production values during low flow periods accounted for?, etc.).</p>	<p>a. The City does not record/document water used in Flushing of hydrants, this section has been revised. The Fire Department flushes the City's hydrants and records the flow emitted. The City may be able to estimate flushing volumes in the future with this information if timing of the flushing is recorded/provided for each flush. If hydrant flushing is continued to be untallied, the DSL will appear larger than actual.</p> <p>b. The City implemented the metering policy in 2011.</p> <p>c. The City did not use the finished water flow-by factor of 10,000 gph to adjust their water use records. The value is only used in the analysis of this Plan. This estimate has been included to assist in calculating DSL.</p> <p>d. Large water main breaks have been included on page 2-4 and were incorporated into the DSL calculation. The City does not have a formal policy for calculating distribution system leakage. The estimation of volume and calculation for each leakage volume were added to the Plan. Large water main breaks do not represent a constant leakage in the system when they are fixed and as such should not be counted in distribution system leakage.</p> <p>e. More details on how the City estimates winter water consumption were added to the Plan. The City pro-rates the winter consumption for billing based on production and makes up for it in the spring when meters are read again. The City does not account for leak-by at the finished water meter in their billing at this time. Once the finished water meter is replaced, the</p>	<p>a. 2-3</p> <p>b. 2-3</p> <p>c. 2-4</p> <p>d. 2-4</p> <p>e. 2-5</p>	



		<p>estimate for winter consumption will be more accurate.</p> <p>f. These percentages were estimates from City staff and have been removed.</p> <p>g. The known discrepancies were not included in Production or Consumption records or reports from the City.</p>	<p>f. 2-5</p> <p>g. 2-5</p>	
<b>2</b>	<p>Average Day Production, page 2-4. To be conservative, the City used 2016 and 2017 average day production values to project future demands. Did the city adjust production values during winter months for 2016 and 2017 when the flow meter readings are less accurate? If so, please identify how the values were adjusted. If not, how are the 2016 and 2017 values conservative if the measured production values are knowingly up to 50% inaccurate? Aside from positive DSL values for 2015 through 2017, what is different in how production and consumption was measured during these years that makes them accurate and more conservative?</p>	<p>The leak-by factor has been added into the Production data. There is no difference in how the 2016-2017 years are measured compared to other years. This statement was removed from the Plan. The 2011 through 2017 data is utilized through the Plan and this statement was removed from the Plan</p>	2-5	
<b>3</b>	<p>Tables 2-2 and 2-3. Verify values of 'Service Area Population' and 'Average Day Production' for consistency between these two tables.</p>	<p>The inconsistency was resolved and the two tables agree.</p>	2-8	
<b>4</b>	<p>Page 2-9. Please explain how the full-time resident definition of recorded water use for at least 6 of the 7 meter readings in a given year aligns with the full-time residence criteria on page 47 of the Water System Design Manual which states:</p> <p>A full-time residence is any single-family dwelling unit that meets two criteria:</p> <ul style="list-style-type: none"> <li>- It houses one or more persons on a regular daily basis for 180 or more days each year.</li> <li>- Its occupants regularly use water for indoor use and outdoor irrigation in a manner typical of a single-family household in a residential setting.</li> </ul>	<p>The methodology was revised consistent with WSDM criteria/</p> <p>"A full-time residence is any single-family dwelling unit that meets two criteria:</p> <ul style="list-style-type: none"> <li>• It houses one or more persons on a regular daily basis for 180 or more days each year.</li> <li>• Its occupants regularly use water for indoor use and outdoor irrigation in a manner typical of a single-family household in a residential setting." <p>Each single-family residence's consumption record was divided by an assumed "regular use" of 350 gpd to provide an estimated total days of residence. Residences that exceed 180 days of calculated occupancy were considered to be full time.</p> <p>Tables throughout the Plan have been updated with the updated numbers.</p> </li></ul>	2-9	

<b>5</b>	Please provide support for using part-time single family residential as a separate classification for current ERU calculations (e.g. Table 2-8) but including with full time single family residential connections for projected ERU's (Table 2-11).	Support for using part-time single-family residential as a separate classification due to the high amount of vacation homes was added to the Plan. Knowing the usage for actual full-time populations provides better information for calculating the ERU. Assuming part-time users are full-time in the future is more conservative since they add more consumption to the system.	2-9	
<b>6</b>	Distribution System Leakage, Page 2-11. a. Identify any adjustments to the values provided in table 2-7 for accuracy issues identified on page 2-4 (source meter inaccuracies during low flow periods; large water main breaks, etc.) b. Aside from the DSL for 2015-2017 having a positive value, are there additional reasons these values would have a greater accuracy than the values given for the years 2011 through 2014?	a. The finished water meter leak-by factor has been included in the analysis. Additionally, the large water line breaks have been factored into the DSL calculation. b. This statement regarding the years to be included in the DSL calculation has been revised. With new DSL values, positive years since 2011 will be utilized for future calculations utilizing DSL.	2-11 through 2-12	
<b>7</b>	The service area population values in Tables 2-2 and 2-6 don't match. Please verify and adjust as needed.	This inconsistency was resolved and the tables agree.	2-10	
<b>8</b>	Page 3-28: Where the capacity of a zone is limited (such as the South Chelan zone, limited by standby storage) please discuss any administrative controls the City has in place to limit growth in the zone.	The City reviews any proposed developments within the City. If capacity in a zone is limited, an approval is not provided until a remedy to the deficit is put in place. The policy regarding development in Chelan was added to Table 1-9. A statement about this policy was added to the 'Potential Development Analysis' section of the Plan.	1-20 3-29	
<b>9</b>	Page 3-34, Worksheet 6-1: The purpose of this worksheet is to identify the current capacity-limiting factor for the water system, and express how many additional ERUs the water system can serve based on that limiting factor. To me, it looks like the treatment capacity of 5268 ERUs is currently the limiting factor, which would result in a capacity for growth of $5268 - 3312 = 1956$ ERUs. Please update this worksheet in the plan.	Worksheet 6-1 was updated to reflect comments.	3-35	
<b>10</b>	Page 3-30, System Deficiencies: Many of the items listed in this section are fire flow deficits. Please describe how the City water department coordinates with the fire department on this issue.	The Fire District coordinates fire flow results with the City. Inactive Hydrants are labeled by the City and hydrant capacity is painted on the bonnet by the Fire District. A statement was added to this effect.	3-31	

<b>11</b>	Water Use Efficiency Goals, Page 4-3. The WUE goals identified in the draft WSP were adopted on November 24, 2009. Water use efficiency goals are required to be evaluated and reestablished as part of updating a water system plan. Please follow the goal setting requirements found in WAC 246-290-830(4) to evaluate and reestablish WUE goals.	The City's Goals and Measures are listed in the WSP. The City is following WAC requirements to evaluate and reestablish Goals and Measures and a public meeting to discuss the proposed items was held on March 26, 2019.	4-3	
<b>12</b>	Page 4-5. Regarding subtracting estimated leakage out prior to calculating DSL. Please explain how this allows an accurate calculation of DSL, also see comment #1(d) above.	Large leak events that are repaired promptly do not represent leakage experienced in the distribution system as a whole. When these leaks are repaired, their volumes should be removed from the DSL calculation.	2-12	
<b>13</b>	A minimum number of supply-side WUE measures that support supply-side goals to reduce leaks are required (WAC 246-290-810(4)(d)(ii), six measures are required for 2,500-9,999 service connections. Required mandatory measures such as annual education of customers about using water efficiently do not count toward this minimum number of measures. Evaluating a rate structure to increase water demand efficiency and evaluating reclaimed water opportunities do count. Please identify clearly identify in the WSP where these measures are found. See the DOH WUE Guidebook, section 5.7, for further information.	Demand-Side WUE measures can be found in Table 4-3.	4-4	
<b>14</b>	Estimation of the water saved through implementation of the WUE program were not found in the WSP. Please include or identify where this information is located in the submitted plan.	Estimation of Annual Water savings has been added in Table 4-3.	4-4	
<b>15</b>	Page 6-9. Update the table to remove Mike Wilson, and replace with the general DOH-ODW phone number of 509-329-2100.	This table has been updated per comments.	6-9	
<b>16</b>	Table 6-13, page 6-17. Is non-revenue water not currently tracked? How does this align with the information included on page 2-3 and 2-4 (e.g. estimation of water used to flush hydrants and water lost from large water main breaks estimated and removed from WUE records)?	This table has been updated to reflect the City's practice for Non-Revenue Water record keeping.	6-18	
<b>17</b>	Deficiencies, page 6-18. On pages 2-11 & 2-4, the city identified inaccuracies in production meter readings during low flows and plans to replace with a compound meter capable of registering low flows from the water treatment plant. You may consider adding the production meter to the list of deficiencies.	A statement about the City's production meter replacement has been added to this section.	6-18	
<b>18</b>	Provide a balanced operational budget for the desired plan approval period (6-10 years). Include capital, operational, and emergency reserves.	The City's Rate Study including operational budget is included in Appendix K.	Appendix K	
<b>19</b>	Provide information for Appendix K.	This has been added.	Appendix K	

<b>20</b>	The water system must meet the consumer input process outlined in WAC 246-290-100(8). Please include documentation of a consumer meeting discussing the Water System Plan prior to its approval, include notification and signed minutes.	The City held a public meeting on March 26, 2019. No comments were received. Signed Meeting Minutes included in Appendix O.	Appendix O	
<b>21</b>	Documentation that the SEPA process was completed was not located in the WSP. Please provide or identify location in plan.	The SEPA and DNS are included in Appendix L.	Appendix L	
<b>22</b>	Completed Local Government Consistency form(s) were not located in the WSP. Please provide or identify location in plan.	The completed Local Government Consistency forms are included in Appendix M	Appendix M	
<b>23</b>	The notice to adjacent utilities that the WSP is available for review and comments was not located in the WSP. Please provide or identify location in plan.	Nearby utilities were notified and comment, if any, will be received at the March 12, 2019 council meeting. The notification correspondence was added as Appendix N.	Appendix N	
<b>24</b>	When DOH is ready to approve the document we will notify you. At that time the governing body will need to officially approve the Water System Plan and send DOH documentation of plan approval by the governing body, such as a copy of the signed meeting minutes or a copy of the signed resolution. When the documentation is received we will send a letter documenting DOH approval.	The Plan was approved at City Council on March 26, 2019. The Council meeting minutes are included in Appendix O.	Appendix O	
<b>25</b>	Please consider adding colored pages or tabs to help identify and separate chapters and appendices.	Tabs have been added to Chapters/Appendices.		
<b>26</b>	The Department of Ecology has issued a comment letter regarding this submittal. A copy of the review letter dated September 17, 2018, from the Department of Ecology is enclosed. Please address the issues, if any, contained in the letter in the second draft submittal.	No issues noted in Department of Ecology comment letter.		



## Water System Plan Submittal Form

This form must be completed and submitted along with the Water System Plan (WSP). It will expedite review and approval of your WSP. **All water systems should contact their regional planner before developing any planning document for submittal.**

City of Chelan Water Department	12300J	City of Chelan Water Department
1. Water System Name	PWS ID# or Owner ID#	Water Systems Owner's Name
Troy Brooks	(509) 682-8032	Water Treatment Plant Operator
Contact Name for Utility	Phone Number	Title
50 Chelan Falls Road	Chelan	WA, 98816
Contact Address	City	State Zip
Adam Miller, P.E.	(509) 853-2460	Principal-in-Charge
2. Project Engineer	Phone Number	Title
11 Spokane Street, Suite 207	Wenatchee	WA, 98801
Project Engineer Address	City	State Zip
Jake Youngren	(509) 682-8030	
3. Billing Contact Name (required if not the same as #1)	Billing Phone Number	Billing Fax Number
50 Chelan Falls Road	Chelan	WA, 98816
Billing Address	City	State Zip

4. How many services are presently connected to your system? 2638

5. Is your system expanding (*circle what applies*: seeking to extend service area or increase number of approved connections)? ☐ Yes ☒ No

6. If the number of services is expected to increase, how many *new* connections are proposed in the next six years? \_\_\_\_\_

7. If your system is private-for-profit, is it regulated by the State Utilities and Transportation Commission? ☐ Yes ☐ No

8. Is the system located in a Critical Water Supply Service Area (i.e., have a Coordinated Water System Plan)? ☐ Yes ☒ No

9. Is your system a customer of a wholesale water system? ☐ Yes ☒ No

10. Will your system be pursuing additional water rights from the Department of Ecology in the next 20 years? ☒ Yes ☐ No

11. Is your system proposing a new intertie? ☐ Yes ☒ No

12. Do you have projects currently under review by us? ☐ Yes ☒ No

13. Are you requesting distribution main project report and construction document submittal exception and if so, does the WSP contain standard construction specifications for distribution mains? ☒ Yes ☐ No

14. The water system is responsible for sending a copy of the WSP to adjacent utilities for review or a letter notifying them that a copy of the WSP is available for their review and where the review copy is located. Has this been completed? ☐ Yes ☒ No

15. The purveyor is responsible for sending a copy of the WSP to all local governments within the service area (county and city planning departments, etc.). Has this been completed? ☐ Yes ☒ No

16. Are you proposing a change in the place of use of your water right? ☐ Yes ☒ No

17. What is the last year of the plan approval period (the year the shortest WSP projection is made)? 2028

If answer to questions 7,8, 11, 14 and/or 15 is "yes," list who you sent the WSP to: \_\_\_\_\_

Is this plan: ☒ an Initial Submittal ☐ a Revised Submittal

Please enclose the following number of copies of the WSP:

**3** copies for Northwest and Southwest Regional Offices **OR 2** copies for Eastern Regional Office (We will send one copy to Ecology)

**1** additional copy if you answered "yes" to question 7.

**2** Total copies attached

**Please return completed form to the Office of Drinking Water regional office checked below.**

☐ Northwest Drinking Water Operations  
Department of Health  
20425 72<sup>nd</sup> Avenue South, Suite 310  
Kent, WA 98032-2358  
253-395-6750

☐ Southwest Drinking Water Operations  
Department of Health  
PO Box 47823  
Olympia, WA 98504-7823  
360-236-3030

☒ Eastern Drinking Water Operations  
Department of Health  
16201 East Indiana Avenue Suite 1500  
Spokane Valley, WA 99216  
509-329-2100

For people with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TDD/TTY call 711).

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## EXECUTIVE SUMMARY

The 2018 City of Chelan Water System Plan (Plan) provides a long-term planning strategy for the City's water department over 10-year and 20-year planning periods. The objectives of this Plan are to evaluate the performance and adequacy of the existing City of Chelan water system, to determine what will be necessary to meet the infrastructure demands for the next twenty years, and to identify the compliance issues that may affect operation of the water system. In addition, the Plan incorporates the elements of the Municipal Water Supply – Efficiency Requirements Act, Chapter 5 Laws of 2003 and the Water Use Efficiency Rule (WUE Rule), which was adopted in January 2007. The Plan was prepared in accordance with the Washington State Department of Health (DOH) requirements specified in Washington Administrative Code (WAC) 246-290 and was adopted at the May 28, 2019 City Council meeting, contingent on DOH approval.

The following elements are addressed in this Plan:

- Chapter 1: Water system history, inventory of facilities, policies and the relationship of this plan to other planning documents.
- Chapter 2: Basic planning data including existing and future estimates of population, water production, and water consumption.
- Chapter 3: Identification of system performance standards, and facility analyses of source capacity, water rights, storage capacity, booster pumping stations, treatment and distribution. Overview of water quality standards, monitoring results, and a schedule of future monitoring requirements. Analysis of distribution system hydraulic capacity to meet existing and future peak hour demand and fire flow demand.
- Chapter 4: Water Use Efficiency Program. Discussion of existing and future water conservation measures.
- Chapter 5: Watershed Control Program description and management plan.
- Chapter 6: The Operation and Maintenance section contains an analysis of existing operation and maintenance procedures, cross connection control program, coliform monitoring plan, and recommendations for improvements to the operation and maintenance of the water system.
- Chapter 7: Distribution facilities design and construction standards.
- Chapter 8: Discussion of proposed capital improvements to address system deficiencies and a 6- and 20-year financial plan for improvements

identified in Chapter 8 along with identification of potential funding mechanisms.

- Chapter 9: Discussion of past, current, and on-going efforts to establish and modernize the City of Chelan's water rates.
- Appendices: Additional required planning elements, including: water rights, construction standards, water quality monitoring documents, power outage information, modelling data, preliminary cost estimates, watershed plan, operator certifications, cross-connection control documents, the unsatisfactory routine coliform sample procedure, Rate Structure analysis by FCS Group, SEPA documentation, governmental consistency statements, notifications to local utilities and public meeting documentation.

The City of Chelan relies on Lake Chelan for 100 percent of their water supply and the raw water they supply to the Isenhart Irrigation District. The raw source water is filtered, and disinfected. The City's water rights are shown in Table E-1.

**TABLE E-1**

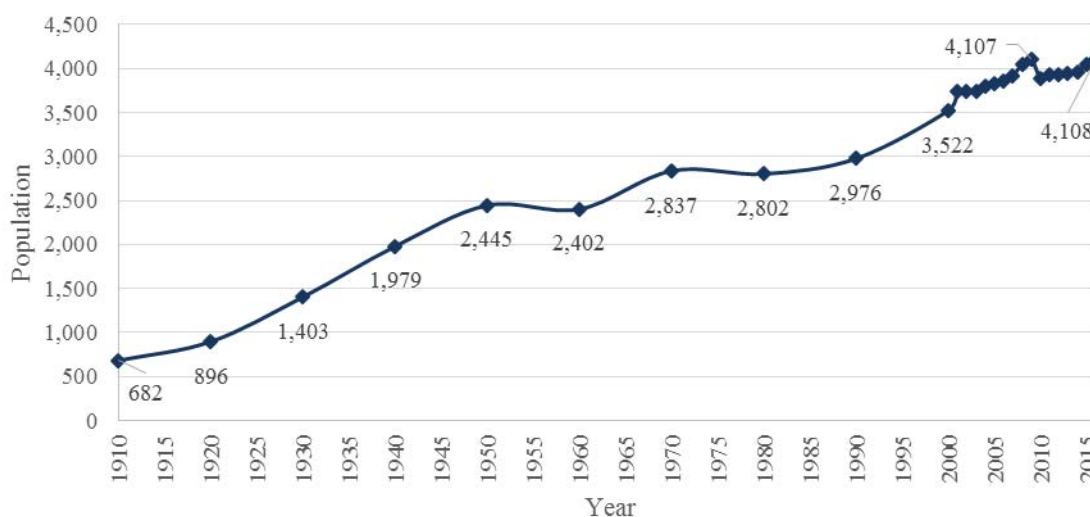
**City of Chelan Water Rights**

<b>Control Number</b>	<b>Priority Date</b>	<b>Instantaneous Withdrawal (gpm)</b>	<b>Annual Withdrawal (ac-ft/yr)</b>
CSWC4018	7/30/1948	898	896
CSWC10891	2/3/1967	799	896
S4-30166	2/8/1990	799	1,290
S4-30167	2/8/1990	1,992	3,214
<b>Total</b>		<b>4,488</b>	<b>4,283<sup>(1)</sup></b>

(1) Per the most recent water rights decisions by Ecology, the instantaneous withdrawal from the City's four water rights are additive, but the annual withdrawal is only partially additive, and limited to a total of 4,283 ac-ft/yr for the four rights.

The water system has fourteen reservoirs with a combined storage capacity of 3,390,000 gallons.

The water system serves residents both inside and outside of the City limits. The estimated population served by the City in 2017 was 4,108 persons. Figure E-1 shows the historical population of the City of Chelan.

**FIGURE E-1****City of Chelan Historical Population**

Distribution System Leakage (DSL) is defined as the difference between metered production and metered consumption. The City has had issues with their production metering which has caused errors in their production water quantities, at times producing negative system leakage numbers. The City has been able to estimate the error by use of a flow-by factor (10,000 gph) in production metering assisting in quantifying DSL. The City's DSL since 2011 is shown in Table E-2.

**TABLE E-2****2011-2017 Distribution System Leakage (DSL)**

Year	Annual Production <sup>(1)</sup> (gal)	Annual Consumption <sup>(1)</sup> (gal)	DSL <sup>(2)</sup> (gal)	DSL <sup>(3)</sup> (%)	3-Year Average (%)
2011	510,390,000	427,287,000	83,103,000	16.3%	
2012	498,280,000	475,691,000	22,589,000	4.5%	11.8%
2013	493,140,000	457,214,000	35,926,000	7.3%	9.4%
2014	492,567,000	490,496,000	2,071,000	0.4%	4.1%
2015	522,601,000	450,755,000	71,846,000	13.7%	7.2%
2016	488,410,000	508,727,000	-20,317,000	-4.2%	7.1%
2017	569,317,000	455,777,000	113,540,000	19.9%	16.8%

(1) Annual Production and Consumption from City's records. See Tables 2-2 and 2-4. Production volumes include the 10,000 gph flow-by factor.

(2)  $DSL = (Annual\ Production) - (Annual\ Consumption)$ .

(3) Percent of Total Production =  $(DSL\ in\ gallons) / (Annual\ Production)$ .

3-Year Average only for DSL values with flow-by factor and negative DSL is calculated at 0%. 3-Year Average for 2011 and 2012 includes an estimated DSL of 14.5% in 2010 (Recorded 2010 Production =

423,196,000 gallons, 2010 with estimated Flow-by = 510,796,000 gallons, Recorded 2010 Consumption = 436,686,000 gallons)

Future population is expected to increase at a rate of 1.245% per year.

Currently, water use by the City of Chelan water system is estimated to be 512 gallons per day per Equivalent Residential Unit (ERU) for an estimated 2,872 ERUs. The current average maximum day production is estimated at 1,840 gallons per minute, and the peak hour demand is estimated at 3,690 gallons per minute. The twenty year projections for maximum day production and peak hour demand is anticipated to be 2,910 gallons per minute, and 5,820 gallons per minute, respectively. Table E-3 summarizes the City's projected water demands.

**TABLE E-3**  
**Project Water System Demands**

Year	Service Area Population	ERUs <sup>(1)</sup>	Projected Average Day Production <sup>(2)</sup>		Projected Max Day Production <sup>(3)</sup>		Projected PHD <sup>(4)</sup>
			gpd	ac-ft/yr	gpd	gpm	gpm
2018	4,211	3,487	1,786,800	2,001	3,389,600	2,350	4,700
2019	4,263	3,523	1,805,400	2,022	3,424,900	2,380	4,760
2020	4,316	3,560	1,824,200	2,043	3,460,600	2,400	4,800
2021	4,370	3,597	1,843,200	2,065	3,496,600	2,430	4,860
2022	4,424	3,635	1,862,500	2,086	3,533,200	2,450	4,900
2023	4,479	3,673	1,882,000	2,108	3,570,200	2,480	4,960
2024	4,535	3,711	1,901,800	2,130	3,607,800	2,510	5,020
2028	4,765	3,870	1,983,200	2,221	3,762,200	2,610	5,220
2038	5,392	4,304	2,205,500	2,470	4,183,900	2,910	5,820

- (1) From Table 2-10. Part-time single family residential connections assumed to be full-time.  
 (2) Average Daily Production = ERUs \* 512 gpd/ERU. See Table 2-8 for calculation of ERUs. The average of Average day production values for 2016 through 2017 was used to project forward.  
 (3) Maximum day production is equal to Average day production multiplied by the Maximum day production to Average day production ratio of 1.9  
 (4) PHD is equal to Maximum day production multiplied by the PHD to Maximum day production ratio of 2.0.

There is interest to develop within the City of Chelan. These developments increase demand on top of the anticipated growth within the City. With potential development in the City the twenty year projection for maximum day production and peak hour demand could be as high as 4,590 gallons per minute, and 9,180 gallons per minute, respectively.

The City's water rights, as summarized in Table E-1, include an instantaneous limit as well as annual withdrawal limits. The City has water rights for an instantaneous

withdrawal rate of 4,488 gallons per minute, a maximum annual withdrawal of 4,283 acre-feet per year from Lake Chelan. The City has an amount of Water Rights that are pending transfers from existing developers. Projected annual withdrawal rates are compared with water rights limits in Table E-4.

**TABLE E-4****Water Rights Adequacy**

<b>Year</b>	<b>Inst. Withdrawal Qi = 4,488 gpm</b>		<b>Annual Withdrawal <sup>(1)</sup> Qa = 4,283 ac-ft/yr</b>	
	<b>Maximum Day Production (gpm)</b>	<b>Surplus (+)/ Deficit (-) (gpm)</b>	<b>Average Day Production (ac-ft/yr)</b>	<b>Surplus (+)/ Deficit (-) (ac-ft/yr)</b>
2018	2,350	2,138	2,001	2,282
2024	2,510	1,978	2,130	2,153
2028	2,610	1,878	2,221	2,062
2038	2,910	1,578	2,470	1,813

(1) Annual Withdrawal limited by Ecology determination.

The raw water pumps at the water treatment plant have a capacity of 5,600 gallons per minute. However, the water treatment plant has a capacity of approximately 4,650 gallons per minute essentially limiting the source capacity of the City's water system. The Treatment Plant capacity is still higher than the instantaneous water rights that the City has which means the limiting source capacity of the City is their water rights.

Water system capacity limits are calculated as a function of Equivalent Residential Units (ERUs). Table E-4 summarizes the Capacity of the City of Chelan's water system in its various components.



TABLE E-5

## Water System Capacity

System Component	Capacity Available (ERUs)	Surplus (+)/ Deficit (-) (ERUs)
Source ADD (18-hour day) <sup>(2)</sup>	9,459	5,155
Source MDD (18-hour day) <sup>(2)</sup>	4,986	682
Source MDD (24-hour day) <sup>(2)</sup>	6,648	2,344
Treatment ADD (18-hour day) <sup>(3)</sup>	9,800	5,496
Treatment MDD (18-hour day) <sup>(3)</sup>	5,166	862
Treatment MDD (24-hour day) <sup>(3)</sup>	6,888	2,584
<b>Storage Capacity</b>		
Main <sup>(4)</sup>	3,444	1,627
South Chelan <sup>(5)</sup>	74	-189
Lakeside <sup>(4)</sup>	444	97
Darnell's <sup>(4)</sup>	1,453	346
Golf Course Terrace <sup>(4)</sup>	378	268
Boyd Road <sup>(4)</sup>	222	36
Washington Street <sup>(4)</sup>	475	0
<b>Total</b>	<b>6,490</b>	<b>2,185</b>
<b>Open System Booster Station Capacity <sup>(6)</sup></b>		
Farnham BPS	296	33
Lakeside BPS	444	97
Darnells BPS	1,037	-69
Higgs BPS	755	646
Boyd Rd BPS	222	36
Washington St BPS	296	-178
<b>Closed System Booster Station Capacity <sup>(7)</sup></b>		
Highland BPS	115	16
High Street BPS	30	13
Pinnacle BPS	25	4
Wilmorth BPS	31	23
<b>Water Rights</b>		
Water Rights Q <sub>i</sub> <sup>(7)</sup>	6,648	2,344
Water Rights Q <sub>a</sub> <sup>(8)</sup>	7,461	3,157

- (1) Estimated 2038 ERU requirement = 4,304 ERU (Table 2-11); and individual zone ERU requirements: Main (1,817), South Chelan (263), Lakeside (348), Darnells (1,106), Golf Course Terrace (110), Boyd Road (186), and Washington Street (475).
- (2) Based on limiting source capacity of 4,488 gpm (Water Rights)
- (3) Based on 2038 WTP capacity of 4,650 gpm.
- (4) Limiting capacity based on Eq. 9-1 WSDM, where: PHD = 2.0 \* Maximum day production; Maximum day production = 1.9 \* Average day production \* N; Average day production = 512 gpd/ERU; Q<sub>s</sub> = the source capacity per zone as shown in Table 3-9; and then solving for N.

- (5) Limiting capacity based on Eq. 9-3 WSDM, where  $ADD = 512 \text{ gpd/ERU}$ ,  $t_m = 1,440 \text{ min.}$ ,  $(Q_s - Q_L) =$  the source capacity per zone as shown in Table 3-9, and then solving for N; or a minimum of 200 gallons/ERU per WSDM whichever is less.
- (6) Limiting capacity based on Maximum Day Production,  $Q (\text{req'd}) = \text{Maximum Day Production} / 1,440$ , where:  $Q (\text{req'd}) =$  physical capacity of booster station in gpm as shown in Table 3-12,  $\text{Maximum Day Production} = 1.9 * \text{Average Day Production} * N$ ,  $\text{Average Day Production} = 512 \text{ gpd/ERU}$ , and then solving for N. Estimated 2038 ERU requirements per model: Farnham BPS (263), Lakeside BPS (348), Darnells BPS (1,106), Higgs BPS (110), Boyd Rd BPS (186), Washington St BPS (475).
- (7) Limiting capacity based on Peak Hour Demand,  $Q (\text{req'd}) = \text{Peak Hour Demand} / 1,440$ , where:  $Q (\text{req'd}) =$  physical capacity of booster station in gpm as shown in Table 3-12,  $\text{Peak Hour Demand} = 2.0 * \text{Maximum Day Production}$ ,  $\text{Maximum Day Production} = 1.9 * \text{Average Day Production} * N$ ,  $\text{Average day production} = 512 \text{ gpd/ERU}$ , and then solving for N. Estimated 2038 ERU requirements per model: Highland BPS (99), High Street BPS (17), Pinnacle BPS (21), Wilmoth BPS (8).
- (8)  $Q_i = 4,488 \text{ gpm}$ ;  $\text{Maximum day production} = 1.9 * \text{Average day production} * N$ ;  $\text{Average day production} = 512 \text{ gpd/ERU}$ .
- (9)  $Q_a = 4,283 \text{ ac-ft}$ ;  $ADD = 512 \text{ gpd/ERU}$

A hydraulic model of the City of Chelan's water supply system was created using H2O NET software. Analysis of the water distribution system's ability to meet peak hour demands and fire flow plus maximum day demands was performed. The Plan describes the hydraulic analysis and lists projects necessary to meet buildout distribution system demands. The hydraulic analysis based on the various planning horizons indicate there are hydraulic deficiencies throughout the City, mostly due to fire flow demands.

The Water Use Efficiency (WUE) Rule requires that water conservation goals must include a measurable outcome, address water supply or demand characteristics, and include an implementation schedule. Currently, the City's 3-year rolling average distribution system leakage (DSL) is above 10 percent of production. The City re-instated their water system goals and measures for the next 6 years. The City continues to promote efforts to reduce water usage and will continue to reduce water leakage throughout the City.

A Capital Improvement Schedule can be found in Table E-6 of this executive summary. General categories include: Water Treatment Improvements, Water Storage Improvements, Booster Station Improvements, Pressure Reducing Valve Station Improvements, Water Distribution System Improvements, and Future Planning efforts. The estimated cost of Capital Improvements is \$44,242,000 though the 20-year planning horizon.

**TABLE E-6****Capital Improvement Schedule <sup>(1)</sup>**

<b>No.</b>	<b>Project Title</b>	<b>Estimated Cost</b>	<b>Year</b>	<b>Financing Source</b>
<b>Water Treatment Improvements</b>				
WTP-1	Interior and Exterior Valve & Instrumentation Replacement	\$1,289,000.00	2020	City
WTP-2	Backwash Basin Cover Installation	\$310,000.00	2019	City
WTP-3	Chemical Dosing System Improvements	\$1,005,000.00	2021	City
WTP-4	Treatment System Improvements	\$14,010,000.00	2027	City
WTP-5	Generator Load Bank Study	\$40,000.00	2020	City
WTP-6	Raw Water Pump Station Improvements	\$610,000.00	2021	City
<b>Storage Improvements</b>				
S-1	Pinnacle Reservoir No. 2	\$400,000.00	2028	City
S-2	Wilmorth Reservoir No. 2	\$808,000.00	2020	City
<b>Booster Station Improvements</b>				
B-1	Washington St 12-inch Loop and Booster Station Improvements	\$259,000.00	2021	City
B-2	High Street Booster Station Improvements	\$144,000.00	2022	City
B-3	Darnells Booster Station Improvements	\$243,000.00	2032	City
B-4	Pinnacle Booster Station Improvements	\$675,000.00	2037	City
B-5	Wilmorth Booster Station Improvements	\$675,000.00	2036	City
<b>PRV Station Improvement</b>				
P-1	Spader Bay PRV Station	\$180,000.00	2032	City
P-2	Key Bay Loop and PRV Station	\$622,000.00		Developer
P-3	PRV Station No. 9 Upgrade	\$110,000.00	2024	City

**TABLE E-6 (continued)****Capital Improvement Schedule <sup>(1)</sup>**

<b>No.</b>	<b>Project Title</b>	<b>Estimated Cost</b>	<b>Year</b>	<b>Financing Source</b>
P-4	PRV Station No. 1 Replacement	\$470,000.00	2020	City
P-5	PRV Station No. 5 Upgrade	\$115,000.00	2034	City
P-6	Golf Course Rd PRV Station	\$423,000.00		Developer
<b>Water Distribution System Improvements</b>				
D-1	Annual Main Zone Pipe Replacement	\$369,600.00	Annual	City
D-2	Submarine Line Replacement	\$1,000,000.00	2022	City
D-3	Sanders Street Transmission Main Upsize to 10"	\$578,000.00	2031	City
D-4	Chelan High School 10" Loop	\$283,000.00	2023	City
D-5	Webster Ave Transmission Main Upsize to 10"	\$720,000.00	2035	City
D-6	Woodin Ave Transmission Main Upsize to 16"	\$2,570,000.00		Developer
D-7	Highland Avenue Transmission Main Upsize to 12"	\$544,000.00	2031	City
D-8	Clifford Street Transmission Main Upsize to 10"	\$185,000.00	2031	City
D-9	Lakeside Waterline Upgrades	\$1,448,000.00	2030	Developer
D-10	Hospital Zone Waterline Upgrades	\$803,000.00	2021	City
D-11	Key Bay Waterline Upgrades	\$733,000.00	2026	City
D-12	Eldorado Loop Upgrade	\$722,000.00	2023	City
D-13	Highpoint Place Waterline Upgrade	\$544,000.00	2032	City

**TABLE E-6 (continued)**  
**Capital Improvement Schedule <sup>(1)</sup>**

No.	Project Title	Estimated Cost	Year	Financing Source
D-14	Monte Carlo Drive Waterline Upgrade	\$349,000.00	2034	City
D-15	Lake Chelan Shores Condos Waterline Upgrades	\$723,000.00	2033	City
D-16	Pinnacle Pl Waterline Upgrade	\$398,000.00	2028	City
D-17	Junior Pt Waterline Upgrade	\$138,000.00	2030	City
D-18	Stehekin Way Waterline Upgrade	\$599,000.00	2027	City
D-19	Crescent St Waterline Upgrade	\$173,000.00	2025	City
D-20	Golf Course Pl Waterline Upgrade	\$242,000.00	2026	City
D-21	Butte Rd Loop Upgrades	\$870,000.00	2027	City
D-22	Lookout and Pyramid Loop Upgrades	\$479,000.00	2029	City
D-23	Orchard View Dr Waterline Upgrades	\$529,000.00	2029	City
D-24	Stormy Way Waterline Upgrade	\$299,000.00	2034	City
D-25	Wilmorth Rd Transmission Main	\$1,124,000.00	2020	City/ Developer
D-26	Isenhardt Rd Waterline Upgrades	\$790,000.00	2024	City/ Developer
D-27	Washington St and Shop Ave Transmission Main Upgrades	\$1,029,000.00	2028	City
<b>Water System Planning</b>				
PLN-1	Water Treatment Plant Capacity Analysis	\$45,000.00	2022	City
PLN-2	Water System plan 2028	\$80,000.00	2025	City
PLN-3	Water System plan 2038	\$80,000.00	2035	City
<b>Total Capital Improvements <sup>(2)</sup></b>		<b>\$44,242,000.00</b>		

(1) May 2018 Engineering News Record (ENR) Seattle Construction Cost Index #11472.

(2) Includes 20 years of Annual Improvements.

The financial status of the water system is described in Chapter 9 of this Plan. Past revenues and expenses are detailed as well. The City should continue to maximize grants and developer financing as a means of funding infrastructure improvements to the extent possible. Rate increases are anticipated to be necessary to fund all the capital projects listed in the twenty-year Capital Facilities Plan and maintain reserves without the use of grant funding. A rate structure analysis was provided by FCS Group using the Capital Improvements developed in this Plan.

# **CHAPTER 1**

# CHAPTER 1

## WATER SYSTEM DESCRIPTION

### INTRODUCTION

In accordance with WAC 246-290, water system plans need to be updated every 10 years. The Plan has been prepared to update the 2010 *City of Chelan Water System Plan*, using the *DOH Water System Design Manual* dated December 2009. This Plan has also been written to be consistent with the *City of Chelan Comprehensive Plan*, dated November 2017. This Plan will assess the current and future capabilities of the City of Chelan (City) water system, recommend any needed improvements to allow the system to provide water service throughout the planning period, and meet the statutory requirements in Chapter 246-290-100 WAC (Water System Planning), Chapter 246-290-135 WAC (Source Protection), Chapter 246-290 WAC Part 5 (Water System Operations), Chapter 246-290 WAC Part 8 (Water Use Efficiency), and Chapter 246-293-250 WAC (Water System Coordination Act).

This chapter presents inventory data, mapping, and other background information for the City of Chelan's existing water system. Also included is information on the City's service area, including a zoning map and a summary of service area policies.

### SYSTEM OWNERSHIP AND MANAGEMENT

The City is governed by a Mayor and City Council. The water system is a Group-A municipal water system owned by the City and operated and managed by City employees. The City's Department of Health (DOH) identification number is 12300. A vicinity map is shown on Figure 1-1. The City's current mailing address and main phone numbers are:

City Hall  
135 East Johnson  
P.O. Box 1669  
Chelan, WA 98816  
(509) 682-4037

Chelan Public Works Department  
50 Chelan Falls Highway  
Chelan, WA 98816  
(509) 682-8030

The water system is managed by Jake Youngren, Public Works Director, who has discretionary control of the water system budget to make purchases and to have work performed. For situations where large expenses are required or long-term decisions are needed, the Public Works Director works in conjunction with the City's engineering staff, Mayor, and City Council to determine a course of action and method of funding. The Public Works Director consults the City's most recent planning documents and Water Facility Inventory (WFI) form to determine the number of connections the system can serve, and uses these documents to guide planning efforts and to plan short-term project



phasing. Finally, the Public Works Director works with the City's engineering staff and engineering consultants when large projects are necessary, when the City is seeking funding for a project, or if a developer requires above average fire flow.

## SYSTEM BACKGROUND AND HISTORY

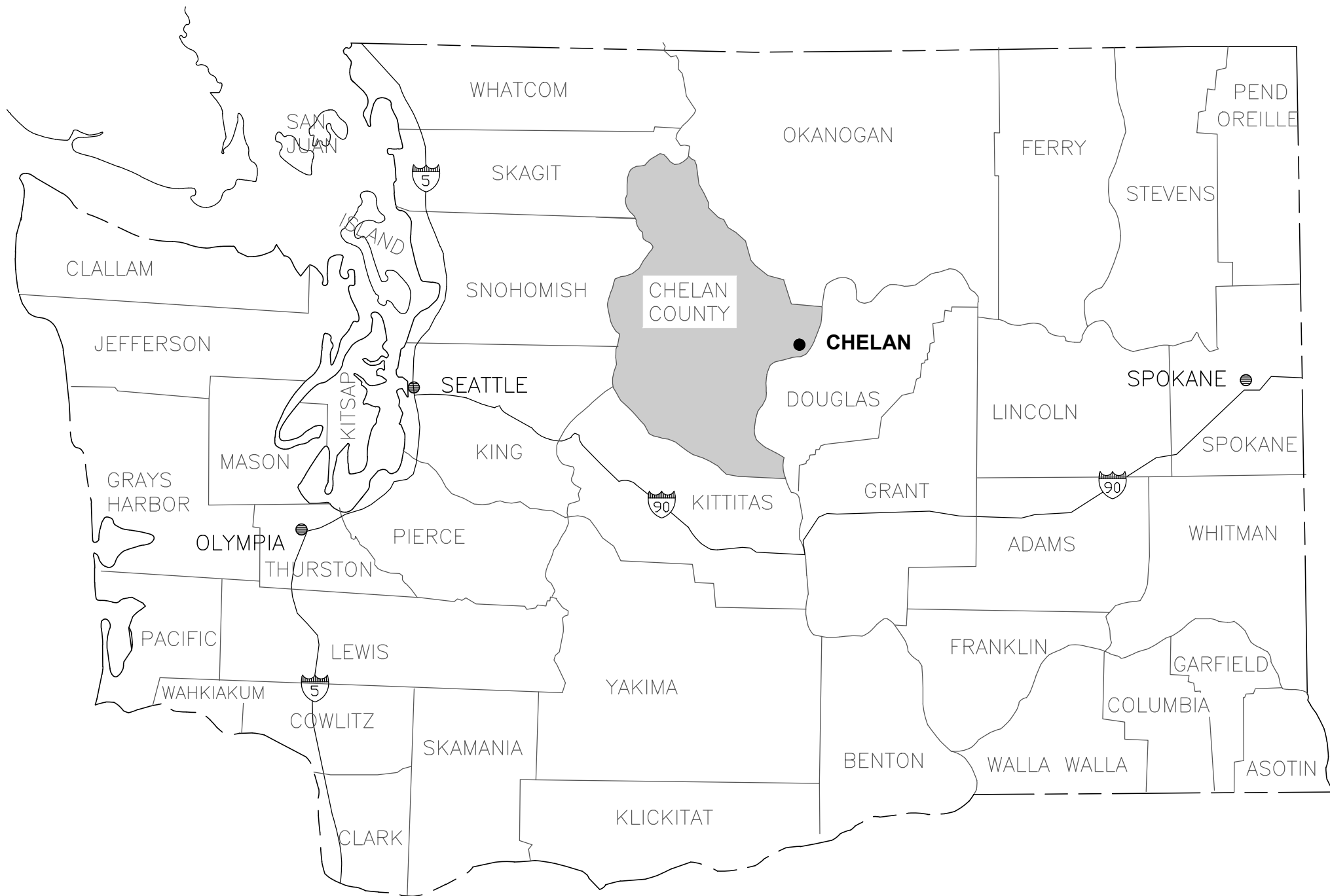
During World War II, Chelan acquired the ownership and operation of its water system from Washington Water and Power. Prior to the City's acquisition, the system had been built mostly for domestic purposes and did not have sufficient capacity for fire protection in most areas. Distribution piping was predominantly 2-inch diameter galvanized iron with a few larger wood stave mains. The first water system piping was constructed in 1921.

Since acquiring the system, the City has continued to improve the quality of the system and to expand it to keep pace with population increase, industrial growth, and the local tourism industry. Improvements have included increased supply capacity, increased capacity for fire protection, significantly more storage, and an expanded distribution system consisting of approximately 36 miles of piping, ranging in size from 1-inch to 18-inch diameter. A brief summary of important improvements to the source, storage, and distribution systems is presented in Table 1-1.

**TABLE 1-1**

### **Water System History**

<b>Date</b>	<b>Event</b>
1921	First pipe is laid by Washington Water and Power
1944	Two 300,000-gallon reservoirs are constructed near the City Shop. Two 50,000-gallon reservoirs are constructed at the Lakeside area.
1947	Marina Pump Plant is constructed.
1956	Hospital Booster Station receives a 7.5 hp pump.
1966	Lakeside Pump Plant is constructed.
1967	Gaukroger-Chelan Hills Booster Station received a 30 hp pump. Highland Booster Station is updated to its current configuration.
1977	Washington Street Booster Station receives a 5 hp pump.
1979	Pinnacle Booster Station is constructed with two 7.5 hp pumps.
1980	Boyd Road Booster Station receives two 10 hp pumps.
1988	Gaukroger-Chelan Hills Booster Station is equipped with a 30 hp and 35 hp pump.
1989	Bogey Booster Station is constructed with a single 20 hp pump.
1993	Comprehensive Water System Plan.



**CITY OF CHELAN**  
**WATER SYSTEM PLAN**  
**FIGURE 1-1**  
VICINITY MAP



**TABLE 1-1 – (continued)****Water System History**

<b>Date</b>	<b>Event</b>
1996	Gaukgroger-Chelan Hills Booster Station receives two, 125 hp pumps and is renamed to Darnell's Booster Station.
1996	Northshore Water System Facilities Plan – Completed Predesign Report
1998	City constructs 6.7 mgd water treatment plant to meet the requirements of the Surface Water Treatment Rule.
2000	City forms an intertie with the Chelan River and Isenhardt Irrigation Districts.
2001	2001 Water System Plan
2004	Construction of 2 <sup>nd</sup> backwater basin at water treatment facility.
2006	Construction of 132,000-gallon Lakeside Reservoir West.
2007	Farnham Booster Station constructed to serve the South Chelan area. Lake Hills Booster Station constructed (not yet in service). Construction of 203,000-gallon Lake Hills Reservoir (not yet in service).
2008	City acquires Chelan River Isenhardt Water District's domestic water system.
2009	Water System Plan Update
2010	City designs Higgs Booster Station to serve Golf Course Terrace pressure zone
2016	City constructs Higgs Booster Station
2018	City replaced their rapid mixer with a static mixer at the Water Treatment Plant City constructs new Highland Booster Station (construction in Fall 2018) City adds manual transfer switch to Darnell's Booster Station (construction in Fall 2018) Water System Plan Update

**INVENTORY OF EXISTING FACILITIES**

The purpose of the water system inventory is to establish the amount, type, and capacities of the various components of the existing water system. The City of Chelan obtains its potable water supply from Lake Chelan, a surface water source. The current potable water system consists of a raw water pump station, a rapid sand filter water treatment plant (WTP), fifteen storage reservoirs, thirteen booster stations, nineteen pressure reducing valve stations (PRVs), and approximately 36 miles of water transmission and distribution lines. The City's existing water system facilities are shown on Figure 1-2.

Due to the large differences in elevation within the City's service area, the City currently has twenty-four pressure zones; one main zone; six boosted open-zones with reservoirs; five boosted closed-zones; and twelve reduced pressure zones. The City pumps water from Lake Chelan to its WTP where it is filtered and disinfected prior to introduction to the distribution system. Finished water is stored in one of three reservoirs located at the

WTP prior to distribution. From the main pressure zone, a network of booster pumps and pressure reducing valves convey water to higher pressure zones within the City.

The City currently owns and operates thirteen booster pumping stations (BPSs), in addition to a raw water pumping station, to maintain adequate pressures at all times throughout the system. A hydraulic profile showing water flow between the pressure zones is shown on Figure 1-3. For simplicity, many of the reduced pressure zones have been combined into one zone as their flow of water only comes from a single reservoir. The pressure zones are shown in Figure 1-4 and are as listed:

- Main;
- Hospital;
- South Chelan;
- Lakeside;
- High Street;
- Darnell's;
- Golf Course Drive;
- Golf Course Terrace;
- Lakehills (constructed, pending development);
- Boyd Road;
- Pinnacle;
- Stehekin Way;
- Orchard View;
- Washington Street; and
- Wilmoth.

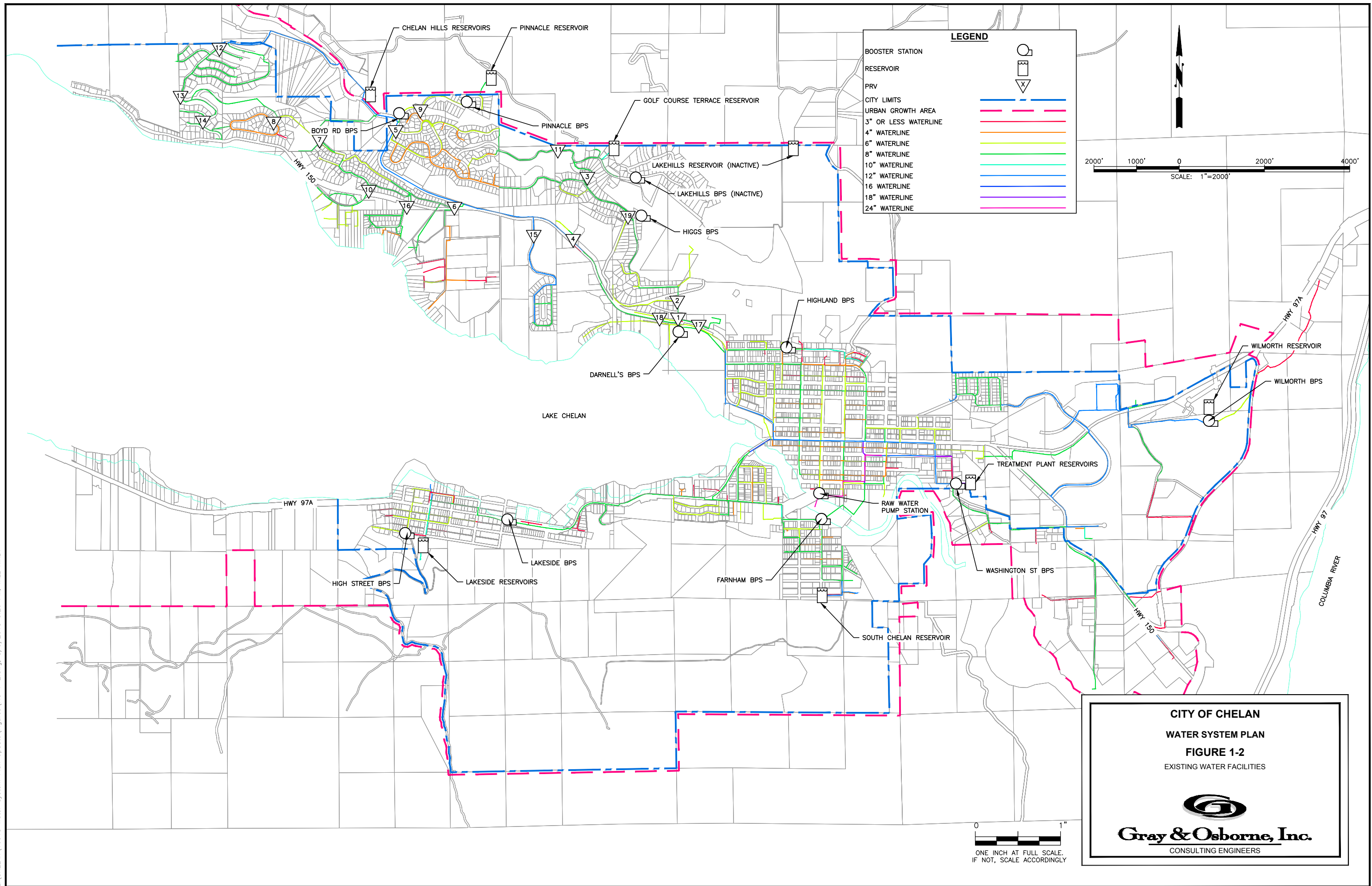
As indicated on Figure 1-3, there is one BPS for each zone except the hospital zone, which is served by two BPSs (one main and one backup), and the Stehekin Way, Orchard View, and Golf Course Drive pressure zones, which are supplied by multiple pressure reducing valves from adjacent pressure zones.

## **SOURCE OF SUPPLY**

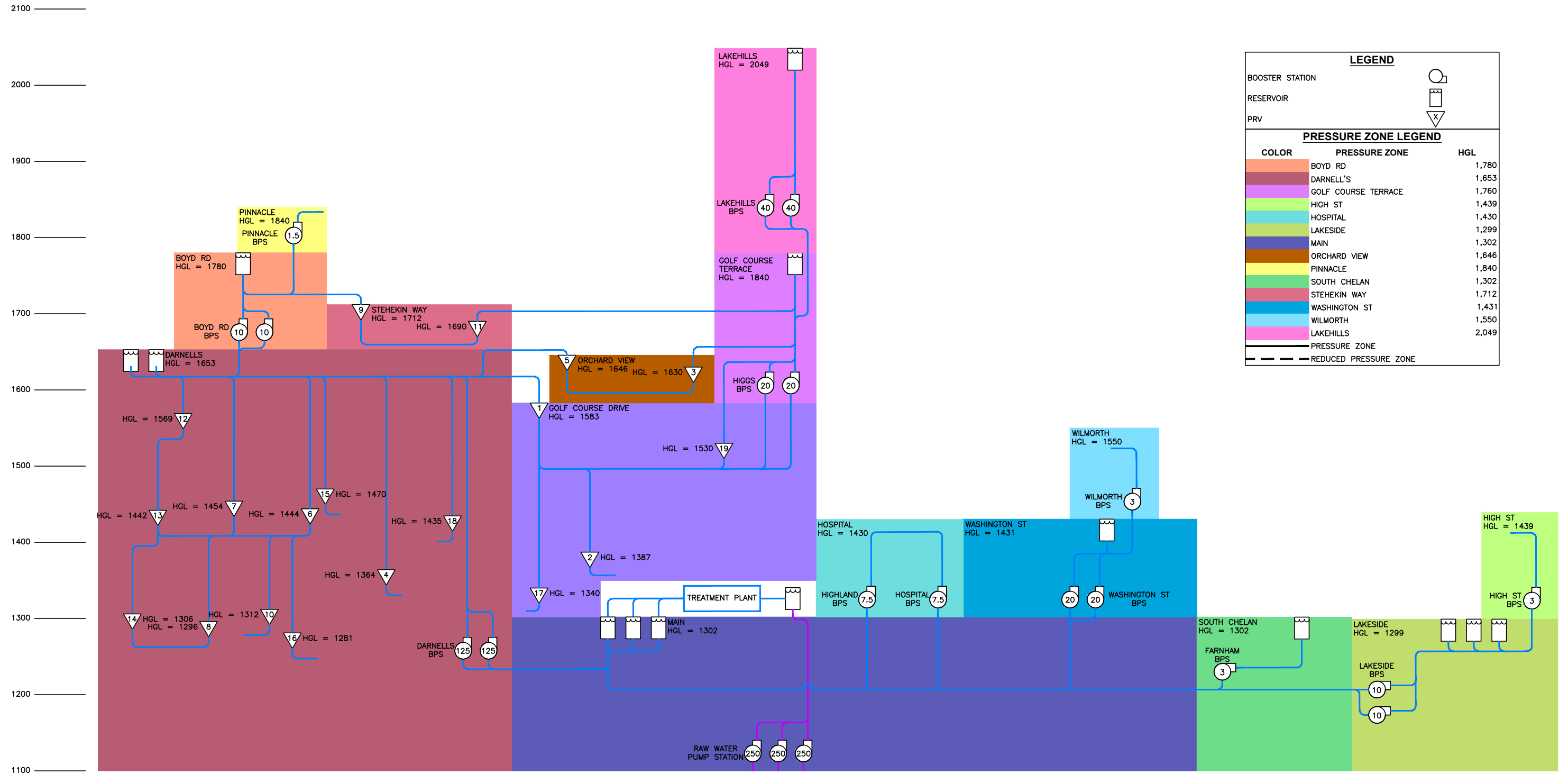
Prior to 1998, the City's drinking water supply was obtained from Lake Chelan through the Marina and Lakeside pumping stations. The City constructed the WTP and raw water pumping station in 1998 to meet the requirements of the federal Surface Water Treatment Rule. The Marina and Lakeside pumping stations continue to be maintained and used by the City for non-potable, municipal purposes.

The raw water pump station pumps water through a 36-inch intake line that extends into the Chelan River near the lake's outlet. Water is pumped by three (3) 250 hp pumps, each capable of pumping 2,800 gpm from the river, which varies in elevation from 1,085 feet to 1,100 feet. The water is pumped through approximately 5,200 feet of 24-inch pipe

L:\CHELAN\16018 Water System Plan Update\Figures\FIG 1-2.dwg, 8/9/2018 3:26 PM, WILL KIRBY



L:\CHELAN\16018 Water System Plan Update\Figures\FIG 1-3.dwg, 8/9/2018 3:31 PM, WILL KIRBY



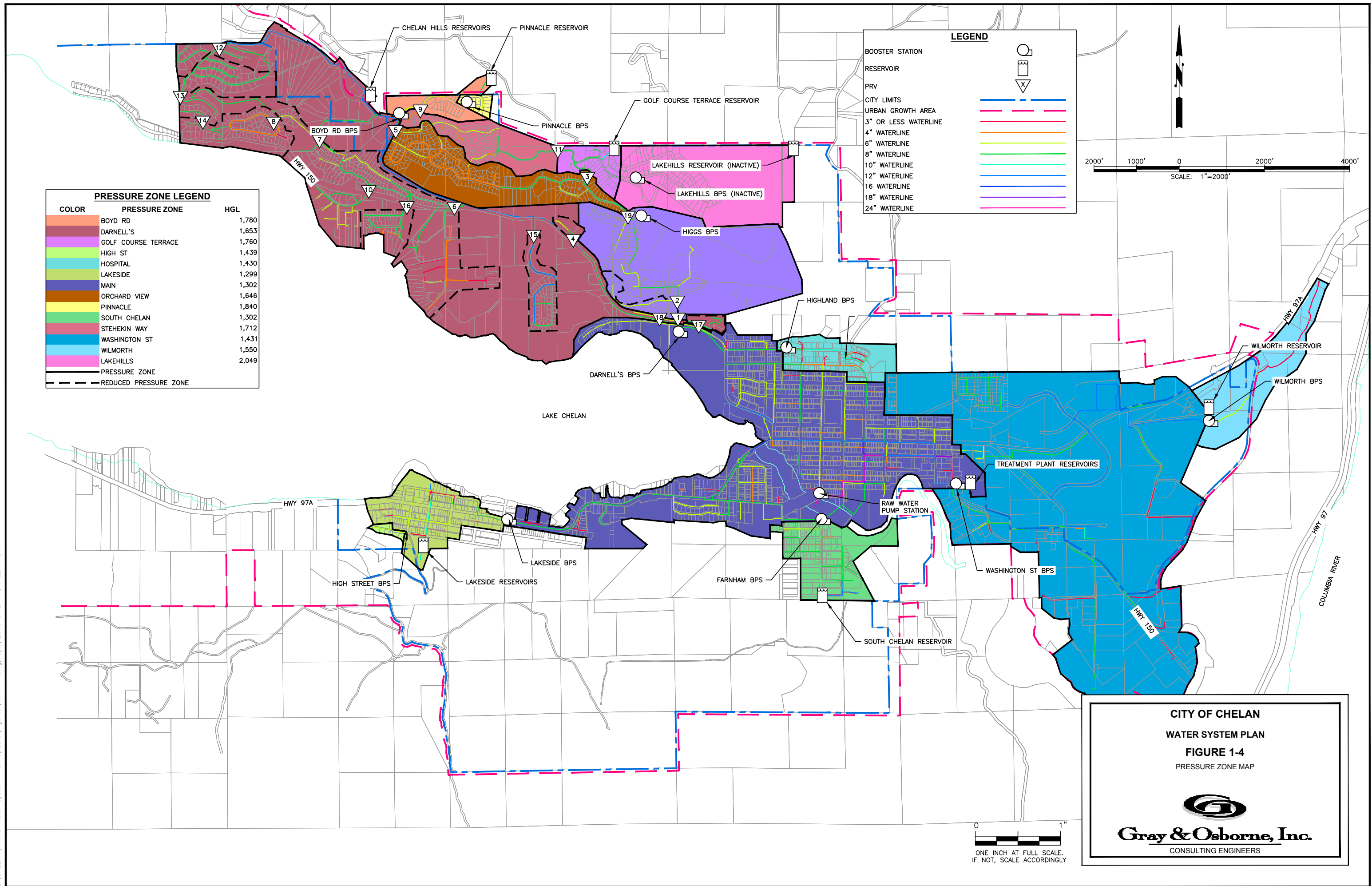
0 1"  
ONE INCH AT FULL SCALE.  
IF NOT, SCALE ACCORDINGLY

**CITY OF CHELAN**  
**WATER SYSTEM PLAN**  
**FIGURE 1-3**  
HYDRAULIC PROFILE

**Gray & Osborne, Inc.**  
CONSULTING ENGINEERS



L:\CHELAN\16018 Water System Plan Update\Figures\FIG 1-4.dwg, 8/9/2018 3:42 PM, WILL KIRBY



to the raw water reservoir. A summary of the City's source characteristics is presented in Table 1-2.

**TABLE 1-2**

**Supply Sources**

<b>Characteristic</b>	<b>Marina Pump</b>	<b>Lakeside Pump</b>	<b>Raw Water Pump Station</b>
DOH Source No.	S 01	S 02	S 03
Status	Not in Service <sup>(1)</sup>	Not in Service <sup>(1)</sup>	Active
Date Constructed	1947	1966	1998
Water Surface Elevation (ft)	N/A	N/A	1,100
Inlet Depth (ft)	N/A	N/A	30
Rated Capacity (gpm)	N/A	N/A	8,400
Inlet Diameter	N/A	N/A	36
Inlet Description	N/A	N/A	Pipe with Screen
Pump Type	N/A	N/A	Submersible Turbine
Motor Characteristics	N/A	N/A	480 Volt, 3 phase

(1) In 1998, the Marina and Lakeside Pump Stations were decommissioned as potable water sources. Since 1998, the raw water pump station is the only potable source for the City.

## **STORAGE**

The City of Chelan currently owns and operates fourteen reservoirs, the characteristics of which are shown in Table 1-3. The City's current total water storage capacity is approximately 3,390,000 gallons.

When the Lake Hills Reservoir is activated the Lake Hills Reservoir will supply the Lake Hills pressure zone.



**TABLE 1-3****Storage Reservoirs**

<b>Reservoir</b>	<b>Date Built</b>	<b>Storage Capacity (gal)</b>	<b>Type</b>	<b>Diam. (ft)</b>	<b>Depth (ft)</b>	<b>Base Elev. (msl)</b>	<b>Overflow Elev. (msl)</b>
Raw Water	1996	286,000	Steel	35	39.75	1300.75	1340.5
Treatment Plant East	1945	301,000	Buried Concrete	50	20.5	1282.5	1303
Treatment Plant West	1945	301,000	Buried Concrete	50	20.5	1282.5	1303
Treatment Plant South	1996	809,000	Steel	90	17	1284.5	1301.5
South Chelan	1996	137,000	Concrete	26	34.6	1267	1301.5
Lakeside North	1950	53,000	Buried Concrete	21	20.5	1278.5	1299
Lakeside South	1950	53,000	Buried Concrete	21	20.5	1278.5	1299
Lakeside West	2006	132,000	Concrete	30	25	1274	1299
Chelan Hills East	1996	478,000	Steel	53	29	1624	1653
Chelan Hills West	1987	150,000	Concrete	30	28.5	1624.5	1653
Golf Course Terrace	1987	115,000	Concrete	26	29	1751	1780
Pinnacle	1996	116,000	Concrete	30	22	1758	1780
Wilmorth <sup>(1)</sup>	1999-2000	256,000	Steel	45	21.5	1409	1430.5
Lake Hills <sup>(2)</sup>	2007	203,000	Concrete	30	37.5	2010	2048.5

(1) Acquired as part of the City's purchase of the Chelan River Isenhardt Water District facilities in January 2008.

(2) The new Lake Hills reservoir is scheduled to begin operation when development in the Lakeview area resumes.

**TREATMENT**

The City of Chelan's WTP provides the City's customers with a supply of filtered, disinfected water. The existing plant was designed to treat 6.7 mgd, with expansion capabilities of up to 10 mgd for future growth. Raw water from Lake Chelan is pumped to the WTP where it is stored in a 286,000-gallon raw water reservoir prior to treatment.

Water flows via gravity from the raw water reservoir through the filtration process to the finished water storage tanks. Raw water is metered into the plant and coagulated with alum and polymer and, when necessary, pre-chlorinated. A static mixer, immediately downstream of the chemical addition point, disperses the chemicals into the raw water. After filtration, finished water is chlorinated and enters one of three finished water reservoirs, Treatment Plant East, West, and South. Backwash water is gravity settled and the clarified backwash water is recycled back to the raw water tank.

## BOOSTER STATIONS

The City currently owns and operates thirteen booster pumping stations (BPSs) and one raw water pump station. The Lake Hills BPS is not currently active. The characteristics of the BPSs and raw water pumping station are provided in Table 1-4.

**TABLE 1-4**

### Booster Pump Stations

Station	Pump	Capacity (gpm)	Motor (hp/ V/ ph/ rpm)	Manufacturer	Model	Inst all Date
Raw Water	1	2,800	250/ 460/ 3/ 1750	Floway	16MKM	1998
	2	2,800	250/ 460/ 3/ 1750	Floway	16MKM	1998
	3	2,800	250/ 460/ 3/ 1750	Floway	16MKM	1998
Darnells	1	700	125/ 460/ 3/ 1785	Gould	Unknown	1996
	2	700	125/ 460/ 3/ 1785	Gould	Unknown	1996
Lakeside	1	300	10/ 208/ 3/ 1760	ITT Marlow	530SC – S9.5	1998
	2	300	10/ 208/ 3/ 1760	ITT Marlow	530SC – S9.5	1998
Highland (old) <sup>(2)</sup>	1	170	7.5/ 220/ 3/ 3475	Goulds	2250H7	1983
	2	1,000	30/ 220/ 3/ 1800	Worthington	10HH - 110	1967

**TABLE 1-4 – (continued)****Booster Pump Stations**

<b>Station</b>	<b>Pump</b>	<b>Capacity (gpm)</b>	<b>Motor (hp/ V/ ph/ rpm)</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Install Date</b>
Highland (new) <sup>(2)</sup>	1	104	5.5/ 480/ 3/ 3530	Grundfos	CR 20-2 A-GJ-A- E-HQQE	2018
	2	104	5.5/ 480/ 3/ 3530	Grundfos	CR 20-2 A-GJ-A- E-HQQE	2018
	3	1,500	60/ 480/ 3/ 1800	Grundfos	PACO- type 5015-9/0 KPV	2018
	4	1,500	60/ 480/ 3/ 1800	Grundfos	PACO- type 5015-9/0 KPV	2018
Hospital	1	225	7.5/ 230/ 3/ 3475	Fairbanks Morse	L79074	1956
	Spare	225	7.5/ 230/ 3/ 3505	Berkeley	6.5TPM	N/A
High Street	1	40	3/ Unknown	Reid	Unknow n	N/A
Boyd Road	1	150	10/ 220/ 3/ 3475	Burks	CAT #3100G7 -2SP	Early 70s
	2	150	10/ 220/ 3/ 3475	Burks	CAT #3100G7 -2SP	Early 70s
Pinnacle	1	17	1/ 115/ 1/ 3450	Weinman	4AC- 10512	1997
	2	34	1.5/ 115/ 1/ 3450	Weinman	4AC- 10512	1997
Farnham	1	200	3/ 460/ 3/ 1800	Peerless	C825A	2007
	Fire	700	40/ 460/ 3/ 3500	Peerless	C740	2007
	Fire	700	40/ 460/ 3/ 3500	Peerless	C740	2007

**TABLE 1-4 – (continued)****Booster Pump Stations**

<b>Station</b>	<b>Pump</b>	<b>Capacity (gpm)</b>	<b>Motor (hp/ V/ ph/ rpm)</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Install Date</b>
Farnham (continued)	Fire	700	40/ 460/ 3/ 3500	Peerless	C740	2007
Washington St. <sup>(1)</sup>	1	200	20/ 460/ 3/ 1750	Weinman	1.5BH- 200P14- U	2000
	2	200	20/ 460/ 3/ 1750	Weinman	1.5BH- 200P14- U	2000
	Fire	1500	150/ 460/ 3/ 1780	Peerless	6AEF16	2006
Wilmorth <sup>(1)</sup>	1	42	3/ 115/ 1/ 3450	Grundfos	CR8-30U	2000
Lake Hills	1	175	40/ 230/ 3/ 3550	Grundfos	CR64-3	2007
	2	175	40/ 230/ 3/ 3550	Grundfos	CR64-3	2007
	Spare	175	40/ 230/ 3/ 3550	Grundfos	CR64-3	2007
Higgs	1	510	40/ 480/ 3/ 1770	Goulds	11WAH C-4	2016
	Spare	510	40/ 480/ 3/ 1770	Goulds	11WAH C-4	2016

(1) Acquired as part of the City's purchase of the Chelan River Isenhart Water District facilities in January 2008.

(2) The existing Highland BPS will be decommissioned when construction of the new Highland BPS is completed in 2018.

**TRANSMISSION AND DISTRIBUTION**

The City's water mains are comprised of asbestos cement, cast iron, galvanized iron, steel, polyvinyl chloride (PVC), wood stave, ductile iron, and high-density polyethylene (HDPE). When water mains are replaced due to leaks or age, PVC pipe is generally used. Table 1-5 lists the approximate length, diameter, and type of pipe within the City's water transmission and distribution system. A schematic of the system is shown on Figure 1-3.

**TABLE 1-5****Transmission and Distribution System Piping**

<b>Pipe Size (in)</b>	<b>Pipe Type <sup>(1)</sup></b>								<b>Total</b>
	<b>AC</b>	<b>CI</b>	<b>GI</b>	<b>S</b>	<b>PVC</b>	<b>WS</b>	<b>DI</b>	<b>HDPE</b>	
3 <sup>(2)</sup>	---	---	8,954	---	5,327	---	---	9,033	23,314
4	24,632	---	58	---	5,755	---	216	---	30,661
6	42,973	333	---	424	20,123	508	518	---	64,878
8	44,844	---	---	4,218	37,425	---	26,429	---	112,916
10	---	1,449	---	---	350	---	2,401	---	4,200
12	6,089	1,231	---	1,288	9,321	---	22,203	---	40,132
16	---	---	---	---	---	---	552	---	552
18	---	---	---	---	---	---	2,487	---	2,487
24	---	---	---	---	---	---	4,897	---	4,897
36	---	---	---	---	---	---	335	---	335
<b>Total</b>	<b>118,538</b>	<b>3,013</b>	<b>9,012</b>	<b>5,929</b>	<b>78,300</b>	<b>508</b>	<b>60,038</b>	<b>9,033</b>	<b>284,371</b>
<b>% of Total</b>	<b>41.7%</b>	<b>1.1%</b>	<b>3.2%</b>	<b>2.1%</b>	<b>27.5%</b>	<b>0.2%</b>	<b>21.1%</b>	<b>3.2%</b>	<b>100%</b>

(1) Pipe lengths are in feet. Pipe types include asbestos-cement (AC), cast iron (CI), galvanized iron (GI), steel (S), polyvinyl chloride (PVC), wood stave (WS), ductile iron (DI), and high-density polyethylene (HDPE).

(2) Includes all pipe size under 3".

**PRESSURE REDUCING VALVES**

Over the course of its history, the City of Chelan has expanded from the relatively flat downtown area of the City to the surrounding hillsides on both the north and south shores of Lake Chelan. Due to varying elevation differences throughout the City's water service area, the City has nineteen pressure reducing valves to regulate pressure within its pressure zones. A summary of the City's PRVs is shown in Table 1-6.

TABLE 1-6

## Pressure Reducing Valves

Valve No.	Valve	Size	Manf.	Model	Inlet Pressure	Outlet Pressure
1	Parkview Road	6"	Cla-Val	6-90	210	165
		2"	Cla-Val	---	210	N/A
2	Cone Road	4"	Cla-Val	4-90	120	84
3	Golf Course Terrace	6"	Cla-Val	6-90	120	41
		2"	Cla-Val	2-90	120	53
4	Cotter Road	6"	Cla-Val	6-90	180	55
		2"	Cla-Val	2-90	180	60
5	Boyd Road	4"	Cla-Val	4-90	98	80
		1.5"	Cla-Val	1 ½-90C	98	82
6	San Remo Lane 1	6"	Cla-Val	6-90	140	92
		3"	Cla-Val	3-90B	140	97
7	Riviera Place	6"	Cla-Val	6-9	115	30
		3"	Cla-Val	3-90-01	120	42
8	Eldorado Way <sup>(1)</sup>	4"	Cla-Val	4-90-01AB	N/A	75-80
		2"	Cla-Val	N/A	N/A	N/A
9	Pinnacle Place <sup>(1)</sup>	2"	Cla-Val	N/A	N/A	N/A
10	San Remo Lane 2 <sup>(1)</sup>	1.5"	Mueller	250 WOO	N/A	N/A
		¾"	Mueller	250 WOO	110	52
11	Crest Drive	6"	Cla-Val	6-90	80	32
		2"	Cla-Val	2-90	80	35
12	Crystal/Westview Dr.	6"	Cla-Val	6-90	80	56
		2"	Cla-Val	2-90	80	60
13	Crystal Drive	6"	Cla-Val	6-90	120	48
		2"	Cla-Val	2-90	120	55
14	Crystal/Apple Ave.	6"	Cla-Val	6-90	100	44
		2"	Cla-Val	2-90	100	48
15	Granite Ridge	10"	Cla-Val	10-90	205	130
		2"	Cla-Val	2-90	205	130
16	Key Lane	6"	Cla-Val	6-90	115	56
		2"	Cla-Val	2-90	110	62
17	Park Pointe	6"	Cla-Val	6-90	165	76
		2"	Cla-Val	2-90	165	81
19	Higgs BPS	6"	Cla-Val	6-90	260	45

(1) The valve type is unknown, has no record for pressure, or is not equipped with pressure gauges.

## TELEMETRY

The City maintains a radio telemetry system that automates many routine operations and collects and records water production data. Data are collected by remote telemetry units (RTUs) located at BPSs and at reservoir sites. In general, reservoirs communicate water level information to the main telemetry unit at the WTP, which is then transmitted to the booster station RTUs for pump “on” or “off” decisions. At the WTP, the operator is able to interface with the system through a computer equipped with Win911™ software, and data are stored in Win911™ spreadsheets. A more detailed description of the system configuration and operation is described in Chapter 6, Operation and Maintenance.

## INTERTIES

The City does not have any interties with other domestic water systems. In January 2008, the City of Chelan acquired the Chelan River Isenhart Water District’s domestic water system. Prior to that date, the City of Chelan had provided filtered potable water to the Chelan River Isenhart Water District’s domestic water system since 2000 via an intertie, through a 3-inch meter, to the Washington Street BPS. The City maintains a metered raw water intertie with the Isenhart Irrigation District.

## WATER RIGHTS

The City holds several water right permits and certificates, has several pending change applications, and three pending applications for new permits. These rights are summarized in Table 1-7, and further discussion of the City’s water rights is included in Chapter 3. The City’s water rights authorize a total instantaneous withdrawal of 4,488 gpm and a total annual withdrawal of 4,283 acre-feet.

Relevant water right documentation is provided in Appendix A.

**TABLE 1-7**

**Water Rights**

<b>Control Number</b>	<b>Priority Date</b>	<b>Instantaneous Withdrawal (gpm)</b>	<b>Annual Withdrawal (ac-ft/yr)</b>
CSWC4018	7/30/1948	898	896
CSWC10891	2/3/1967	799	896
S4-30166	2/8/1990	799	1,290
S4-30167	2/8/1990	1,992	3,214
<b>Total</b>		<b>4,488</b>	<b>4,283<sup>(1)</sup></b>

(2) Per the most recent water rights decisions by Ecology, the instantaneous withdrawal from the City’s four water rights are additive, but the annual withdrawal is only partially additive, and limited to a total of 4,283 ac-ft/yr for the four rights.

## **RELATED PLANNING DOCUMENTS**

The following planning documents were used in the preparation of this Plan:

- 2010 City of Chelan, Water System Plan
- 2017 City of Chelan, Chelan Comprehensive Plan Update (Growth and Model Assumptions)
- 2014 Lake Chelan Watershed Planning Unit, WRIA 47 Lake Chelan Detailed Implementation Plan

## **WATER SERVICE AREA CHARACTERISTICS**

The following sections address the features and characteristics of the City of Chelan's Water System Service Area.

### **EXISTING AND FUTURE SERVICE AREAS**

Figure 1-5 delineates the City's existing service area. This figure also shows the extent of the City's retail service area, its future water service area, its water rights place of use, and other nearby service areas.

### **EXISTING LAND USE AND ZONING**

The City's Urban Growth Area (UGA) encompasses approximately 8.19 square miles, including approximately 7.89 square miles that are within the corporate limits of the City of Chelan. Primary land use designations within the corporate limits include tourist accommodations (31 percent), single family residential (29 percent), warehouse industrial (11 percent), public lands & facilities (8 percent), and special use district (6 percent). Table 1-8 contains a summary of current land use designations and their areas within the City's corporate limits. A map indicating the City's current land use designations is shown on Figure 1-6.



TABLE 1-8

Land Use Designations <sup>(1)</sup>

Land Use Designation	City Area, sq miles	UGA Area, sq miles	Total Area, sq miles	Percent
Airport	0.10	0.10	0.19	2%
Highway Service Commercial	0.07	0.00	0.07	1%
Waterfront Commercial	0.04	0.00	0.04	0%
Downtown Mixed Residential	0.25	0.00	0.25	3%
Downtown Mixed Use	0.05	0.00	0.05	1%
Downtown Public	0.02	0.00	0.02	0%
Downtown Single Family	0.02	0.00	0.02	0%
Public Lands & Facilities	0.47	0.09	0.55	7%
Single Family Residential	1.67	0.98	2.65	32%
Multi-Family Residential	0.32	0.14	0.47	6%
Special Use District	0.35	0.74	1.10	13%
Tourist Accommodations	1.78	0.00	1.78	22%
Tourist Mixed Use	0.01	0.00	0.01	0%
Warehouse Industrial	0.65	0.34	0.99	12%
<b>Total</b>	<b>5.80</b>	<b>2.39</b>	<b>8.19</b>	<b>100%</b>

(1) Data per City of Chelan Comprehensive Plan Update 2017, Exhibit 2-11. Acreages converted to sq. miles.

## WATER SYSTEM POLICIES

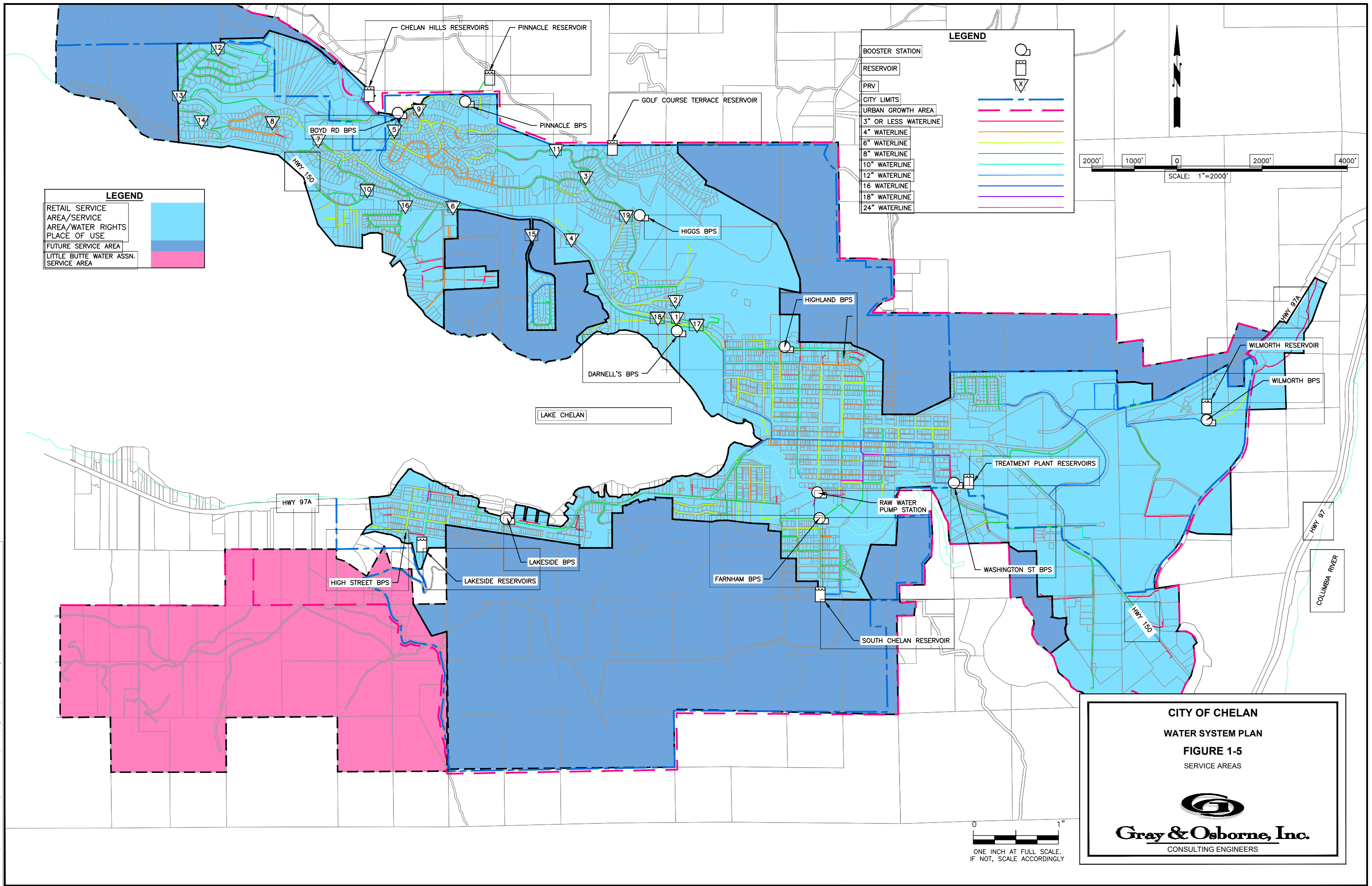
### GENERAL POLICIES

The City has established capital facilities policies as a portion of the City of Chelan Comprehensive Plan Update 2017. The capital facilities goals and policy section recognizes the need to coordinate planning and provide for service demands created by new growth. In addition, these policies below, express a commitment to appropriate rate structures and environmental compatibility. Many of the goals and policies in the capital facilities section of the comprehensive plan are not applicable to this plan and are therefore omitted as noted below.

#### Goal CFP I

Provide and maintain adequate public facilities and services for today's population and future.

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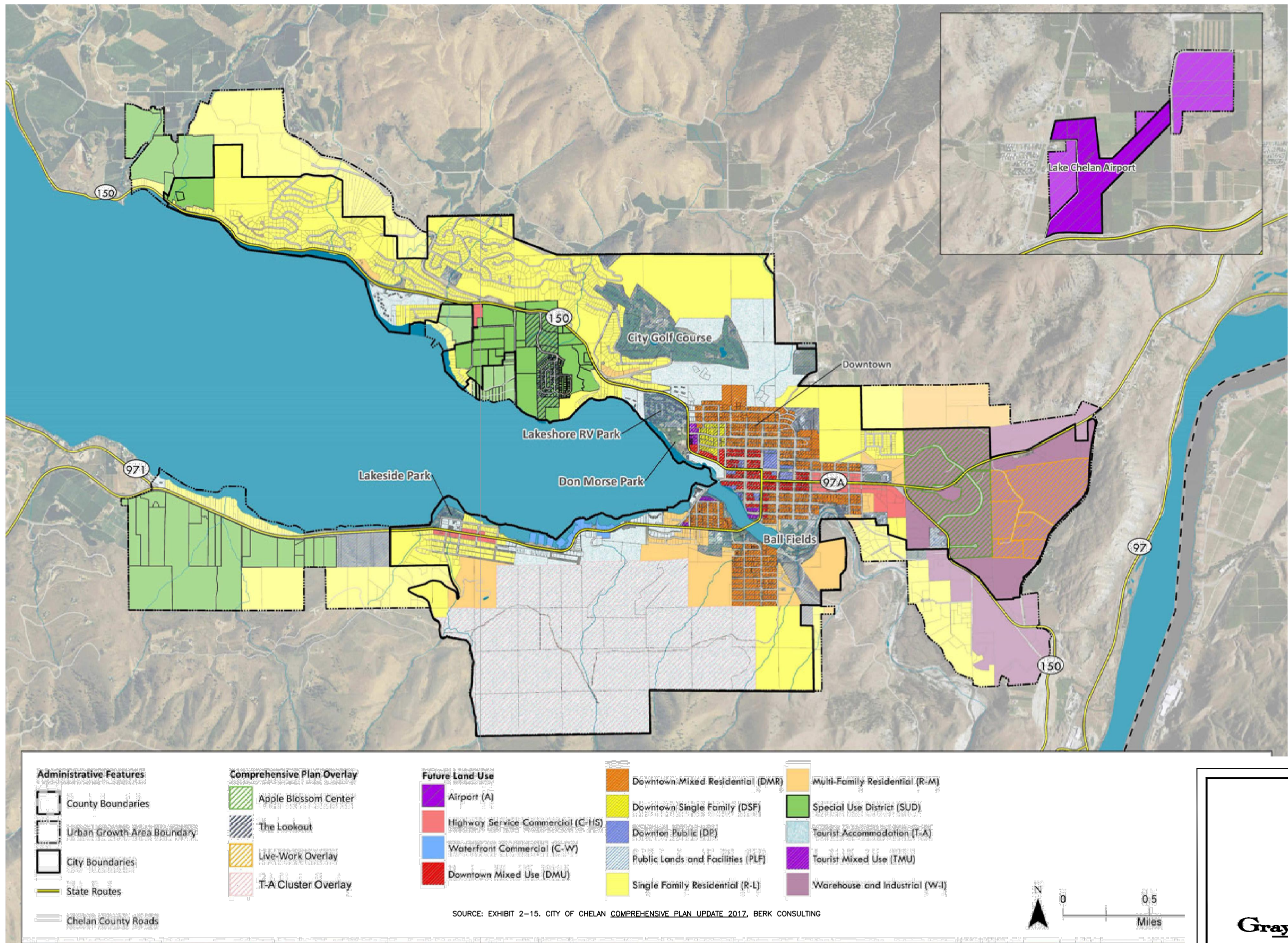


CITY OF CHELAN  
WATER SYSTEM PLAN  
FIGURE 1-5  
SERVICE AREAS


  
**Gray & Osborne, Inc.**  
CONSULTING ENGINEERS

0 1"  
ONE INCH AT FULL SCALE.  
IF NOT, SCALE ACCORDINGLY





**CITY OF CHELAN**  
**WATER SYSTEM PLAN**  
**FIGURE 1-6**  
CITY OF CHELAN  
LAND USE AND ZONING PLAN

  
**Gray & Osborne, Inc.**  
CONSULTING ENGINEERS



Policy CFP I-1

Adopt level of service standards for individual services in order to measure performance and evaluate future facility needs. Standards are defined in Exhibit 7-2. Level of Service Standard.

Policy CFP I-2

Work with the City and public facility purveyors providing services to the Chelan Planning Area to develop a six-year plan to finance capital facilities, assess funding capacities, and identify public and private financing in order to ensure adequate levels of service are maintained through prioritizing investments.

Policy CFP I-3

Encourage the establishment of a regional forum to address area-wide service and utility needs and to identify where consolidation of services may be appropriate.

Policy CFP I-4

Coordinate capital improvement program planning in a manner consistent with the Growth Management Act.

Policy CFP I-5

Adopt provisions for consultation with special districts to ensure that such districts exercise their powers in a way that does not conflict with the City's Comprehensive Plan and the City's anticipated growth.

**Goal CFP II**

Ensure that public facilities are adequate to serve the planned land use patterns in the City and its Urban Growth Area.

Policy CFP II-1

Provide capital facilities to areas designated for residential, commercial and industrial development consistent with an appropriate level of service for the designated land use.

Policy CFP II-2

Require sufficient system capacity for potable water, sewer, surface water, and transportation prior to approval of any new development. Allow mitigation as appropriate.

Policy CFP II-3

Ensure new development meets Chelan's transportation levels of service before development may be permitted. Mitigation may be required to meet levels of service.

Policy CFP II-4

Ensure the extension of utilities is sized to meet anticipated growth of the study area.

**Policy CFP II-5**

Require development to carry a proportionate share of the cost for extending and increasing the capacity of needed capital facilities, including parks and recreation and transportation facilities.

**Policy CFP II-6**

Ensure new utilities are placed underground within developments unless prohibitive.

**Policy CFP II-7**

Design, locate, and build public facilities so that they are accessible to all segments of the population.

**Goal CFP III**

Consider the City's fiscal position and community needs by optimizing available funds and seeking new revenue sources.

**Policy CFP III-1**

Ensure budget decisions are consistent with the Comprehensive Plan.

**Policy CFP III-2**

Optimize available funds through prioritization of capital projects.

**Policy CFP III-3**

Aggressively pursue funding from all levels of government and private agencies to accomplish the City's capital investment program while optimizing resources.

**Policy CFP III-4**

Reassess the land use element if probable funding falls short of existing needs. The reassessment may result in changes to growth projections, alternative level of service standards, or expanded funding or financing options.

**Goal CFP IV**

Not Applicable.

**Goal CFP V**

Develop and maintain a system of wastewater treatment and disposal and water supply and distribution which will support the future development of the area.

**Policy CFP V-1**

Ensure that public services and facilities are available and adequately sized to protect the public health, safety and welfare by relying on adopted level of service standards for water and sewer services.

Policy CFP V-2

Ensure adequate sewer availability and adequate water supply and fire flow are available prior to permitting development.

Policy CFP V-3

Not Applicable.

Policy CFP V-4

Encourage the hookup to a public water system for those properties on existing private well systems.

Policy CFP V-5

Allow interim water systems or interim on-site septic systems that allow a property owner to exercise development rights without connecting to the City's water or sewer system within the city limits and Urban Growth Area when the municipal system is not available and when agreements are reached to connect in the future when municipal systems are reasonably available. Develop incentives that retain agricultural land or open space, and requirements that limit premature conversion of property to urban uses until such time as municipal water and sewer service is extended.

Policy CFP V-6

Additional connections to the City of Chelan's water system shall not be allowed outside of the Urban Growth Area or the incorporated city limits except for:

1. A water hook-up outside the urban growth area may be allowed when a person has provided documentation that:
  - The lot was legally created prior to May 28, 1998; and
  - At least two attempts to drill wells in different locations on parcels 5 acres or greater or 1 attempt on parcels less than 5 acres down to bedrock yielded no potable water.
2. A water hook-up for a recorded plat or short plat in situations where the city indicated that water would be available and the county approved the lots sizes and final plat based on the city's commitment to provide water.

Policy CFP V-7

Protect domestic water intakes from waste discharge in accordance with the Lake Chelan Water Quality Plan. Placement of the outfalls for these discharges should protect the intake of domestic water sources and the potential effect that the discharges may have on "downstream" water users. Treatment of the discharge should reflect the necessity for clean water.

Policy CFP V-8

Not Applicable.

Policy CFP V-9

Not Applicable.

**Goal CFP VI**

Not Applicable.

**Goal CFP VII**

Not Applicable.

**Goal CFP VIII**

Not Applicable.

**Goal CFP IX**

Not Applicable.

**Goal CFP X**

Not Applicable.

**Goal CFP XI**

Not Applicable.

**Goal CFP XII**

Not Applicable.

**DUTY TO SERVE**

Per RCW 43.20.260, the City has a duty to serve within its retail service area if a potential user approaches the City with a request for connection and the following threshold factors apply:

- The City has sufficient capacity to serve water in a safe and reliable manner.
- The service request is consistent with adopted local plans and development regulations.
- The City has sufficient water rights to provide service.
- The City can provide service in a timely and reasonable manner.

The Mayor and staff determine whether the request meets the above criteria, and make recommendations to the Planning Commission and the City Council. City Council has final approval authority.

## SERVICE AREA POLICIES

Chapters 13 and 25 of the Chelan Municipal Code (CMC) establishes the adopted policies for Water and Sewer by the City of Chelan. Table 1-9 summarizes the applicable sections and the policies they adopt.

**TABLE 1-9**

### Service Area Policies

<b>Chelan Municipal Code</b>	<b>Policies</b>
CMC 13.04 Water System	<p>This Chapter establishes the following policies:</p> <ul style="list-style-type: none"> <li>• Duty to provide domestic water service to all properties with the City requesting such service.</li> <li>• Designates the Public Works Director as the general supervisor of the system and lists the responsibilities of the position.</li> <li>• Establishes policy regarding service extensions within City Limits provided that the costs of the extensions and additional system facilities are at the expense of the new customers or developer.</li> <li>• Establishes the standards of construction and maintenance policy for water services in regards to responsibility.</li> <li>• Establishes a policy for users who fail to connect in a timely manner.</li> </ul>
CMC 13.05 Cross Connection Control	This Chapter establishes the City's Cross Connection Control policy.
CMC 13.08 Rates	This Chapter Establishes the Rate Structure policy.
CMC 13.12 Payment and Collection	This Chapter Establishes policies for the timeline for reading meters, billing cycles, the measurement for billing, procedures for bill delinquency, excess usage, and natural disaster policy in regards to water service.
CMC 13.16 Water Meters	This Chapter establishes policies regarding the installation, ownership, and protection of water meters. This chapter also establishes a policy for unmetered water services.



**TABLE 1-9 – (continued)**

**Service Area Policies**

<b>Chelan Municipal Code</b>	<b>Policies</b>
CMC 13.20 Miscellaneous Regulations	<p>This Chapter establishes the following policies:</p> <ul style="list-style-type: none"> <li>• Inspections by the City.</li> <li>• Temporary water shut off.</li> <li>• Temporary water use limitations.</li> <li>• Service transferring procedure.</li> <li>• Water service disconnection/reconnection procedure.</li> <li>• Booster pump station main service disconnection policies.</li> <li>• Standby Fire Service connection payment.</li> <li>• Unfiltered water service agreements.</li> </ul>
CMC 13.28 Violation – Penalty	This chapter establishes unlawful activities and the penalties applied to such.
CMC 13.32 Rate Reductions	This Chapter establishes the eligibility, application process, qualifications, and rate schedule for persons who desire to apply for a rate reduction.
CMC 13.33 Family Accessory Dwelling Unit Rate Reduction	This Chapter establishes the eligibility, application process, qualifications, rate schedule, and penalties for Family Accessory Dwelling Units who desire to apply for a rate reduction.
CMC 13.34 Utility Extensions Outside City Limits	<p>This Chapter establishes the following policies:</p> <ul style="list-style-type: none"> <li>• Utility extensions outside of the City Boundary but within the UGA.</li> <li>• Application process for providing City utilities outside of the City Boundary.</li> <li>• The “Utility Extension Agreement”.</li> <li>• The City’s policy in the event a property is not annexed into the City Boundary.</li> <li>• The City’s policy in the event a property is removed from the City’s Boundary.</li> <li>• Exceptions to limitations as established in the Chapter.</li> </ul>
CMC 13.36 Latecomer Agreements	This Chapter establishes the policies and procedures for latecomer agreements as provided in CMC 12.28.

**TABLE 1-9 – (continued)****Service Area Policies**

<b>Chelan Municipal Code</b>	<b>Policies</b>
CMC 13.40 Water Rights Transfers	This Chapter establishes policies in order to acquire water rights necessary to sustain proposed developments within the City's UGA. Additionally, this Chapter establishes policies regarding the water rights within annexed areas to be transferred to the City. This Chapter also establishes the amount of rights to be transferred the costs associated with the transfer of rights and the form of transfer acceptable to the City.
CMC 25 Development Standards	This Chapter establishes policies in regards to proposed development within the City. The Chapter mandates that new developments have water service consistent with the requirements of the development standards and CMC 13.
CMC 25 Development Standards – cont.	If new developments cannot provide the required water service, this Chapter provides mitigation efforts that a developer can pursue with the City.

**CHELAN COUNTY CODES**

Chelan County Code maintains jurisdiction of properties outside of the City of Chelan's corporate limits but within the Urban Growth Area. Chelan County Code (CCC) 10.12.060, as amended, adopts the City of Chelan's Comprehensive Plan Capital Facilities element for all of the City of Chelan's Urban Growth Area including the South shore except for the property governed by the Tuscan Development Agreement. Additionally, CCC 10.14.050, as amended, adopts the City of Chelan's development standards for all of the City of Chelan's Urban Growth Area including the South shore except for the property governed by the Tuscan Development Agreement.

## **CHAPTER 2**

## **CHAPTER 2**

### **BASIC PLANNING DATA**

#### **INTRODUCTION**

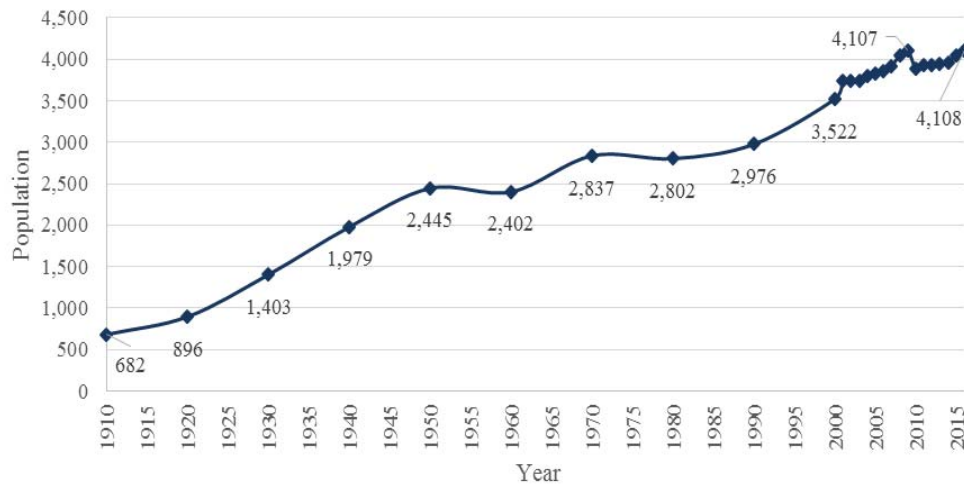
This chapter presents the basic planning data used to project the City of Chelan's future water demands. These water demand projections will be used to evaluate the adequacy of the City's existing water system and to determine the need for capital improvements. Information presented in this chapter includes historical population trends and water demands, population growth projections based on recent Citywide planning efforts, and water demand projections for the 10- and 20-year planning periods.

#### **CURRENT DATA**

This section contains information on existing and historical population, existing service connections, water usage, and equivalent residential units (ERUs).

#### **HISTORICAL POPULATION**

The population of the City of Chelan has grown steadily since its incorporation in 1902. The City experienced its greatest growth between 1910 and 1950, when the population increased at an annual rate of 3.2 percent. Growth slowed to an annual rate of 0.7 percent from 1950 to 2000, and the City experienced an average annual growth rate of 1.0 percent from 2000 to 2010. Based on the United States Census Bureau population estimate for 2016 of 4,108 residents, the population of the City has increased at an annual growth rate of 0.9 percent from 2011 to 2016. Figure 2-1 provides historical population trends for the City between 1910 and 2016.

**FIGURE 2-1****City of Chelan Historical Population****SERVICE CONNECTIONS**

The total number of City water service connections for 2016 and 2017 is summarized in Table 2-1. For this report, the City classifies its service connections by single-family (SF) residential, multifamily (MF) residential, commercial, schools, municipal, and purveyors. The commercial designation consists of motels, restaurants, businesses, churches, and institutions such as hospitals and clinics. The municipal designation encompasses the parks, the City golf course clubhouse, and City facilities. Irrigation for the City golf course is provided by a separate non-potable system that withdraws surface water from Lake Chelan. The City recently acquired the purveyor connections.

**TABLE 2-1****2016 & 2017 City Water Service Connections**

Customer Classification	Number of Connections		Percent of Total Connections	
	2016	2017	2016	2017
Single-Family Residential	1,898	1,883	79.6%	79.7%
Multi-Family Residential	169	168	7.1%	7.1%
Commercial	275	270	11.5%	11.4%
Schools	7	7	0.3%	0.3%
Municipal	33	34	1.4%	1.4%
Purveyors	2	0	0.1%	0.0%
<b>Total</b>	<b>2,384</b>	<b>2,362</b>	<b>100%</b>	<b>100%</b>

(1) 2016 & 2017 water service connections from City records.

## **HISTORICAL WATER USE**

Since December 1998, the City has pumped water from Lake Chelan using its raw water pump station through a 36-inch pipe to the City's raw water reservoir located at the City's Water Treatment Plant (WTP). Raw water quantity is measured prior to entering the raw reservoir. Recycled backwash water is metered before it re-enters the treatment stream ahead of the source flow meter, requiring net water production to be calculated by subtracting recycled backwash water from source water metering. Treated water is then stored in one of three reservoirs (Treatment Plant East, West, and South), from which point it is conveyed through the City's water distribution system to service-area customers. All connections within the water service area are metered. Meters are read once per month by water department personnel, except during the winter months of November through February.

### **Water Use Discrepancies**

The City has noted discrepancies between recorded production/consumption and reported numbers listed in the Water Use Efficiency reports. These discrepancies are due to unaccounted water use, leakage through the flow meter and valves at the water treatment plant, water theft, and differences in times of the year when service meters are checked. The following is a narrative of the discrepancies the City has noted.

The City donates water for fire activities throughout the area (both training and firefighting). After the recent discovery that unauthorized users were stealing water from these training exercises the City implemented a metering policy in 2011 to determine actual quantities used/stolen and to deter further theft. While the metering takes place for fire activities, meters are not always implemented immediately, meaning an amount of water is unaccounted for between the time a hydrant is used and when it is metered. The City does not have an estimate for this water for the analysis period of this Plan.

The Fire District provide flushing and check for available flow rates for the City of Chelan. The Fire District provides the flow results to the City however, they do not list the time it took to flow the individual hydrants. The volume of water used to flow hydrants is not tallied and thus shows up as additional Distribution System Leakage.

The Water Treatment Plant has a flow meter which has been allowing water to pass through without recording the amount of water. This error typically occurs during low flow periods. This water is not accounted for and as such has been under documented in the production records. During the summer months the flow meter is expected to be around 99 percent accurate for the flows that occur at the discharge from the Water Treatment Plant. Conversely, during the winter months the flow meter can be as low as 50 percent accurate. The City had testing provided that looked at the finished water levels in the Treatment Plant Reservoir to determine the difference between the actual and recorded flow rates. The City was able to estimate that the flow meter allows approximately 10,000 gallons per hour on average of unaccounted for water for a year.

The City does not use this estimate in their reporting to the Department of Health. This 'flow-by' factor has been added to the Production totals in the analysis period for this Plan to show more realistic production volumes. The City plans to upgrade their flow meter with a compound flow meter to increase the range of metering they can track.

The City does not check service meters between November and April due to snow. As such, an estimate for the amount of water consumed in November, December and January is needed to complete the Water Use Efficiency reports. The City estimates consumption for these months based on production records. The City looks at the ratio of production to consumption for the previous year as a whole and applies this ratio to their consumption data. This estimation can cause minor discrepancies in the actual and reported data. The flow-by occurring at the Treatment Plant in the main flow meter is not taken into account when doing this calculation. When the flow meter replacement is finished this estimation will be more accurate.

### **Average Day Production**

Table 2-2 lists total annual water production between 2011 and 2017. Annual production, or demand, is commonly reduced to a daily value, and is referred to as the Average Day Production. The average flow-by amount of 10,000 gallons per hour was added into the production records to show the potential difference in recorded and realistic production volumes. As shown by the Table, there has been a general increase in the average water usage starting in 2015 possibly corresponding to an increase in population.

**TABLE 2-2****2011-2017 Average Day Production**

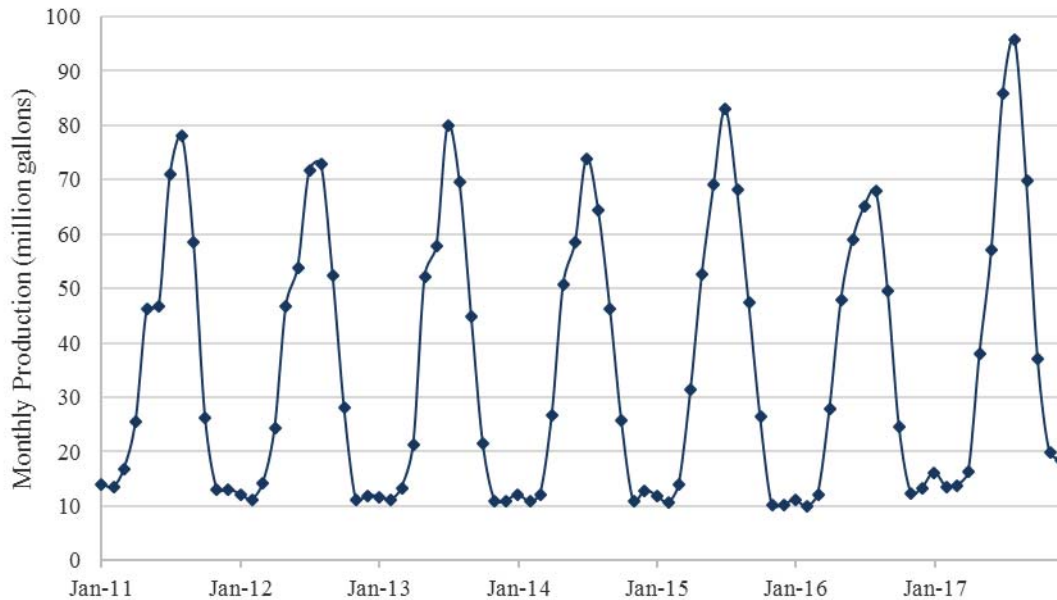
<b>Year</b>	<b>Service Area Population</b>	<b>Total Annual Water Production (1,000 gal)</b>		<b>Average Day Production (1,000 gpd)</b>		<b>ADP (ac-ft/year) <sup>(2)</sup></b>
		<b>Recorded</b>	<b>w/ Flow-by Factor <sup>(2)</sup></b>	<b>Recorded</b>	<b>w/ Flow-by Factor <sup>(2)</sup></b>	
2011	3,924	422,790	510,390	1,158	1,398	1,566
2012	3,929	410,680	498,280	1,125	1,365	1,529
2013	3,942	405,540	493,140	1,111	1,351	1,513
2014	3,960	404,967	492,567	1,109	1,350	1,512
2015	4,045	435,001	522,601	1,192	1,432	1,604
2016	4,108	400,810	488,410	1,098	1,338	1,499
2017	4,159 <sup>(1)</sup>	481,717	569,317	1,320	1,560	1,747
<b>Average</b>		<b>423,072</b>	<b>510,672</b>	<b>1,159</b>	<b>1,399</b>	<b>1,600</b>
<b>2016-2017 Average</b>		<b>441,263</b>	<b>528,863</b>	<b>1,209</b>	<b>1,449</b>	<b>1,623</b>

(1) Estimated 2017 population based on City of Chelan estimated growth rate of 1.245%.

(2) Average flow meter flow-by of 10,000 gph (10,000 gph x 24 hr/day x 365 day/year = 87,600,000 gallons/year) added to recorded production amounts.

As required by DOH's Water Use Efficiency Rule, a monthly distribution of the City's water demands is shown on Figure 2-2. Due to the fact that the City does not have a separate irrigation system, demands increase significantly in the summer as a result of lawn irrigation. Furthermore, the City has a significant transient tourist population in the summer that increases overall demand during the summer. This figure does not include the flow-by adjustment factor.



**FIGURE 2-2****2011-2017 Monthly Water Production****Maximum Day Production**

The maximum amount of water produced in a 24-hour period is defined as the Maximum Day Production. Maximum Day Production values are important in determining whether the water system source capacity and instantaneous water rights are sufficient to meet current and future production demands. Maximum Day Production values presented in Table 2-3 are based on water treatment plant water meter records. The average Maximum Day Production to Average Day Production ratio of 1.9 is used to project future demands later in this chapter.

**Peak Hour Demand (PHD)**

The maximum amount of water produced in a one-hour period during a maximum day is the Peak Hour Demand (PHD). PHD is an important parameter in determining the amount of reservoir storage needed to make up the difference between the peak hour production requirement and the system's pumping capacity. It is also an important factor in determining closed-zone pumping capacity.

PHD calculations normally require reservoir water surface elevations and metered production data. Because the City does not keep records of reservoir levels, it is not possible to directly calculate PHD values. In the absence of information to calculate PHD, the DOH's 2009 Water System Design Manual (WSDM) provides a means to estimate the PHD through the use of the following equation:

$$\text{PHD} = (\text{MDD}/1,440) [(C) (N) + F] + 18$$

Where:

PHD = Peak Hour Demand, gpm  
 C = Coefficient Associated with Ranges of ERUs  
 N = Number of ERUs  
 F = Factor Associated with Ranges of ERUs  
 MDD = Maximum Day Demand, gpd/ERU

The City's previous water system plans, completed in 2001 and 2010, addressed the use of the WSDM equation, and determined that the City of Chelan would be better served with a more conservative estimate of peak usage. Therefore, in an effort to remain consistent with previous planning efforts, a PHD to Maximum day production ratio of 2.0 will be used for projecting future water needs. Table 2-3 shows the estimated PHD for 2011 through 2017 using a PHD to Maximum day production peaking factor of 2.0. Using ERU counts as shown later in this Chapter for example, the estimated 2018 PHD is calculated as 3,196 gpm using the DOH equation ( $C = 1.6$ ,  $N = 3,620$  ERUs,  $F = 225$ ,  $\text{MDD} = \text{Maximum day production} = \text{Average day production} \times 1.9$  (Average day production to Maximum day production ratio) = 760 gpd/ERU). As can be seen, using the 2.0 peaking factor is still conservative as the average PHD using the peaking factor is over the calculated estimate.

**TABLE 2-3**

**2011-2017 Water Production**

Year	Pop.	Average Day Production ( <sup>1</sup> ) (gpd)	Maximum Day Production ( <sup>2</sup> ) (gpd)	Maximum Day Production (gpm)	Maximum Day Production / Average Day Production	PHD ( <sup>3</sup> ) (gpm)
2011	3,924	1,398,300	2,696,970	1,870	1.9	3,740
2012	3,929	1,365,200	2,474,120	1,720	1.8	3,440
2013	3,942	1,351,100	2,282,430	1,590	1.7	3,180
2014	3,960	1,349,500	2,579,618	1,790	1.9	3,580
2015	4,045	1,431,800	2,894,144	2,010	2.0	4,020
2016	4,108	1,338,100	2,691,358	1,870	2.0	3,740
2017	4,159	1,559,800	2,971,065	2,060	1.9	4,120
<b>Average</b>		<b>1,399,100</b>	<b>2,655,700</b>	<b>1,840</b>	<b>1.9</b>	<b>3,690</b>

(1) See Table 2-2. Includes the flow-by factor of 10,000 gph.

(2) From City records.

(3) PHD = Maximum day production \* 2.0.

## Consumption History

The City tracks its water consumption throughout the water system, and places each customer into a classification. Meter records with classification information was only available for 2016 and 2017. Meter records from before these dates assume percentage of water use by each customer classification has remained stable since the 2010 Water System Plan, with the exception of 2015. In August 2015, the City experienced serious fires that resulted in water usage greater than would otherwise be typical for the month. Therefore, it has been assumed that the increase in flows for the month was entirely due to an increase in the Municipal customer class.

Table 2-4 shows the consumption history for 2011 to 2017 for each customer class. The commercial customer class includes City classifications for motels, restaurants, small businesses, churches, institutions (i.e. hospitals, clinics, etc.), and large businesses. The Municipal customer class includes City classifications for City parks, other parks, City facilities, and the City golf course clubhouse (the golf course has a separate irrigation source and water right from Lake Chelan).

**TABLE 2-4**  
**2011-2017 Water Consumption (1,000 gallons)**

Year	Residential		Comm.	Schools	Muni.	Purveyors	Totals
	SF	MF					
2011 <sup>(1)</sup>	224,617	48,900	77,657	6,543	56,789	12,781	427,287
2012 <sup>(1)</sup>	250,063	54,440	86,454	7,284	63,223	14,228	475,691
2013 <sup>(1)</sup>	240,350	52,325	83,096	7,001	60,767	13,676	457,214
2014 <sup>(1)</sup>	257,845	56,134	89,145	7,510	65,190	14,671	490,496
2015 <sup>(1)(2)</sup>	223,812	48,725	77,378	6,519	81,586	12,735	450,755
2016	249,189	55,862	136,919	5,131	38,104	23,522	508,727
2017	241,419	52,071	112,823	4,761	44,703	0	455,777
Average <sup>(3)</sup>	<b>241,042</b>	<b>52,637</b>	<b>94,782</b>	<b>6,393</b>	<b>54,796</b>	<b>15,269 <sup>(4)</sup></b>	<b>469,180</b>

(1) Customer classification values calculated based upon annual consumption records and 2010 Water System Plan fraction of use for each classification.

(2) Due to a fire in Chelan in August 2015, it is estimated that water consumption increased by 25,000,000 gallons for the year. This volume has been removed from the total annual consumption for purposes of calculating each classification's use, and then added to the Municipal classification.

(3) Average does not take into account 2015 Municipal water use due to August fire.

(4) Average for 2011-2016.

Due to the high amount of vacation homes the single-family residential class has been separated into Full-time and Part-time users as seen in Table 2-5. The WSDM has a methodology to compute Full and Part time users:

*“A full-time residence is any single-family dwelling unit that meets two criteria:*

1. *It houses one or more persons on a regular daily basis for 180 or more days each year.*
2. *Its occupants regularly use water for indoor use and outdoor irrigation in a manner typical of a single-family household in a residential setting.”*

This methodology was used to calculate the amount of Full and Part time single-family residential users. ‘Regular’ water usage was assumed to be 350 gallons per day. Each monthly total for the Single-family customers was divided by the amount of days in the billing period to get a daily use value. If this value was greater than our assumed ‘Regular’ water usage then the maximum amount of days was assigned for the billing period. If the daily water usage was less than the assumed ‘Regular’ usage, then the total usage was divided by the assumed ‘Regular’ water usage value to get an estimated number of days in which the service was ‘Occupied’. The total days ‘Occupied’ for the year was totaled. If the total days ‘Occupied’ was greater than 180 days then the user was considered to be a Full-time user. Meter Record information was only available for the years 2016 and 2017. Since the City of Chelan has a high amount of vacation properties, this differentiation assists in calculating an accurate Equivalent Residential Unit for further calculations. Future calculations assume that Part-time properties operate with a Full-time demand to be conservative.

TABLE 2-5

**Full/Part Time Single Family Residential Water Consumption (1,000 gallons)**

<b>Year</b>	<b>SF Residential (Total)</b>	<b>SF Residential (Full Time)</b>	<b>SF Residential (Part Time)</b>
2016	249,189	221,900	27,289
2017	241,419	198,931	42,488
<b>Average (2016-2017)</b>	<b>245,304</b>	<b>210,416</b>	<b>34,889</b>

In general, water consumption for all customer classes shown in Table 2-4 is greater from May to October than during the low-demand winter months, due to irrigation usage and an increase in tourism in the spring to summer months.

The City’s residential consumption, consisting of both single- (SF) and multi-family (MF) units, is summarized in Table 2-6. The City’s average residential per capita consumption is not excessive, considering that this amount includes water for irrigation.

TABLE 2-6

## Per Capita Residential Water Consumption

Year	Service Area Population <sup>(1)</sup>	Residential Consumption <sup>(2)</sup> (gal/yr)	Avg. Day Res. Consumption (gpd)	Per Capita Res. Consumption <sup>(3)</sup> (gpcd)
2011	3,924	273,517,688	749,400	191
2012	3,929	304,502,366	834,300	212
2013	3,942	292,674,750	801,800	203
2014	3,960	313,979,437	860,200	217
2015	4,045	272,536,809	746,700	185
2016	4,108	305,051,000	835,800	203
2017	4,159	293,490,000	804,100	193
<b>Average</b>				<b>201</b>

(1) From Table 2-2.

(2) Sum of SF Residential and MF Residential from Table 2-4.

(3) Per Capita Consumption = Avg. Day Res. Consumption / Service Area Population.

The City's average per capita residential consumption of 201 gpd per person for 2011 through 2017 is generally typical of other Eastern Washington water systems without separate irrigation systems, and represents an improvement in water consumption from the 214 gpd for 2004 through 2007 identified in the 2010 Water System Plan. It is worth noting that the WSDM provides Equation 5-1 to estimate the ADD for a typical residential connection.

$$ADD = \frac{8000}{AAR} + 200$$

Where:

ADD = Average Daily Demand, gpd/ERU

AAR = Average Annual Rainfall, 11.4 in/yr

This equation produces an estimate of 902 gpd per ERU, or about 376 gpd per person, assuming 2.4 persons per household (2010 Census). The City's average consumption rate of 201 gpd per person is well below this amount.

**Distribution System Leakage**

Section 8 of WAC 246-290, as revised to incorporate the 2003 Municipal Water Law, requires municipal water suppliers with 500 or more connections to meet a state distribution system leakage (DSL) standard of no more than 10 percent as averaged over the previous three years. DSL must be reported as a volume and as a percentage of total production. The City's DSL for 2011 through 2017 is summarized in Table 2-7.

**TABLE 2-7****2011-2017 Distribution System Leakage (DSL)**

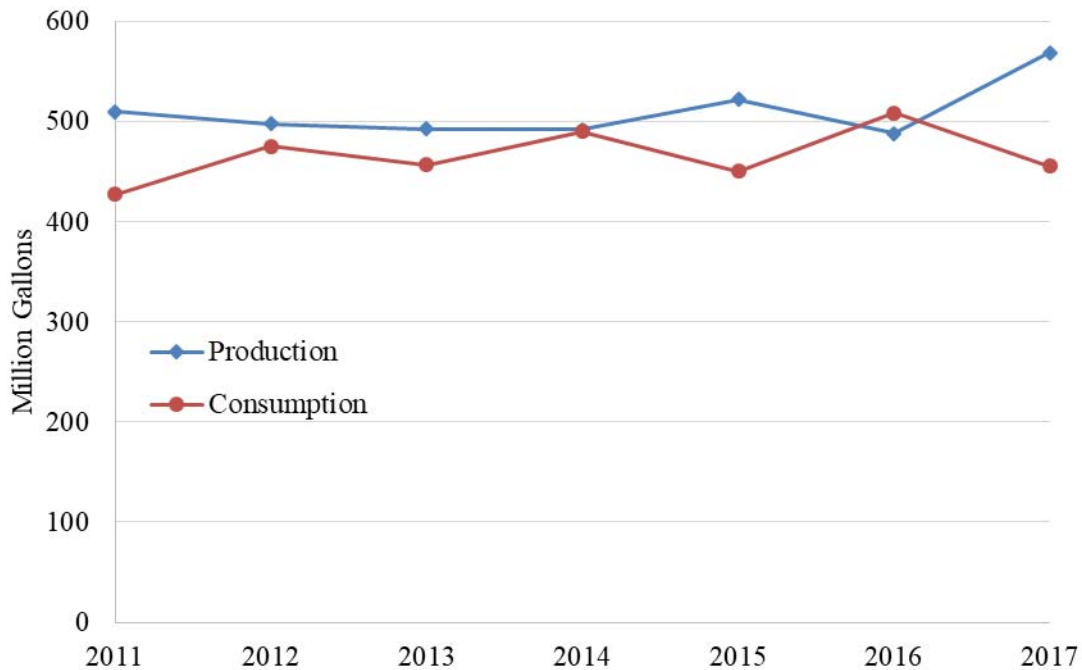
<b>Year</b>	<b>Annual Production <sup>(1)</sup> (gal)</b>		<b>Annual Consumption <sup>(1)</sup> (gal)</b>	<b>DSL <sup>(2)</sup> (gal)</b>		<b>DSL <sup>(3)</sup> (%)</b>		<b>3-Year Average (%) <sup>(4)</sup></b>
	<b>Recorded</b>	<b>w/ Flow-by <sup>(1)</sup></b>		<b>Recorded</b>	<b>w/ Flow-by <sup>(1)</sup></b>	<b>Recorded</b>	<b>w/ Flow-by <sup>(1)</sup></b>	
2011	422,790,000	510,390,000	427,287,000	-4,497,000	83,103,000	-1.1%	16.3%	
2012	410,680,000	498,280,000	475,691,000	-65,011,000	22,589,000	-15.8%	4.5%	11.8%
2013	405,540,000	493,140,000	457,214,000	-51,674,000	35,926,000	-12.7%	7.3%	9.4%
2014	404,967,000	492,567,000	490,496,000	-85,529,000	2,071,000	-21.1%	0.4%	4.1%
2015	435,001,000	522,601,000	450,755,000	-15,754,000	71,846,000	-3.6%	13.7%	7.2%
2016	400,810,000	488,410,000	508,727,000	-107,917,000	-20,317,000	-26.9%	-4.2%	7.1%
2017	481,717,000	569,317,000	455,777,000	25,940,000	113,540,000	5.4%	19.9%	16.8%

- (1) Annual Production and Consumption from City's records. See Tables 2-2 and 2-4. Columns with flow-by include the 10,000 gph flow-by factor in production volumes.
- (2)  $DSL = (Annual\ Production) - (Annual\ Consumption)$
- (3)  $Percent\ of\ Total\ Production = (DSL\ in\ gallons) / (Annual\ Production)$ .
- (4) 3-Year Average only for DSL values with flow-by factor and negative DSL is calculated at 0%. 3-Year Average for 2011 and 2012 includes an estimated DSL of 14.5% in 2010 (Recorded 2010 Production = 423,196,000 gallons, 2010 with estimated Flow-by = 510,796,000 gallons, Recorded 2010 Consumption = 436,686,000 gallons).

As discussed in previous sections, there are sources of errors in the production data that cause an under accounting of actual production volumes. When the 10,000 gph flow-by factor is added to the data, many negative DSL values are removed. The year 2016 still shows a negative DSL, potentially due to inaccuracies in the flow-by factor used. The City has been working diligently to reduce water system losses, although it is difficult to quantify the effect this pipe replacement effort has had on distribution leakage. It appears that the 3-year average has been consistently below 10% since 2012. However, 2017 shows an increase to 19.9%. With the upgrade of the finished-water flow meter the City expects a more accurate representation of its DSL to be recorded in subsequent years.

Figure 2-3 compares annual production to annual consumption for the period 2011 to 2017 (including the flow-by factor). It is apparent that Production and Consumption do not match consistently. As discussed previously, the City has identified that because production is measured as treated water leaves the water treatment plant, there are many periods where water slowly exits the treated water reservoirs and does not register as production. As a result, the consumption data is considered to be the more accurate data set, and the City plans to replace the production meter with a compound meter capable of registering low flows from the water treatment plant.

The City's inconsistent data creates difficulty in determining an appropriate leakage rate to use for future water use planning. The future leakage rate is calculated using the average leakage rate for 2011 through 2017 without the 2016-year value (negative DSL). The resulting 3-year average leakage rate of 16.8 percent is higher than the three-year average DSL of 9.0 percent identified in the 2010 Water System Plan.

**FIGURE 2-3****2011-2017 Annual Production and Consumption****Equivalent Residential Units**

Equivalent residential units (ERUs) are a way to express water use by non-residential customers as an equivalent number of residential customers. Table 2-8 summarizes consumption and ERUs for each customer classification. As identified in the table, the average full time single-family residential consumption for 2016 through 2017 is calculated to be 512 gpd/ERU (210,416,000 gallons/year ÷ 365 day/year ÷ 1,125 full time single family residential connections). This number is divided into the average annual consumption for each customer class to arrive at the number of ERUs for that class.

Since the 2010 Water System Plan, the water consumption per ERU appears to have risen from 468 gpd/ERU to 512 gpd/ERU. However, the 2010 ERU calculation does not account for Full/Part time single family residential users. When calculating this value using all of the single-family residential users the resulting value is 355gpd/ERU (245,304,000 gallons/year ÷ 365 day/year ÷ 1,891 single family residential connections); an overall decrease in usage.

DSL ERU calculations shown in the Table 2-8 represents an average DSL from 2011 through 2017 without 2016 data as justified in the previous section.



**TABLE 2-8****2016-2017 Average Equivalent Residential Units**

<b>Classification</b>	<b>Metered Consumption <sup>(1)</sup> (gal)</b>	<b>Number of Connections <sup>(2)</sup></b>	<b>ERUs <sup>(3)</sup></b>	<b>ERUs/ Conn.</b>	<b>Percent of Total ERUs</b>
SF Residential (Total)	245,304,000	1,891	1,312	0.7	45.7%
SF Residential (Full Time)	210,416,000	1,125	1,125	1.0	39.2%
SF Residential (Part Time)	34,889,000	714	187	0.3	6.5%
MF Residential	53,967,000	169	289	1.7	10.1%
Commercial	124,871,000	273	668	2.4	23.3%
Schools	4,946,000	7	26	3.7	0.9%
Municipal <sup>(4)</sup>	53,165,000	34	284	8.4	9.9%
DSL <sup>(5)</sup>	54,845,833	N/A	293	N/A	10.2%
<b>Total</b>	<b>537,099,833</b>	<b>2,322</b>	<b>2,872</b>		<b>100%</b>

(1) From City records. Average values from Table 2-4.

(2) Average for 2016 and 2017.

(3) Metered Consumption ÷ 365 days ÷ 512 gpd/ERU.

(4) City absorbed purveyor usage in 2017. 2016 purveyor usage combined with 2016 municipal usage and averaged with 2017 municipal usage.

(5) Average of 2011 through 2017 Leakage Volume (with flow-by factor) without 2016 data as seen in Table 2-7.

**Largest Water Users**

Peak consumption patterns by large water users are important because a modest increase or decrease in consumption by a large water user could significantly change the overall demands of the system. It is also important for the hydraulic model to identify locations of high demand in the water service area. The City's largest water users during 2017 and their percentage of total consumption are listed in Table 2-9.

**TABLE 2-9****2017 Largest Water Users**

<b>Customer</b>	<b>2017 Usage (1,000 gallons)</b>	<b>Percent of Total Consumption</b>
City of Chelan	44,703	9.8%
Chelan Fruit	28,572	6.3%
Campbell's	28,419	6.2%
Lakeside Lodge & Suites	8,033	1.8%
Fred Sharp	7,077	1.6%
Chelan Co PUD	6,241	1.4%
Slidewater's Water Park	5,314	1.2%
Lake Chelan Shores Condos	4,344	1.0%
Lake Chelan School District	3,230	0.7%
Chelan Bluff	3,184	0.7%
<b>Total</b>	<b>139,117</b>	<b>30.5%</b>

**PROJECTED FUTURE POPULATION AND WATER DEMANDS**

The following section provides population and water use projections based on the historical data presented in the previous sections.

**PROJECTED POPULATIONS AND ERUS**

The City has recently updated its Comprehensive Plan, including a revision to growth projections for the City. The City has completed a variety of planning documents in recent years pertaining to its wastewater collection system, transportation system, and water system, each of which has utilized a different method for projecting growth. In addition to these planning documents, Chelan County has identified a target growth projection for 2017-2037. The City has determined that the most appropriate growth rate to utilize for its various infrastructure planning is an annual growth rate of 1.245 percent, which is the average annual growth rate that the City experienced between 1990 and 2015 and is consistent with the 2017 Comprehensive Plan. This growth rate will be utilized for all classes of ERUs, besides Municipal, Purveyors, and Leakage (assumed to be constant) to determine future ERUs and population. This growth rate does not factor in potential developments (discussed later in this Chapter).

Table 2-10 shows the projected City population and ERUs for the years 2018-2023 and the 6-, 10-, and 20-year planning periods.

**TABLE 2-10**  
**Projected ERUs <sup>(1)</sup>**

<b>Year</b>	<b>Pop.</b>	<b>Single-Family Residential (4)</b>	<b>Multi-Family Residential</b>	<b>Commercial</b>	<b>Schools</b>	<b>Municipal (2)(3)</b>	<b>Leakage <sup>(3)</sup></b>	<b>Total</b>
2018	4,211	1,915	293	676	26	284	293	3,487
2019	4,263	1,939	297	684	26	284	293	3,523
2020	4,316	1,963	300	693	27	284	293	3,560
2021	4,370	1,987	304	702	27	284	293	3,597
2022	4,424	2,012	308	710	27	284	293	3,635
2023	4,479	2,037	312	719	28	284	293	3,673
2024	4,535	2,063	316	728	28	284	293	3,711
2028	4,765	2,167	332	765	29	284	293	3,870
2038	5,392	2,453	375	866	33	284	293	4,304

- (1) Based upon an annual growth rate of 1.245%.  
 (2) Purveyor ERUs added to Municipal  
 (3) Assumed constant  
 (4) Assumes all Single-Family Residential Connections are Fulltime

## PROJECTED DEMANDS

Table 2-11 summarizes the Average Day Production, Maximum Day Production, and PHD projections for the next 20 years. These projections will be used in the system analysis presented in Chapter 3. The Average day production for 2016 and 2017 calculated before (512 gpd/ERU) was used as the starting point for these projections. Potential savings from water use efficiency measures are discussed in Chapter 4.

**TABLE 2-11**

### Project Water System Demands

Year	Service Area Population (1)	ERUs (1)	Projected Average Day Production (2)		Projected Max Day Production (3)		Projected PHD (4)
			gpd	ac-ft/yr	gpd	gpm	gpm
2018	4,211	3,487	1,786,800	2,001	3,389,600	2,350	4,700
2019	4,263	3,523	1,805,400	2,022	3,424,900	2,380	4,760
2020	4,316	3,560	1,824,200	2,043	3,460,600	2,400	4,800
2021	4,370	3,597	1,843,200	2,065	3,496,600	2,430	4,860
2022	4,424	3,635	1,862,500	2,086	3,533,200	2,450	4,900
2023	4,479	3,673	1,882,000	2,108	3,570,200	2,480	4,960
2024	4,535	3,711	1,901,800	2,130	3,607,800	2,510	5,020
2028	4,765	3,870	1,983,200	2,221	3,762,200	2,610	5,220
2038	5,392	4,304	2,205,500	2,470	4,183,900	2,910	5,820

- (1) From Table 2-10. Part-time single family residential connections assumed to be full-time.
- (2) Average Daily Production = ERUs \* 512 gpd/ERU. See Table 2-8 for calculation of ERUs. The average of Average Day Production values for 2016 through 2017 was used to project forward.
- (3) Maximum Day Production is equal to Average Day Production multiplied by the Maximum Day Production to Average Day Production ratio of 1.9, see Table 2-3.
- (4) PHD is equal to Maximum day production multiplied by the PHD to Maximum Day Production ratio of 2.0.

## POTENTIAL DEVELOPMENTS

When projecting future demands, it is also important to forecast potential future developments that could add demand to the water system. Since the assumed growth rate does not factor in future developments it is necessary to add the developments to any estimated growth in the City. Table 2-12 shows developments that have been proposed to the City of Chelan's planning department, the assumed pressure zone, their estimated year of connection, and estimated ERUs added. This table was generated using maps of potential developments and preliminary planning documents of the potential developments. ERUs have been estimated by the number of lots or from past development reviews. See Figure 2-4 for locations of the future developments.

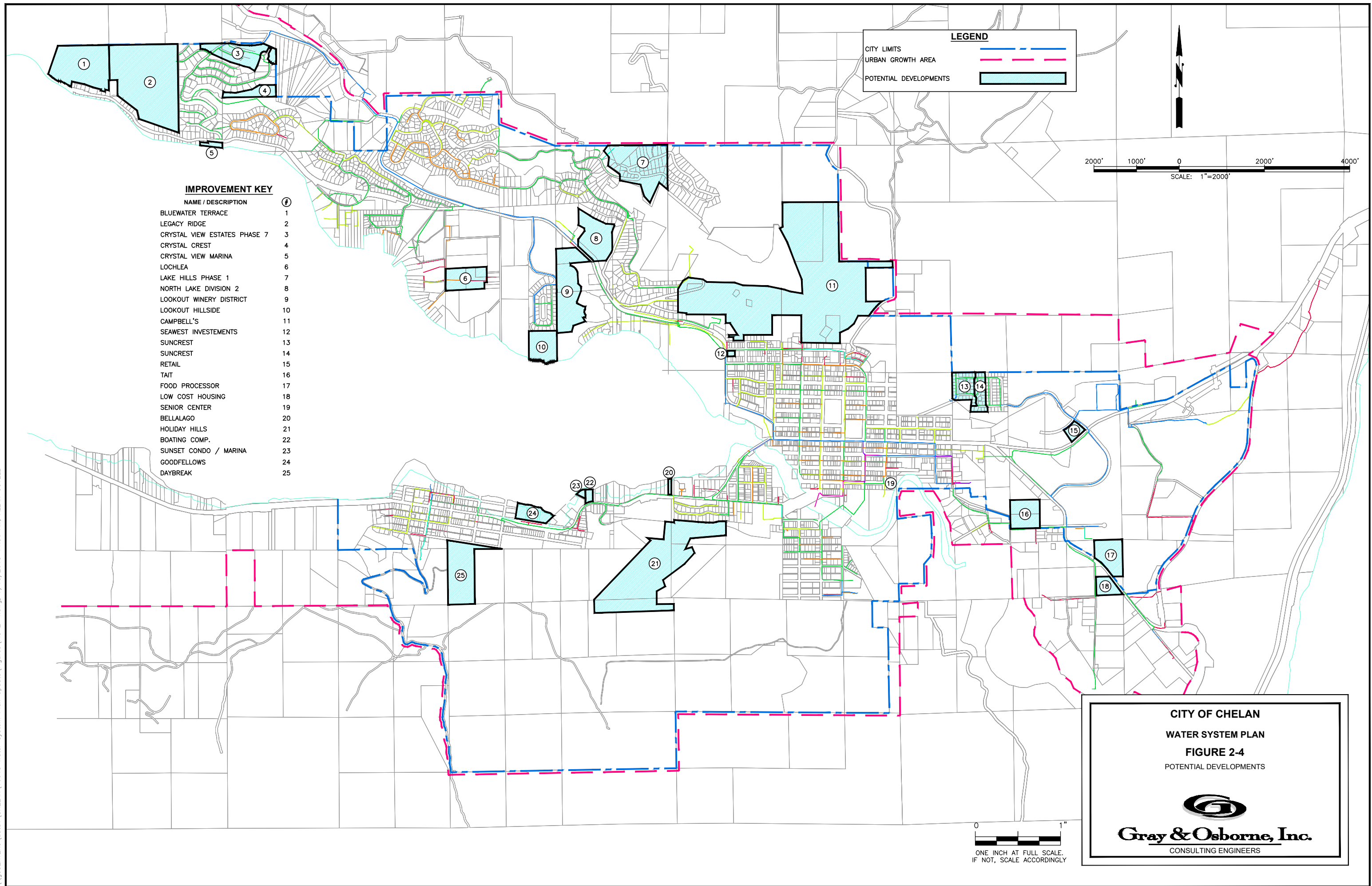
**TABLE 2-12****Potential Developments**

Development	Pressure Zone	Estimated ERUs			
		2018	2024	2028	2038
Legacy Ridge	Darnell's	5	30	60	90
Northlake Division 2	Darnell's				40
Lochlea	Darnell's				61
Bluewater Terrace	Darnell's		10	20	48
Crystal View Estates	Darnell's			10	10
Crystal View Marina	Darnell's				3
Crystal Crest	Darnell's				17
Lookout Winery District	Darnell's				137
Lookout Hillside	Darnell's				43
Seawest Investments	Main			39	39
Downtown Senior Center	Main				160
Bellalago	Main			14	14
Sunset Marina	Main			36	36
Good Fellows	Main				33
Boat Company	Main				3
Suncrest	Washington St		10	30	53
Tait	Washington St			22	22
Low cost Housing	Washington St				40
Food Processor	Washington St				10
14,000 sf Retail	Washington St				6
Lake Hills	NEW			86	86
Holiday Hills	NEW			219	428
Daybreak	NEW				900
Campbell's	NEW		120	137	216
<b>Total</b>		<b>5</b>	<b>170</b>	<b>673</b>	<b>2,495</b>

As can be seen, an estimated 2,495 ERUs worth of potential developments have been submitted to the City's planning department for review. Many of these developments are for commercial or tourist use and as such, upon completion, may have instantaneous demand. As opposed to single-family and multi-family developments that may see population over the course of years. For further projections and analyses, growth and developments will be analyzed separately.

Tables 2-13 and 2-14 show the estimated projection of ERUs and demands with the proposed developments taken into account. Further analyses will focus on growth for calculations, however, a summary of the effect of potential developments will be provided in Chapter 3 and will be considered for the development of capital improvements.

\\goSERVER3\data1\CHELAN\16018 Water System Plan Update\Figures\FIG 2-4.dwg, 7/10/2018 11:56 AM, ALLAN COVELL



**TABLE 2-13****Projected ERUs <sup>(1)</sup> – With Developments**

<b>Year</b>	<b>Single-Family Residential (4)</b>	<b>Multi-Family Residential</b>	<b>Commercial</b>	<b>Schools</b>	<b>Municipal (2)(3)</b>	<b>Leakage <sup>(3)</sup></b>	<b>Potential Developments</b>	<b>Total</b>
2018	1,915	293	676	26	284	293	0	3,487
2019	1,939	297	684	26	284	293	5	3,528
2020	1,963	300	693	27	284	293	38	3,598
2021	1,987	304	702	27	284	293	71	3,668
2022	2,012	308	710	27	284	293	104	3,739
2023	2,037	312	719	28	284	293	137	3,810
2024	2,063	316	728	28	284	293	170	3,881
2028	2,167	332	765	29	284	293	673	4,543
2038	2,453	375	866	33	284	293	2,495	6,799

(1) Based upon an annual growth rate of 1.245%.

(2) Purveyor ERUs added to Municipal

(3) Assumed constant

(4) Assumes all Single-Family Residential Connections are Full time

**TABLE 2-14****Projected Water System Demands – With Developments**

<b>Year</b>	<b>ERUs <sup>(1)</sup></b>	<b>Projected Average Day Production <sup>(2)</sup></b>		<b>Projected Max Day Production <sup>(3)</sup></b>		<b>Projected PHD <sup>(4)</sup></b>
		<b>gpd</b>	<b>ac-ft/yr</b>	<b>gpd</b>	<b>gpm</b>	<b>gpm</b>
2018	3,487	1,786,800	2,001	3,389,600	2,350	4,700
2019	3,528	1,808,000	2,025	3,429,900	2,380	4,760
2020	3,598	1,843,700	2,065	3,497,600	2,430	4,860
2021	3,668	1,879,600	2,105	3,565,700	2,480	4,960
2022	3,739	1,915,800	2,146	3,634,400	2,520	5,040
2023	3,810	1,952,200	2,187	3,703,400	2,570	5,140
2024	3,881	1,988,900	2,228	3,773,000	2,620	5,240
2028	4,543	2,328,100	2,608	4,416,500	3,070	6,140
2038	6,799	3,484,000	3,903	6,609,300	4,590	9,180

(1) From Table 2-13.

(2) Average Daily Production = ERUs\* 512 gpd/ERU. See Table 2-8 for calculation of ERUs. The average of Average Day Production values for 2016 through 2017 was used to project forward.

(3) Maximum Day Production is equal to Average Day Production multiplied by the Maximum Day Production/Average Day production ratio of 1.9, see Table 2-3.

(4) PHD is equal to Maximum Day Production multiplied by the PHD to Maximum Day Production ratio of 2.0.



## **CHAPTER 3**

## **CHAPTER 3**

### **SYSTEM ANALYSIS**

#### **INTRODUCTION**

The purpose of this chapter is to determine if the existing water system facilities are able to supply sufficient quality and quantity of water to meet existing and projected demands. The major sections of this chapter are:

- Water System Standards
- Water Quality Analysis
- Facility Analysis
- Water System Capacity Analysis
- System Deficiencies

The design and construction standards identify the standards that apply to the City's water system facilities. The system component analyses compare the various design standards to the City's existing facilities. Based on these analyses, a summary of deficiencies is provided. Recommended improvements, project costs, and prioritization of recommended improvements are presented in Chapter 8 of this plan.

#### **WATER SYSTEM STANDARDS**

The City complies with water quality standards established by the Washington State Department of Health.

Design standards established by the Washington State Department of Health are used to evaluate the City's water system in this Chapter.

This plan adopts construction standards as described in Chapter 7 and located in Appendix B.

#### **GENERAL FACILITY STANDARDS**

WAC 246-290 is the primary drinking water regulation used by DOH to assess capacity, water quality, and compliance with drinking water standards. The 2009 Water System Design Manual (WSDM) serves as guidance for the preparation of plans and specifications for Group-A public water systems in compliance with WAC 246-290. The WSDM also references the following codes and guidelines:

- International Building Code
- Uniform Plumbing Code

- Local codes
- American Water Works Association (AWWA) Standards
- American Society of Civil Engineers (ASCE) Standards
- American Public Works Association (AWPA) Standards

Table 3-1 lists the suggested WSDM guidance and the City's policies with regard to each standard for general facility requirements. The design standards for the following subjects are discussed in the order shown below:

**TABLE 3-1**  
**Water System General Facility Requirements**

Standard	DOH Water System Design Manual	City of Chelan Standard
Average Day and Maximum Day Demand	Average Day Demand (ADD) and Maximum Day Demand (MDD) should be determined from previous metered water use data.	ADD = Metered Production Data MDD = 1.9*ADD (based on historical MDD/ADD ratios)
Peak Hour Demand	Peak hour demand is determined using the following equation: $PHD = (MDD/1440)[(C)(N) + F] + 18$ Where: C = Coefficient from DOH Table 5-1 N = Number of connections, ERUs F = Factor from Table 5-1	PHD = 2.0 * MDD for consistency with previous planning efforts (See Chapter 2 discussion)
Source Capacity	Capacity must be sufficient to meet MDD and recommended sufficient to replenish fire suppression storage in 72 hours.	Same as DOH WSDM, Chapter 7.

TABLE 3-1 (continued)

## Water System General Facility Requirements

Standard	DOH Water System Design Manual	City of Chelan Standard
Storage Requirements	<p>The sum of:  <u>Operational Storage</u> Volume sufficient to prevent pump cycling.  <u>Equalizing Storage</u>:  <math>V_{ES} = (Q_{PH} - Q_S) * 150</math>  <u>Standby Storage</u>:  <math>V_{SB} = (2 * ADD * N) - t_m * (Q_S - Q_L)</math>  <u>Fire Suppression Storage</u>:  <math>V_{FSS} = NFF * T</math>            Where:            ADD = average day demand, gpd/ERU            N = number of ERUs            Q<sub>PH</sub> = peak hour demand, gpm            Q<sub>S</sub> = capacity of all sources, excluding emergency sources, gpm            Q<sub>L</sub> = capacity of largest source, gpm            t<sub>m</sub> = daily pump run time, min (1440)            NFF = needed fire flow, gpm            T = fire flow duration, min</p>	Same as DOH WSDM, using the formulas provided in the manual, Chapter 9.
Minimum System Pressure	The system should be designed to maintain a minimum of 30 psi in the distribution system under PHD and 20 psi under fire flow conditions during MDD.	Same as DOH WSDM, Chapter 8.
Fire Flow Standard	The minimum fire flow shall be determined by the local fire authority or WAC 246-293 for systems within a critical water supply service area (CWSSA).	Fire flow requirements are provided by building official requirements, see Table 3-2 and Figure 3-1.
Minimum Pipe Sizes	The diameter of a transmission line should be determined by hydraulic analysis. The minimum size distribution system line shall not be	Same as DOH WSDM, Chapter 8.

**TABLE 3-1 (continued)****Water System General Facility Requirements**

<b>Standard</b>	<b>DOH Water System Design Manual</b>	<b>City of Chelan Standard</b>
Minimum Pipe Sizes (cont.)	less than 6 inches in diameter.	Same as DOH WSDM, Chapter 8.
Reliability Recommendations	<ul style="list-style-type: none"> <li>• Sources capable of supplying MDD within an 18-hour period</li> <li>• Sources meet ADD with largest source out of service</li> <li>• Backup power equipment for pump stations unless there are two independent power sources</li> <li>• Provision of multiple storage tanks</li> <li>• Standby storage equivalent to ADD x 2, with a minimum of 200 gpd/ERU</li> <li>• Low- and high-level storage alarms</li> <li>• Looping of distribution mains when feasible</li> <li>• Pipeline velocities not &gt;8 fps at PHD</li> <li>• Flushing velocities of at least 2.5 fps for all pipelines</li> </ul>	Same as DOH WSDM, Chapter 5.
Valve and Hydrant Spacing	Sufficient valving should be placed to keep a minimum of customers out of service when water is turned off for maintenance or repair. As a general rule, valves on distribution mains of 12 inches and smaller should be located every 1,000 feet. Fire hydrants on lateral should be provided with their own auxiliary gate valve.	Valve and hydrant standards are outlined in the City's Developer Standards. Valve spacing is a maximum of 600 feet, and hydrant spacing is 300 feet in commercial and industrial areas.
Water Quality Standards	The primary drinking water regulation utilized by DOH to assess capacity, water quality, and overall compliance with drinking water standards.	WAC 246-290

## FIRE FLOW DEMANDS AND MINIMUM PRESSURE

Table 3-2 shows the highest required fire flow rate and duration for each pressure zone. Consistent with WAC 246-290-230, the City requires a minimum pressure of 30 psi under PHD conditions and 20 psi during MDD and fire flow conditions. Individual portions of the City are required to meet fire flow standards as established by the City Fire Marshal, the City's fire flow standards are also shown on Figure 3-1.

**TABLE 3-2**

### Chelan Fire Flow Requirements <sup>(1)</sup>

Pressure Zone	Required Fire Flow Rate (gpm)	Required Fire Flow Duration (hr)	Total Required Fire Suppression Storage (gal)
Main	2,000	4	480,000
South Chelan	1,750	2	210,000
Lakeside	1,500	2	180,000
High Street	1,500	2	180,000
Hospital	1,500	2	180,000
Darnell's	2,500	2	300,000
Golf Course	1,500	2	180,000
Golf Course Terrace	1,500	2	180,000
Orchard View	1,500	2	180,000
Stehekin Way	1,500	2	180,000
Boyd Road	1,500	2	180,000
Pinnacle	1,500	2	180,000
Washington Street	2,750	2	330,000
Wilmorth	1,500	2	180,000

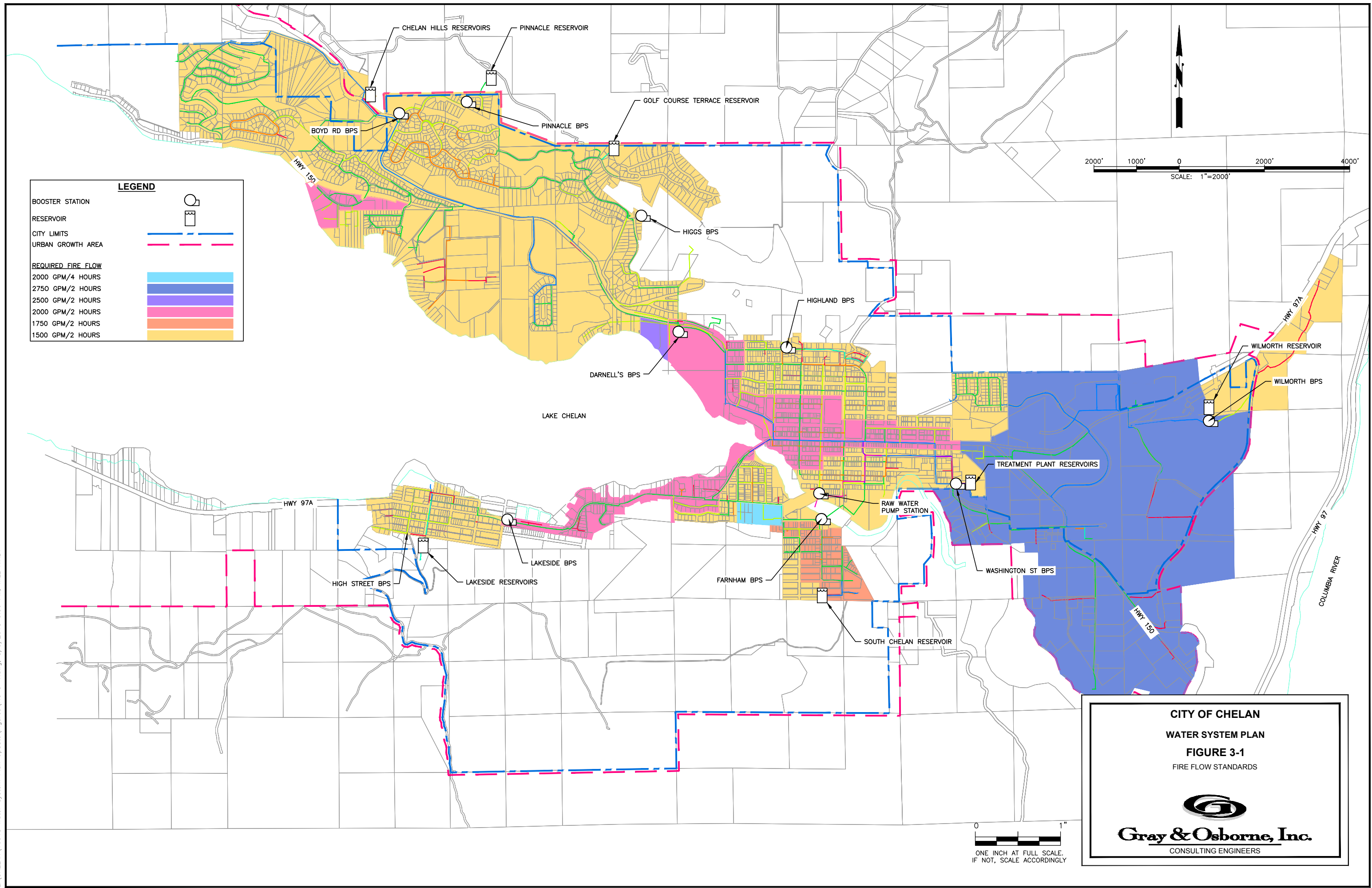
(1) Highest fire flow rates and durations within each pressure zone provided by City Fire Marshal.

## WATER QUALITY ANALYSIS

Group-A public community water systems must comply with the drinking water standards of the federal Safe Drinking Water Act and its amendments. The Washington State Department of Health adopted the federal standards under WAC 246-290. To enable Group-A water systems to comply with the regulations, DOH utilizes an online Water Quality Monitoring Schedules (WQMS) listing that system's reporting requirements. A WQMS is located in Appendix C along with water quality samples from 2018. The Coliform Monitoring Plan can be found in Chapter 6. The following lists the appendices containing the City's water quality monitoring and reporting information:

- Water Quality Monitoring Schedule (WQMS)      Appendix C-1
- 2018 Water Quality Samples      Appendix C-2

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- |   |  |                  |
|---|--|------------------|
| • | Consumer Confidence Report             | Appendix C-3     |
| • | Coliform Monitoring Plan               | Appendix C-4     |
| • | Disinfectant Byproduct Monitoring Plan | See Appendix C-1 |
| • | Sampling Locations                     | Figure C-1       |

The City has only had one water quality event since the 2010 Water System Plan. A positive coliform tested resulted from a sample taken from the City's distribution system on July 7, 2016. Repeat samples were satisfactory. The City is currently in compliance with all other State and federal water quality requirements.

## **FACILITY ANALYSIS**

The following section evaluates the existing water system facilities. They are analyzed based on their capacity, physical conditions, and performance capabilities relative to existing and projected growth conditions. Figure 1-2 shows a map of the City's existing water system. A summary of the City's water system deficiencies and proposed improvements is presented in Table 3-15. A comprehensive description of proposed improvements including costs and a schedule for implementation is presented in Chapter 8. An analysis of the system in regards to potential developments is provided at the end of the section.

## **SOURCE OF SUPPLY ANALYSIS**

WAC 246-290-222(4) requires source capacity to be sufficient to provide a reliable supply of water equal to or exceeding the Maximum Day Demand (MDD) at all times. For these analyses the Maximum Day Production value will be used. Capacity of the raw water pumping station with one pump out of service is approximately 5,600 gpm, while the available capacity of the water treatment plant is approximately 4,650 gpm (6.7 MGD), both of which are capable of exceeding the City's maximum instantaneous water right of 4,488 gpm. The limiting instantaneous water right capacity of 4,488 gpm will be used to analyze the City's ability to meet projected Maximum Day Production requirements. The City's raw water pumping station is equipped with a variable frequency drive (VFD) that can adjust the pump speed to the capacity of the limiting instantaneous water right. Table 3-3 compares the City's source production capacity with projected Maximum Day Production requirements through the year 2038.



**TABLE 3-3****Source Capacity Analysis**

<b>Year</b>	<b>Source Capacity <sup>(1)</sup> (gpm)</b>	<b>Maximum Day Production <sup>(2)</sup> (gpm)</b>	<b>Surplus (+)/ Deficit (-) (gpm)</b>
2018	4,488	2,350	2,138
2019	4,488	2,380	2,108
2020	4,488	2,400	2,088
2021	4,488	2,430	2,058
2022	4,488	2,450	2,038
2023	4,488	2,480	2,008
2024	4,488	2,510	1,978
2028	4,488	2,610	1,878
2038	4,488	2,910	1,578

(1) Source Capacity is currently limited by the maximum instantaneous water right of 4,488 gpm.

(2) Maximum day production from Table 2-12.

Table 3-3 indicates that the City has sufficient instantaneous water rights, and therefore source capacity, to meet the projected Maximum Day Production through the 10- and 20-year planning periods.

Besides the requirements of WAC 246-290-222(4), the WSDM recommends that systems wishing to provide a high level of reliability to their customers consider the following source criteria for emergency conditions:

1. Provide sufficient source capacity to meet the MDD and replenish fire suppression storage within 72 hours. The largest fire suppression storage requirement is 480,000 gallons (2,000 gpm for 4 hours).
2. Meet the MDD with 18 (rather than 24) hours of pumping.
3. Meet the ADD with the largest source out of service.
4. Provide two independent power feeds, or portable or in-place backup power unless the power grid meets the following minimum reliability criteria:
  - a. Outage frequency average three or less per year based on data for the three previous years with no more than six outages in a single year. A power outage is considered a loss of power for 30 minutes or longer.
  - b. Outage duration averages less than four hours based on data for the

three previous years with no more than one outage during the previous three-year period exceeding 8 hours.

Table 3-5 summarizes the City's water system capacity with respect to the first three of these recommendations by the end of the 20-year planning period. The City can reliably meet the first three criteria using existing sources through the 20-year planning period. Regarding the fourth recommendation, power outages in the Chelan area are usually short and infrequent, averaging approximately 2 hours for years without fires. The average outage in the Chelan area was much higher in 2015 due to the prevalence of fires forcing fire crews to deactivate power in certain areas and due to infrastructure damage. Appendix D contains recorded power outages for the previous 5 years. Because of the availability of an alternate power feed to the City's raw water pumping station, the availability of standby power at the WTP, and a majority of open-system pressure zones with standby storage throughout the City, the City only considers a standby generator at Darnell's booster station an urgent need at this time. This project completed construction fall 2018. The City requires backup power connections on all of its booster stations and currently owns and operates a fleet of trailer-mounted generators capable of running stations in the event of a power outage, see Table 3-4.

**TABLE 3-4**

**Generator Fleet**

<b>No.</b>	<b>Location/Name</b>	<b>Capacity</b>	<b>Trailer mounted?</b>
1.	Walmart Fire Booster	75kw/ 3ph	Yes
2.	Darnell's	75kw/ 3ph	Yes
3.	Portable No. 1	260 kw/ 3ph	Yes
4.	Portable No. 2	260 kw/ 3ph	Yes
5.	Highland	60 kw/ 3ph	Yes
6.	Raw Water	800kw/ 3ph	Yes
7.	Chelan Bluff	60kw 3ph	No <sup>(1)</sup>
8.	Water Treatment Plant	220kw/ 3ph	No

(1) The City is in the process of mounting this generator onto a trailer.

**TABLE 3-5****Source Production Capacity Analysis**

Criteria	Flow req'd (gpm)	WTP		Inst. Water Right	
		Flow Avail. (gpm)	Surplus (+)/ Deficit (-) (gpm)	Flow Avail. (gpm)	Surplus (+)/ Deficit (-) (gpm)
2018					
1. Meet MDD & Replenish FSS w/i 72 hrs <sup>(1)</sup>	2,461	4,650	2,189	4,488	2,027
2. Meet MDD w/ 18 hrs Pumping <sup>(2)</sup>	3,133	4,650	1,517	4,488	1,355
3. Meet ADD w/o Largest Source <sup>(3)(4)</sup>	1,241	2,325	1,084	4,488	3,247
2024					
1. Meet MDD & Replenish FSS w/i 72 hrs <sup>(1)</sup>	2,621	4,650	2,029	4,488	1,867
2. Meet MDD w/ 18 hrs Pumping <sup>(2)</sup>	3,347	4,650	1,303	4,488	1,141
3. Meet ADD w/o Largest Source <sup>(3)(4)</sup>	1,321	2,325	1,004	4,488	3,167
2028					
1. Meet MDD & Replenish FSS w/i 72 hrs <sup>(1)</sup>	2,721	4,650	1,929	4,488	1,767
2. Meet MDD w/ 18 hrs Pumping <sup>(2)</sup>	3,480	4,650	1,170	4,488	1,008
3. Meet ADD w/o Largest Source <sup>(3)(4)</sup>	1,377	2,325	948	4,488	3,111
2038					
1. Meet MDD & Replenish FSS w/i 72 hrs <sup>(1)</sup>	3,021	4,650	1,629	4,488	1,467
2. Meet MDD w/ 18 hrs Pumping <sup>(2)</sup>	3,880	4,650	770	4,488	608
3. Meet ADD w/o Largest Source <sup>(3)(4)</sup>	1,532	2,325	793	4,488	2,956

(1) FSS = 480,000 gal. Flow (req'd) = Maximum Day Production per Table 2-11 + 480,000 / 72 / 60 = MDD + 111 gpm.

(2) Flow (req'd) = Maximum Day Production per Table 2-11 \* 24/18

(3) Water treatment plant capacity with one filtration unit out of service.

(4) Raw Water Pump Station capacity is 5,600 gpm with one pump out of service. Instantaneous water rights capacity is still limiting condition in this scenario.

As shown in the Table 3-5 the City has adequate source capacity through the 20-year planning horizon.

## WATER RIGHTS ANALYSIS

As indicated by Table 3-6, the City has sufficient water rights to serve its retail water service area for the 20-year planning period. The City's Water Rights Self-Assessment form is presented in Chapter 4.

**TABLE 3-6**

### Water Rights Adequacy

Year	Inst. Withdrawal Qi = 4,488 gpm		Annual Withdrawal <sup>(1)</sup> Qa = 4,283 ac-ft/yr	
	Maximum Day Production (gpm)	Surplus (+)/ Deficit (-) (gpm)	Average Day Production (ac-ft/yr)	Surplus (+)/ Deficit (-) (ac-ft/yr)
2018	2,350	2,138	2,001	2,282
2024	2,510	1,978	2,130	2,153
2028	2,610	1,878	2,221	2,062
2038	2,910	1,578	2,470	1,813

(1) Annual Withdrawal limited by Ecology determination.

## STORAGE ANALYSIS

The nominal volume of a water reservoir is generally taken as the amount of water the reservoir could hold if filled all the way to the top of the reservoir wall. However, practically speaking a reservoir cannot be filled to the top of the wall, and a reservoir also cannot, under normal operational conditions, be drained completely. Therefore, there is a need to determine how much of a reservoir volume is effective storage, and how much effective storage a water system needs.

The DOH WSDM identifies the following components of reservoir storage volume:

- Operational Storage
- Equalizing Storage
- Standby Storage
- Fire Suppression Storage
- Dead Storage

A reservoir's effective storage volume is the nominal volume less operational storage and dead storage. This volume must be large enough to accommodate the requirements for equalizing storage, standby storage and fire suppression storage. Standby storage is nested with Fire Suppression Storage for further analyses.

### **Operational Storage (OS)**

Operational storage is the water volume that typically corresponds to the band of storage between the lead pump-off and lag pump-on conditions. Operational storage for the City's storage reservoirs was determined from operational setpoints provided by the City or as indicated in Table 3-7 and 3-8.

**TABLE 3-7****Operational Storage – Main, South Chelan, and Lakeside Pressure Zones**

<b>Parameter</b>	<b>Treatment Plant Reservoirs.</b>			<b>South Chelan Reservoir</b>	<b>Lakeside Reservoirs.</b>		
	<b>East</b>	<b>West</b>	<b>South</b>		<b>North</b>	<b>South</b>	<b>West</b>
Zone	Main			South Chelan	Lakeside		
Diameter	50	50	90	26	21	21	30
Overflow Elevation	1,303.0	1,303.0	1,301.5	1,301.5	1,299.0	1,299.0	1,299.0
Operational Set Point (Off) <sup>(1)</sup>	1,300.0	1,300.0	1,300.0	1,300.0	1,297.5	1,297.5	1,297.5
Operational Set Point (On) <sup>(1)</sup>	1,295.5	1,295.5	1,295.5	1,292.0	1,295.5	1,295.5	1,295.5
Operational Storage, gal	153,900			31,800	20,900		
Base Elevation, ft.	1282.5	1282.5	1284.5	1,267.0	1,278.5	1,278.5	1,274.0
Highest Service Elevation, ft	1,215			1,578	1,191		
Dead Storage, gal	0			0	0		

- (1) Operational set point elevations for Main and South Chelan pressure zones provided by City; operational set point elevations for Lakeside pressure zone set to provide maximum fire suppression storage.

**TABLE 3-8****Operation Storage – Darnell’s, Golf Course Terrace, Boyd Road, and Washington Street Pressure Zones**

Parameter	Chelan Hills Reservoirs		Golf Course Terrace Reservoir	Pinnacle Reservoir	Wilmorth Reservoir
	East	West			
Zone	Darnell’s		GC Terrace	Boyd Road	Wash. St.
Diameter	53	30	26	30	45
Overflow Elevation	1,653.0	1,653.0	1,780.0	1,780.0	1,430.5
Operational Set Point (Off) <sup>(1)</sup>	1,649.0	1,649.0	1,779.0	1,779.0	1,427.1
Operational Set Point (On) <sup>(1)</sup>	1,643.5	1,643.5	1,776.0	1,776.0	1,423.0
Operational Storage, gal	119,800		15,900	11,900	15,900
Base Elevation, ft.	1,624.0	1,624.5	1,751.0	1,758.0	1,409.0
Highest Service Elevation, ft <sup>(2)</sup>	1,580		1,618	1,709	1,354 <sup>(3)</sup>
Dead Storage, gal	38,120		0	0	0

(1) Operational set point elevations provided by City.

(2) Calculated per static pressure information per the 2010 City of Chelan Water System Plan (Tables 3-10 through 3-15).

(3) Per Google Earth™ topography.

### Equalizing Storage (ES)

This storage component consists of the amount of storage that is needed to make up the difference between the PHD and the capacity of the delivery system. The WSDM requires sufficient ES to make up this difference for 150 minutes, i.e.:

$$ES = (PHD - Q_s)(150 \text{ min})$$

Where:

ES = Equalizing Storage (gallons)

PHD = Peak Hour Demand (gpm)

Q<sub>s</sub> = Sum of all installed and active source of supply capacities, excluding emergency sources of supply in the zone, supplying the reservoir (gpm)

WAC 246-290-230 (5) requires a minimum pressure of 30 psi at the bottom of the ES elevation.

Equalizing storage as shown in Table 3-11 was calculated using peak hour demands for each pressure zone. The water meter records were used to determine the percent usage in each zone and ultimately provide peak hour demand in each zone. Current available source capacity for the Main pressure zone is determined by the capacity of the water treatment plant. The individual source capacities for the remaining zones are determined by the various booster station capacities throughout the City, as summarized in Table 3-9.

**TABLE 3-9**

#### Pressure Zone Source Capacities – Equalizing Storage

Pressure Zone	Water Source	Source Capacity (Q <sub>s</sub> ) (gpm)
Main	Water Treatment Plant	4,650
S. Chelan	Farnham BPS	200
Lakeside	Lakeside BPS	600
Darnells	Darnells BPS	1,400
GC Terrace	Higgs BPS	510
Boyd Road	Boyd Road BPS	300
Wash. St.	Washington St. BPS	400



## Fire Suppression Storage (FSS)

Fire suppression storage is provided to ensure that the volume of water required for fighting fires is available when necessary. Fire suppression storage also reduces the impact of firefighting on distribution system water pressure. The amount of water required for firefighting purposes is specified in terms of rate of flow in gallons per minute and an associated duration. WAC 246-290-230 (6) requires a minimum pressure of 20 psi when the system is simultaneously providing MDD plus the required fire flow.

Fire suppression storage is calculated using the following equation:

$$FSS = (NFF)(t_m)$$

Where:

- FSS = Required fire suppression storage component (gallons)
- NFF = Required fire flow rate, as specified by fire protection authority (gpm)
- $t_m$  = Duration of FF rate, as specified by fire protection authority (minutes)

The fire suppression requirements for each pressure zone are identified in Table 3-2.

## Standby Storage (SB)

Standby storage is water held in reserve for emergency situations, such as temporary loss of a water source. The DOH WSDM recommends that this volume be estimated as 2 days of average day demand for the water system, less the amount of water that can be produced by the water system in one day with the largest source of supply out of service, but not less than 200 gallons per ERU.

Standby storage is calculated using the following equation:

$$SB_{TMS} = (2 \text{ days})(ADD)(N) - t_m(Q_s - Q_L)$$

Where:

- $SB_{TMS}$  = Total standby storage component for a multiple source system (gal)
- ADD = Average day demand for the system (gpd/ERU) = Average day production (gpd/ERU)
- N = Number of ERUs
- $Q_s$  = Sum of all installed and continuously available source of supply capacities, except for emergency sources (gpm)
- $Q_L$  = Capacity of the largest single source serving the system (gpm)
- $t_m$  = Maximum time remaining sources will be allowed to pump per day

Current available source capacity for the Main pressure zone is determined by the

capacity of the water treatment plant. The individual source capacities for the remaining zones are determined by the various booster stations capacities throughout the City, as summarized in Table 3-10.

**TABLE 3-10**  
**Pressure Zone Source Capacities <sup>(1)</sup> – Standby Storage**

<b>Pressure Zone</b>	<b>Water Source</b>	<b>Source Capacity (Q<sub>s</sub>) (gpm)</b>
Main	Water Treatment Plant	2,325 <sup>(2)</sup>
S. Chelan	Farnham BPS	0 <sup>(3)</sup>
Lakeside	Lakeside BPS	300 <sup>(2)</sup>
Darnells	Darnells BPS	700 <sup>(2)</sup>
GC Terrace	Higgs BPS	510 <sup>(4)</sup>
Boyd Road	Boyd Road BPS	150 <sup>(2)</sup>
Wash. St.	Washington St. BPS	200 <sup>(2)</sup>

- (1) With largest pump out of service.
- (2) 50% capacity due to one pump out of service.
- (3) 0% capacity due to pump out of service scenario.
- (4) 100% capacity due to redundant pump out of service.

### **Dead Storage**

During PHD the system must provide 30 psi, which requires a water surface elevation in the various reservoirs that is capable of meeting this requirement. Any water in the reservoirs stored below the required water surface is considered dead storage. The Chelan hills reservoirs have approximately 2' of dead storage for the highest service elevation.

### **Total Storage Requirements**

Total storage volumes available in the City's reservoirs for the next 20 years are shown in Tables 3-11.

**TABLE 3-11****Storage Analysis Summary <sup>(1)</sup>**

<b>Pressure Zone</b>	<b>OS (gal)</b>	<b>ES (gal)</b>	<b>SB1 (gal) (<sup>2</sup>)</b>	<b>SB2 (gal) (<sup>2</sup>)</b>	<b>FSS (gal) (<sup>3</sup>)</b>	<b>Dead Storage (gal)</b>	<b>Total Required Storage (gal) <sup>(4)</sup></b>	<b>Total Available Storage (gal)</b>	<b>Surplus (+)/ Deficit (-) (gal)</b>
<b>2018</b>									
Main	346,300	0	0	338,000	480,000	0	826,300	1,251,600	425,300
S. Chelan	31,800	4,400	174,000	34,000	210,000	0	246,200	131,100	-115,100
Lakeside	20,900	0	0	44,600	180,000	0	200,900	222,700	21,800
Darnell's	119,800	0	0	196,200	300,000	38,120	419,800	503,980	84,180
GC Terrace	11,900	0	0	6,600	180,000	0	191,900	111,200	-80,700
Boyd Road	15,900	0	0	21,800	180,000	0	195,900	111,000	-84,900
Wash. St.	48,800	0	100	56,200	330,000	0	378,800	215,300	-163,500
<b>2024</b>									
Main	346,300	0	0	345,000	480,000	0	826,300	1,251,600	425,300
S. Chelan	31,800	9,600	200,200	39,000	210,000	0	251,400	131,100	-120,300
Lakeside	20,900	0	0	51,400	180,000	0	200,900	222,700	21,800
Darnell's	119,800	0	32,900	203,200	300,000	38,120	419,800	503,980	84,180
GC Terrace	11,900	0	0	10,800	180,000	0	191,900	111,200	-80,700
Boyd Road	15,900	0	0	26,000	180,000	0	195,900	111,000	-84,900
Wash. St.	48,800	7,700	54,600	66,800	330,000	0	386,500	215,300	-171,200
<b>2028</b>									

Pressure Zone	OS (gal)	ES (gal)	SB1 (gal) (2)	SB2 (gal) (2)	FSS (gal) (3)	Dead Storage (gal)	Total Required Storage (gal) (4)	Total Available Storage (gal)	Surplus (+)/ Deficit (-) (gal)
Main	346,300	0	0	350,000	480,000	0	826,300	1,251,600	425,300
S. Chelan	31,800	13,200	218,800	42,600	210,000	0	263,800	131,100	-132,700
Lakeside	20,900	0	0	56,200	180,000	0	200,900	222,700	21,800
Darnell's	119,800	600	57,800	208,000	300,000	38,120	420,400	503,980	83,580
GC Terrace	11,900	0	0	13,800	180,000	0	191,900	111,200	-80,700
Boyd Road	15,900	0	0	29,000	180,000	0	195,900	111,000	-84,900
Wash. St.	48,800	15,300	93,200	74,400	330,000	0	394,100	215,300	-178,800
<b>2038</b>									
Main	346,300	0	0	363,400	480,000	0	826,300	1,251,600	425,300
S. Chelan	31,800	23,300	269,500	52,600	210,000	0	324,600	131,100	-193,500
Lakeside	20,900	0	0	69,600	180,000	0	200,900	222,700	21,800
Darnell's	119,800	14,000	125,800	221,200	300,000	38,120	433,800	503,980	70,180
GC Terrace	11,900	0	0	22,000	180,000	0	191,900	111,200	-80,700
Boyd Road	15,900	0	0	37,200	180,000	0	195,900	111,000	-84,900
Wash. St.	48,800	36,100	198,600	95,000	330,000	0	414,900	215,300	-199,600

(1) Reservoirs included in each zone are from Tables 3-7 and 3-8.

(2) SB1 from DOH equation 9-3,  $SB2 = 200 * N$  where  $N$  = number of ERUs per zone.

(3) From Table 3-2.

(4) Total Required Storage = OS + ES + [Larger of: SB1, SB2 or FSS]

As can be seen in Table 3-11, the South Chelan, Golf Course Terrace, Boyd Road, and Washington Street Pressure zones do not have sufficient storage capacity to meet fire flow/standby storage requirements without additional storage or fire pumps in all of the planning years, with and without developments. The following sections describe additional considerations for the deficient zones.

- **South Chelan:** The required fire flow storage for the South Chelan pressure zone is 210,000 gallons (1,750 gpm for 2 hours). The fire flow storage deficiency of 193,500 gallons (or  $193,600 \text{ gallons} / 120 \text{ min} = 1,613 \text{ gpm}$ ) is resolved through three 700 gpm fire pumps (three in total) located in the Farnham Booster Station. The South Chelan zone is hydraulically connected to the Main zone through a check valve. The Main zone has sufficient capacity to supplement the South Chelan pressure zone, however, if there is high usage and the Farnham Booster Station is unable to operate, the zone may experience low pressures. This scenario was not analyzed in the preparation of this Plan.
- **Golf Course Terrace:** The required fire flow storage for the Golf Course Terrace pressure zone is 180,000 gallons (1,500 gpm for 2 hours). When the Lake Hills reservoir is in operation, fire suppression storage for the new reservoir can be utilized as it is at a higher elevation. A pressure reducing valve (PRV) will reduce the pressure in the higher Lake Hills pressure zone to the Golf Course Terrace zone. Approximately 96,000 gallons (800 gpm for 2 hours) can be transferred to the Golf Course Terrace zone through the proposed 4-inch PRV which surpasses the 80,700-gallon deficit.
- **Boyd Road:** The required fire flow storage for the Boyd Road pressure zone is 180,000 gallons (1,500 gpm for 2 hours). The fire flow storage deficiency of 84,900 gallons (or  $84,900 \text{ gallons} / 120 \text{ min} = 708 \text{ gpm}$ ) is resolved through the Crest PRV station (PRV Station No. 11). This station provides fire flow through the use of a 6-inch PRV set to open when a fire demand drops the pressure in the zone to 32 psi (at the valve outlet). This valve is capable of providing approximately 700 gpm to the Boyd Road zone. Additional Fire Suppression Storage is planned as a Capital Improvement, discussed later in the chapter and in Chapter 8.
- **Washington Street:** The required fire flow storage for the Washington Street pressure zone is 330,000 gallons (2,750 gpm for 2 hours). The fire flow storage deficiency of 199,600 gallons (or  $199,600 \text{ gallons} / 120 \text{ min} = 1,663 \text{ gpm}$ ) without developments and 229,000 gallons (or  $229,000 \text{ gallons} / 120 \text{ min} = 1,908 \text{ gpm}$ ) is resolved through the use of a 1,500 gpm fire pump located at the Washington St. booster station and a planned Capital Improvement to add additional Fire Suppression Storage to the zone.

## **Condition Assessment**

The City has indicated that the storage reservoirs are in excellent condition.

## **BOOSTER STATION ANALYSIS**

The characteristics of the City's BPSs and Raw Water Pumping station are provided in Table 1-4. The City's BPSs pump to both open systems (pressure zones with storage reservoirs open to atmospheric pressure) and closed systems (pressure zones not open to atmospheric pressure). Open system BPSs include Darnell's, Lakeside, Higgs, Boyd Road, Farnham, and Washington Street. Closed system BPSs include Highland, Hospital, High Street, Pinnacle, and Wilmoth. The Lake Hills booster pump will pump to an open system when activated.

### **Open System Booster Pump Station Analysis**

Based on the DOH WSDM, the City's open pressure zone booster stations must meet the following requirements:

1. The BPS shall supply the ADD in the high-pressure system with the largest pump out of service.
2. The BPS shall supply a minimum pressure of 30 psi during the PHD in the supplying system and during the MDD in the high-pressure system with all pumps in service.
3. During the MDD and fire demand of the supplying system, the BPS may need to include provisions to lock out the pump operation whenever either of the following conditions exists:
  - a. At a suction pressure that would cause the pressure at service connections along the supplying distribution system to fall below 20 psi.
  - b. At a suction pressure less than 10 psi anywhere in the suction end of the BPS piping. Storage in the high-pressure system would provide water during the lock-out period.
4. It is recommended that the BPS be connected to a 24-hour alarm system.
5. Back-up power should be provided and operated through an automatic transfer switch.

A capacity analysis was performed to determine each open system BPS's capacity to meet the DOH's requirements discussed herein for the 10- and 20-year planning periods

shown in Table 3-12.

**TABLE 3-12**

**Open System Booster Station Capacity Analysis**

Booster Pump Station	ADD w/o Largest Pump			MDD		
	Flow Req'd (gpm)	Flow Avail. (gpm)	Surplus (+) / Deficit (-)	Flow Req'd (gpm)	Flow Avail. (gpm)	Surplus (+) / Deficit (-)
<b>2018</b>						
Farnham	60	0	-60	115	200	85
Lakeside	79	300	221	150	300	150
Darnells	349	700	351	663	700	37
Higgs	12	510	498	22	510	488
Boyd Rd	39	150	111	74	150	76
Washington St	100	200	100	190	200	10
<b>2024</b>						
Farnham	70	0	-70	132	200	68
Lakeside	91	300	209	173	300	127
Darnells	361	700	339	686	700	14
Higgs	19	510	491	36	510	474
Boyd Rd	46	150	104	88	150	62
Washington St	119	200	81	226	200	-26
<b>2028</b>						
Farnham	76	0	-76	144	200	56
Lakeside	100	300	200	190	300	110
Darnells	370	700	330	702	700	-2
Higgs	24	510	486	46	510	464
Boyd Rd	52	150	98	98	150	52
Washington St	132	200	68	251	200	-51
<b>2038</b>						
Farnham	94	0	-94	178	200	22
Lakeside	124	300	176	235	300	65
Darnells	394	700	306	747	700	-47
Higgs	39	510	471	74	510	436
Boyd Rd	66	150	84	126	150	24
Washington St	169	200	31	320	200	-120

As can be seen in Table 3-12, the Farnham Booster Station has insufficient flow available

to provide ADD without the largest pump. This is because the Farnham Booster Station does not have a backup pump for regular duty. As discussed in the storage analysis, the South Chelan zone is hydraulically connected to the Main pressure zone which can provide flow to the zone without any need to open a valve. Additionally, the booster station has redundant pumps that provide fire flow that can be available to supplement the regular duty pump.

The Washington St Booster Station is expected to be 120 gpm deficient by the 2038 planning year under the MDD scenario. Capital improvements are planned to increase the capacity of this station.

Darnell's Booster Station is expected to be deficient in 2038 under the MDD scenario. Capital improvements are planned to increase the capacity of this station.

### **Closed System Booster Pump Station Analysis**

Based on the DOH WDSM, the City's closed pressure zone BPSs must meet the following requirements:

1. The BPS shall supply the PHD in both the high-pressure system and supplying system with all pumps in service, at a minimum pressure of 30 psi at all service connections throughout the distribution system.
2. It is recommended that the BPS be able to supply the PHD in the high system and supplying system with the largest pump out of service.
3. The BPS shall be capable of meeting the fire suppression requirements (if fire flow is to be provided) by the fire pump(s), or a combination of the fire pump(s) and domestic pump(s).
4. If fire flow is to be provided in the high system, the BPS shall be capable of supplying the MDD plus the required fire flow in the high system, plus the PHD in the supplying system, at a pressure of at least 20 psi in the high system and the supplying system, and under the condition where all equalizing and fire suppression storage has been depleted.
5. If fire flow is to be provided in the supplying system, the BPS shall be capable of supplying the MDD plus the required fire flow in the supplying system at a pressure of at least 20 psi, plus the PHD in the high system at a pressure of at least 30 psi, and under the condition where all equalizing and fire suppression storage has been depleted.
6. If the public water system is located in an area governed by the Public Water System Coordination Act (PWSCA), the fire flow shall be met under the conditions in No. 4 above, even when the largest capacity



booster pump is out of service.

7. It is recommended that the BPS be connected to a 24-hour alarm system.
8. Back-up power should be provided and operated through an automatic transfer switch.

An analysis was performed to determine each closed system BPS's capacity to meet the DOH's requirements discussed herein for the 10- and 20-year planning periods. The physical capacity of the BPSs is shown in Table 3-13.

**TABLE 3-13**

**Closed System Booster Station Capacity Analysis**

Booster Pump Station	PHD			PHD w/o Largest Pump		
	Flow Req'd (gpm)	Flow Avail. (gpm)	Surplus (+) / Deficit (-)	Flow Req'd (gpm)	Flow Avail. (gpm)	Surplus (+) / Deficit (-)
<b>2018</b>						
Highland <sup>(1)</sup>	120	155	35	120	155	35
High Street	15	40	25	15	0	-15
Pinnacle	15	34	19	15	0	-15
Wilmorth	5	42	37	5	0	-5
<b>2024</b>						
Highland <sup>(1)</sup>	124	155	31	124	155	31
High Street	18	40	22	18	0	-18
Pinnacle	19	34	15	19	0	-19
Wilmorth	7	42	35	7	0	-7
<b>2028</b>						
Highland <sup>(1)</sup>	127	155	28	127	155	28
High Street	19	40	21	19	0	-19
Pinnacle	22	34	12	22	0	-22
Wilmorth	8	42	34	8	0	-8
<b>2038</b>						
Highland <sup>(1)</sup>	134	155	21	134	155	21
High Street	23	40	17	23	0	-23
Pinnacle	28	34	6	28	0	-28
Wilmorth	11	42	31	11	0	-11

(1) Estimated highest flow rate possible for regular duty pump upon completion of the project.

As can be seen from Table 3-13, the capacities of the booster stations are sufficient

through the 20-year planning horizon, however, the High Street, Pinnacle, and Wilmoth booster stations lack redundancy.

Results of the closed system BPS capacity analysis indicate that supply zone and high zone system pressures under PHD and Maximum day production plus fire flow conditions at the Highland BPS do not meet DOH requirements within the planning periods of this Plan. Improvements required to resolve low system pressures include upsizing various water lines within the Hospital pressure zone are indicated in Table 3-14 and discussed in Chapter 8.

In addition, improvements to increase capacity of the High Street and Pinnacle BPSs to meet MDD plus fire flow requirements are needed. The City plans to address this issue through future development within these pressures zones as it occurs. Until that time, the City will coordinate hydrant use with the fire district by painting the hydrants black and notifying the fire district of the flow conditions.

Improvements at the Highland BPS to meet these are currently in construction and is scheduled to be completed in spring 2019.

### **Condition Assessment**

As discussed before, the Darnell's Booster Station is in need of a back-up generator. The City is providing back-up power to Darnell's BPS. Back-up power availability to the Darnell's BPS is essential since this BPS provides water to the entire north shore service area of the City. The City is also planning on rebuilding the pumps in this station beginning in September.

Most of the Booster the booster stations are in good condition and are not in need of major upgrades at this time to maintain their current operation. In general, any booster stations that lack redundancy have been noted for upgrades to increase their reliability and upgrade their equipment to a higher standard.

### **TREATMENT ANALYSIS**

As described in Chapter 1, the City receives its potable water from the outlet of Lake Chelan via its 5,600 gpm capacity raw water pump station. Raw water is filtered and treated at the City's Water Treatment Facility prior to entry into the City's water distribution system.

## **Capacity Analysis**

The City is estimated to be at approximately 60 percent treatment plant capacity as of this Plan. Due to increased tourism populations in the summer months and increased development in the area, demand on the plant is expected to continue to rise. Based on the assumed growth estimates assumed in this model and potential developments, the treatment plant is expected to reach 80 percent capacity in 2025. At this point the City plans to proceed with a study to increase the capacity of the treatment plant. Physical capacity of the plant will be analyzed further at this point.

## **Treatment Performance**

The City has indicated that treatment performance is optimal and no upgrades are anticipated other than those discuss herein. The plant itself is currently running at approximately 98 percent efficiency.

## **Condition Assessment**

The City has indicated that they have a number of valves within the treatment facility that have not been replaced since the construction of the building that are leaking through the seals and need replacement. This in turn causes high pressures to leak across the valves spiking pressures in other parts of the plant. Additionally, the City has indicated a need to upgrade their flow monitoring in the plant so they can track a range of flows and how much water is going to certain facilities within the plant. The City has also identified the need for a roof on the second backwash basin to protect backwash water from potential contaminants and eliminate a potential safety hazard.

In the last power outage, the City noticed that not all of the Treatment Plant facilities were at full power. The City wants to study the existing emergency power facilities and make upgrades where necessary. Lastly, the raw water pumping station is due for an upgrade to bring the existing facilities to the City's new standards, for example: providing VFDs, and providing better access for the generator. The City has indicated that the Raw Water pump station, while in need of modernization, is still running satisfactorily.

## **TELEMETRY ANALYSIS**

As discussed in Chapter 1, the City operates and maintains a radio telemetry system for its water system. A detailed description of the systems configuration and operation is described in Chapter 6. This system has undergone a retrofit since the last Water System Plan.

## **TRANSMISSION AND DISTRIBUTION ANALYSIS**

This section provides a discussion of the hydraulic model calibration and results, and the improvements resulting from the modeling. Additionally, this section will provide a condition assessment for the pressure reducing valves in the City.

### **Hydraulic Capacity Analysis**

A hydraulic model was developed for the City's water system by creating an H<sub>2</sub>ONet database of the distribution system, reservoirs, pump stations and valve stations. H<sub>2</sub>ONet uses a graphical interface loaded into AutoCAD to develop the water system grid and components. A linked computer model performs hydraulic calculations and returns output flows and pressures.

Field fire flow testing was conducted by City staff and Gray & Osborne in May 2017. The results of the fire flow testing were used to calibrate C-factors of pipes within the model.

Using the City's utility basemap and meter records, the City was able to identify approximate locations of Single-Family Residential, Multi-Family Residential, Commercial, Municipal, and School (Purveyor connections were transferred to municipal in 2017) connections throughout the City's water system. These connections were correlated, in relation to location, with nodes in the model to approximate the type of demands at each node. The City's water users' demands were placed at the nodes nearest their connection. Modeling information and fire flow data are contained in Appendix E.

Results of the hydraulic analysis identified areas within the City's water distribution system where improvements are needed in order to provide required peak hour and/or maximum day and fire flow demands. Most of the improvements identified to alleviate these system deficiencies consist of the replacement of existing 4- and 6- inch distribution lines with 8-inch lines. Distribution system improvements are shown in Table 3-15 and discussed in more detail in Chapter 8.

### **Peak Hour Evaluation**

The ability of the water system to meet existing and future PHD was evaluated using the hydraulic model in accordance with design standards as outlined in Table 3-1. Improvements identified to resolve PHD deficiencies are identified in Table 3-15. A detailed description of proposed improvements including costs and a schedule for implementation is presented in Chapter 8. Figure E-1 in Appendix E shows pressures throughout the City during the Peak Hour evaluation for 2038.

## **Fire Flow Evaluation**

The City's fire flow standards are shown in Table 3-2. The water system must have a sufficient supply, storage, and distribution system capacity to supply fire-fighting requirements during MDD and also maintain a minimum pressure of 20 psi to its customers. Improvements identified to resolve MDD plus fire flow deficiencies are identified in Table 3-15. A detailed description of proposed improvements including costs and a schedule for implementation is presented in Chapter 8. Figure E-2 in Appendix E shows available fire flows throughout the City during the various Fire Flow Evaluation for the 2038 planning year.

## **Pressure Reducing Valve (PRV) Condition Assessment**

The City has indicated that the Parkview PRV station (PRV No. 1) has been causing pressure issues. After the construction of the Higgs BPS, the new demand on the system caused the older 6-inch valve to begin opening. It is expected that this valve had only rarely opened since the 2-inch valve was able to provide adequate flow in the past. The 6-inch valve was not closing fast enough and was creating pressure spikes when the Higgs BPS shut down. The occurrence of the spikes has decreased recently, however, the PRV station is still scheduled to be replaced in a new area for accessibility. Gray and Osborne, Inc. provided a memorandum on the subject in October 2017.

The City has indicated that the Eldorado PRV (PRV No. 7) is in need of replacement as well.

The City has indicated that they will be starting a maintenance program for their PRV stations.

## **WATER SYSTEM CAPACITY ANALYSIS**

Chapter 6 of the WSDM provides a methodology for determining the physical capacity of a water system using the ERU as the basic unit of measure. Historically, the DOH has used the physical capacity of a water system (based on the limiting system component) to establish system growth limits for the system. Table 3-14 summarizes the water system physical capacity for source, storage, booster stations, and water rights. This analysis is based on future demands from Tables 2-11, which uses current production per ERU to determine future water use.

TABLE 3-14

## Water System Capacity

System Component	Capacity Available (ERUs)	Surplus (+)/ Deficit (-) (ERUs)
Source ADD (18-hour day) <sup>(2)</sup>	9,459	5,155
Source MDD (18-hour day) <sup>(2)</sup>	4,986	682
Source MDD (24-hour day) <sup>(2)</sup>	6,648	2,344
Treatment ADD (18-hour day) <sup>(3)</sup>	9,800	5,496
Treatment MDD (18-hour day) <sup>(3)</sup>	5,166	862
Treatment MDD (24-hour day) <sup>(3)</sup>	6,888	2,584
<b>Storage Capacity <sup>(1)</sup></b>		
Main <sup>(4)</sup>	3,444	1,627
South Chelan <sup>(5)</sup>	74	-189
Lakeside <sup>(4)</sup>	444	97
Darnell's <sup>(4)</sup>	1,453	346
Golf Course Terrace <sup>(4)</sup>	378	268
Boyd Road <sup>(4)</sup>	222	36
Washington Street <sup>(4)</sup>	475	0
<b>Total</b>	<b>6,490</b>	<b>2,185</b>
<b>Open System Booster Station Capacity <sup>(6)</sup></b>		
Farnham BPS	296	33
Lakeside BPS	444	97
Darnells BPS	1,037	-69
Higgs BPS	755	646
Boyd Rd BPS	222	36
Washington St BPS	296	-178
<b>Closed System Booster Station Capacity <sup>(7)</sup></b>		
Highland BPS	115	16
High Street BPS	30	13
Pinnacle BPS	25	4
Wilmorth BPS	31	23
<b>Water Rights</b>		
Water Rights Q <sub>i</sub> <sup>(8)</sup>	6,648	2,344
Water Rights Q <sub>a</sub> <sup>(9)</sup>	7,461	3,157

- (1) Estimated 2038 ERU requirement = 4,304 ERU (Table 2-11); and individual zone ERU requirements: Main (1,817), South Chelan (263), Lakeside (348), Darnells (1,106), Golf Course Terrace (110), Boyd Road (186), and Washington Street (475).
- (2) Based on limiting source capacity of 4,488 gpm (Water Rights)
- (3) Based on 2038 WTP capacity of 4,650 gpm.
- (4) Limiting capacity based on Eq. 9-1 WSDM, where: PHD = 2.0 \* Maximum Day Production; Maximum Day Production = 1.9 \* Average Day Production \* N; Average Day Production = 512 gpd/ERU; Q<sub>s</sub> = the source capacity per zone as shown in Table 3-9; and then solving for N.

- (5) Limiting capacity based on Eq. 9-3 WSDM, where  $ADD = 512 \text{ gpd/ERU}$ ,  $t_m = 1,440 \text{ min.}$ ,  $(Q_s - Q_L) =$  the source capacity per zone as shown in Table 3-9, and then solving for  $N$ ; or a minimum of 200 gallons/ERU per WSDM whichever is less.
- (6) Limiting capacity based on Maximum Day Production,  $Q (\text{req'd}) = \text{Maximum Day Production} / 1,440$ , where:  $Q (\text{req'd}) =$  physical capacity of booster station in gpm as shown in Table 3-12,  $\text{Maximum Day Production} = 1.9 * \text{Average Day Production} * N$ ,  $\text{Average Day Production} = 512 \text{ gpd/ERU}$ , and then solving for  $N$ . Estimated 2038 ERU requirements per model: Farnham BPS (263), Lakeside BPS (348), Darnells BPS (1,106), Higgs BPS (110), Boyd Rd BPS (186), Washington St BPS (475).
- (7) Limiting capacity based on Peak Hour Demand,  $Q (\text{req'd}) = \text{Peak Hour Demand} / 1,440$ , where:  $Q (\text{req'd}) =$  physical capacity of booster station in gpm as shown in Table 3-12,  $\text{Peak Hour Demand} = 2.0 * \text{Maximum Day Production}$ ,  $\text{Maximum Day Production} = 1.9 * \text{Average Day Production} * N$ ,  $\text{Average day production} = 512 \text{ gpd/ERU}$ , and then solving for  $N$ . Estimated 2038 ERU requirements per model: Highland BPS (99), High Street BPS (17), Pinnacle BPS (21), Wilmoth BPS (8).
- (8)  $Q_i = 4,488 \text{ gpm}$ ;  $\text{Maximum Day Production} = 1.9 * \text{Average Day Production} * N$ ;  $\text{Average Day Production} = 512 \text{ gpd/ERU}$ .
- (9)  $Q_a = 4,283 \text{ ac-ft}$ ;  $ADD = 512 \text{ gpd/ERU}$

As shown in Table 3-14, the storage capacity of the system as a whole has sufficient capacity to provide service through the 2038 planning year, however, individual pressure zones are capacity-limited due to particular storage requirements. The South Chelan zone is limited to 74 ERUs by its Standby Storage. This is due to its lack of source capacity as the Farnham booster station contains only one booster pump. For open system booster stations, the Darnell's Booster station and Washington Street Booster station are showing deficiencies through the 2038 planning year. These booster stations require upgrades to increase the pumping capacities in each station. The closed system booster stations are showing adequate capacity through the 2038 planning year.

## POTENTIAL DEVELOPMENT ANALYSIS

The City of Chelan expects a continued increase in development to occur within the 20-year planning horizon of this plan. As described in Chapter 2 and as seen in Figure 2-4 many of the developments are commercial and tourist attraction related. These types of developments have the potential to increase demands more instantaneously than residential developments which may increase demand over a number of years. Due to uncertainties in the construction schedule of new developments and only preliminary information on the extent and use of new developments the years of construction and number of ERUs per development were estimated. A surface-level analysis was performed to determine potential impacts of developments and capital improvements were developed to mitigate the effects. The following section provides a summary of the potential impacts to the City's infrastructure.

The City of Chelan has a code that mandates the adequacy of water (CMC 25.10.020) before land use approval. If water cannot be adequately provided to a new development then mitigation must be analyzed to remedy any deficiencies caused by the proposed development.

## Source

An analysis for the impact of development on the source capacity of the City was performed and shows that the City will be 102 gpm ( $4,590 \text{ gpm} - 4,488 \text{ gpm} = 102 \text{ gpm}$ ) deficient for their water rights for the 20-year planning horizon. The City will be required to acquire new water rights to supplement their existing water rights. The City has a number of change applications that are in the process of being transferred to the City along with an application that the City submitted in 2005 for a new water right that could feasibly provide water for any future development. This water right is not expected to be approved due to limitations in water rights for the basin as a whole.

In regards to the Raw Water Pumping Station, to meet reliability standards (MDD in 18 hrs) the City will need to increase the pumping capacity of the raw water pump station by approximately 520 gpm ( $4,590 \text{ gpm} * (24\text{hr} / 18\text{hr}) - 5,600 \text{ gpm} = 520 \text{ gpm}$ ). This upgrade would need to take place by approximately 2035. Upgrades to the raw water pumping station are already being considered for capital improvements in the year 2021 and an increase to the capacity could be considered at the time of design.

## Storage

A similar analysis to the analysis used in Table 3-11 was provided for the reservoirs in Chelan to determine capacity constraints with potential developments. Most of the high demand developments are expected to be created with their own pressure zones and as such do not cause added demand to other zones besides the Main zone. The Main zone will see added demand but is still only constrained by its Fire Suppression Storage since Standby Storage and Fire Suppression Storage are nested. The other developments are expected to occur in the Washington Street and Darnell's pressure zones. The Chelan Hills reservoirs (Darnell's pressure zone) has sufficient capacity through 10-year planning horizon for the anticipated developments. However, it is expected to be Standby Storage deficient by the 20-year planning horizon. Anticipated CIPs to the Darnells Booster station will assist in relieving the Standby Storage requirement in the area, however the area may need additional storage by 2038. The Wilmoth reservoir (Washington St pressure zone) is expected to need added capacity due to new developments. Capital facility improvements to add new capacity to the zone already considered for growth will also take into account added developments.

## Booster Stations

A similar analysis to the analysis used in Table 3-12 was provided for the booster stations in the City to determine capacity constraints with potential developments. The only booster stations expected to see higher demands due to added developments is the Darnell's and Washington Street booster stations. The Darnell's booster station could potentially see a deficiency of 350 gpm with the new developments at the end of the 20-year planning horizon. Capital improvements already being considered for the Darnell's booster station could provide additional capacity to the booster station that would remedy



the capacity deficit. The Washington St booster station could potentially see a lack of capacity of approximately 209 gpm at the end of the 20-year planning horizon. Capital improvements are being considered that will increase the capacity of the booster station to remedy the capacity deficiencies.

## SYSTEM DEFICIENCIES

Table 3-15 summarizes the deficiencies identified in this chapter and the improvements that the City plans to implement. A schedule for the improvements planned within the next 10- and 20-years is presented in Chapter 8, Capital Improvements. Preliminary cost estimates are also provided in Chapter 8, and detailed cost estimates are included in Appendix F.

For cases in which fire flow deficiencies are noted, the City notifies the Fire District of the potential deficiency. If there is a measured deficiency, the City and Fire Marshal will coordinate on mitigation efforts. The Fire District will also provide fire flow tests on the City's hydrants and report the findings to the City. The Fire Districts color codes the City's hydrants with the available flow.

**TABLE 3-15**

### Summary of Deficiencies

<b>System Deficiency</b>	<b>Proposed Improvement</b>
<b>Source Improvements</b>	
Source Improvements	Provide VFD capabilities to the existing pumps, relocate generator receptacles, provide security fencing and evaluate the need for capacity improvements.
<b>Storage Improvements</b>	
Fire Suppression Storage Deficiency in Boyd Rd pressure zone	Construct Pinnacle Reservoir No. 2.
Fire Suppression Storage deficiency in Washington St pressure zone	Construct Wilmoth reservoir No. 2.

**TABLE 3-15 (continued)****Summary of Deficiencies**

<b>System Deficiency</b>	<b>Proposed Improvement</b>
<b>Booster Station Improvements</b>	
Washington St booster station capacity deficits and surging issues	Provide improvements to the Washington St Booster Station to increase capacity and provide equipment to alleviate surging.
Redundancy at the High Street Booster Station	Provide redundancy and reliability upgrades for the High Street booster station.
Redundancy and capacity at the Darnell's Booster Station	Provide an additional pump and analyze the station for capacity improvements for potential development.
Fire flow deficiencies in the Pinnacle pressure zone	Provide an analysis and upgrades to the booster station or piping network to provide fire flow to the closed system pressure zone.
Redundancy at the Wilmoth Booster Station	Provide an additional pump and analyze the station for potential upgrades to provide fire flow to the pressure zone in the future.
<b>Treatment Improvements</b>	
Valve seals leak within plant	Provide access and replacement of all interior and exterior valves in the Treatment Plant.
Instrumentation monitoring errors and replacement	Provide additional flow monitoring and turbidimeters to increase the range and documentation of flows throughout the plant and modernize equipment.
Backwash Basin No. 2 uncovered	Provide a cover similar to the cover that has been installed on Basin No. 1.
Chemical dosing equipment replacement and HVAC analysis	Replace alum and polymer dosing pumps along with analyzing the chemical dosing room for HVAC improvements to create a comfortable work environment.
Treatment capacity nearing 80% capacity	When the treatment plant exceeds 80% capacity the City will pursue an analysis and ultimate upgrade to provide a full plant upgrade to increase capacity to 10 mgd.
Generator Size deficiency	Provide a load study on the treatment plant and purchase an additional generator if necessary.

**TABLE 3-15 (continued)****Summary of Deficiencies**

<b>System Deficiency</b>	<b>Proposed Improvement</b>
<b>Transmission and Distribution System Improvements</b>	
Main Zone fire flow deficits.	Loop the 12" line that connects to the Washington St. Booster Station with the 18" outlet pipe at the treatment plant.
	Upsize 2", 4" and 6" pipes to 8" to replace aging pipes and increase pipe capacity in the zone.
	Replace the 8-inch Submarine feeder line for the Farnham Booster Station with a 12" Line on the Webster Ave bridge.
	Upsize pipes in Sanders St and Webster Ave from the Highway to Woodin Ave in conjunction with the submarine line replacement.
	Upsize the Woodin Ave transmission main within Highway 97A to 16" to accommodate future development needs.
	Upsize the waterline loop at Chelan High School to provide the required fire flow.
	Upsize the transmission line in highland Avenue to the Highland Booster Station
	Upsize the waterline in Clifford St from Woodin Ave to Johnson Ave.
	Construct a new PRV station that provides water from the Darnell's pressure zone to the Spader Bay region of the Main pressure zone.
Lakeside zone fire flow deficits	Upsize 2", 4", and 6" pipes in High St, Millard St, Prospect St, and the Alleyway north of Prospect St to 8".
	Connect Prospect Alley waterline to Water St.
Hospital zone fire flow deficits	Upsize 2", 4", and 6" pipes.
	Connect 10" and new 8" waterlines within Bradley St.
Darnell's zone fire flow deficits	Upsize waterlines within the Key Bay region.
	Loop the Key Bay region and provide a secondary PRV station for future developments.
	Upsize the Eldorado Loop to 8" pipe.
	Upsize the Highpoint Place transmission main.
	Upsize waterline in Monte Carlo Drive.
	Upsize waterline within the Lake Chelan Shores Condos complex.
Boyd Road zone fire flow deficits	Upsize waterlines from the Boyd Road Booster Station to the Pinnacle Booster Station.
	Upsize the waterline in Junior Pt, Stehekin Way, and Crescent St.
	Replace/Upgrade PRV Station No. 9

**TABLE 3-15 (continued)**

**Summary of Deficiencies**

<b>System Deficiency</b>	<b>Proposed Improvement</b>
Golf Course Drive zone fire flow deficits	Replace PRV Station No. 1.
	Upsize waterlines in Golf Course Pl and the southern end of Golf Course Dr.
	Construct additional PRV Station in Golf Course Rd to loop the zone.
Orchard View zone fire flow deficits	Upsize the Butte Road, Lookout, and Pyramid loops.
	Upsize Orchard view and Stormy Way waterlines.
	Upgrade PRV Station No. 5
Washington Street zone fire flow deficits	Construct a 12" transmission main along Wilmoth Rd to loop the southern portion of the zone.
	Upsize the waterline in Isenhart Rd and connect to the proposed Wilmoth Rd improvements.
	Upsize the discharge pipe from the Washington St Booster Station.

**WORKSHEET 6-1: ERU Determinations****Water System Physical Capacity Documentation Based on 2016-2017 MDD**

**Note:** Capacity determinations are only for existing facilities that are operational for the Water System (no developments)

**Specific Single-Family Residential Connection Criteria (measured of estimated demands) (see Chapter 2):**

ADD, gpd/ERU 512

MDD, gpd/ERU 972

<b>Water System Service Connection Correlated to ERUs</b>			
<b>Service Classification</b>	<b>Total MDD for the Classification, gpd</b>	<b>Total # Connections in the Classification <sup>(1)</sup></b>	<b>2016-2017 ERUs <sup>(1)</sup></b>
Single-Family Residential	1,275,000	1,891	1,312
Multifamily Residential	281,000	169	289
Commercial	649,000	273	668
Schools	25,000	7	26
Municipal	276,000	34	284
<b>DSL</b>	285,000	N/A	293
<b>Total existing ERUs =</b>			<b>2,872</b>

<b>Physical Capacity as ERUs</b>			
<b>Water System Component</b>	<b>Calculated Capacity (ERUs)</b>	<b>Average 2016-2017 <sup>(1)</sup> (ERUs)</b>	<b>Average 2016-2017 Surplus (+)/Deficit (-) (ERUs)</b>
Source(s) at 18 hrs/day	4,986	2,872	+2,114
Treatment at 18 hrs/day	5,166	2,872	+2,294
Equalizing Storage <sup>(2)</sup>	6,678	2,872	+3,806
Standby Storage <sup>(3)</sup>	9,087	2,872	+6,215
Distribution <sup>(4)</sup>	N/A	---	---
Transmission	N/A	---	---
Water Rights, Qi	6,648	2,872	+3,776
Water Rights, Qa	7,461	2,872	+4,589
<b>Water System Physical Capacity (ERUs) =</b>			<b>4,986</b>
<b>Capacity for Growth (ERUs) <sup>(5)</sup> =</b>			<b>+2,114</b>

(1) From Table 2-8.

(2) Calculated Capacity from Eq. 6-6, WSDM.

(3) Calculated Capacity from Eq. 6-7, WSDM.

(4) Transmission and Distribution system physical capacity varies within the distribution system.

(5) Capacity for Growth = Water System Physical Capacity (ERUs) – Total Existing ERUs.

## **CHAPTER 4**

## CHAPTER 4

### WATER USE EFFICIENCY REQUIREMENTS

#### BACKGROUND

In 2003, the Washington State Legislature passed Engrossed Second Substitute House Bill 1338, which has come to be known as the 2003 Municipal Water Law. Among other things, the new law required the Washington State Department of Health (DOH) to develop a rule that defines how municipalities are to demonstrate efficient use of their water supplies. In response, DOH developed the Water Use Efficiency (WUE) Rule, which became effective on January 22, 2007. Key elements of the rule and the City of Chelan's progress in meeting the rule are summarized in Table 4-1.

**TABLE 4-1**

**Summary of Water Use Efficiency Rule Requirements**

<b>Requirement</b>	<b>Deadline</b>	<b>Status: City of Chelan</b>
Install source meters	January 22, 2007	Completed
Begin collecting production and consumption data	January 1, 2008	Completed
Include WUE program in planning documents	January 22, 2008	Completed
Set WUE goal through a public process	July 1, 2009	Completed April 23, 2014
Submit service meter installation schedule	July 1, 2008	Services are fully metered
Meet distribution leakage standard	July 1, 2010	Completed
Complete installation of all service meters	January 22, 2017	Completed

#### METERING PROGRAM

##### PRODUCTION AND SOURCE METERS

The City's drinking water supply is obtained from Lake Chelan through a 36-inch intake line that extends into the Chelan River near the lake's outlet. Water is pumped through the raw water pump station by three (3) 250 hp pumps, each capable of pumping 2,800 gpm from the river, which varies in elevation from 1,085 feet to 1,100 feet. The water is pumped through approximately 5,200 feet of 24-inch pipe to the raw water reservoir

located at the City's water treatment plant (WTP). A more detailed description of the City's source of supply and WTP is provided in Chapter 1 of this Plan. The Raw Water Pump Station is equipped with a 24-inch Sparling flow meter.

As discussed in Chapter 3 of this Plan, the City has adequate annual withdrawal water rights for the 20-year planning period of this Plan, but insufficient instantaneous water rights for the 20-year planning period with the proposed developments. To address this shortfall, the City has pending change applications for additional instantaneous and annual withdrawal water rights that would increase the City's total water rights. In addition, the City has adopted an ordinance requiring developers to either provide sufficient water rights for their projects or pay a fee sufficient to enable the City to purchase the same amount. Finally, the City has applied to Ecology for a new permit that would provide the City with sufficient instantaneous and annual quantities through full build out of the City.

Monthly water production for 2011-2017 are shown in Figure 2-2. Annual production data, including average day demands, maximum demands, and estimated peak hour demands, are summarized in Table 2-3.

## **CONSUMPTION AND SERVICE METERS**

Table 2-4 of this Plan summarizes the City's annual water consumption history for 2011 through 2017. The City's water consumption data was taken from City billing records produced from service meter readings. All of the City's residential, commercial, school, and municipal customers are metered. Chelan Municipal Code (CMC 13.16.010) requires meter installation prior to connection of any water service to the City's water system. The City has an ongoing program of replacing service meters on an as-needed basis.

## **INTERTIES**

The City currently has one raw water intertie with the Isenhart Irrigation District. This intertie is metered and is only used for emergencies. The water use is for non-potable purposes.

There are a number of small Group-A water systems located within the City's UGA. The Bear Mountain Water District (DOH Number 07155E, 43/149 connections) is located on the south shore approximately 4 miles from the City center. The Little Butte Water Association (DOH Number 49120B, 33/38 connections) is located on the south shore above the Lakeside Pressure Zone (see Figure 1-4).



## **WATER USE EFFICIENCY PROGRAM**

In January 2009, DOH published the second edition of its Water Use Efficiency Guidebook (Guidebook). Section 5.3 of the Guidebook summarizes the items that should be included in a WUE program. A discussion of each item is provided in this section.

### **CURRENT WATER USE EFFICIENCY PROGRAM**

The City last updated its water use efficiency plan for its 2010 Water System Plan. At that time the City committed to maintaining distribution leakage under 10 percent through 2014, and to reduce average day demand by 5 percent by December 31, 2014. The City has installed many new service meters and continues to encourage efficient use of water through its annual consumer confidence report. In the past 8 years, average consumption per single-family residential customer has decreased from 468 gpd/ERU to 396 gpd/ERU, a decrease of approximately 15 percent.

### **WATER USE EFFICIENCY GOALS**

The WUE rule requires a water system's elected governing body to establish WUE goals that are measurable and have a timeframe. The goals of Chelan's WUE Program were discussed by the City public works staff and was presented to City Council in a public meeting on April 23, 2019 and was approved contingent with DOH approval of the Water System Plan on May 28, 2019. The meeting was held in accordance with the requirements of WAC 246-290-830. The City's goals are as follows:

1. Supply Side Goal - Maintain DSL below 10 percent for the next six years.
2. Demand Side Goal - Reduce ADD 5 percent by December 31, 2024.

### **WATER USE EFFICIENCY MEASURES**

The WUE Rule requires all municipal water system to implement and evaluate certain mandatory water use efficiency measures. The City is also required to identify additional demand (i.e., customer) side measures. The purpose of adopting a particular set of water use efficiency measures is to develop a strategy to meet the City's water use efficiency goal as described above. The mandatory measures the City is required to address are summarized in Table 4-2.

**TABLE 4-2****Mandatory Water Use Efficiency Measures**

<b>Measure</b>	<b>Requirement</b>	<b>Status: City of Chelan</b>
Install source meters	Implementation	Completed
Install service and intertie meters	Implementation	Completed
Calibrate meters per industry standards	Implementation	As Needed
Water loss control action plan if DSL > 10%	Implementation	N/A
Educate customers about WUE practices once per year	Implementation	On-going every year
Water conservation rates	Evaluation	Completed, evaluated inclined block rates
Evaluate water reclamation opportunities	Evaluation	Completed

In addition to the mandatory measures shown in Table 4-2, WAC 246-290-810(4)(d) requires systems with more than 2,500 but less than 9,999 connections to adopt another 6 demand (i.e., customer) side water use efficiency measures. The Guidebook provides that a qualified WUE measure that is implemented for different customer classes counts as multiple WUE measures. Table 4-3 summarizes the demand-side water use efficiency measures the City plans to implement over the next six years.

**TABLE 4-3****Demand-Side Water Use Efficiency Measures**

<b>Demand Side Measure</b>	<b>Customer Classes Affected</b>	<b>Number of Measures<sup>(1)</sup></b>	<b>Estimated Annual Water Savings<sup>(2)</sup></b>	<b>Status</b>	<b>Cost</b>
Notify customers of unusually high-water use	5 <sup>(3)</sup>	5	5%	Ongoing	Minimal
Consumption history on water bill	5 <sup>(3)</sup>	5	5%	Ongoing	Minimal
<b>Total Measures (6 Required)</b>		<b>10</b>			

(1) Per the Guidebook, if a qualified WUE measure is implemented for different customer classes, it counts a multiple WUE measures.

(2) 5% reduction in end use (USEPA Water Conservation Plan Guidelines – Appendix B) by

- end of 2024.
- (3) Customer classes include single-family residential, multi-family residential, commercial, schools, and municipal.

As indicated, the City adopted, in addition to the mandatory measures, two demand-side measures for five of its customer classes, which results in a total of 10 measures, 4 more than required. The City has determined that the cost to implement these measures will be minimal. The City believes these measures, in addition to ongoing efforts to educate its customers about water use efficiency, will enable it to meet its second WUE goal to reduce average day demand by 5 percent by December 31, 2024.

## **WATER USE EFFICIENCY EDUCATION**

The City encourages water use efficiency by including conservation information (from the DOH webpage) in its annual consumer confidence report. The City plans to continue this effort.

## **WATER USE PROJECTED DEMANDS**

Of the measures as listed in Table 4-2, only water loss control has a quantifiable benefit into the future. Other efforts may have a benefit, however, projecting those benefits is not possible. As the City is currently operating with less than 10 percent distribution leakage, it is expected that with continuing efforts their leakage can be expected to be constant. The water-use projections as seen in Chapter 2 assume a constant DSL, therefore Table 2-11 shows the projected demands that can be expected for the 10- and 20-year planning horizons.

## **EVALUATING WATER USE EFFICIENCY EFFECTIVENESS**

The City plans to track the effectiveness of its WUE efforts by annually checking its residential per capita water use to see if its education and outreach efforts are having the desired effect. The City's plan for collecting data to make these evaluations is summarized in Table 4-4.

**TABLE 4-4****Water Use Data Collection Strategy**

<b>Data Type</b>	<b>Unit of Measure</b>	<b>Collection Frequency</b>	<b>Comments</b>
Water Production	Gallons	Billing Period	Total by month and by year
Revenue Water	Gallons	Billing Period	Total sold by customer class for each billing period
Unmetered Consumption	Gallons	Billing Period	Estimate and record authorized unbilled metered and unmetered consumption
Authorized Consumption	Gallons	Billing Period	The sum of Revenue Water and Billed and Unbilled Metered Consumption
Water Losses	Gallons	Annual	The difference between monthly Water Production and Authorized Consumption
Calculate Distribution System Leakage	Gallons	Annual	Authorized Consumption – Water Losses
	Percent	Annual	(Authorized Consumption – Water Losses) / Total Production, expressed as a percent
Apparent Losses	Gallons	Annual	Estimate unauthorized consumption, water theft, meter inaccuracies, and other non-leakage losses.
Leakage Eliminated	Gallons	Per Occurrence	When leaks are discovered and repaired, the leakage rate and duration are estimated and the resultant leakage volume for the billing period is estimated and recorded.

Although the WUE Rule does not allow the last two items, Apparent Losses and Leakage Eliminated, to be subtracted out in the calculation of DSL, both are useful in tracking opportunities for reducing DSL.

## **DISTRIBUTION SYSTEM LEAKAGE**

The City's distribution system leakage analysis is discussed in Chapter 2 of this Plan. The City's 3-year average distribution system leakage is approximately 8.9 percent. One of the City's current goals is to maintain distribution system leakage at less than 10 percent. The City hopes to continue achieving this goal through its continuing efforts to identify and repair leaks throughout its distribution system.

## SOURCE OF SUPPLY ANALYSIS

The City of Chelan's water supply characteristics are summarized as follows:

- Name and Location: The City's water supply source consists of a raw water intake and pump station located at the outlet of Lake Chelan as shown on Figure 1-2 of this Plan. Additional description of the City's source is provided in Chapter 1 of the Plan.
- Capacity and Seasonal Limitations: The raw water pump station currently is capable of producing approximately 5,600 gpm with one pump out of service. The raw water pump station operates year-round.
- Water Rights: The City has sufficient water rights to serve its existing population through the 10-year planning period of this Plan. Additional discussion of the City's water rights, as well as measures the City is taking to ensure that future water rights are adequate, is provided in Chapter 3.
- Legal Constraints: There are currently no legal constraints that would affect the City's ability to supply water to its customers over the next 20 years.

## WATER RIGHTS SELF-ASSESSMENT

The following table provides the City's Water Rights Self-Assessment detailing the City's current water rights, new applications, and pending transfers.

TABLE 4-5  
Water Rights Self-Assessment

Permit, Certificate, or Claim #	Right holder or Claimant Name	Priority Date	Source Name/ Number or Reference	Existing Water Rights				Production		Current Water Right Status Excess/ (Deficiency)	
				Qi = Instan. Flow Rate allowed (gpm) Qa = Annual Volume Allowed (ac-ft/yr)				Qi = MDD (gpm)	Qa = ADD (ac-ft/yr)	Qi (gpm)	Qa (ac-ft/yr)
Primary Qi	Non-Additive Qi	Primary Qa	Non-Additive Qa								
1. CSWC4018	City of Chelan	07/30/1948	WTP, MPS <sup>(1)</sup>	898		896					
2. CSWC10891	City of Chelan	02/03/1967	WTP, LPS <sup>(2)</sup>	799			896				
3. S4-30166P	City of Chelan	02/08/1990	WTP, LPS <sup>(3)</sup>	799			1,290				
4. S4-30167P	City of Chelan	02/08/1990	WTP <sup>(4)</sup>	1,992			3,214				
Totals – 2018				4,488		4,283 <sup>(5)</sup>		2,350	1,995	2,138	2,288
Totals – 2028								2,610	2,215	1,878	2,068
Totals – 2038								2,900	2,464	1,588	1,819
Other Water Rights								Comments			
5. CS4-08093	City of Chelan (Campbell rt.)	12/29/1960	WTP, GC <sup>(6)</sup>	538		240					
6. G4-29044	City of Chelan	08/15/1986	WWTP <sup>(7)</sup>	50		18.1					
7. S4-25651P	Chelan River ID	11/09/1977	Lake Chelan	449		117					
8. SWC 3244	Gaukroger	01/26/1948	Lake Chelan	525		Irr. of 116.5 ac					
Pending New Water Right Applications								Comments			
9. S4-32847	City of Chelan	03/09/1999	N/A	152		53		Application to withdraw from lake at Marina Pumping Station to irrigate Don Morse Park.			
10. S4-35072	City of Chelan	10/20/2005	N/A	10,000		3,800		Application to serve City through buildout (2005 UGA)			
11. S4-32554	City of Chelan	06/10/1997	N/A	628.32				Application through Chelan River Irrigation District to provide water for Washington Street Pressure zone area.			
Pending Transfers								Comments			
12. CS4-SWC4511@1	City of Chelan	09/28/1950	Crystal View Estates	153		For use on 25 ac		Change application was submitted to Ecology on 03/19/1998 for irrigation of Don Morse Park during irrigation season.			
13. CS4-SWC5043@1	City of Chelan	11/29/1948	Crystal View Estates	112		Domestic & Irr. of 20 ac		Change application was submitted to Ecology on 03/19/1998. Proposes to move 10 ac to Lakeside Park, 10 ac to ball fields near WWTP.			
14. CS4-28906C(A)	RAD Dev. LLC, City of Chelan	04/04/1986	Legacy Ridge	129		41.36		The Record of Examination (CHEL-09-08) was approved by the Chelan County Water Conservancy Board (WCB) in June 2011, and Ecology in August 2011. The City is currently waiting for a Superseding Certificate from Ecology.			
15. CS4-SWC709(A) <sup>(8)</sup>	Lake Chelan Dev. Co., City of Chelan	02/26/1930	Talleys	148		33.6		Continuous municipal purpose. This right is subject to restrictions as noted. Pending transfer for Granite Ridge development.			

16. CS4-SWC710 <sup>(8)</sup>	Lake Chelan Dev. Co., City of Chelan	03/27/1930	Talleys	175		104		Continuous municipal purpose. This right is subject to restrictions as noted. Pending transfer for Granite Ridge development.
17. CS4-SWC458 (A) <sup>(8)</sup>	Lake Chelan Dev. Co., City of Chelan	04/26/1929	Talleys	85		59		Continuous municipal purpose. This right is subject to restrictions as noted. Pending transfer for Granite Ridge development.
18. CS4-SWC178	Holiday Hills, LLC	08/26/1926	Holiday Hills	83.4		39.53		This change was submitted on November 11, 2009. It proposes to transfer the irrigation right to the City for municipal purposes.
19. S4-30361P	City of Chelan	8/3/1990	William Ziehl	269.28		30		Pending transfer for Crystal View Estates.

- (1) August 19, 1996 Report of Examination indicates the WTP raw water intake was added to the original point of diversion, the Marina Pumping Station (MPS). No superseding certificate was located in Ecology’s files during the investigations for this report.
- (2) August 19, 1996 Report of Examination indicates the WTP raw water intake was added to the original point of diversion, the Lakeside Pumping Station (LPS). No superseding certificate was located in Ecology’s files during the investigations for this report.
- (3) August 19, 1996 Report of Examination indicates the WTP raw water intake was added to the original point of diversion, the Lakeside Pumping Station. The August 22, 2002 superseding permit included the Lakeside Pumping Station as a point of diversion. The permit remains in good standing.
- (4) August 19, 1996 Report of Examination indicates the WTP raw water intake was added to the original point of diversion, the Marina Pumping Station. The December 20, 1996 superseding permit, however, did not include the Marina Pumping Station as a point of diversion. The permit remains in good standing.
- (5) Qi is additive. Only the original 896 af/yr from CSWC4018 is additive, the other three rights are non-additive. Per most recent Ecology decisions, the total of permits S4-30166P and S4-30167P, and certificates 4018 and 10891 shall not exceed 4,283 af/yr. This amount is based on permits S4-30166P and S4-30167P pumping 799 + 1,992 gpm, 18 hours per day, 365 days/yr plus 896 af/yr from CSWC4018 and CSWC10891.
- (6) This water right identifies the golf course intake and the raw water intake as point of diversion. The City uses this right for municipal use and to irrigate the golf course to the extent that the Gaukroger right is insufficient.
- (7) This certificate is for use at the City’s secondary wastewater treatment plant on the Columbia River. The purpose of use is listed as 2.3 af/yr for sewage treatment plant maintenance and restroom facilities; 15.8 af/yr for the irrigation of 4.5 acres from April 1 to October 31. These rights are listed for information only. They are not available to the City to use in its potable water system, and therefore are not included in the totals for existing water rights.
- (8) Three restrictions affect these rights, including consumptive use limits, a development schedule pursuant to a fixed and developed plan, and an agreement between the City and Lake Chelan Development, LLC. (See text for further details.) These rights will be additive when Ecology issues superseding certificates to the City. Certificate #10891 with a priority date of February 3, 1967 issued for 1.78 cubic feet per second for a primary instantaneous amount and not to exceed 896 ac-ft/yr under this certificate and Certificate #4018.

## **WATER SYSTEM RELIABILITY ANALYSIS**

Water system reliability is enhanced by having diversity of sources and interties with other water systems whenever practical. The following sections discuss reliability issues as they apply to the City.

### **SUMMARY OF WATER SYSTEM RELIABILITY EFFORTS**

The City's water system is reliably able to produce and serve water to its customers by ensuring levels of redundancy in the system. The City has been updating Booster Stations with redundant pumps and backup generators and providing secondary Pressure Reducing valves where possible. Since the City has only a single water source, reliability is ensured through the use of Water Treatment Plant storage that meets pressure and fire flow requirements well into the future. Additionally, the City has a backup generator capable of providing electricity to the City's water treatment facility in the event of power interruption.

### **WATER SHORTAGE RESPONSE PLANNING**

The City's water utility has discussed planning in case of water shortage. With the current system of reliability, the City's contingency plan to meet short-term water storage is adequate. Most of the pressure zones have multiple reservoirs and a few areas are served by reservoirs in adjacent zones as a backup. Backup power is available via portable generators and can be easily mobilized in the case of a power outage. Additional information for water shortage response can be found in Chapter 6.

## **EVALUATION OF WATER RECLAMATION OPPORTUNITIES**

The City evaluated water reclamation and reuse opportunities in its 2008 General Sewer Plan. The following evaluation is taken from that plan.

As required by RCW 90.48.112, this Report must evaluate the "opportunities for the use of reclaimed water". Reclaimed water is defined in RCW 90.46.010 as "effluent derived in any part from sewage from a wastewater treatment system that has been adequately and reliably treated, so that as a result of that treatment, it is suitable for a beneficial use or a controlled use that would not otherwise occur, and is no longer considered wastewater."

Key differences between the requirements for water reuse and those for effluent disposal are the levels of reliability required within the treatment process, distribution, and use areas. The State of Washington's reuse treatment standards call for continuous compliance, meaning that the treatment standards must be met on a constant basis or the treated water cannot be used as reclaimed water.



## **ALLOWABLE USES FOR RECLAIMED WATER**

The Washington State Water Reclamation and Reuse Standards describe several allowable uses for reclaimed water, including:

- Agricultural irrigation;
- Landscape irrigation;
- Impoundments and wetlands;
- Groundwater recharge;
- Streamflow augmentation;
- Industrial and commercial uses; and
- Municipal uses.

Depending upon its end use, there are four categories of reclaimed water: Class A, Class B, Class C, and Class D. Class A has the highest degree of effluent treatment. In general, when unlimited public access to the reclaimed water is involved or when irrigation of crops for human consumption is the intended end use, the criteria will require Class A reclaimed water.

## **CITY OF CHELAN REUSE EVALUATION**

Factors that could lead a wastewater treatment provider to pursue reclaimed water include the following:

- Regulatory Requirements: Regulatory conditions are such that making reclaimed water is a viable option compared to continuing to make secondary effluent.
- Environmental Benefits: There are substantial environmental benefits to making reclaimed water versus secondary effluent.
- Water Rights: The ability to make and reuse reclaimed water could benefit the City's water rights.
- Cost Effectiveness: The cost to make and reuse reclaimed water is comparable to continuing to make and dispose of secondary effluent.

An evaluation of how each of these factors relates to the City of Chelan's wastewater treatment utility is provided in the following sections.

### **Regulatory Requirements**

At this time the City is meeting or exceeding all of its permit requirements with regard to the existing NPDES permit which allows the discharge of secondary effluent to the Columbia River. The City has not had any consent orders or notice of violations in the past five years. Consequently, there are no current regulatory conditions that require

consideration of reclaimed water.

### **Environmental Benefits**

The fact that the Washington State Department of Ecology has not identified regulatory conditions that require consideration of reclaimed water suggests that the environmental benefits of producing reclaimed water for discharge to the Columbia River would be minimal. Further, there would appear to be little environmental benefit to replacing the City's potable water with reclaimed water for residential irrigation. Consequently, the City does not believe it is worth considering converting its existing secondary treatment facilities to water reclamation facilities and constructing a completely separate transmission and distribution system solely for the environmental benefits of reclaimed water.

### **Water Rights**

RCW 90.46.120 states that the owner has the exclusive right to any reclaimed water generated by the wastewater treatment facility. Consequently, reclaimed water has the potential to benefit water purveyors who are water right deficient. At present, the City has the potential for being deficient with respect to its instantaneous water rights near the end of its 20-year planning period. Annual withdrawal quantities are expected to be adequate within that planning horizon.

To meet its future water right needs, the City has submitted to Ecology an application for a new water right permit that would provide additional instantaneous and annual withdrawal water rights from Lake Chelan. The City has also passed an ordinance requiring developers to either provide sufficient water rights to serve their proposed development or to pay a fee sufficient to enable the City to purchase a comparable quantity of water rights. As a result of these measures, the City does not believe that the potential to increase water right quantities through the provisions in the reclaimed water statute is compelling at this time. If, over time, the City's measures prove ineffective and its water right deficiencies become more acute, the City will reconsider reclaimed water as one way to address these deficiencies.

### **Cost Effectiveness**

The City believes that if water reclamation and reuse is to be seriously considered, it must be cost effective and affordable for its customers. However, there are two substantial cost factors that make it unlikely that water reclamation would be economically attractive on its own without a substantial benefit – such as regulatory compliance - to balance its considerable costs.

The first major cost factor is that the City's secondary WWTF would require conversion from a biofilm reactor plant (rotating biological contactors) to an activated sludge plant to provide the process control required to reliably produce reclaimed water. This is

particularly true if use of the reclaimed water would include human contact, a condition that would require the plant to produce Class A reclaimed water. Improvements would also be required to add coagulation and filtration and additional disinfection if Class A reclaimed water were required. It is estimated that these costs would be at least \$2.5 million.

The second cost factor is that the secondary WWTF is 3.5 miles from the City, and unless there is a nearby user, new reclaimed water pumping facilities and a transmission pipeline would be required to convey water back to the City. The cost of these facilities would be expected to exceed \$3.0 million. This does not include distribution facilities once the pipeline reaches the City limits. However, all City parks and the municipal golf course are adequately served by irrigation systems and surface water rights owned by the City, and there are no other potential reclaimed water users that have been identified who would benefit from access to reclaimed water.

## **Conclusions**

After evaluating the potential for water reclamation and reuse, the City of Chelan does not believe there is currently a clear regulatory, environmental, or water right benefit to water reclamation and reuse, and the costs are much too great to consider water reuse as being a cost-effective alternative to its current collection and treatment system. Consequently, the City does not plan to pursue the construction of water reclamation and reuse facilities at this time.

Finally, it has been proposed that the City consider allowing developers to construct water reclamation and reuse facilities for their proposed developments that would be separate from the City's collection and treatment system. Because the City has sufficient water rights, water distribution treatment capacity, and wastewater collection and treatment capacity to serve growth for the next 20 years, it does not consider such satellite systems to be viable alternatives to connecting to the City's water and sewer utilities.

## **CHAPTER 5**

## CHAPTER 5

### SOURCE WATER PROTECTION

In Washington State, water supply systems using a surface water source must develop and implement a watershed control program in order to protect the water supply and the health of water system customers.

Prior to 2007, water quality planning for Lake Chelan was provided by the Lake Chelan Water Quality Committee (LCWQC), which included Chelan County, the Lake Chelan Sewer District, the Lake Chelan Reclamation District, the Chelan County Public Utility District, the U.S. Forest Service, and the City of Chelan. The Lake Chelan Watershed Planning Unit (LCWPU) was formed in October 2007 by most of the members in the LCWQC in order to continue watershed planning efforts. The City of Chelan is an active member of this planning unit.

The LCWPU completed the November 2014 WRIA 47 Lake Chelan Detailed Implementation Plan to satisfy requirements of RCW 90.82.043 and 90.82.048. This Plan identifies key components as required by WAC 246-290-135 and is located in Appendix G. It is the City's intent to meet WAC requirements for a watershed control program through continued planning within the LCWQC, the plan cited, and a commitment to participate in required future regional plans regarding watershed planning. The City recognizes that independent pursuit of a watershed control program by the City would result in less benefit than active participation in the organized water quality planning efforts that are currently in place.

## **CHAPTER 6**

## CHAPTER 6

### OPERATION AND MAINTENANCE

#### INTRODUCTION

The objective of this Chapter is to provide an evaluation of the Town's operation and maintenance (O&M) program and its ability to assure satisfactory management of the water system operations in accordance with WAC 246-290. A list of O&M elements and where they are discussed or presented in this Plan is provided in Table 6-1.

**TABLE 6-1**

#### **Operation and Maintenance Program Elements**

<b>Operation and Maintenance Component</b>	<b>Location in Plan</b>
Water System Management and Personnel	Chapter 6
Operator Certification	Chapter 6/Appendix H
Routine Operating Procedures	Chapter 6
Coliform Monitoring Plan	Chapter 6/Appendix J
Emergency Response Plan	Chapter 6
Safety Procedures	Chapter 6
Cross-Connection Control	Chapter 6
Customer Complaint Response Program	Chapter 6
Record Keeping and Reporting	Chapter 6
O & M Improvements	Chapter 6

#### WATER SYSTEM MANAGAMENT AND PERSONNEL

##### OPERATOR CERTIFICATIONS

The City's water system personnel and their certifications are listed below. The City Hall daytime phone number is (509) 682-4037. The City shop phone number is (509) 682-8030. A comprehensive list of emergency phone numbers is provided in the Emergency Response Plan (this chapter).

**TABLE 6-2****Water System Personnel**

<b>Name</b>	<b>Title</b>	<b>Certification</b>	<b>Phone</b>
Jake Youngren	Public Works Director	N/A	(509) 682-4575 (Cell)
			(509) 682-8030 (Office)
Troy Brooks	Water Treatment Plant Operator	WTPO 3	(509) 679-1307 (Cell)
			(509) 682-5919 (Office)
Eric Gocke	Water Treatment Plant Operator	WDM 3, WTPO 2	(509) 630-1800 (Cell)
			(509) 682-5919 (Office)
Lee Reynolds	Water Treatment Plant Operator	WTPO 2	(509) 630-0921 (Cell)
			(509) 682-5919 (Office)
Thomas Tupling	City Engineer	N/A	(509) 630-4835 (Cell)
			(509) 682-8030 (Office)

At a minimum, all water system operation and maintenance personnel are trained in the following areas: confined space entry, flagging, commercial driver's license, asbestos cement pipe handling, general safety, CPR, first aid, shoring, forklift operation, and backhoe operation. Operator Certifications can be found in Appendix H.

**PROFESSIONAL GROWTH REQUIREMENTS**

In order to promote and maintain expertise for the various grades of operator certification, Washington State requires all certified operators to meet professional growth requirements by completing no less than three continuing education units (CEUs) every three years. Programs sponsored by both Washington Environmental Training Resources Center (WETRC) and the American Water Works Association (AWWA) Pacific Northwest Subsection are the most popular source of CEUs for certified operators in Washington State. The professional growth requirement may also be met by advancement by examination or certification by examination in a different classification.

**OPERATION AND MAINTENANCE PROGRAM**

The following sections provide general information on the City's operation and maintenance program.

**PREVENTATIVE MAINTENANCE**

Table 6-3 summarizes the City's principal operating and preventive maintenance activities and their frequency.



**TABLE 6-3****Operation and Maintenance Procedures**

<b>Activity</b>	<b>Frequency</b>
Water Treatment Plant Maintenance	Per equipment manufacturer's recommendations
Chlorination equipment inspection	5 days per week
Record Flow and Reservoir Data	Telemetry records continuously
Collect Water samples for Coliform testing	Monthly
Read Service Meters	Monthly, except when snow covered
Flush fire hydrants and blow offs	Biennially
Flush Distribution Mains	In conjunction with hydrant operation
Exercise Valves	Biennially
Clean Reservoirs	Every 4 years
Inspect each reservoir's alarms, controls interior surfaces, vents, and screens	Annually
Telemetry system software adjustment and minor system adjustment	Performed by TSI services annually
Visual at water treatment plant equipment and building inspection	Daily
Production data reports	Monthly
Check PRV operation	Monthly
Clean and inspect PRVs	Annually
Check booster pumping rates	Monthly
Flow and Inspect meters according to schedule	Annually
Inspect booster pump power and controls	Annually
Trigger all system alarms to ensure proper function	Annually
Meter Re-Calibration (Source and BPS)	Every 4 years
Meter Replacement	Every 10 years (10% annually)

Table 6-4 summarizes the normal settings, positions and readings used for the City's water system equipment. Reservoir set points are adjusted via the telemetry system interface at the Water Treatment Plant.

TABLE 6-4

## Normal Equipment Settings

Control Reservoir (Booster Pump Station)	Elev. (ft, msl)	Elev. Below Overflow (ft)	Setting
Raw Water Reservoir (Raw Water Intake)	1,340.5	0.0	Overflow
	1,338.5	2.0	Pump off
	1,333.5	7.0	Pump on
Treatment Plant Reservoirs – East, West and South (Water Treatment Plant) <sup>(3)</sup>	1,303.0 <sup>(1)</sup>	0.0 <sup>(2)</sup>	Overflow
	1,300.0	3.0 <sup>(2)</sup>	Pump off
	1,295.5	7.5 <sup>(2)</sup>	Pump on
South Chelan Reservoir <sup>(4)</sup>	1,301.5	0.0	Overflow
	1,300.0	1.5	Pump off
	1,292.0	9.5	Pump on
Lakeside Reservoir – North, South and West (Lakeside) <sup>(5)</sup>	1,299.0	0.0	Overflow
	1,297.5	1.5	Pump off
	1,295.5	3.5	Pump on
Chelan Hills Reservoirs – East and West (Darnell's)	1,653.0	0.0	Overflow
	1,649.0	4.0	Pump off
	1,643.5	9.5	Pump on
Golf Course Terrace Reservoir (Higgs)	1,780.0	0.0	Overflow
	1,779.0	1.0	Pump off
	1,776.0	4.0	Pump on
Pinnacle Reservoir (Boyd Road)	1,780.0	0.0	Overflow
	1,779.0	1.0	Pump off
	1,776.0	4.0	Pump on
Wilmoth Reservoir <sup>(6)</sup>	1,430.5	0.0	Overflow
	1,427.1	3.4	Pump off
	1,423.0	7.5	Pump on
Lake Hills Reservoir (Lake Hills) <sup>(7)</sup>	2,048.5	0.0	Overflow
	N/A	N/A	Pump off
	N/A	N/A	Pump on

(1) Overflow elevation for East and West reservoirs; overflow elevation of South Reservoir = 1,301.5.

(2) For East and West reservoirs only.

(3) The Water Treatment is automatically controlled based on water level in the Water Treatment Plant South reservoir.

(4) The South Chelan reservoir is supplied by the Treatment Plant reservoirs via gravity during low demand periods through the year; during high demand periods, hydraulic head is insufficient to keep this reservoir filled and the Farnham Booster Station provides additional head to fill the Reservoir.

(5) The Lakeside reservoirs are supplied by the Treatment Plant reservoirs via gravity during low demand periods (from approximately mid-September to mid-June); during high demand periods, hydraulic head is insufficient to keep these reservoirs filled and the Lakeside Booster Station provides additional head to fill the reservoirs.

(6) Operation set point elevations from the City.

- (7) The Lake Hills reservoir is constructed but not currently in service.

Table 6-5 provides a list of the typical water system supplies used by the City, and the current suppliers for these materials.

**TABLE 6-5**  
**Supplies and Suppliers**

<b>Supply</b>	<b>Supplier</b>	<b>Phone</b>
PVC Pipe	Hughes/HD Supply	800-456-0531
Gate Valves	Hughes/HD Supply	800-456-0531
Fire Hydrants	Hughes/HD Supply	800-456-0531
Service Meters & Setters	United Pipe and Supply	509-662-7128
Meter Boxes	Hughes/HD Supply	800-456-0531
Repair Bands	Hughes/HD Supply	800-456-0531
Dresser Couplings	Hughes/HD Supply	800-456-0531
Miscellaneous pipe Fittings	Hughes/HD Supply	800-456-0531
Electrical	Furnished by outside contractor	N/A
Chlorine	Oxarc, Inc., Wenatchee	509-662-8417
Aluminum Sulfate, Caustic Soda	Vanwaters & Rogers	253-872-5000
Polymers	Cytec	800-582-1088
Laboratory Chemicals	Hach	800-227-4224
PRVs	CG Systems	800-525-9425

## **WATER QUALITY MONITORING**

The City receives an annual statement, in the form of a Water Quality Monitoring Schedule (WQMS), from DOH that indicates what water quality tests are required and when they are required. The monitoring requirements for 2018 are provided in Appendix C. An analysis of the City's most current water quality test results can be found in Appendix C. The City is also required to publish a Consumer Confidence Report (CCR) every year to provide customers with water quality data to explain to its customers any deficiencies the water system may have. A copy of the most recent CCR can be found in Appendix C. A map of sampling locations is provided in Appendix C.

## EMERGENCY RESPONSE PROGRAM

The following tables/sections describes means and methods for the City of Chelan to respond to emergency situations affecting its water utility. In an emergency, the City's mission is to protect the health of the residences by being prepared to respond immediately to a variety of events that could result in contamination or disruption of the distribution of the water supply. To be successful, the City must have a plan, which is able to quickly identify the emergency, notify the necessary local, state, and federal agencies, notify the public of the situation and how it is being resolved, and repair damages quickly to minimize system down time. This Plan was created under the guidance of Department of Health Publication No. 331-211. In an effort to protect the citizens of Chelan, information from some of the sections has been omitted to protect the water system.

### SECTION 1 – EMERGENCY RESPONSE MISSION AND GOALS

TABLE 6-6

#### Section 1 - Emergency Response Mission and Goals

<b>Mission Statement</b>	In an emergency, the mission of the Chelan water system is to protect the health of our customers by being prepared to respond immediately to a variety of events that may result in contamination or disruption of water supply.
<b>Goal 1</b>	Be able to quickly identify and emergency and initiate timely and effective response action.
<b>Goal 2</b>	Be able to quickly notify local, state, and federal agencies to assist in the response.
<b>Goal 3</b>	Protect public health by being able to quickly determine if the water is not safe to drink or use and being able to immediately notify customers effectively of the situation and advise them of appropriate protective action.
<b>Goal 4</b>	To be able to quickly respond and repair damages to minimize system down time.

**SECTION 2 – SYSTEM INFORMATION****TABLE 6-7****Section 2 – System Information**

<b>System Identification Number</b>	12300J	
<b>System Name and Address</b>	City of Chelan Public Works Department 50 Chelan Falls Highway Chelan, WA 98816	
<b>Direction to the system</b>	From Wenatchee, WA.: Travel north on U.S. 97 Alternate approximately 40 miles to Chelan, WA.	
<b>Basic description and location of system facilities</b>	The location of City facilities are shown on Figure 1-2. The current water system consists if a raw water pump station, a rapid sand filter water treatment plant, 15 storage reservoirs, 13 booster pump stations, 19 pressure reducing valves and approximately 36 miles of water transmission and distribution lines.	
<b>Location/City</b>	Chelan, WA	
<b>Population served and service connections from Division of Drinking Water records</b>	4,108 (2016 estimate, USCB)	2,384 connections (2016)
<b>System owner</b>	City of Chelan	
<b>Name, title, and phone number of person responsible for maintaining and implementing the emergency plan</b>	Jake Youngren City Engineer	509-682-8030 (Office) 509-682-4575 (Cell) jyoungen@cityofchelan.us

### SECTION 3 – CHAIN OF COMMAND

**TABLE 6-8**

#### **Section 3 – Chain of Command**

<b>Name and Title</b>	<b>Responsibilities During Emergency</b>
Mike Cooney Mayor	Responsible for guiding City Council in decision-making, should Public Works require its involvement
Jake Youngren	Responsible for overall management and decision-making for water system
Larry Sweeney Assistant Public Works Director	Responsible for operation and maintenance of the City's water system
Troy Brooks Water Treatment Plant Operator	Responsible for operation and maintenance of the City's water treatment plant.

### SECTION 4 – EVENTS THAT CAUSE EMERGENCIES

Omitted.

### SECTION 5 – SEVERITY OF EMERGENCIES

Omitted.

### SECTION 6 – EMERGENCY NOTIFICATION

**TABLE 6-9**

#### **Section 6 – Emergency Call List**

<b>Person or Agency</b>	<b>Phone Number</b>
<b>City Personnel</b>	
Troy Brooks, Water Treatment Plant Operator	509-679-1307 (Cell)
Larry Sweeney, Assistant Public Works Director	509-670-1639 (Cell)
Jake Youngren, City Engineer	509-682-4575 (Cell)
<b>Local, State, and Federal Agencies</b>	
Chelan Police Department	911 or 509-682-2588
Chelan County Fire District No. 7	911 or 509-682-4476

**TABLE 6-9 (continued)****Section 6 – Emergency Call List**

Chelan County Department of Emergency Management, Wenatchee	509-663-9911
Washington State Department of Health, Spokane Valley Office	509-329-2100
<i>After Hours and Weekends</i>	877-481-4901
Chelan-Douglas Health District, East Wenatchee	509-886-6400
Washington State Department of Ecology, Yakima	509-575-2490
Chelan County Public Works Department, Wenatchee	509-667-6415
Chelan County Sheriff, Brian Burnett	509-667-6851
U.S. Environmental Protection Agency – Region 10, Seattle	800-424-4371
<b>Utilities</b>	
Power – Chelan Co PUD	509-663-8121
Telephone – Verizon	800-922-0204
Fiber Optics – Chelan Co PUD	509-663-8121
One-Call Locates	800-424-5555
<b>Suppliers and Contractors</b>	
Pipe and Appurtenance Supplier – United Pipe and Supply	509-662-7128
Cla-Valve – Home Office	949-722-4800
Cla-Valve Service, Washington – GC Systems	253-939-8322
Oxarc, Inc., Wenatchee	509-662-8417
Vanwaters & Rogers	253-872-5000
Cytec	800-582-1088
<b>Media</b>	
Local Newspaper – Lake Chelan Mirror	509-682-2213
Radio – KOZI	509-682-4033
<b>City Engineer</b>	
Gray & Osborne, Inc.	509-853-2460
<b>Priority Customers</b>	
Lake Chelan School District	509-682-3515
Chelan Valley Independent School	509-682-2020
Lake Chelan Community Hospital	509-682-3300
Regency Manor (Nursing Home)	509-682-2551
Heritage Heights (Assisted Living)	509-682-1998
Lake Chelan Clinic	509-682-2511
Columbia Valley Community Health	509-682-6000

## **Notification Procedures**

The water system has designed an emergency/after-hours response call-out list of City personnel trained to respond in various situations. Numbers are assigned to each person for each type of problem in the order that they should be contacted. The emergency call-out list is shown on the previous page. Copies of the call-out list are given to the police and fire department since they would most likely receive the emergency call.

### Police Department

The City's police department is prepared to respond and assist the City's public works department during an emergency. For emergencies that are brought on by water quality or quantity problems, the police department is prepared to assist public works in notifying citizens of possible dangers. For general emergencies such as earthquakes or fires, the police department and public works department are prepared to work together to ensure that communications and incident response activities are coordinated and effective.

### Media

The City has access to a local newspaper in the Lake Chelan Mirror. The City would use the newspaper to inform citizens of emergencies such as water quality or quantity issues that could affect their daily lives. KOZI radio at 1230 AM, and 93.5, 100.9, and 103.1 FM would be used for emergencies that require immediate notification. The media will continue to be used through the entire event to deliver messages about the situation. The use of the radio and any local television channel will allow for 24-hour information to be delivered to the customers.

### Department of Health

The Washington State Department of Health should be contacted in the following situations:

- Positive coliform sample. DOH must be contacted within 24 hours if an acute violation has occurred, see Appendix J.
- Inorganic chemical or volatile organic chemical exceedance. DOH must be contacted within 48 hours if confirmation sample exceeds MCL to develop notification procedures and a follow-up testing plan.
- Major transmission line break that interrupts service.
- Extended loss of power.
- Cross connection incident.

Note: this list is not intended to be all inclusive. DOH should be contact when in doubt.



### Other Considerations

In addition to water quality notification, some water customers require immediate notification should their water service be interrupted for any reason. These customers include facilities such as nursing homes and kidney dialysis patients, if any. The City will maintain a list of all kidney dialysis patients so that in the event that the City's water supply is interrupted by an emergency situation, these customers can be notified quickly.

## **SECTION 7 – WATER QUALITY SAMPLING**

### **Bacteriological Detection**

Notification procedures for notifying system customers, the local health department, and DOH of water quality emergencies are an important component of an emergency response program. All public water systems will occasionally detect positive coliform samples, mainly as a result of minor contamination in distribution mains or sample taps, or improper bacteriological sampling procedures. However, the persistent detection of coliforms in the water supply, particularly E. coli or fecal bacteria, may require issuing a public boil water notice to ensure the health and safety of the water customers. WAC 246-290-320 requires water utilities to follow specific procedures in the event coliform bacteria are detected in the water system. These procedures are outlined in Appendix J.

### **VOC/SOC and Inorganic Chemical Detection**

In the event of a volatile organic chemical or synthetic organic chemical event, contact DOH to develop notification procedures and a follow-up testing plan.

## **SECTION 8 – EFFECTIVE COMMUNICATION**

Omitted.

## **SECTION 9 – THE VULNERABILITY ASSESSMENT**

Omitted.

## SECTION 10 – RESPONSE ACTIONS FOR SPECIFIC EVENTS

**TABLE 6-10**

### **Section 10 – Response to Specific Events**

<b>A. Construction Accident</b>	
<b>Assessment</b>	Construction crews often encounter pipes expectantly. Pipe rupture is possible.
<b>Immediate Action</b>	If a water distribution pipe is ruptured, identify the necessary valves to isolate the line and remove all pressure to it. Identify all connections to isolate line. Perform water quality testing in system to determine if contamination has occurred.
<b>Notifications</b>	Notify all affect water users of the break and expected duration of water loss. If pipe supplies are needed, contact pipe suppliers listed in Emergency Call List above.
<b>Follow-up Actions</b>	Once line break is repaired, open all valve used to isolate section.
<b>B. Sever Weather</b>	
<b>Assessment</b>	Chelan experiences freezing weather consistently throughout winter months, but these conditions do not necessarily result in emergency situations.
<b>Immediate Action</b>	During an extended storm situation, maintain roads necessary to reach all system components. Should the storm result in damage to system components, the ability to access them in a timely manner is important.
<b>Notifications</b>	Unless major system components must be taken out of service, weather conditions should not require notification of customers.
<b>Follow-up Actions</b>	Following an extended period of freezing weather, examine water use records in the following month to determine if distribution leakage has escalated, indicating the probability of a pipe main break.
<b>C. Earthquake</b>	
<b>Assessment</b>	Historically, the likelihood for an earthquake in Chelan is low.
<b>Immediate Action</b>	Verify if the City’s water sources and reservoirs are operating correctly. Perform bacteriological testing to determine if earthquake damage to the system has resulted in system contamination. Contact neighboring water systems and/or local grocers to determine availability of portable water in the area.
<b>Notifications</b>	Notify the public of any boil orders or the requirement of bottled water. In the event of major system damage, Department of Health will need to be involved.

**TABLE 6-10 (continued)****Section 10 – Response to Specific Events**

<b>Follow-up Actions</b>	Perform necessary system repairs and disinfection, and continue testing until water is determined to be clean and safe.
<b>D. Vandalism</b>	
<b>Assessment</b>	The City has historically had problems with vandalism on water system infrastructure due to security measures.
<b>Immediate Action</b>	Contact police in all cases to report criminal activity. If Nature of the vandalism indicates a direct threat to water system operation or water quality, perform water testing to determine the extent of the impact. Graffiti or other aesthetic damage should be repaired, but requires no official response beyond police notification.
<b>Notifications</b>	Local police department should be contacted. If water quality has been impaired, contact Department of Health. Public to be notified as necessary, based upon nature and extent of water contamination.
<b>Follow-up Actions</b>	Perform Necessary system repairs and disinfection, and continue testing until water is determined to be clean and safe.
<b>E. Power Outage</b>	
<b>Assessment</b>	Historically, risk of extended power outage is low.
<b>Immediate Action</b>	Verify that emergency generator at the Water Treatment Plant is operating and run Darnell's booster Station with the City's portable generator. Provide generators to run other City Booster Stations as necessary, depending on duration of power outage.
<b>Notifications</b>	Notify Chelan County PUD of outage. Water System should be operating correctly, and as such, no further notification is necessary.
<b>Follow-up Actions</b>	Verify that emergency generators continue to run for duration of power outage.
<b>F. Microbial (coliform, E. coli) contamination – SEE APPENDIX J</b>	
<b>G. Chemical contamination</b>	
<b>Assessment</b>	Historically, risk of Chemical contamination is low.
<b>Immediate Action</b>	Contact DOH.
<b>Notifications</b>	Develop notification procedure with DOH.
<b>Follow-up Actions</b>	Develop follow-up testing plan with DOH

## SECTION 11 – ALTERNATIVE WATER SOURCES

**TABLE 6-11**

### **Alternative Water Sources**

Intertie to Adjacent Water Supply System				
Water systems within one-quarter mile of the City’s water system			Feasibility of connecting	
The Closest water system is the City of Chelan Falls. Which is operated by Chelan County PUD.			At this time, the City of Chelan has no interest in connecting to other local water systems. Chelan Falls is approximately 4 miles away. An intertie would be a significant, expensive undertaking that is not warranted at this time.	
Alternate Source(s) of water				
Alternate Sources	Names	Phone	Availability	Is the water safe for drinking?
Bottle Water Suppliers	Safeway Walmart	509-682-2615 509-682-4291	Short term solution but available immediately	Yes

## SECTION 12 – CURTAILING WATER USE

If the restriction of outside water usage, such as watering lawns or washing cars, or the restriction of inside usage needs to take place the following need to be done:

- Draft door postings with curtailment messages
- Post on customers doors
- Contact media to announce curtailment message
- Monitor system usage and spot check meter usage if time is available
- Continue message as long as curtailment is warranted

**SECTION 13 – RETURNING TO NORMAL OPERATION****TABLE 6-12****Section 13 – Returning to Normal Operation**

<b>Action</b>	<b>Description and Actions</b>
Inspect, flush, and disinfect the system	Utility Lead and support staff inspect all system facilities, ensure all water quality tests have been completed and the system has been flushed and disinfected in necessary. City staff report to the Public Works Director/City Engineer as to the nature of the work completed. The Public Works Director/City Engineer will determine when necessary work is completed.
Verification of Water Quality	Public Works Director/City Engineer verifies water quality sampling results.
Coordinate with DOH	Public Works Director/City Engineer coordinates with DOH on system condition and water quality results.
Notify Customers	Public Works Director/City Engineer works with City staff to write notice to customers. This notice will then be distributed to the public.

**CROSS-CONNECTION CONTROL PROGRAM**

The objective of a cross connection control (CCC) plan is to protect the City's distribution system from the possibility of contamination as the result of existing or potential cross connections. Chapter 246-290-490 WAC describes ten elements of a CCC plan.

**ELEMENT 1**

The adoption of a resolution, ordinance, or legal instrument that established the City's authority to implement a CCC program, describes the operating policies and technical provisions of the program, and describes the corrective actions used to ensure that consumers comply with the program's requirements.

*Action Taken* The City addresses cross connection control in Chapter 13.05 of the Chelan Municipal Code (CMC). The City's current municipal code is available at its website at [www.cityofchelan.com](http://www.cityofchelan.com).

## **ELEMENT 2**

The City must develop and implement procedures for evaluating connections to the water system for possible cross connections. The initial evaluation for new connections must be made before service is provided. Existing conditions must all be evaluated. Periodic reevaluations must also be conducted.

*Action Taken*                      These requirements are covered in CMC Chapter 13.05.

## **ELEMENT 3**

The City must ensure that cross connections are eliminated whenever possible. If not possible to eliminate, the hazard must be controlled by approved backflow preventers.

*Action Taken:*                      These requirements are covered in CMC Chapter 13.05.

## **ELEMENT 4**

The City must provide personnel, including at least one person trained as a cross control specialist, to develop and implement the program.

*Action Taken:*                      Larry Sweeney, the City's Assistant Public Works Director, is a Cross Connection Control Specialist.

## **ELEMENT 5**

The City must ensure that the backflow preventers are tested annually and that documentation is provided to the City.

*Action Taken:*                      This requirement is covered by reference in CMC 13.05.

## **ELEMENT 6**

The City must develop a quality control program to ensure that the testing of backflow preventers is being performed in accordance with the City's standards.

*Action Taken:*                      This requirement is covered by reference in CMC 13.05.

## **ELEMENT 7**

The City must develop procedures for dealing with backflow incidents.

*Action Taken:*                      This requirement is addressed in the Emergency Response Program (this chapter).

## **ELEMENT 8**

The City must include information on cross connection control in the existing program for consumer education.

*Action Taken:* The City makes information on backflow prevention available to the public at City Hall.

## **ELEMENT 9**

The City must maintain cross connection control records. These records must include a master list of service connections with cross connection, the hazard present at each, and the required backflow preventers. An inventory must be maintained on approved air gaps, approved backflow assemblies, and approved atmosphere vacuum breakers. Records of any backflow incidents must also be kept.

*Action Taken:* The City has completed a cross connection survey of the City and has developed an inventory of potential cross connections (Appendix I).

## **ELEMENT 10**

If the City distributes and/or has facilities to received reclaimed water, additional measures are required.

*Action Taken:* The City does not produce, distribute or receive reclaimed water.

## **CUSTOMER COMPLAINT RESPONSE**

The City maintains customer complaint records to verify trends that may assist the City to improve service to its customers. Response to questions and complaints is typically verbal, either through a field visit or a telephone call. However, depending on the nature of the question or complaint, written response can also be given. City Council meetings, scheduled on the second and fourth Thursdays of the month, are the main venue for public involvement in the water system.

## RECORD KEEPING AND REPORTING

The City keeps the following water system records and data.

**TABLE 6-13**

### **Record Keeping Practices**

<b>Record Type</b>	<b>Comment</b>
Source meter readings	Daily reading kept indefinitely
Maximum Day Demand	Manually recorded, kept indefinitely
Peak Hour Demand	Not Available
Service Meter Readings	Monthly readings (except in snow) kept for 3 years
Non-revenue water	Records kept indefinitely
Bacteriological test results	Records kept indefinitely
Chlorine use and residual	Records kept indefinitely
Sanitary surveys, other DOH correspondence	Records kept indefinitely
Legal Documents	Records kept indefinitely
Backflow Device Inspection Notices	Records kept indefinitely
Backflow Violation Case Files	Records kept indefinitely
Water Availability Request Forms	Records kept indefinitely

The City also keeps water system mapping, including the location of pipelines, hydrants, and valves up to date.

## OPERATIONS PROGRAM SUMMARY

### DEFICIENCIES

In generating this report, it has come to the City's attention that its production and consumption data did not agree, most likely due to the production meter not registering flows during low flow events. Due to the Water Use Efficiency requirements, the City plans to resolve these errors with the replacement and calibration of their production meter with a compound meter and maintain better record-keeping practices.



## **CHAPTER 7**

## **CHAPTER 7**

### **DISTRIBUTION FACILITIES DESIGN AND CONSTRUCTION STANDARDS**

#### **OBJECTIVE**

The objective of this chapter is to document the City's design and construction standards to allow the City to obtain DOH approval to utilize the alternative review process for construction of new and replaced water distribution facilities. Through this process, a purveyor needs no further approval from DOH for distribution project reports, construction documents, or installation of distribution mains, pipe linings, and tank coatings.

This chapter includes the following elements:

- System Standards, Policies and Procedures
- Project Review Procedures
- Design and Construction Standards
- Construction Certification and Follow-up Procedures

The City's Water System Standards and Designs are located in Appendix B.

#### **SYSTEM STANDARDS, POLICIES, AND PROCEDURES**

The City has developed the Development Standards Manual to govern any improvements within the public right-of-way and/or public easements, all improvements required within the proposed right-of-way of new subdivisions and for all improvements intended for maintenance by the City. Water System Standards and Designs are Sections 1 & 2 of this document.

#### **PROJECT REVIEW PROCEDURES**

Project review procedures vary with the level of complexity of the anticipated project. In general, water main distribution projects identified in a Water System Plan do not require DOH review. Any water main distribution projects beyond those identified in the plan, and any booster station, storage, or treatment projects will require DOH review and approval.

The City Council and the City's consulting engineer shall review all distribution improvements and replacements during the design phase. This review will be to ensure the project is in compliance with the City's Water System Standards. During construction, the City's personnel will make site visits to ensure the project is constructed

in accordance with the specifications. Any changes from the City's Water System Standards will require written approval from the City Council. A Construction Report for Public Water System Project form shall be submitted to the City Council and DOH within 60 days of completion and prior to use of the installation. The report shall state that the project was constructed in accordance with the plans and specifications.

Connection of additional water customers will be requested on an on-going basis as the City grows. Reviews for new customers will be done through the City's water service application process. The City Council, Public Works Director/City Engineer and Cross-Connection Control Specialist will be involved in the review process. The City Council's review will be to ensure it is consistent with the planning goals of the City. The Public Works Director/City Engineer will review the application for water availability according to the system's Operating Permit, water main extension requirement if any, and to ensure anticipated water use is consistent with water system guidelines. The Cross-Connection Control Specialist will review the application for water use and its cross-connection control potential. Prior to the construction of the service connection, the Specialist will review the backflow prevention assembly installation for compliance with Cross-Connection requirements.

## **DESIGN AND CONSTRUCTION STANDARDS**

Design and construction of water facilities are to be designed in accordance with the design standards in Chapter 3 of this Water System Plan and the City of Chelan Development Standards Manual included in Appendix B. These standards are to be followed for any water facility design and construction project.

## **CONSTRUCTION CERTIFICATION AND FOLLOW-UP PROCEDURES**

During the construction of any water facility the City shall have a representative make periodic checks. The representative will report progress and any variance from the construction documents to the consulting engineer responsible for construction management. Additionally, the representative should be present for all pressure tests, disinfection procedures and water quality sampling as defined in the Standards. In the future the City may want to consider requiring the developer to hire an on-site representative to be present a minimum of four hours per day in addition to the testing and disinfection procedures.

Upon completion of the project, the engineer responsible for construction management shall complete a Construction Report for Public Water System Projects form and submit it to DOH. This form is the Engineer's certification that the project was completed in conformance with the plans, specifications and City standards. Additionally, the construction manager shall prepare record drawings and submit to the City for their project files.

## **CHAPTER 8**

## **CHAPTER 8**

### **CAPITAL IMPROVEMENT PROGRAM**

#### **OBJECTIVE**

The objective of this Chapter is to present the City of Chelan's Capital Improvement Program (CIP), which is composed of projects to address deficiencies identified in the previous chapters. These improvements are assessed and prioritized for implementation over 10- and 20-year planning periods. The CIP has been developed in conjunction with the financial capabilities and recommendations presented at the end of this chapter.

The chapter includes capital improvement projects for source of supply, storage, distribution, and other identified capital and non-capital improvements. The chapter provides an assessment of alternatives including a cost analysis, the preferred alternatives for each project, a schedule for the improvements, and available funding sources.

#### **IDENTIFICATION OF SYSTEM IMPROVEMENTS**

Water system deficiencies identified in previous chapters are summarized in the following sections, together with evaluations of alternatives and planning level cost estimates. Details of planning level cost estimates are included in Appendix F.

#### **CAPITAL IMPROVEMENTS**

The following sections discuss capital improvements as identified within this Water System Plan and provides a schedule for capital improvements.

#### **WATER TREATMENT IMPROVEMENTS**

##### **WTP-1: Interior and Exterior Valve and Instrumentation Replacement**

All the process valves in the WTP have leaky seals. The City has estimated that they lose 40,000 – 55,000 gallons/day which leak through these valves. The expected life of these valves is ~15 years and all of these valves are ~20 years old. There is no good way to get the valves out of and into the WTP and this project will include extensive renovations such as some type of hoist and door so they can be removed or replaced again in the future. This project will also include new, more accurate flow meters and new turbidimeters and a single SC200 controller. The project will reduce the lost water and allow the City to more accurately determine exactly how much water the plant is producing and better forecast when the WTP will need more extensive capacity upgrades.

Estimated Cost:        \$1,289,000.00

### **WTP-2: Backwash Basin Cover Installation**

DOH performed a sanitary survey of Chelan's WTP and indicated that backwash basin #2 which is open to air is considered a contamination risk. Filter backwash water flows to the basin, settles for 1-3 days, and then is recycled and used to backwash the existing media filters. Additional raw water is used as required to make up the flow and pressure required to backwash the filters. The fact that this basin does not contain a cover presents a risk of contamination to the filters and subsequently, the finished water produced by the WTP. This project includes the installation of a fiberglass reinforced plastic (FRP) cover on the north backwash basin located directly west of the existing finished water reservoir. The style and color of the proposed cover will match the existing cover on the south backwash basin and will include a 7-foot access door, ventilation, and interior/exterior lighting. The existing north basin already contains access to the center of the tank, and the proposed cover will be situated to allow access to this existing platform. The proposed cover will be shipped in sections, assembled onsite adjacent to the existing basin, then installed and secured using cranes.

Estimated Cost:       \$310,000.00

### **WTP-3: Chemical Dosing System Improvements**

The existing alum dosing pumps are old and require significant maintenance in order to ensure consistent and accurate performance. The existing pumps are Milton Roy motor driven diaphragm pumps and require a full rebuild approximately once per year. The VFD motor starters for these pumps were replaced in 2017 and are working well. This project includes the removal of all pumps, piping, appurtenances, and connections between the existing alum dosing pumps and alum dosing tank. A new, fabricated duplex pump skid would be provided and installed on the existing concrete equipment pad. The new skid would include a calibration column, backpressure and pressure relief valves, isolation valves, gauges, pumps, and pump motors to deliver alum to the raw water upstream of the existing flocculation basins. Additionally, flexible connections will be provided for the pumps and alum storage tank, and new seismic straps will be provided for the alum dosing tank. New pumps will be Grundfos, Prominent, or other high-quality, long-lasting motor driven pump designed for use with alum coagulant. The project also includes replacement of the existing FilterAid polymer dosing pumps. These pumps are also Milton Roy motor driven diaphragm pumps and have maintenance requirements similar to the alum dosing pumps. A new duplex pump skid would be provided as described above. Lastly, the existing HVAC system within the chemical dosing room will be analyzed and upgraded with new air conditioning equipment and/or exhaust fans to help maintain a consistent, comfortable working environment for WTP staff.

Estimated Cost:       \$1,005,000.00

### **WTP-4: Treatment System Improvements**

The WTP is currently operating around 70-76 percent of their maximum 6.7 MGD capacity during heavy summertime use. Per DOH requirements, when any water treatment facility produces 80 percent of its design capacity, the Owner must begin planning for adding additional treatment capacity. Several planned residential

developments, if completed, could push the City over 80 percent of their existing treatment capacity (5.3 MGD). In addition, the City is losing water due to leaking valves in the WTP and flow meters that may not be accurately recording all the flows. CIP project #33 will replace the leaky valves and install new flow meters so the City will be better able to determine exactly how much water the plant is currently producing and better forecast exactly when the WTP will need to be upgraded to add additional capacity. When required, WTP improvements should include an additional flocculation basin, four additional filter bays, additional raw water storage, and additional finished water storage.

Estimated Cost: \$14,010,000.00

#### **WTP-5: Generator Load Bank Study**

The City has indicated that during the last power outage that the generator may not be sized to provide full operations of the WTP during an emergency outage. With additional small electrical loads being added to the WTP a load bank study and a generator analysis should be conducted and an additional generator should be provided if required.

Upgrades would include an automatic transfer switch if desired.

Estimated Cost: \$40,000.00

#### **WTP-6: Raw Water Pump Station Improvements**

The existing raw water pump station is located at the west end of Sayles Street and moves water from the Chelan River to the WTP. The station is completely below grade and lacks adequate security from vandalism and protection against injury to the public. The station includes one 100 hp pump and three 250 hp pumps and only the 100 hp pump utilizes a VFD motor starter. This project will install a new VFD motor starter for one of the 250 hp pumps which will allow the pump to more effectively match summer peak demands, which will increase the pump's efficiency and reduce annual electrical costs. To make room in the existing station for the new VFD, the existing portable generator cable connections will be relocated to the surface. This will reduce the time required to connect the City's portable generator. Additional security fencing will be provided to restrict access to the facility, and a roof structure with security cameras will provide additional protection from weather and vandalism.

Estimated Cost: \$610,000.00

### **STORAGE IMPROVEMENTS**

#### **S-1: Pinnacle Reservoir No. 2**

In the 2010 WSP it was determined that the Boyd Rd Pressure Zone was fire flow deficient. The Pinnacle Reservoir No. 2 project provides for construction of another reservoir to supplement the existing reservoir. Due to property size constraints and the potential to acquire nearby land, the City has placed this project on hold.

Estimated Cost: \$400,000.00

**S-2: Wilmoth Reservoir No. 2**

This project includes the construction and connection of a new storage reservoir to complement the existing Wilmoth Reservoir in the Washington Street pressure zone. This reservoir will be sized for about 200,000 gallons to better supply Fire Suppression Storage to the zone.

Estimated Cost: \$808,000.00

**BOOSTER STATION IMPROVEMENTS**

**B-1: Washington St. 12-inch Loop and Booster Station Improvements**

This project completes the 12-inch loop between the Washington St. Booster Station and the Water Treatment Plant effectively increasing Fire Flow potential and increasing pressure to users near the Booster stations during a Fire Flow event. This project will also provide analysis and construction of an upgrade to the Washington St. Booster Station to decrease the likelihood of over-pressurization upon fire pump startup.

Estimated Cost: \$259,000.00

**B-2: High Street Booster Station Improvements**

This project includes an analysis and replacement of the High Street Booster Station.

Estimated Cost: \$144,000.00

**B-3: Darnell's Booster Station Improvements**

The Darnell's Booster Pump Station is essential to maintain water service to the north shore of Lake Chelan. The station currently has two pumps and at periods of high water use, both pumps operate at the same time. This project will add a 3rd pump to provide backup and redundancy in the event that one of the pumps is out of service when the demand is too high for a single pump.

Estimated Cost: \$243,000.00

**B-4: Pinnacle Booster Station Improvements**

The City's Fire Marshal has indicated that 1,500 gpm fire flow is desired in the Pinnacle pressure zone. This project would be designed to increase fire flow capabilities to this zone and add redundancy to the existing booster station.

Estimated Cost: \$675,000.00

**B-5: Wilmoth Booster Station Improvements**

The City Fire Marshal has indicated a desire to provide Fire flow to the Wilmoth pressure zone. This project would be designed to provide 1,500 gpm of fire flow and increase the redundancy of the Wilmoth booster station.

Estimated Cost: \$675,000.00



## **PRV STATION IMPROVEMENTS**

### **P-1: Spader Bay PRV Station**

The Spader Bay area is designated as an area that requires a fire flow of 2,500 gpm for 2 hours. Due to the limited size of pipes that provide water to the area the City is not able to supply required fire flow. This project adds a PRV station near the outlet of the Darnell's Booster Station that feeds from the Darnell's zone to the Main zone in order to provide additional fire flow to the Spader Bay area. Additional components of this project include telemetry improvements to the Darnell's Booster Station to disable Booster Station Pumping while the new PRV is active.

Estimated Cost: \$180,000.00

### **P-2: Key Bay PRV Station**

It is anticipated that development in the Key Bay area will increase the demand and potentially fire flow requirements. This project provides a PRV Station to the Key Bay area and loops the zone for added fire flow capacity.

Estimated Cost: \$622,000.00

### **P-3: PRV Station No. 9 Upgrade**

This upgrade will incorporate new pressure reducing valves for domestic and fire flow in an accessible vault.

Estimated Cost: \$110,000.00

### **P-4: PRV Station No. 1 Replacement**

This project includes the replacement of PRV Station No. 1 in the City's right-of-way inside of an accessible vault.

Estimated Cost: \$470,000.00

### **P-5: PRV Station No. 5 Replacement**

This project includes the replacement of PRV Station No. 5 in the City's right-of-way inside of an accessible vault.

Estimated Cost: \$115,000.00

### **P-6: Golf Course Rd PRV Station**

This project includes the addition of a PRV station in Golf Course Rd to loop the Golf Course Dr Pressure zone.

Estimated Cost: \$423,000.00

## **WATER DISTRIBUTION SYSTEM IMPROVEMENTS**

### **D-1: Annual Main Zone Pipe Replacement**

This project is intended to be an annual project to replace and upsize aging and undersized pipes with the Main Pressure Zone to 8-inch.

Estimated Cost: \$369,600.00 (Annually)

**D-2: Submarine Line Replacement**

The City owns a submarine waterline that provides water to the Farnham Booster Station. This line is a steel line that sits at the bottom of the Lake/River near the dam. The waterline is a safety risk due to the potential for cross connection and damage. This project includes the replacement of the 8-inch submarine line with a new 12-inch line that crosses the Webster Ave Bridge. This new waterline will connect to lines that end in Webster Ave and Sander St.

Estimated Cost: \$1,000,000.00

**D-3: Sanders Street Transmission Main Upgrade**

This project includes replacing the existing 6-inch AC water main in Sanders Street with a new 10-inch pipe. This project, in conjunction with the Submarine Line Replacement increase fire flow capabilities to the southern portion of the Main pressure zone.

Estimated Cost: \$578,000.00

**D-4: Chelan High School Loop**

The Chelan High School property is currently listed as an area required to have a fire flow of 2,000 gpm for 4 hours. Due to the size limitations of the waterlines feeding this area the City is not able to provide the required fire flow to this area. This project includes replacing the 8-inch loop at the Chelan High School with a 10-inch pipe. This project, in conjunction with the submarine line replacement and Sanders St upgrades provides added fire flow capabilities to the southern portion of the Main pressure zone.

Estimated Cost: \$283,000.00

**D-5: Webster Avenue Transmission Main Upgrade**

This project includes replacing the 8-inch AC line in Webster Avenue with a 10-inch line to increase fire flow capabilities to southern portion of the Main pressure zone.

Estimated Cost: \$720,000.00

**D-6: Woodin Ave. Transmission Line Upgrade**

This project upsizes the Transmission Main within Highway 97A/Woodin Ave to 16-inch to provide domestic/fire flow for future developments along the South Shore of Chelan.

Estimated Cost: \$2,570,000.00

**D-7: Highland Avenue Transmission Main Upgrades**

This project upsizes the 6-, and 8-inch; lines in Highland Avenue to 12-inch from Highway 150 to the Highland Booster Station Inlet. This project provides more flow for the Highland Avenue booster during high demands such as during fire flow events.

Estimated Cost: \$544,000.00

**D-8: Clifford Street Waterline Upgrade**

This project upsizes the waterline in Clifford Street from Woodin Avenue to Johnson Avenue to provide added fire flow to the north-eastern corner of the Main pressure zone.

Estimated Cost: \$185,000.00

**D-9: Lakeside Zone Waterline Upgrades**

This improvement consists of upsizing 2-, 4-, and 6-inch waterlines in High St, Millard St, Prospect St, and the Alleyway north of Prospect St to increase fire flow capacity on the western-half of the Lakeside pressure zone. Additionally, this project is intended to connect the Prospect Alley waterline to Water St.

Estimated Cost: \$1,448,000.00

**D-10: Hospital Zone Waterline Upgrades**

This project upsizes 2-, 4-, and 6-inch pipes to 8-inch to better-provide fire flow to the Hospital pressure zone. Additionally, this project connects the crossing waterlines in Bradley St to loop the zone better.

Estimated Cost: \$803,000.00

**D-11: Key Bay Waterline Upgrades**

Upsize pipes within Key bay to provide increased fire flow capacity and provide sufficient capacity for new developments.

Estimated Cost: \$733,000.00

**D-12: Eldorado Loop Upgrade**

Upsize 4-inch pipes in the Eldorado Loop to 8-inch to increase fire flow capacity and replace aging AC waterlines.

Estimated Cost: \$722,000.00

**D-13: Highpoint Place Waterline Upgrade**

Upsize the Highpoint Place Transmission Line to increase fire flow capacity for the region south of the Chelan Hills Reservoirs.

Estimated Cost: \$544,000.00

**D-14: Monte Carlo Drive Waterline Upgrade**

Upsize waterline in Monte Carlo Drive to increase fire flow capacity.

Estimated Cost: \$349,000.00

**D-15: Lake Chelan Shores Condos Waterline Upgrades**

The Lake Chelan Condos area of the North Shore of Chelan has a high required fire flow than most of the North Shore. Due to the size of pipes serving this area the required flow rate is not achievable. This project upsizes the 8-inch AC watermain that crosses Highway 150 and the main line within the condo's main drive to provide sufficient fire flow to the area. This project also upsizes the 6-inch AC water main that follows the boat launch drive to increase fire flow capabilities in the area as well.

Estimated Cost: \$723,000.00

**D-16: Pinnacle Pl. Waterline Upgrades**

Upsize 6-inch pipes from the Boyd Booster Station to the Pinnacle Booster Station to 8-inch to increase fire flow capacity in the Boyd pressure zone.

Estimated Cost: \$398,000.00

**D-17: Junior Pt. Waterline Upgrades**

Upsize waterline in Junior Pt to increase fire flow capacity.

Estimated Cost: \$138,000.00

**D-18: Stehekin Way Waterline Upgrades**

Upsize Waterline in Stehekin way to increase fire flow capacity.

Estimated Cost: \$599,000.00

**D-19: Crescent St. Waterline Upgrades**

Upsize Waterline in Crescent St to increase fire flow capacity.

Estimated Cost: \$173,000.00

**D-20: Golf Course Pl. Waterline Upgrade**

Upsize the waterline in Golf Course Pl and the southern end of Golf Course dr.

Estimated Cost: \$242,000.00

**D-21: Butte Rd loop Upgrades**

Upsize the Butte Rd Loop to provide increase fire flow capacity.

Estimated Cost: \$870,000.00

**D-22: Lookout and Pyramid Loop Upgrades**

Upsize the Lookout and Pyramid Loops to increase fire flow capacity.

Estimated Cost: \$479,000.00

**D-23: Orchard View Dr. Waterline Upgrades**

Upsize the Orchard View waterline to increase fire flow capacity.

Estimated Cost: \$529,000.00

**D-24: Stormy Way Waterline Upgrades**

Upsize the Stormy Way waterline to increase fire flow capacity.

Estimated Cost: \$299,000.00

**D-25: Wilmoth Rd Transmission Main**

Due to the amount of commercial fruit packing sheds and increase in development for the industry in the Washington Street zone, a fire flow requirement of 2,750 gpm for 2 hours is required in the zone. This project adds a 12-inch line along Wilmoth Rd to loop the southern portion of the Washington Pressure zone.

Estimated Cost: \$1,124,000.00

**D-26: Isenhardt Rd. Waterline Upgrades**

This project in conjunction with the Wilmoth Rd Transmission Main is intended to further increase fire flow capacity in the Washington Street Zone. This project upsizes the Isenhardt Rd waterline and connects to improvements in Wilmoth Rd to loop and increase the fire flow capacity in the Washington Pressure zone.

Estimated Cost: \$790,000.00

**D-27: Washington St. and Shop Ave. Transmission Line Upgrades**

Water users in close proximity to the Washington Street Booster Station have noticed surges in water pressure when the Fire pumps at the Booster Station activate. This project is intended to relieve some of the surging and increase fire flow capabilities throughout the Washington Street Zone. This project upsizes the discharge pipe from the Washington Street Fire Booster Station through Shop Avenue.

Estimated Cost: \$1,029,000.00

**PLANNING**

**PLAN-1: Water Treatment Plant Capacity Evaluation**

The Water Treatment Plant is estimated to be at 80 percent capacity in the year 2025 which will trigger planning for improvements to increase the capacity of the plant to approximately 10 MGD. This analysis will examine one years' worth of more accurate production and consumption data after the WTP Interior and Exterior Valve and Instrumentation Replacement project has been completed and also look at the latest development projections to determine more exactly when the WTP capacity will need to be increased.

Estimated Cost: \$45,000.00

**PLAN-2: 2028 Water System Planning**

Water System plans are required to be updated every 10 years. This Plan will be scheduled to begin in 2025.

Estimated Cost: \$80,000.00

**PLAN-3: 2028 Water System Planning**

Water System plans are required to be updated every 10 years. This Plan will be scheduled to begin in 2035.

Estimated Cost: \$80,000.00

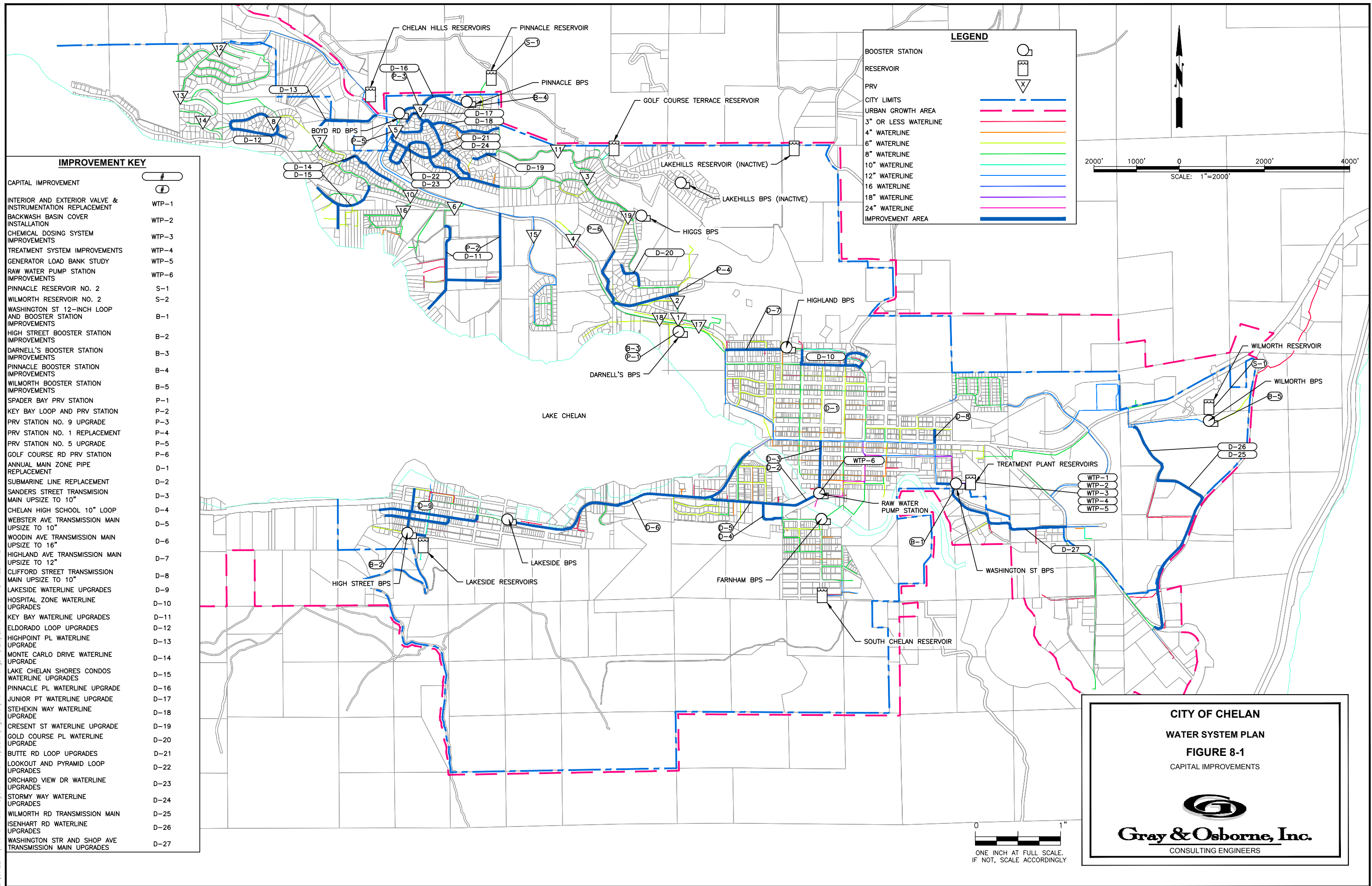
**CAPITAL IMPROVEMENT SCHEDULE**

Capital Improvements identified above are indicated on Figure 8-1. The City's Capital Improvement Schedule is presented in Table 8-1. Planning level cost estimates are provided in Appendix F. The total estimated cost of all recommended capital improvement is \$36,070,000.00.

**TABLE 8-1****Capital Improvement Schedule <sup>(1)</sup>**

<b>No.</b>	<b>Project Title</b>	<b>Estimated Cost</b>	<b>Year</b>	<b>Financing Source</b>
<b>Water Treatment Improvements</b>				
WTP-1	Interior and Exterior Valve & Instrumentation Replacement	\$1,289,000.00	2020	City
WTP-2	Backwash Basin Cover Installation	\$310,000.00	2019	City
WTP-3	Chemical Dosing System Improvements	\$1,005,000.00	2021	City
WTP-4	Treatment System Improvements	\$14,010,000.00	2027	City
WTP-5	Generator Load Bank Study	\$40,000.00	2020	City
WTP-6	Raw Water Pump Station Improvements	\$610,000.00	2021	City
<b>Storage Improvements</b>				
S-1	Pinnacle Reservoir No. 2	\$400,000.00	2028	City
S-2	Wilmorth Reservoir No. 2	\$808,000.00	2020	City
<b>Booster Station Improvements</b>				
B-1	Washington St 12-inch Loop and Booster Station Improvements	\$259,000.00	2021	City
B-2	High Street Booster Station Improvements	\$144,000.00	2022	City
B-3	Darnells Booster Station Improvements	\$243,000.00	2032	City
B-4	Pinnacle Booster Station Improvements	\$675,000.00	2037	City
B-5	Wilmorth Booster Station Improvements	\$675,000.00	2036	City
<b>PRV Station Improvement</b>				
P-1	Spader Bay PRV Station	\$180,000.00	2032	City
P-2	Key Bay Loop and PRV Station	\$622,000.00		Developer
P-3	PRV Station No. 9 Upgrade	\$110,000.00	2024	City
P-4	PRV Station No. 1 Replacement	\$470,000.00	2020	City

L:\CHELAN\16018 Water System Plan Update\Figures\FIG 8-1.dwg, 7/25/2018 9:30 AM, WILL KIRBY



**TABLE 8-1 (continued)****Capital Improvement Schedule <sup>(1)</sup>**

P-5	PRV Station No. 5 Upgrade	\$115,000.00	2034	City
P-6	Golf Course Rd PRV Station	\$423,000.00		Developer
<b>Water Distribution System Improvements</b>				
D-1	Annual Main Zone Pipe Replacement	\$369,600.00	Annual	City
D-2	Submarine Line Replacement	\$1,000,000.00	2022	City
D-3	Sanders Street Transmission Main Upsize to 10"	\$578,000.00	2031	City
D-4	Chelan High School 10" Loop	\$283,000.00	2023	City
D-5	Webster Ave Transmission Main Upsize to 10"	\$720,000.00	2035	City
D-6	Woodin Ave Transmission Main Upsize to 16"	\$2,570,000.00		Developer
D-7	Highland Avenue Transmission Main Upsize to 12"	\$544,000.00	2031	City
D-8	Clifford Street Transmission Main Upsize to 10"	\$185,000.00	2031	City
D-9	Lakeside Waterline Upgrades	\$1,448,000.00	2030	Developer
D-10	Hospital Zone Waterline Upgrades	\$803,000.00	2021	City
D-11	Key Bay Waterline Upgrades	\$733,000.00	2026	City
D-12	Eldorado Loop Upgrade	\$722,000.00	2023	City
D-13	Highpoint Place Waterline Upgrade	\$544,000.00	2032	City
D-14	Monte Carlo Drive Waterline Upgrade	\$349,000.00	2034	City
D-15	Lake Chelan Shores Condos Waterline Upgrades	\$723,000.00	2033	City
D-16	Pinnacle Pl Waterline Upgrade	\$398,000.00	2028	City



**TABLE 8-1 (continued)****Capital Improvement Schedule <sup>(1)</sup>**

D-17	Junior Pt Waterline Upgrade	\$138,000.00	2030	City
D-18	Stehekin Way Waterline Upgrade	\$599,000.00	2027	City
D-19	Crescent St Waterline Upgrade	\$173,000.00	2025	City
D-20	Golf Course Pl Waterline Upgrade	\$242,000.00	2026	City
D-21	Butte Rd Loop Upgrades	\$870,000.00	2027	City
D-22	Lookout and Pyramid Loop Upgrades	\$479,000.00	2029	City
D-23	Orchard View Dr Waterline Upgrades	\$529,000.00	2029	City
D-24	Stormy Way Waterline Upgrade	\$299,000.00	2034	City
D-25	Wilmorth Rd Transmission Main	\$1,124,000.00	2020	City/ Developer
D-26	Isenhardt Rd Waterline Upgrades	\$790,000.00	2024	City/ Developer
D-27	Washington St and Shop Ave Transmission Main Upgrades	\$1,029,000.00	2028	City
<b>Water System Planning</b>				
PLN-1	Water Treatment Plant Capacity Analysis	\$45,000.00	2022	City
PLN-2	Water System plan 2028	\$80,000.00	2025	City
PLN-3	Water System plan 2038	\$80,000.00	2035	City
<b>Total Capital Improvements <sup>(2)</sup></b>		<b>\$44,242,000.00</b>		

(1) May 2018 Engineering News Record (ENR) Seattle Construction Cost Index #11472.

(2) Includes 20 years of Annual Improvements.

## **CHAPTER 9**

## CHAPTER 9

### FINANCIAL PROGRAM

#### PAST AND PRESENT FINANCIAL STATUS

Table 9-1 summarizes the City's revenues and expenditures between 2010 and 2017.

**TABLE 9-1**

#### Water Utility Historical Revenue and Expenditures <sup>(1)</sup>

<b>Revenues</b>	<b>2014</b>	<b>2015</b>	<b>2016 <sup>(3)</sup></b>
Water Sales	\$1,796,368	\$1,866,441	\$1,700,000
Miscellaneous Revenue	\$12,665	\$1,903	\$1,000
<b>Total Revenues</b>	<b>\$1,809,034</b>	<b>\$1,868,345</b>	<b>\$1,701,000</b>
<b>Expenditures</b>			
Wages and Benefits <sup>(2)</sup>	\$565,009	\$589,055	\$639,000
Supplies	\$107,239	\$88,191	\$132,000
Other Services & Charges	\$211,092	\$227,291	\$173,400
Intergovernmental Services	\$62,990	\$66,250	\$92,000
Interfund Payments	\$179,263	\$182,629	\$183,758
Operating Transfers Out	\$600,000	\$700,000	\$600,000
<b>Total Expenditures</b>	<b>\$1,725,593</b>	<b>\$1,853,415</b>	<b>\$1,820,558</b>
<b>Balances</b>			
Beginning of Year	\$536,771	\$620,212	\$635,142
End of Year	\$620,212	\$635,142	\$515,584

(1) Per City of Chelan 2016 Budget Document.

(2) The City has regularly increased water utility salaries per the CPI plus merit increases.

(3) Budget as adopted in 2016.

As can be seen from Table 9-1, the City's revenues have consistently outpaced expenditures for 2014 and 2015. 2016 shows a prediction that the end of the year budget will be lower than the beginning of the year, however, predictions typically show end year budgets lower than the previous year but in actuality tend to increase. This is most likely case of conservative budgeting.

#### CURRENT RATE STRUCTURE

Table 9-2 shows the City of Chelan's current water rate structure.

**TABLE 9-2****Current Rate Structure**

<b>Type of Service</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>
<b>Water</b>						
Water Service base rate	\$34.00	\$34.53	\$35.06	\$35.61	\$36.16	\$36.72
Amount of Water included in Base Rate (gal/month)	7,000	7,000	6,900	6,800	6,700	6,600
Water service volume rate (per 1,000 gal)	\$1.00	\$1.02	\$1.04	\$1.06	\$1.08	\$1.10
Booster pump surcharge (per month)	\$2.60	\$2.64	\$2.68	\$2.72	\$2.76	\$2.81
<b>Miscellaneous Charges</b>						
Turn-off	\$25.00	\$25.00	\$25.00	\$25.00	\$25.00	\$25.00
Turn-on (during regular business hours 8:00 a.m. to 5:00 p.m.)	\$15.00	\$15.00	\$15.00	\$15.00	\$15.00	\$15.00
Turn-on (before/after regular business hours)	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00
<b>Stand-by fire service connection (per month)</b>						
1-1/2-Inch pipe	\$10.10	\$10.26	\$10.42	\$10.58	\$10.74	\$10.91
2-Inch pipe	\$12.10	\$12.29	\$12.48	\$12.67	\$12.87	\$13.07
3-Inch pipe	\$17.60	\$17.87	\$18.15	\$18.43	\$18.72	\$19.01
4-Inch pipe	\$22.70	\$23.05	\$23.41	\$23.77	\$24.14	\$24.51
5-Inch pipe	\$30.30	\$30.77	\$31.25	\$31.73	\$32.22	\$32.72
6-Inch pipe	\$40.40	\$41.03	\$41.66	\$42.31	\$42.96	\$43.63
8-Inch pipe	\$66.70	\$67.73	\$68.78	\$69.85	\$70.93	\$72.03
10-Inch pipe	\$101.90	\$103.48	\$105.08	\$106.71	\$108.37	\$110.05
12-Inch pipe	\$145.50	\$147.76	\$150.05	\$152.37	\$154.73	\$157.13
3/4-Inch meter	\$3.10	\$3.15	\$3.20	\$3.25	\$3.30	\$3.35
1-Inch meter	\$12.40	\$12.59	\$12.79	\$12.99	\$13.19	\$13.39
1-1/2-Inch meter	\$24.70	\$25.08	\$25.47	\$25.87	\$26.27	\$26.67
2-Inch meter	\$58.70	\$59.61	\$60.53	\$61.47	\$62.42	\$63.39
3-Inch meter	\$230.70	\$234.28	\$237.91	\$241.59	\$245.34	\$249.14
4-Inch meter	\$401.70	\$407.93	\$414.25	\$420.67	\$427.19	\$433.81
<b>Bulk Water Users</b>						
Initial hydrant connection fee	\$31.00	\$31.48	\$31.97	\$32.46	\$32.97	\$33.48
Cost per day of use	\$8.25	\$8.38	\$8.51	\$8.64	\$8.77	\$8.91
Volume rate	\$3.00	\$3.05	\$3.09	\$3.14	\$3.19	\$3.24

## **RATE STRUCTURE ANALYSIS**

The City is currently contracted with FCS Group who is tasked with developing the City's rate structure. FCS Group is using data from this Plan to develop new rates for the City in order to fund the projects as mentioned in Chapter 8. FCS Group is scheduled to complete its rate study in December 2018. A fall 2019 draft of the rate structure analysis is included in Appendix K.

## **ALTERNATIVE CAPITAL IMPROVEMENT FUNDING SOURCES**

The following section describes several funding sources for municipal water projects that are available to the City. The applicability of a specific funding source will depend on the nature of the project, the status of the City's existing financial commitments, capital and cash flow requirements, funding source availability, and the impact on the service rates and connection charges. The following are potential funding sources available for public water utility improvements.

<b>Grants:</b>	Community Development Block Grant (CDBG) US Economic Development Administration (US EDA) USDA Forest Service, Rural Assistance Program (USFS) USDA Rural Development (RD)
<b>Loans:</b>	Public Works Trust Fund (PWTF) Community Economic Revitalization Board (CERB) Drinking Water State Revolving Fund (DWSRF) USDA Rural Development (RD)
<b>Bonds:</b>	Revenue Bonds General Obligation Bonds
<b>Other:</b>	Utility Local Improvement Districts

### **COMMUNITY DEVELOPMENT BLOCK GRANT (CDBG)**

The Community Development Block Grant program is a competitive source of federal funding for a broad range of community development projects. A primary requirement of the CDBG program is that the project must principally benefit at least 51 percent of the low-to-moderate income residents of the project area. The State received about \$10.3 million in federal funding in fiscal year 2018. The General Purpose program provides grant funds for the planning, design, construction, or reconstruction of water and sewer systems up to the amount of \$750,000. The Planning portion of the General Purpose program includes projects such as comprehensive plans, community development plans, capital improvement plans, and other plans such as land use and urban environmental design, economic development, floodplain and wetlands management, transportation, and utilities.

Eligible applicants for the CDBG program includes cities and towns with populations less than 50,000 or counties with populations less than 200,000. Though port districts and economic development districts are not eligible to apply directly, a city or county can submit a joint application and include these entities as partners.

## **PUBLIC WORKS TRUST FUND (PWTF)**

The Public Works Trust Fund is a revolving loan fund designed to help local governments finance public works projects through low-interest loans and technical assistance. The PWTF, established in 1985 by legislative action, offers loans substantially below market rates, payable over periods ranging up to 20 years. To be eligible for the PWTF programs, an applicant must be a local government such as a city, county, special purpose utility district, or quasi-municipal organization.

The Public Works Board has three programs to provide loans assistance; the Emergency Loan Program, Pre-Construction Loan Program, and Construction Loan Program. The interest rate for the 2016 Construction Loan Program is 2.55 percent and limited to \$7 million per jurisdiction.

The Construction Program accepts applications once per year in May, and the money becomes available approximately 1 year later. The Preconstruction and Planning programs are open on a year-round basis and must be submitted to the Public Works Board prior the 15th of the month to be reviewed at the next Board meeting. These funds become available shortly after the Public Works Board makes their final decision as to the award. Emergency projects must have a locally declared emergency and are applied for on an open cycle depending on the availability of funds. Project expenditures are reimbursable from the date of the declared emergency.

An applicant must have a long-term plan for financing its public works needs. If the applicant is a county or city, it must adopt the 1/4 percent real estate excise tax that is dedicated to public works construction projects. Eligible public works projects include streets and roads, bridges, storm sewers, sanitary sewer collection and treatment systems, and domestic water. Loans are presently offered only for purposes of repair, replacement, rehabilitation, reconstruction, or improvement of existing eligible public works systems. Eligible project costs can include expenses related to serving 20-year forecasted growth as identified in a growth management comprehensive plan.

Since substantially more trust fund dollars are requested than are available, local jurisdictions must compete for the available funds. The applications are carefully evaluated, and the Public Works Board submits a prioritized list of those projects to the Legislature that are recommended to receive low-interest financing. The Legislature reviews the list and indicates its approval through the passage of an appropriation from the Public Works Assistance Account to cover the cost of the proposed loans. Once the Governor has signed the appropriation bill into law (an action that usually occurs by the

following April), those local governments recommended to receive loans are offered a formal loan agreement with appropriate interest rates and terms as determined by the Public Works Board. PWTF funding can be diverted to the State General Fund by the legislature to cover budget short falls. This has occurred in recent years.

### **COMMUNITY ECONOMIC REVITALIZATION BOARD (CERB)**

The Community Economic Revitalization Board's prime mission is to partner with business and industry and local governments to maintain and create jobs. Established by the Legislature in 1982, CERB provides low-interest loans or, in unique circumstances, grants to help finance local public infrastructure necessary to develop or retain stable business and industrial activities. Projects eligible for funding include domestic and industrial waters systems, sanitary and storm sewers, port facilities, and telecommunications.

Typically, CERB provides loans in the amount of \$1 million and, where applicable, grants in the amount of \$300,000. The interest rate is tied to the current cost of a 10-year bond and a local match of 10 percent is required.

Eligible applicants include Washington State subdivisions in partnership with private enterprise. If there is no economic partner, a local government can produce a feasibility study that documents realistic job retention or creation. Applications must be submitted 45 days prior to a regularly scheduled CERB Meeting, which typically meets in January, March, July, and November.

### **DRINKING WATER STATE REVOLVING FUND (DWSRF)**

In 1996, Congress established the Drinking Water State Revolving Fund through the reauthorization of the federal Safe Drinking Water Act. The program is managed by both the Washington State Department of Health and the Washington State Public Works Board. The purpose of the program is to provide low-interest loans to assist publicly- and privately-owned water systems improve drinking water and protect public health.

Eligible publicly-owned water systems include city and county governments, public utility districts, and special purpose districts. Privately-owned systems are eligible as long as they are a Group A system.

Eligible projects include the following:

- New source.
- Source reconstruction.
- Disinfection improvements/treatment.

- Filtration.
- New reservoir or reservoir improvements.
- Treatment plant discharge improvements.
- Water main or distribution improvements (including main extensions to connect safe and reliable drinking water sources, booster pumps, and seismic improvements.
- Replacing aging infrastructure or making distribution improvements to maintain compliance or further protect public health.
- Restructuring and consolidation projects to take over non-compliant, failing, or struggling water systems.
- Security measures, as a stand-alone project.
- Backflow prevention, as a stand-alone project.

Maximum award per single water system is \$12,000,000 and for combining systems an award of \$24,000,000 is available. DWSRF requires a 1 percent loan fee, but no local match. A summary of interest rates and loan terms is presented in Table 9-2.

**TABLE 9-3**

**Drinking Water State Revolving Fund Load Terms**

<b>Applicant's Income Level</b>	<b>Interest Rate</b>	<b>Loan Fee</b>	<b>Repayment Period</b>
Water system is not economically disadvantaged	1.5% fixed	1% at loan execution <sup>(1)</sup>	20 years or life of project, whichever is less
Projects with basic interest rate of 1.5% that are completed within 24 months of contract execution	Adjusted to 1.0% at project closeout	1% at loan execution <sup>(1)</sup>	20 years or life of project, whichever is less



**TABLE 9-3 (continued)****Drinking Water State Revolving Fund Load Terms**

Water system with an affordability index between 2.01% and 2.0%	1% interest on loan	1% at loan execution <sup>(1)</sup>	20 years or life of project, whichever is less
Water system with an affordability index between 2.01% and 3.5%	30% principal forgiveness and 1% interest on loan	N/A <sup>(2)</sup>	20 years or life of project, whichever is less
Water System with an affordability index of 3.51% or higher	50% principal forgiveness and 1% interest on loan	N/A <sup>(2)</sup>	20 years or life of project, whichever is less
Eligible restructuring/consolidation projects proposed by municipal Group A water systems. Projects must result in a change in ownership prior to signing the funding contract.	50% principal forgiveness and 1% interest on loan	N/A <sup>(2)</sup>	20 years or life of project, whichever is less

(1) Loan fee is not subject to loan limit.

(2) Water systems receiving subsidy are not subject to loan fees.

### **USDA RURAL DEVELOPMENT, RURAL UTILITY SERVICE (RUS) – WATER AND WASTEWATER**

The RD Rural Utility Service administers water and wastewater loan and grant programs to improve the quality of life and promote economic development in rural areas.

Rural Development has a loan program that, under certain conditions, includes a limited grant program. Grants may be awarded when the annual debt service portion of the utility rate exceeds 1.0 percent to 1.5 percent of the municipality's median household income.

In addition, RD has a loan program for needy communities that cannot obtain funding by commercial means through the sale of revenue bonds. The loan program provides 30- to 40-year loans at an interest rate that is based on federal rates and varies with the commercial market. RD loans are revenue bonds with a 1.1 debt coverage factor.

Eligible projects include the construction, expansion, extension or improvement of rural water, sanitary sewers, solid waste disposal, storm, and wastewater disposal facilities.

Basic criteria for RD funding are as follows:

- Dependent on inability to obtain funds from other sources at reasonable terms.
- A 45 percent grant is available if the median household income of the service area exceeds 80 percent of the statewide non-metropolitan median household income.
- A 75 percent grant is eligible if the service area is below the higher of the poverty line or 80 percent of the state non-metropolitan median household income, and the project is necessary to alleviate a health and safety issue.

Eligible applicants include municipalities; counties; non-profit corporations, associations, or cooperatives; and federally-recognized Indian tribes in rural areas with populations less than 10,000.

### **US ECONOMIC DEVELOPMENT ADMINISTRATION (US EDA) – WATER AND WASTEWATER**

US EDA offers competitive grants up to \$1 million for projects within Region 10. Projects are selected locally by an economic development district and submitted to Congress for competitive selection among other regions in the United States. Similar to CERB, applicants must have an industrial partner ready to proceed or a feasibility study that establishes realistic job creation.

### **US FOREST SERVICE – WATER AND WASTEWATER**

Forest Service grants are available through the Rural Community Assistance Program to assist rural communities that are dependent on natural resources. Project proposals must show a broad community benefit that result in greater ability to improve economically, socially, or environmentally. The project must have the potential for economic development and/or job creation/retention. An application must be located within 100 miles of a Forest Service office and be able to document a history of at least 15 percent dependency on forest products. Grant funds are available for components of planning and design and are limited to \$50,000.

### **REVENUE BONDS – WATER AND WASTEWATER**

The most common source of funds for construction of major utility improvements is the sale of revenue bonds. These are tax-free bonds are issued by a city or town. The major source of funds for debt service on revenue bonds is from monthly water or sewer service charges. In order to qualify to sell revenue bonds marketable to investors, the bonds typically have contractual provisions for the city or town to meet debt coverage requirements. The city or town must show that its annual net operating income (gross

income less operation and maintenance expenses) must be equal to or greater than a factor, typically 1.2 to 1.4 times the annual debt service on all par debt. If a coverage factor has not been specified it will be determined at the time of any future bond issues.

## **GENERAL OBLIGATION BONDS – WATER AND WASTEWATER**

A city or town may by council action or special election issue general obligation bonds to finance almost any projects of general benefit to the city or town. The bonds are repaid by tax assessments levied against all privately-owned properties within the city or town. This includes vacant property that would not otherwise contribute to the cost of the specific improvements. This type of bond issue is usually reserved for municipal improvements that are of general benefit to the public, such as arterial streets, bridges, lighting, municipal buildings, firefighting equipment, parks, and water and wastewater facilities. General obligation bonds are the most attractive bonds to investors because they are backed by the municipality's full taxing authority and carry the lowest rate of interest of any type of bond that a city or town may issue.

Disadvantages of general obligation bonds include the following:

- Voter approval is often required. The city or town will incur the legal costs of drafting a ballot measure and pay for the cost of holding a special election. There is also the additional cost of investing staff time in public education of the need for the project, yet there is always uncertainty to the outcome of elections.
- There are legal, as well as practical limits on the amount of general obligation debt a city or town can issue. Financing capital improvements through general obligation debt reduces the ability of the city or town to issue additional general obligation debt, which is often the only source of outside financing for many general government facilities.

## **UTILITY LOCAL IMPROVEMENT DISTRICTS – WATER AND WASTEWATER**

Another potential source of funds for improvements can be obtained through the formation of Utility Local Improvement Districts (ULIDs) involving a special assessment made against properties benefiting by the improvements. ULID bonds are further backed by a legal claim to the revenues generated by the utility, similar to revenue bonds.

Sewer system expansion is a frequent application of ULID financing. Typically, ULIDs are formed by the city or town at the written request (by petition) of the property owners within a specific section of the city or town's service area. Upon receipt of a sufficient number of signatures or petitions, and acceptance by the city or town council, the local improvement area is formed. Therefore, a sewer system is designed for that particular area in accordance with the city or town's sewer comprehensive plan. Each separate

property in the ULID is assessed in accordance with the special benefits the property receives from the water or wastewater system improvements. A citywide ULID could form part of a financing package for large-scale capital projects such as sewer line extensions or replacements that benefit all residents in the service area. The assessment places a lien on the property that must be paid in full upon sale of the property. ULID participants have the option of paying their assessment immediately upon receipt, thereby reducing the portion of the costs financed by the ULID bonds.

The advantages of ULID financing, as opposed to rate financing, to the property owner include:

- The ability to avoid interest costs by early payment of assessments.
- If the ULID assessment is paid in installments, it may be eligible to be deducted from federal income taxes.
- Low-income senior citizens may be able to defer assessment payments until the property is sold.
- Some Community Block Grant funds are available to property owners with incomes near or below poverty level. Funds are available only to reduce assessments.

The major disadvantage to the ULID process is that it may be politically difficult to approve formation. The ULID process may be stopped if 40 percent of the property owners protest its formation. Also, there are significant legal and administrative costs associated with the ULID process, which increases total project costs by approximately 30 percent over other financing options.

## **APPENDICES**

## **APPENDIX A**

### **Water Rights**

STATE OF WASHINGTON  
DEPARTMENT OF ECOLOGY

**SUPERSEDING PERMIT**  
TO APPROPRIATE PUBLIC WATERS OF THE STATE OF WASHINGTON  
Supersedes Superseding Permit dated December 20, 1996

- ☒ Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)
- ☐ Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
February 8, 1990	S4-30167	S4-30167P	

NAME	(CITY)	(STATE)	(ZIP CODE)
City of Chelan	Chelan	WA	98816-1669
ADDRESS (STREET)			
PO Box 1669			

The applicant is, pursuant to the Report of Examination which has been accepted by the applicant, hereby granted a permit to appropriate the following public waters of the State of Washington, subject to existing rights and to the limitations and provisions set out herein.

**PUBLIC WATERS TO BE APPROPRIATED**

SOURCE	MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE - FEET PER YEAR
Lake Chelan	4.44		3214
TRIBUTARY OF (IF SURFACE WATERS)			
Columbia River			
QUANTITY, TYPE OF USE, PERIOD OF USE			
Continuous municipal supply.			

**LOCATION OF DIVERSION/WITHDRAWAL**

- APPROXIMATE LOCATION OF DIVERSION--WITHDRAWAL
- 500 feet S. and 500 feet E. of the NW $\frac{1}{4}$  corner of Section 13.
  - 100 feet S. and 1850 feet W. of the E $\frac{1}{4}$  corner of Section 13.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
1) NW $\frac{1}{4}$ NW $\frac{1}{4}$ ; 2) NW $\frac{1}{4}$ SE $\frac{1}{4}$	13/13	27	22 E.	47	Chelan

**RECORDED PLATTED PROPERTY**

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

**LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED**

An Ecology approved future service area as depicted within the most recent edition of the Comprehensive Water System Plan approved by the Washington State Department of Health.



# DESCRIPTION OF PROPOSED WORKS

Municipal water supply diverted from the City's Lakeside Pump Station.

## DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE: Begun	COMPLETE PROJECT BY THIS DATE: Complete	WATER PUT TO FULL USE BY THIS DATE: April 1, 2011
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## PROVISIONS

The annual diversion made by the City of Chelan under Surface Water Certificate No. 4018, Surface Water Certificate No. 10891, Surface Water Permit No. S4-30166P, and Surface Water Permit No. S4-30167P shall not exceed 4283 feet.

An approved measuring device shall be installed and maintained for each of the sources identified by this water right in accordance with the rule "Requirements for Measuring and Reporting Water Use", Chapter 173-173 WAC.

Weekly readings shall document the water use. These records shall be made available to the Department of Ecology upon request or at the least in the progress report required every 6 years which are to commence no later than April 1, 1999.

The following information shall be included with each submittal of water use data: owner, contact name if different, mailing address, daytime phone number, WRIA, Permit/Certificate/Claim No., source name, annual quantity used including units, maximum rate of diversion including units of measurement, monthly meter readings including units of measurement, peak monthly flow including units, Department of Health WFI water system number and source number(s), purpose of use, fish screen status, well tag number, open channel flow or pressurized diversion, other, and period of use. In the future, Ecology may require additional parameters to be reported or more frequent reporting. Ecology prefers web based data entry, but does accept hard copies. Ecology will provide forms and electronic data entry information.

Chapter 173-173 WAC describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition Ecology for modifications to some of the requirements. Installation, operation and maintenance requirements are enclosed as a document entitled "Water Measurement Device Installation and Operation Requirements".

Department of Ecology personnel, upon presentation of proper credentials, shall have access at reasonable times, to the records of water use that are kept to meet the above conditions, and to inspect at reasonable times any measuring device used to meet the above conditions.

Conservation and system efficiency programs as outlined within the Chelan Conservation Plan shall be implemented and maintained.

It is intended that the place of use authorized by this permit be the future service area as depicted within the latest approved edition of the City of Chelan Comprehensive Water System Plan accepted by the Washington State Department of Health and the Washington State Department of Ecology.

The City of Chelan shall acquire existing water rights, where possible, which are replaced by municipal service or community development. The City shall consult with Ecology regarding the procedures required to modify any acquired rights to meet its water needs.

The City of Chelan shall file reports to Ecology every six years reporting progress in the development of the authorized municipal system extension. Updates to the City of Chelan Comprehensive Water System Plan may be filed as a report and will be evidence of good faith and due diligence in pursuance of the development of this project.

This authorization is subject to Washington Department of Fish and Wildlife juvenile salmon and gamefish screening criteria (pursuant to RCW 77.55.040). Please contact the Department of Fish and Wildlife, 600 Capitol Way N, Olympia, WA 98501-1091, Attention: Habitat Management Division, Phone: (360)753-3318 or call (509)575-2734 for the Yakima Screen Shop to obtain specific gamefish (trout, bass, etc.) requirements for your project. Juvenile salmon screening criteria are attached to the Report of Examination if applicable to your diversion.

Any wells which are to be put out of use in favor of connection to the Chelan Municipal System must be abandoned in accordance with Chapter 173-160 of the Washington Administrative Code.

*This permit shall be subject to cancellation should the permittee fail to comply with the above development schedule and/or to give notice to the Department of Ecology on forms provided by that Department documenting such compliance.*

Given under my hand the seal of this office at Yakima, Washington,

this 22nd day of August, 2002.

Department of Ecology

ENGINEERING DATA  
OK [Signature]

by [Signature] Robert F. Barwin  
Robert F. Barwin, Section Manager



STATE OF WASHINGTON  
DEPARTMENT OF ECOLOGY

**SUPERSEDING PERMIT**  
TO APPROPRIATE PUBLIC WATERS OF THE STATE OF WASHINGTON  
Supersedes Superseding Permit dated December 20, 1996

- ☒ Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)
- ☐ Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE February 8, 1990	APPLICATION NUMBER S4-30166	PERMIT NUMBER S4-30166P	CERTIFICATE NUMBER
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NAME City of Chelan			
ADDRESS (STREET) PO Box 1669	(CITY) Chelan	(STATE) WA	(ZIP CODE) 98816-1669

The applicant is, pursuant to the Report of Examination which has been accepted by the applicant, hereby granted a permit to appropriate the following public waters of the State of Washington, subject to existing rights and to the limitations and provisions set out herein.

**PUBLIC WATERS TO BE APPROPRIATED**

SOURCE Lake Chelan		
TRIBUTARY OF (IF SURFACE WATERS) Columbia River		
MAXIMUM CUBIC FEET PER SECOND 1.78	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE -FEET PER YEAR 1290
QUANTITY, TYPE OF USE, PERIOD OF USE Continuous municipal supply; snow making for the purposes of a ski resort may be evaluated as a purpose at a date after permit issuance (see report).		

**LOCATION OF DIVERSION/WITHDRAWAL**

- APPROXIMATE LOCATION OF DIVERSION-WITHDRAWAL
- 220 feet N. and 350 feet W. of the E $\frac{1}{4}$  corner of Section 15.
  - 100 feet S. and 1850 feet W. of the E $\frac{1}{4}$  corner of Section 13.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION) 1) SE $\frac{1}{4}$ NE $\frac{1}{4}$ ; 2) NW $\frac{1}{4}$ SE $\frac{1}{4}$	SECTION 15/13	TOWNSHIP N. 27	RANGE, (E. OR W.) W.M. 22 E.	W.R.I.A. 47	COUNTY Chelan
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**RECORDED PLATTED PROPERTY**

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)
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**LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED**

An Ecology approved future service area of the City of Chelan as depicted within the most recent edition of a Comprehensive Water System Plan approved by the Washington State Department of Health.

FILE COPY



**DESCRIPTION OF PROPOSED WORKS**

Municipal water supply diverted from the City's Lakeside Pump Station.

**DEVELOPMENT SCHEDULE**

BEGIN PROJECT BY THIS DATE: Begun	COMPLETE PROJECT BY THIS DATE: Complete	WATER PUT TO FULL USE BY THIS DATE: April 1, 2011
--------------------------------------	--	--

**PROVISIONS**

The annual diversion made by the City of Chelan under Surface Water Certificate No. 4018, Surface Water Certificate No. 10891, Surface Water Permit No. S4-30166P, and Surface Water Permit No. S4-30167P shall not exceed 4283 feet.

An approved measuring device shall be installed and maintained for each of the sources identified by this water right in accordance with the rule "Requirements for Measuring and Reporting Water Use", Chapter 173-173 WAC.

Weekly readings shall document the water use. These records shall be made available to the Department of Ecology upon request or at the least in the progress report required every 6 years which are to commence no later than April 1, 1999.

The following information shall be included with each submittal of water use data: owner, contact name if different, mailing address, daytime phone number, WRIA, Permit/Certificate/Claim No., source name, annual quantity used including units, maximum rate of diversion including units of measurement, monthly meter readings including units of measurement, peak monthly flow including units, Department of Health WFI water system number and source number(s), purpose of use, fish screen status, well tag number, open channel flow or pressurized diversion, other, and period of use. In the future, Ecology may require additional parameters to be reported or more frequent reporting. Ecology prefers web based data entry, but does accept hard copies. Ecology will provide forms and electronic data entry information.

Chapter 173-173 WAC describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition Ecology for modifications to some of the requirements. Installation, operation and maintenance requirements are enclosed as a document entitled "Water Measurement Device Installation and Operation Requirements".

Department of Ecology personnel, upon presentation of proper credentials, shall have access at reasonable times, to the records of water use that are kept to meet the above conditions, and to inspect at reasonable times any measuring device used to meet the above conditions.

Conservation and system efficiency programs as outlined within the Chelan Conservation Plan shall be implemented and maintained.

It is intended that the place of use authorized by this permit be the future service area as depicted within the latest approved edition of the City of Chelan Comprehensive Water System Plan accepted by the Washington State Department of Health and the Washington State Department of Ecology.

The City of Chelan shall acquire existing water rights, where possible, which are replaced by municipal service or community development. The City shall consult with Ecology regarding the procedures required to modify any acquired right to meet its water needs.

The City of Chelan shall file reports to Ecology every six years reporting progress in the development of the authorized municipal system extension. Updates to the City of Chelan Comprehensive Water System Plan may be filed as a report and will be evidence of good faith and due diligence in pursuance of the development of this project.

This authorization is subject to Washington Department of Fish and Wildlife juvenile salmon and gamefish screening criteria (pursuant to RCW 77.55.040). Please contact the Department of Fish and Wildlife, 600 Capitol Way N, Olympia, WA 98501-1091, Attention: Habitat Management Division, Phone: (360)753-3318 or call (509)575-2734 for the Yakima Screen Shop to obtain specific gamefish (trout, bass, etc.) requirements for your project. Juvenile salmon screening criteria are attached to the Report of Examination if applicable to your diversion.

Any wells which are to be put out of use in favor of connection to the Chelan Municipal System must be abandoned in accordance with Chapter 173-160 of the Washington Administrative Code.

*This permit shall be subject to cancellation should the permittee fail to comply with the above development schedule and/or to give notice to the Department of Ecology on forms provided by that Department documenting such compliance.*

Given under my hand the seal of this office at Yakima, Washington,

this 22nd day of August, 2002.

Department of Ecology

ENGINEERING DATA

OK [Signature]

by [Signature] for Robert F. Barwin

Robert F. Barwin, Section Manager



STATE OF WASHINGTON  
DEPARTMENT OF ECOLOGY

APPLICATION FOR CHANGE OF WATER RIGHT

☐ PURPOSE ☒ DIVERSION OR WITHDRAWAL  
☒ PLACE ☒ ADDITIONAL POINT OR POINTS

Accepted By _____
Date _____
Is Field Exam. Required? <input type="checkbox"/> YES <input type="checkbox"/> NO
Determined By _____

NAME City of Chelan Bus. Tel. 509-682-8010  
Home Tel. \_\_\_\_\_  
Other Tel. \_\_\_\_\_  
ADDRESS PO Box 1669 (CITY) Chelan (STATE) WA (ZIP CODE) 98816

APPLICATION NUMBER 20080 PERMIT NUMBER 14838 CERTIFICATE NUMBER 10891

DECREED RIGHT (TITLE OF CASE)  
-----

APPROPRIATIONS MADE (GIVE DATE IF PRIOR TO JUNE 7, 1917 IF SURFACE WATER, OR JUNE 7, 1945 IF GROUND WATER)  
-----

IS THE WATER RIGHT RECORDED IN YOUR NAME? ☒ YES ☐ NO IF NO, GIVE NAME RECORDED UNDER  
-----

1. RIGHT CONSISTS OF

WATERS USED FROM (STREAM, LAKE, WELL, OR TRENCH, ETC.) <u>Lake Chelan</u>	GALLONS PER MINUTE OR CUBIC FEET PER SECOND <u>1.78 cfs, 896 ac-ft/yr</u>
WATER CURRENTLY USED FOR <u>municipal supply</u>	TIME OF USE <u>continuous</u>

2. LOCATION OF PRESENT POINT OF DIVERSION OR WITHDRAWAL

ENTER BELOW THE DISTANCES FROM THE NEAREST SECTION OR PROPERTY CORNER TO THE DIVERSION OR WITHDRAWAL.  
-----

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION) <u>northerly of gov't lot 1</u>	SECTION <u>15</u>	TOWNSHIP N. <u>27</u>	RANGE (E. OR W.) W.M. <u>22E</u>	COUNTY <u>Chelan</u>
--	----------------------	--------------------------	-------------------------------------	-------------------------

IF THIS IS WITHIN THE LIMITS OF A RECORDED PLATTED PROPERTY, COMPLETE THIS SECTION

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)
-----	-------	------------------------------------

3. LEGAL DESCRIPTION OF LANDS WATER IS USED ON

Town of Chelan

SECTION	TOWNSHIP N.	RANGE (E. OR W.) W.M.	COUNTY
---------	-------------	-----------------------	--------

(ATTACH SEPARATE SHEET IF NECESSARY)

ARE YOU THE LEGAL OWNER OF THE ABOVE DESCRIBED LANDS ☐ YES ☒ NO IF NO, EXPLAIN YOUR INTEREST  
municipal water purveyor

REASONS FOR THE PROPOSED CHANGE

Best alternative for complying with surface water treatment regulations  
was determined to be a new pump station, combining existing rights.

A MINIMUM FEE OF \$10.00 MUST ACCOMPANY THIS APPLICATION

CONTINUE ON REVERSE SIDE

CHANGE



4. **CHANGE REQUESTED**

CHANGE WATER USE TO  
same

TIME OF USE  
same

GALLONS PER MINUTE OR CUBIC FEET PER SECOND  
same

## 5. LOCATION OF PROPOSED POINT OF DIVERSION OR WITHDRAWAL

ON ACCOMPANYING SECTION MAPS, ACCURATELY MARK AND IDENTIFY EACH POINT OF DIVERSION. SHOW NORTH-SOUTH AND EAST-WEST DISTANCES FROM NEAREST SECTION CORNER OR PROPERTY CORNER.

ALSO, ENTER BELOW THE DISTANCES FROM THE NEAREST SECTION OR PROPERTY CORNER TO THE DIVERSION OR WITHDRAWAL.

approximately 1850' W & 100' S of E 1/4 corner Sec. 13

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)

NW 1/4 SE 1/4

SECTION

13

TOWNSHIP N.

27

RANGE (E. OR W.) W.M.

22E

COUNTY

Chelan

6. IF THIS IS WITHIN THE LIMITS OF A RECORDED PLATTED PROPERTY, COMPLETE THIS SECTION

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)
--	--	Within Saunders & Sayles Street R/W in Plat of South Chelan

ARE YOU THE OWNER OF THE LAND ON WHICH THE PROPOSED POINT OF DIVERSION OR WITHDRAWAL IS TO BE LOCATED

☐ YES    ☒ NO WSDOT ownership, under City of Chelan jurisdiction

## LEGAL DESCRIPTION OF LANDS WATER IS USED ON

An Ecology approved future service area of **the City** of Chelan as

depicted within the most recent edition of a Comprehensive Water

System & Plan approved by the Washington State Department of Health.

SECTION

TOWNSHIP N.

RANGE (E. OR W.) W.M.

COUNTY

(ATTACH SEPARATE SHEET IF NECESSARY)

ARE YOU THE LEGAL OWNER OF THE ABOVE DESCRIBED LANDS | IF NO, EXPLAIN YOUR INTEREST

☐ YES      ☒ NO

municipal water purveyor

\* PLEASE NOTE LEGAL LAND OWNER SIGNATURE AND APPLICANT SIGNATURE ARE BOTH REQUIRED. IF THE LEGAL LAND OWNER AND APPLICANT ARE THE SAME, PLEASE SIGN IN BOTH PLACES. THANK YOU.

NA for municipal water purveyors  
LEGAL LANDOWNER (PLEASE PRINT)

APPLICANT'S SIGNATURE

LEGAL LANDOWNER SIGNATURE (OWNER OF PROPERTY DESCRIBED IN ITEM NUMBER 3)

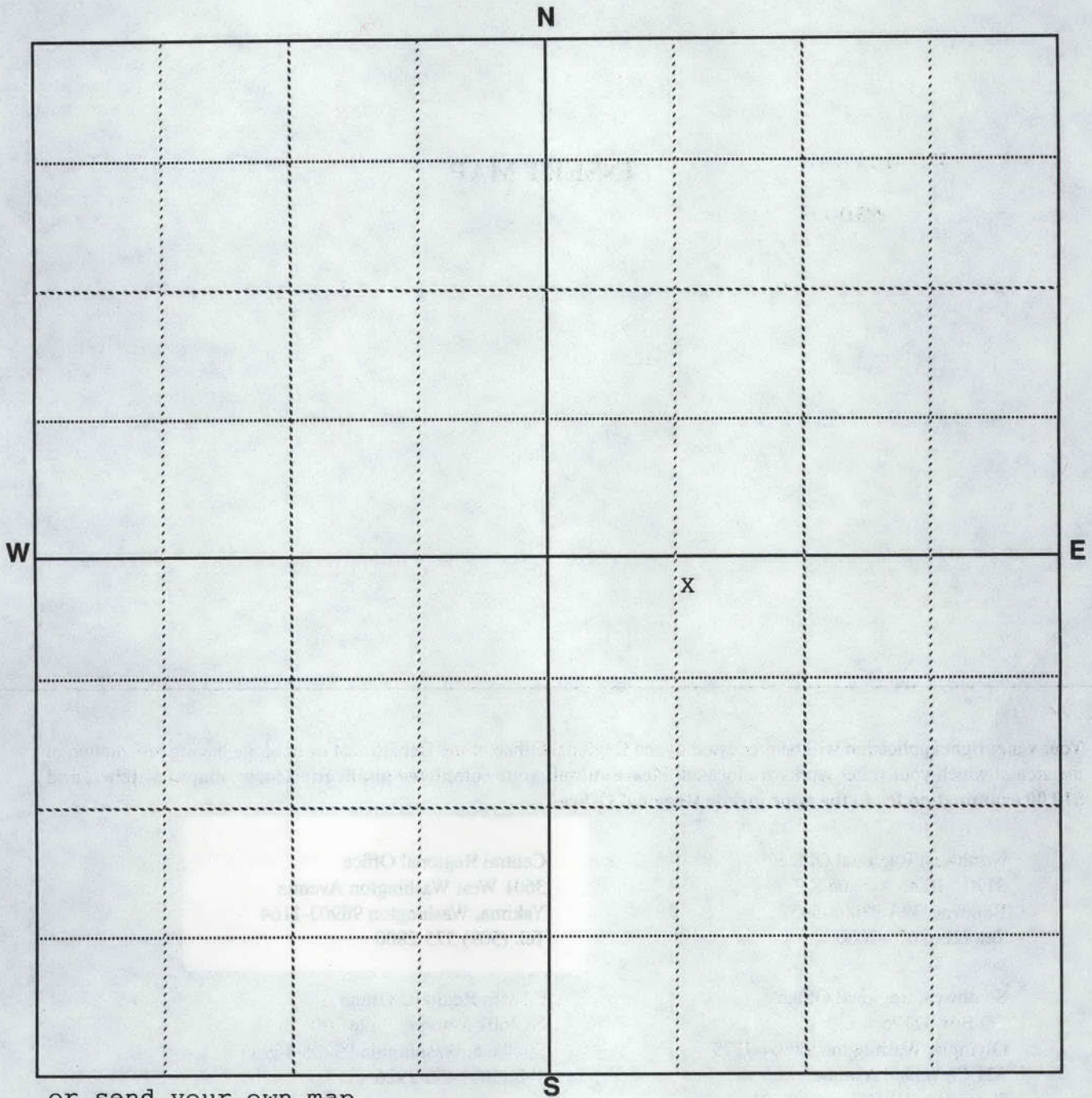
CH SWC-10891

LEGAL LANDOWNER'S ADDRESS



# SECTION MAP

Sec. 13 Twp. 27 N. R. 22E



or send your own map

Scale: 1 inch = 800 feet (each small square = 10 acres)

Show by a cross (X) the location of point of diversion (surface water source) or point of withdrawal (ground water source). For ground water applications, show by a circle (O) the locations of other wells or works within a quarter of a mile. Indicate traveling directions from nearest town in space below.

Point of diversion is located at the NE corner of the Dan Gordon Bridge in Chelan, WA

Detach here

Fold along scale



CH SWC-10891

Detach this scale at the performance, fold excess paper under or cut off excess by cutting along the scale line. This scale corresponds to the SECTION MAP above. You can read feet directly from this scale to outline property and locate points of diversion or withdrawal on the SECTION MAP. Enclose this map along with the application and \$10.00 examination fee.



**INSERT MAP**

Your water right application will be processed by the Regional Office of the Department of Ecology having jurisdiction in the area in which your water works are located. **Please submit your completed application form, maps, sketches, and \$10.00 examination fee to the appropriate Regional Office.**

Northwest Regional Office  
3190 - 160th Avenue S.E.  
Bellevue, WA 98008-5452  
Tel. (206) 679-7000

Department of Ecology - CRO  
15 W Yakima Ave Ste 200  
Yakima WA 98902-3401  
Tel. (509) 575-2597

Southwest Regional Office  
PO Box 47775  
Olympia, Washington 98504-7775  
321 Cleveland Avenue  
Tumwater, Washington 98501  
Tel. (206) 586-6380

Eastern Regional Office  
N. 4601 Monroe, Suite 100  
Spokane, Washington 99205-1295  
Tel. (509) 456-2926

The appropriate Regional Office will be happy to answer any further questions you may have.

CH SWC-10891





STATE OF WASHINGTON  
DEPARTMENT OF ECOLOGY

Accepted By _____
Date _____
Is Field Exam. Required? <input type="checkbox"/> YES <input type="checkbox"/> NO
Determined By _____

APPLICATION FOR CHANGE OF WATER RIGHT

☐ PURPOSE    ☒ DIVERSION OR WITHDRAWAL  
☒ PLACE        ☒ ADDITIONAL POINT OR POINTS

NAME (City of Chelan)	Bus. Tel. 509-682-8010
	Home Tel. _____
	Other Tel. _____

ADDRESS PO Box 1669	(CITY) Chelan	(STATE) WA	(ZIP CODE) 98816
------------------------	------------------	---------------	---------------------

APPLICATION NUMBER 8530	PERMIT NUMBER 5758	CERTIFICATE NUMBER 4018
----------------------------	-----------------------	----------------------------

DECEED RIGHT (TITLE OF CASE)  
-----

APPROPRIATIONS MADE (GIVE DATE IF PRIOR TO JUNE 7, 1917 IF SURFACE WATER, OR JUNE 7, 1945 IF GROUND WATER)  
-----

IS THE WATER RIGHT RECORDED IN YOUR NAME?    IF NO, GIVE NAME RECORDED UNDER  
☒ YES    ☐ NO

CR# 024660  
#40-23  
10/24/95

RIGHT CONSISTS OF

WATERS USED FROM (STREAM, LAKE, WELL, OR TRENCH, ETC.) Lake Chelan	GALLONS PER MINUTE OR CUBIC FEET PER SECOND 2.0 cfs
WATER CURRENTLY USED FOR municipal domestic supply	TIME OF USE continuous

LOCATION OF PRESENT POINT OF DIVERSION OR WITHDRAWAL

ENTER BELOW THE DISTANCES FROM THE NEAREST SECTION OR PROPERTY CORNER TO THE DIVERSION OR WITHDRAWAL.  
-----

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION) NE 1/4 NW 1/4	SECTION 13	TOWNSHIP N. 27	RANGE (E. OR W.) W.M. 22 E	COUNTY Chelan
--	---------------	-------------------	-------------------------------	------------------

IF THIS IS WITHIN THE LIMITS OF A RECORDED PLATTED PROPERTY, COMPLETE THIS SECTION

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)
-----	-------	------------------------------------

LEGAL DESCRIPTION OF LANDS WATER IS USED ON

Within town of Chelan, Sec. 13, T. 27N., R. 22 E.W.M.

SECTION	TOWNSHIP N.	RANGE (E. OR W.) W.M.	COUNTY
---------	-------------	-----------------------	--------

(ATTACH SEPARATE SHEET IF NECESSARY)

ARE YOU THE LEGAL OWNER OF THE ABOVE DESCRIBED LANDS    IF NO, EXPLAIN YOUR INTEREST  
☐ YES    ☒ NO        purveyor

consolidation to one new pumping station

REASONS FOR THE PROPOSED CHANGE  
Surface water treatment requirements being met with best alternative =  
consolidation to one new pumping station

A MINIMUM FEE OF \$10.00 MUST ACCOMPANY THIS APPLICATION

CONTINUE ON REVERSE SIDE

CHANGE



4. CHANGE REQUESTED		
CHANGE WATER USE TO	TIME OF USE	GALLONS PER MINUTE OR CUBIC FEET PER SECOND
same	same	same

5. LOCATION OF PROPOSED POINT OF DIVERSION OR WITHDRAWAL

ON ACCOMPANYING SECTION MAPS, ACCURATELY MARK AND IDENTIFY EACH POINT OF DIVERSION. SHOW NORTH-SOUTH AND EAST-WEST DISTANCES FROM NEAREST SECTION CORNER OR PROPERTY CORNER. Replace current location and move to:

ALSO, ENTER BELOW THE DISTANCES FROM THE NEAREST SECTION OR PROPERTY CORNER TO THE DIVERSION OR WITHDRAWAL.

approximately 1850' W & 100' S of E 1/4 corner Sec. 13

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE (E. OR W.) W.M.	COUNTY
NW 1/4 SE 1/4	13	27	22 E	Chelan

6. IF THIS IS WITHIN THE LIMITS OF A RECORDED PLATTED PROPERTY, COMPLETE THIS SECTION

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)
--	--	within Saunders & Sayles Street R/W in Plat of South Chelan

ARE YOU THE OWNER OF THE LAND ON WHICH THE PROPOSED POINT OF DIVERSION OR WITHDRAWAL IS TO BE LOCATED

☐ YES ☒ NO WSDOT ownership, under City of Chelan jurisdiction

LEGAL DESCRIPTION OF LANDS WATER IS USED ON

An Ecology approved future service area of the City of Chelan as depicted within the most recent edition of a Comprehensive Water System Plan approved by the Washington State Department of Health.

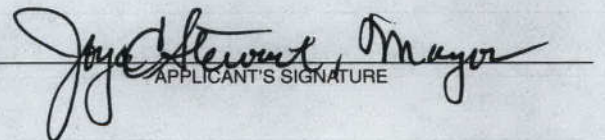
SECTION	TOWNSHIP N.	RANGE (E. OR W.) W.M.	COUNTY
---------	-------------	-----------------------	--------

(ATTACH SEPARATE SHEET IF NECESSARY)

ARE YOU THE LEGAL OWNER OF THE ABOVE DESCRIBED LANDS	IF NO, EXPLAIN YOUR INTEREST
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	municipal water purveyor

\* PLEASE NOTE LEGAL LAND OWNER SIGNATURE AND APPLICANT SIGNATURE ARE BOTH REQUIRED. IF THE LEGAL LAND OWNER AND APPLICANT ARE THE SAME, PLEASE SIGN IN BOTH PLACES. THANK YOU.

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LEGAL LANDOWNER (PLEASE PRINT)

  
APPLICANT'S SIGNATURE

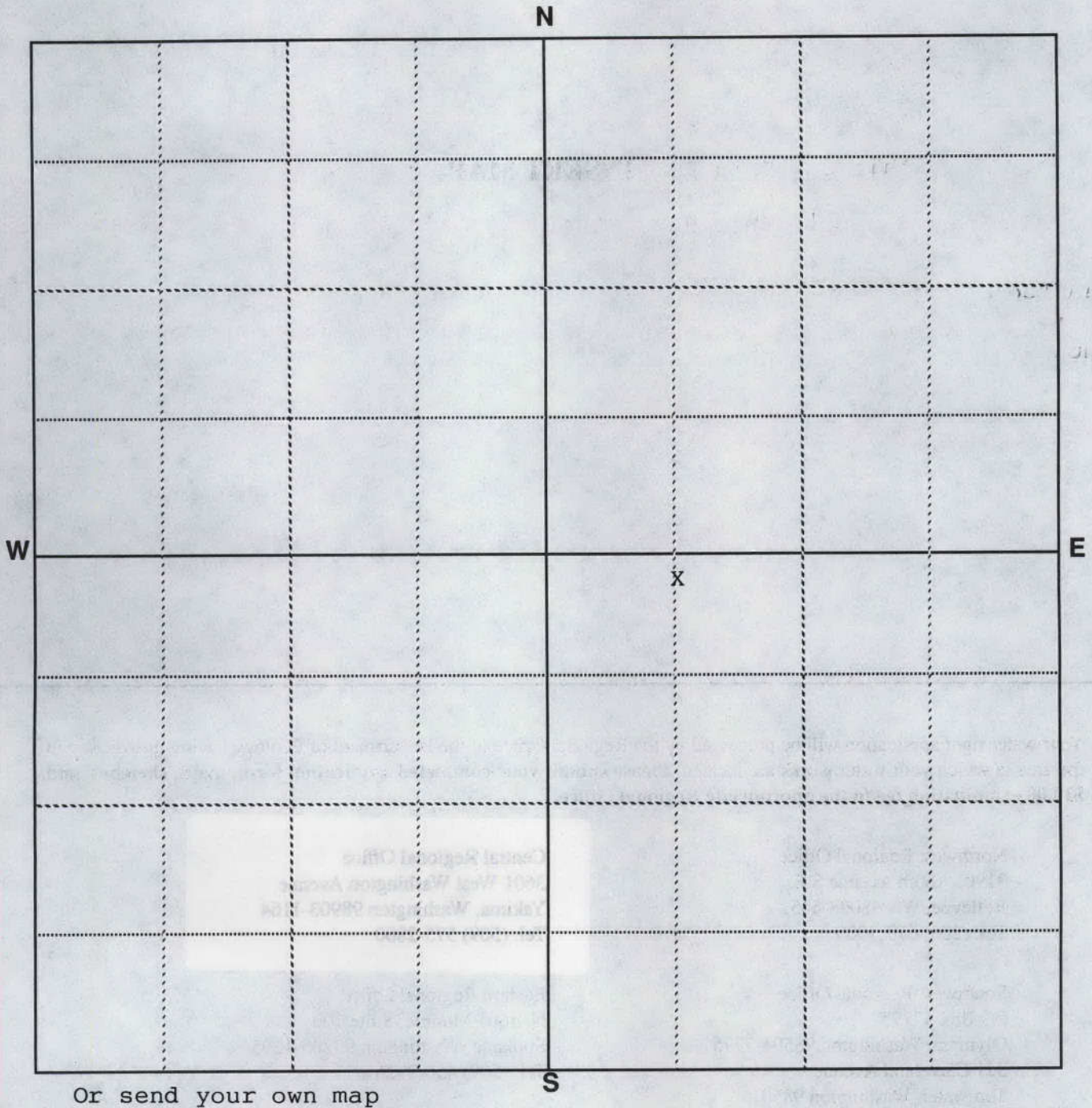
LEGAL LANDOWNER SIGNATURE (OWNER OF PROPERTY DESCRIBED IN ITEM NUMBER 3)

LEGAL LANDOWNER'S ADDRESS



# SECTION MAP

Sec. 13 Twp. 27 N. R. 22E



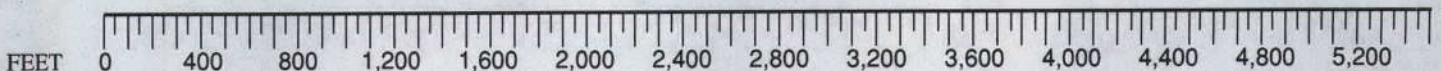
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Detach here

Fold along scale



CH SWC-4018

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Northwest Regional Office  
3190 - 160th Avenue S.E.  
Bellevue, WA 98008-5452  
Tel. (206) 679-7000

Department of Ecology - CRO  
15 W Yakima Ave Ste 200  
Yakima WA 98902-3401  
Tel. (509) 575-2597

Southwest Regional Office  
PO Box 47775  
Olympia, Washington 98504-7775  
321 Cleveland Avenue  
Tumwater, Washington 98501  
Tel. (206) 586-6380

Eastern Regional Office  
N. 4601 Monroe, Suite 100  
Spokane, Washington 99205-1295  
Tel. (509) 456-2926

The appropriate Regional Office will be happy to answer any further questions you may have.

## **APPENDIX B**

### **Construction Standards**

# City of Chelan Development Standards Manual



---

## CITY DEVELOPMENT STANDARDS MANUAL

In the event of conflict between these standards and sections of the Chelan Municipal Code, these standards shall prevail.

### Compliance with Provisions and Concurrency Requirements

All subdivisions and developments shall conform to the design standards of this manual in addition to the City comprehensive plan and all zoning regulations in effect at the time any preliminary plat of a subdivision is submitted for approval. Lots shall be of sufficient area, width, and length to satisfy zoning requirements. Further, the standards established in this manual shall apply to all streets to be constructed and subsequently dedicated to the City as a right-of-way, to all development projects that require a development permit (planned development, conditional use permits, etc.) and propose to utilize an existing City street, a private road, or otherwise on all proposed improvements to existing City streets and to all extensions to existing water, sewer and storm drain systems. If the development results in a level of service lower than those set forth in these standards or in the Comprehensive Plan, the development may be approved if improvements or strategies to raise the level of service above the minimum standard are made concurrent with the development. For the purpose of this section, "concurrent with the development" is defined as the required improvements or strategies in place at the time of occupancy.

CITY DEVELOPMENT STANDARDS MANUAL  
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SECTION TWO - WATER DESIGNS

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SECTION FOUR- SEWER DESIGNS

SECTION FIVE - STREET STANDARDS

SECTION SIX - STREET DESIGNS

SECTION SEVEN - STORM WATER MANAGEMENT

SECTION EIGHT - DRAFTING STANDARDS

SECTION NINE - PARKING STANDARDS

SECTION TEN - UTILITY DESIGNS

SECTION ELEVEN - ILLUMINATION

SECTION TWELVE - ADMINISTRATIVE PROVISION

SECTION THIRTEEN - BONDING AND LIABILITY INSURANCE

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APPENDIX B - FORMS

APPENDIX C - ADOPTION ORDINANCE

APPENDIX D - TRAFFIC IMPACT ANALYSIS

APPENDIX E - PLAN CHECKLIST

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**DOMESTIC WATER MAIN EXTENSIONS****GENERAL:****INTRODUCTION:**

The items herein contained are the domestic water main extension and repair Standards, Conditions, and Specifications for the City of Chelan. These are minimums only when they exceed the minimums required in the Washington State DOH Standard (Department of Health "Water System Design Manual"), and may be increased or altered at the discretion of the Public Works Director to fit particular situations, but in no event shall said standards be reduced below the DOH standard. In the event of conflicting standards the higher standard shall control.

**STANDARDS AND CONDITIONS**

- A. When extension of the existing water distribution system is required for service, an Agreement for Domestic Water Main Extension in the form which is attached hereto and incorporated herein by this reference as Appendix B, Exhibit 1, shall be entered into between the Developer and the City.
- B. To initiate the Water Main Extension process the Developer shall submit a water plan designed by a registered professional engineer licensed in the State of Washington. Final plan and profile drawings shall be stamped by the same.
- C. The licensed professional engineer shall certify that the design and construction of the water distribution system meets or exceeds all applicable standards, to include backflow prevention and cross connection control.
- D. Obtaining necessary permits will be the responsibility of the Developer.
- E. Where franchises, easements or deeds to property are required it shall be the responsibility of the Developer to obtain and provide the same and submit appropriate documentation to the City.
- F. Easements shall be as per Section 10 of this code.
- G. All developments shall be required to provide sufficient water storage for fire protection which shall be in addition to those water supplies required for domestic purposes.
- H. A development containing forty lots or more shall contain at least two water supply routes, completing a system loop.
- I. In a development where lot size is larger than one acre, fire hydrants shall be spaced no further than one thousand feet apart and in subdivisions where lot size



is less than one acre, fire hydrants shall be spaced no further than six hundred feet apart. Where multiple family housing developments are developed within a subdivision, fire hydrant spacing shall be no further than five hundred feet apart, with additional fire hydrants located as may be necessary to permit all sides of a building to be reached by hose outlays of no greater than three hundred feet. In industrial or commercial areas, hydrants will be installed at three hundred (300) foot spacing. Typically, hydrants will be installed on alternating sides of the street. The size, type and location of fire hydrants shall meet the approval of Fire District 7. Fire hydrants shall conform with the Uniform Fire Code as adopted by the City.

- J. The minimum size water main permitted shall be eight inch (8") diameter. Hydraulic calculations shall be submitted where required to validate designs involving two or more pressure zones, a pressure reducing station, a booster pump, or a reservoir. Six inch (6") pipe shall be allowed at the discretion of the City Engineer, when hydraulic analysis shows it will be adequate to transport peak daily demand plus fire flow.
- K. The Developer shall supply an "as-built" drawing on approved mylar film and electronic CD format as an AutoCAD file.
- L. The Developer is required to supply bonding and insurance as per the Section on "Bonding and Liability Insurance."
- M. The Developer shall notify the City 48 hours prior to connection between the City's existing system and the new water distribution system.
- N. All main lines must be designed to provide proper circulation of water and fire flow to all lands serviced by the development. Extensions shall be required through and to the extremes of the property for future service as determined by the City. Fire flow demand shall be in accordance with the Uniform Fire Code Appendix Table III-A as now exists or as may be amended.
- O. Hydrostatic testing (see page-1-13) shall be accomplished by the developer on lines before completion of backfilling, with the pipe joints accessible for examination. Sufficient backfill material shall be placed over the pipe barrel between joints to prevent movement.
- P. Final acceptance shall not constitute acceptance of any unauthorized or defective work or material. The City shall not be barred from requiring the Developer to reimburse the City for the removal, adjustment, replacement, repair or disposal of any unauthorized or defective work or material or from recovering costs for any such work or material within two years.
- Q. Meters smaller than 2" shall be furnished and set by the City. Meters shall not be activated prior to payment by water user of all applicable hook-up fees. The City owns and maintains only appurtenances from and including the water meter to the

water main.

- R. Water Main Extension projects shall be conveyed to the City for operation and maintenance upon final project acceptance.
- S. Installation and testing shall be in conformance with the current edition of APWA (American Public Work Association) specifications, Division IV. The City must supervise the owner taking necessary samples for bacteriological tests. The system shall not be placed into service until the City provides written permission.
- T. For existing platted lots, the City may enter into Latecomer Agreements with Developers, prior to installation of water mains and appurtenances, in order to provide for the reimbursement to Developers for a pro-rata share of the cost of construction pursuant to Chelan Municipal Code Chapter 13.36 and Chapter 12.28 as now exists or as may hereafter be amended.
- U. Interim Water Systems
  - 1. Individual or small group domestic wells are allowed in unincorporated areas (i.e., outside city limits) within the City's Urban Growth Area where domestic water service is not available within 750 feet in the following cases only:
    - a. In the case of single family residential land divisions, provided:
      - i. The parcel to be divided shall be at least 20 acres in size;
      - ii. The parcel may be divided into no more than four lots; and
      - iii. Each lot must be at least five acres in size.
    - b. To serve agricultural tourism uses and small-scale craft beverage production uses.
  - 2. Domestic wells shall meet all applicable requirements of the Chelan-Douglas Health District, the Washington State Department of Health, and the Washington State Department of Ecology, including compliance with Chapter 173-160 WAC.
  - 3. Domestic wells for agricultural tourism uses and small-scale craft beverage production uses must be decommissioned in accordance with Chapter 173-160 WAC if the agricultural tourism or small-scale craft beverage production use is discontinued.
  - 4. The property owner shall sign an agreement not to protest a future local improvement district (LID), later comer agreement or other pro rata sharing of costs to construct and extend public water to the property.
    - a. Said agreement shall describe the property, shall be recorded with the Chelan County auditor's office, and shall constitute a covenant running with the property. The agreement and all provisions of the on-site well approval shall bind the owner and all other persons subsequently acquiring any right, title or interest in or to the property.
    - b. In addition to the cost of constructing and extending public water to the property, the owner shall be required to pay all applicable General Facilities Charges.

5. The property owner shall sign an agreement not to protest annexation of the property to the city. Said agreement shall allow the city to execute a petition for annexation on behalf of the owner if the owner does not do so when requested by the city; and shall describe the property, be recorded with the Chelan County auditor's office, and constitute a covenant running with the property. The agreement and all provisions of the on-site well approval shall bind the owner and all other persons subsequently acquiring any right, title or interest in or to the property.
6. Future roadway development.
  - a. In the case of land divisions, the layout of the parcels shall accommodate future urban growth, providing for road access to all parcels created by the division and to neighboring properties.
  - b. In all cases, building setbacks from the front and, where applicable, side property lines must be adequate to accommodate future development of a street meeting the City's standards, which may include sidewalks, parking lanes, bicycle lanes, planter strips, and utility easements.
  - c. The City may impose requirements for future urban development, including requiring dedication of easements for future roadway and utility easements.
  - d. The property owner shall sign an agreement not to protest a future LID or other pro rata sharing of costs to construct and extend public streets to and adjacent to the property. Said agreement shall describe the property, shall be recorded with the Chelan County auditor's office, and shall constitute a covenant running with the property. The agreement shall bind the owner and all other persons subsequently acquiring any right, title or interest in or to the property.
7. The property owner shall comply with all requirements of the city's comprehensive land use plan, zoning and building codes, and development standards when dividing, developing, or redeveloping the property. In particular:
  - a. Domestic wells must comply with Chapter 14 CMC, Critical Areas.
  - b. The property owner shall improve the city right-of-way adjacent to the property in conformance with the City's standards or, in cases in which concurrent street improvement is not required (e.g., where access via private driveway is allowed), shall execute a waiver of protest for an LID to construct any street improvements required for access to or through adjacent property.

## **SPECIFICATIONS**

### **EXTENSIONS:**

All extensions to the water system shall conform to the design standards of the City

as set forth herein. The system must be capable of future expansion if required and be constructed of permanent materials.

#### **PLANS AND SPECIFICATIONS:**

The installation of water extensions shall be in accordance with construction plans and specification approved by the City.

#### **METHODS AND MATERIALS OF CONSTRUCTION:**

1. Water pipe shall be ductile iron or C900 PVC. Ductile iron shall typically be class 50 in improved areas and class 52 in easement areas. PVC shall be class 200.
2. Fire hydrants shall be installed in accordance with these standards and the current fire code as adopted.
3. Valving shall be installed at all intersections, on each end of easement lines and in line at maximum spacing of 600 feet.
4. Minimum cover for all water mains shall be four (4) feet to top of pipe unless otherwise approved.
5. Except as otherwise noted herein, all work shall be accomplished as recommended in the current applicable American Waterworks Association (AWWA) and American Public Works Association/Department of Transportation Standard Specifications and according to the recommendations of the manufacturer of the material or equipment use. Contractor shall have a copy of the specifications on the job site at all times. Contractor shall furnish a water tight plug of the appropriate size which shall be installed in the end of the water main when work is delayed or stopped at the end of the work day.
6. All materials shall be new and undamaged. Unless otherwise approved by the City, the same manufacturer of each item shall be used throughout the work.

#### **TRENCH EXCAVATION:**

Clearing and grubbing where required shall be performed within the easement or public right-of-way and as permitted by the property owner and/or governing agencies. Debris resulting from the clearing and grubbing shall be disposed of by the Developer in accordance with the terms of all applicable permits.

Trenches shall be excavated to the line and depth designated by the approved plans to provide a minimum of 48 inches of cover over the pipe, unless otherwise

approved. The trench width shall be excavated only to such widths as are necessary for adequate and safe working space. Trench width to one foot above the pipe crown shall not exceed 30 inches or 1.5 times the pipe nominal O.D. plus 18 inches, whichever is greater. The trench shall be kept free from water until complete. Surface water shall be diverted so as not to enter the trench. The Developer shall maintain sufficient pumping equipment on the job to insure that these provisions are carried out.

The Developer shall perform all excavation. Boulders, rocks, roots and other obstructions shall be entirely removed or cut out to the width of the trench and to a depth 6 inches below water main grade. Where material is removed from below subgrade, the trench shall be backfilled to grade with material satisfactory to the City and thoroughly compacted to 85% for easements outside of roadway and 95% in streets, alleys or traveled ways, using modified proctor testing. The Developer shall be responsible for meeting current Labor and Industry Trench and Shoring Protection and Washington State Safety Standards.

Unsuitable material below the depth of the proposed pipe shall be removed and replaced with satisfactory materials as determined by the City.

When trenching operations cut through asphalt/concrete pavement, the pavement shall be removed to a solid edge along the width of the trench as approved by the City engineer. The pavement shall be saw cut on a straight line and shall be beveled so that the cut will be approximately 1 inch wider at the top than at the bottom.

Trenching operation shall not proceed more than 200 feet in advance of pipe laying without written approval of the City.

#### **PIPE INSTALLATION WITHIN STREET RIGHT-OF-WAYS:**

The Developer may use any method which provides satisfactory results which complies with Chapter 12.20 of the Chelan Municipal Code as it now exists or may be hereafter amended and is acceptable to the City and the agency having control of the road, provided that the Developer restores the roadway to its original condition. Permits shall be required for all crossings. Highway crossings may require the placing of steel pipe casing by jacking or tunneling and laying the water main within this casing.

#### **PIPE IN FILLED AREAS:**

Special treatment may be required at the discretion of the City. This treatment may consist of compacting the backfill in 6" layers, use of select backfill materials, use of Mechanical Joint Ductile Iron Pipe in short lengths, welded HDPE pipe, or such other reasonable methods or combinations as may be necessary in the opinion of the City based upon topography, soil type and any other unique characteristics or

the area.

**PIPE BEDDING:**

1. Except when excavating in pure sand, where imported bedding material will not be required, the pipe shall be placed on a prepared subgrade of imported bedding material four inches under the pipe for all pipe sizes of 27 inches diameter and smaller and 6 inches for all pipe sizes 30 inches and larger. Bedding material shall consist of clean, granular, unfractured material of which 100 percent will pass the U.S. Standard 5/8 inch opening; not more than 3 percent will pass the U.S. No. 200 (wet sieve). Bell holes shall be excavated so the pipe, when laid, will have a uniform bearing under the full length of the pipe. The Developer shall be responsible for adequate support and bedding for the pipe. The trench shall be backfilled from the spring line of the pipe to six inches above the top of the pipe as shown in the Standard Detail drawing. The material shall be placed in four-inch layers and compacted to no less than 95 percent of the maximum theoretical density as measured by a soil lab, using the modified proctor test.
2. Where the undisturbed trench below the four-inch bedding is unstable, the unstable material shall be removed and backfilled with foundation gravel upon which to place the bedding, as approved by the City engineer. The Contractor shall be responsible for providing a stable foundation for placing of the bedding.
3. Boulders, rocks, roots and other obstructions shall be entirely removed or cut out to the full width of the trench and to a depth six inches below the pipe. In solid rock, the trench shall be excavated six inches below the pipe bottom and backfilled as provided above.
4. Whenever the trench is excavated below the depth required for proper bedding, it shall be backfilled with bedding gravel and compacted, as provided above.

**DUCTILE IRON PIPE:**

Ductile iron pipe shall be cement-lined standard thickness Class 50 in improved areas or Class 52 in non-roadway easement areas, unless otherwise specified and shall conform to the standards of USA Standard A-21.51 (AWWA C-111).

Rubber gasket pipe joints to be push-on-joint (Tyton) or mechanical joint (M.J.) in accordance with USA Standard A21-11 (AWWA C-111), unless otherwise specified.

Flanged joint shall conform to USA Standard B16.1.

Standard Thickness cement lining shall be in accordance with USA Standard A21.4

(AWWA C-1-4).

The Developer shall furnish written certification from the manufacturer of the pipe and gasket being supplied that the inspection and all of the specified tests have been made and the results thereof comply with the requirements of this standard.

#### **DUCTILE IRON PIPE INSTALLATION:**

Ductile iron pipe shall be installed in accordance with AWWA Standard C-151 and the manufacturers recommendation.

The bottom of the trench shall be finished to grade with hand tools in such a manner that the pipe will have bearing along the entire length of the barrel. The bell holes shall be excavated with hand tools to sufficient size to make up the joint. Bolts on mechanical joint pipe and fittings shall be tightened uniformly with a "Torque" wrench which measures the torque applied. Required torque for mechanical joints shall be as follows:

4" - 24" pipe size 3/4" bolts 60-90# torque.

Installation of push-on-joint (Tyton) pipe shall be in accordance with the manufacturer's instructions.

#### **PVC PIPE:**

PVC pipe shall be AWWA C900-81 high pressure water pipe, class 200, and shall meet the requirements of DR 14.

The gasketed joint assembly shall conform to ASTM D3139 with gaskets conforming to ASTM F477.

The Developer shall furnish written certification from the manufacturer of the pipe and gasket being supplied that the inspections and all of the specified tests have been made and the results thereof comply with the requirements of this standard.

#### **PVC PIPE INSTALLATION:**

PVC pipe shall be installed in accordance with AWWA M23 and the manufacturers recommendation.

The bottom of the trench shall be finished to grade with hand tools in such a manner that the pipe will have bearing along the entire length of the barrel. The bell holes shall be excavated with hand tools to sufficient size to make up the joint.

**TRACER WIRES**

The Contractor shall install a tracer wire, in addition to the location ribbon, over all non-metallic water mains. The tracer wire shall be 14 gauge copper wire with blue coded UF insulation. The tracer wire shall be installed as shown on the City of Chelan Standard Drawing. Bare wire contact points shall be provided at valve boxes, air release and blow off installations.

**DETECTABLE MARKING TAPE:**

Detectable Marking Tape (S.9-15.18) shall be installed 12" to 18" above pipe crown over all pipe located within public street right-of-ways. Pipe locator ribbon shall be two inches wide, plastic coated aluminum and shall be clearly marked, "CAUTION BURIED WATER LINE" continuously along the length of the ribbon with minimum 1-1/2 inch letters. The ribbon shall be blue in color for water pipe.

**DUCTILE IRON FITTINGS:**

Ductile iron fittings shall be short body for pressure rating of 150 psi, unless otherwise noted. Metal thickness and manufacturing process shall conform to applicable portions of USA Standard A21.10, A21.11, B16.2 and B16.4.

Fittings shall be cement-lined in accordance with USA Standard A21.4 (AWWA C-104).

Rubber gaskets for mechanical joint (M.J.) in accordance with USA Standard A21.11 (AWWA C-111).

Gasket material for flanges shall be neoprene, Buna N, chlorinated butyl. Type of connections shall be specified as push-on-joint (Tyton), mechanical joint (M.J.), plain end (P.E.), flanged (FL.) or threaded.

**BOLTS IN PIPING:**

Bolts shall be cast iron, zinc or chromium plated or stainless steel, as approved by the City.

**GALVANIZED IRON PIPE AND FITTINGS:**

Where specified, galvanized iron pipe shall be standard weight, Schedule 80. Fittings shall be threaded malleable iron galvanized per USA Standard B16.3.

**CONCRETE THRUST BLOCKING:**

Concrete thrust blocking shall be cast in place and have a minimum of 1/4 square foot bearing against the fitting and two square feet bearing area against undisturbed



soil. Blocking shall bear against fittings only and shall be clear of joints so as to permit taking up or dismantling joint. All poured in place blocking shall have a minimum measurement of twelve inches (12") between the pipe and the undisturbed bank. All bends and tees shall be blocked in accordance with Standard Blocking as per design details which shall be adequate to withstand full test pressures as well as to continuously withstand operating pressure under all conditions of service. Polyethylene sheeting shall be installed to cover joints and bolts for future dismantling.

**BEDDING CONCRETE:**

Bedding concrete shall be mixed from materials acceptable to the City and shall have a 30-day compressive strength of not less than 1,500 psi. The mix shall contain four sacks of cement per cubic yard and shall be of such consistency that the slump is between 1 inch and 5 inches.

**GATE VALVES:**

Gate Valves shall be used in all applications unless otherwise specified by the City Engineer. They shall conform to the Standards of AWWA C-515 . Buried gate valves shall be iron body, bronze mounted, resilient wedge, nonrising stem, operating stems equipped with Standard two (2) inch operation nut, and O-ring stem seals, suitable for installation with the type and class of pipe being installed. Ends to be as specified.

Valves not buried shall be so specified.

**BUTTERFLY VALVES:**

When specified, butterfly valves shall conform to AWWA Standard C504, Class 150, with cast iron short body and O-ring stem seal. Valves in chambers shall have a manual crank operation. Buried valves shall have stem extension with AWWA 2-inch operation nut. Full cycle open and close shall be confirmed after installation but prior to backfill. Butterfly valves shall not be directly connected to C900 pipe.

**CHECK VALVES:**

Check valves shall be for 150 psi working pressure, unless otherwise specified. Valve shall have adjustable tension lever and spring to provide non-slamming action under all conditions unless otherwise specified. Check valves shall be equal to Empire Fig. 230 single increasing lever and spring.

**AIR AND VACUUM RELEASE VALVES:**

Air and vacuum release valves shall be APCO - Valve and Primer Corporation, "Heavy-Duty", combination air release valve, or equal.

Installation shall be as shown on the Standard Detail, Section Two, page 5.

Piping and fittings shall be copper or brass. The installation shall be set at the high point of the line. Water line must be constructed so the air release valve may be installed in a convenient location.

**VALVE INSTALLATION:**

The valve and valve box shall be set plumb with the valve box centered on the valve. Valve boxes shall be set flush in pavement and in gravel roads as required by the City. An area around the top shall be black topped in unimproved roads for 2 feet. Where valve operation nut is more than 3 feet below finished grade, a stem extension shall be installed conforming to the Standard Detail, Section 2, pg 2-6.

**VALVE BOXES:**

Valve boxes shall be cast iron, two-piece with tabs, for 42-inch trench with extension, Tyler 7126 top and 7100 bottom.

**VALVE MARKER INSTALLATION:**

When specified, concrete marker posts painted with two coats, Rust-Oleum yellow paint shall be set for all valves except auxiliary hydrant valves. The post shall be set at right angles to the road from the valve and shall be situated in a safe and reasonably conspicuous location, normally on the property line. Distance to valve shall be neatly stenciled on the post with two inch numerals. Valve markers shall be installed in unimproved or unpaved areas.

Valve marker posts shall be reinforced concrete posts, 4" x 4" on one end, 42 inches long. Fogtite Meter Seal Co. or equal.

**FIRE HYDRANTS:**

Fire hydrants shall have a minimum valve opening of 5-1/4" O-ring stem seal, two 2½" N.S.T. hose nozzle connections, and one 4½" N.S.T. pumper connection. The shoe connection shall be 6" mechanical joint or flanged. The operation nut shall be 1¼" pentagonal. Hydrants shall be Mueller Centurion or approved equal, with approved breakaway features and Storz fitting. A minimum of one field re-build kit will be supplied by the Developer. On large projects, one kit will be supplied for every ten hydrants installed.

**HYDRANT GUARDS:**

When required by City engineer, hydrant guards shall consist of individually designed curbed planters. Hydrant guards shall be required where hydrants are susceptible to potential vehicle contact as determined by the City.

**SERVICE CONNECTION:**

Connections shall be installed with pipe saddles and corporation stops on C900 PVC, asbestos cement, and steel, and by direct tap into Class 52 or thicker ductile. Installation shall be as shown in the Standard Details. Minimum size tap is 1 inch.

**METER BOX:**

Meter box shall be complete with full lid. Lid shall have a hole for Sensus Touch Read. One inch service box shall be Mueller/McCullough thermal-coil meter box 18" diameter 48" depth equipped with inlet angle meter stop with lockwing, dual angle check valve outlet and insulating pad. 1½" and 2" meter boxes shall be concrete H 2 precast 2019.

**PLASTIC SERVICE PIPE AND CONNECTIONS:**

Plastic pipe shall be manufactured from high molecular weight polyethylene (average molecular weight of 1,750,000) defined by ASTM-1248, as polyethylene Type 111 (3306) (PE). Pipe shall be made of all virgin material and conform to CS-255-63. Plastic pipe shall meet all requirements of ASTM D2241-67. The pipe shall be copper tube size, and have a working pressure of 200 psi at 73.4 degrees F. It shall sustain 300 psi at 73.4 degrees F. for 1000 hours. All connections to this pipe shall be of the Ford Packjoint, Mueller instatite, or equal, compression type connection with a stainless steel insert stiffener or by O-ring type self sealing fittings. All connections shall be rated at a working pressure of 160 psi.

**DETECTOR CHECK AND BACKFLOW DEVICE:**

Cross connection control is governed by Chelan Municipal Code, Chapter 13.05. All backflow devices are to be tested and certified upon installation and annually thereafter by a Washington State certified backflow assembly tester. All backflow devices must be models included on the current list of backflow prevention assemblies approved for use in Washington State. The current approved assemblies list is available from the Office of Drinking Water.

Detector checks will be installed on all fire lines. See Standard Details, Section 2.

In addition to Chelan Municipal Code, Chapter 13.05.070, an approved backflow device will be required on the following fire systems:

- a. All foamite or chemically charged installations.
- b. Systems where an unapproved water source is permanently connected to the fire system.
- c. Systems in which anti-freeze is allowed.

- d. Systems with private hydrants.
- e. Wet systems with an in-line booster pump or building over three stories high.
- f. Wet systems with pumper connection within 1700 feet of an auxiliary water supply.
- g. Dry systems with pumper connection.
- h. Sprinkler systems.

**PUMP AND PRESSURE REDUCING STATION:**

Pipe, fittings, and equipment shall be supported and blocked against static and dynamic loading in accordance with the "Concrete Thrust Blocking" standard drawing, and the equipment manufacturer's recommendations.

Drain lines from pumps and other equipment shall be piped to a below grade drainage system connected to the station sump or drain.

**BACKFILLING:**

Backfilling and surface restoration shall closely follow installation and testing of pipe, so that not more than 200 feet is left exposed without express approval of the City. Selected backfill material shall be placed and compacted around and under the water mains by hand tools to a height of 6 inches above the top of the water main. The remaining backfill shall be compacted to current WSDOT Standards, modified proctor test, of the maximum density as determined by a certified soils lab. Where other agencies have jurisdiction over roadways, the backfill and compaction shall be done to the standard of the agency having jurisdiction.

**HYDROSTATIC TESTS:**

Prior to the acceptance of the work, the installation shall be subjected to a hydrostatic pressure test of 200 psi for 15 minutes at the high point in the line, as per APWA (American Public Works Association), and any leaks or imperfections developing under said pressure shall be remedied by the Developer before final acceptance of the work. No air will be allowed in the line. The main shall be tested between valves. Insofar as possible, no hydrostatic pressure shall be placed against the opposite side of the valve being tested. Test pressure shall be maintained while the entire installation is inspected. The Developer shall provide all necessary equipment including valves to test against where needed and shall perform all work connected with tests. Tests shall be made after all connections as shown on the plan are complete. Insofar as is practical, tests shall be made with

pipe joints, fittings and valves exposed for inspection. For approval, the quantity of water lost from the main shall not exceed the number of gallons per hour as determined by the formula 
$$L = (ND(P)^{1/2})/7400$$

in which      L = Allowable leakage, gallons/hour  
                  N = No. of joints in the length of pipeline tested  
                  D = Nominal diameter of the pipe in inches  
                  P = Average test pressure during the leakage test, psi

There shall not be an appreciable or abrupt loss in pressure during the 15 minute test period. The Developer shall test to assure that the equipment to be used for the test is adequate and in good operating condition and the air in the line has been released before requesting the City to witness the test. The City engineer shall witness the test; if the test does not pass inspection for any reason, additional trips required to witness the test may be at the Developer's expense.

### **STERILIZATION AND FLUSHING OF WATER MAINS:**

Sterilization of water mains shall be accomplished by the Developer in accordance with the requirements of the State Health department and in a manner satisfactory to the City. The section to be sterilized shall be thoroughly flushed at maximum flow prior to chlorination. At no time shall chlorinated water from a new main be flushed into a body of fresh water. This includes lakes, rivers, streams and any and all other waters where fish or other natural water life can be expected. Flushing period must be approved by the City. Sections will ordinarily be sterilized between adjacent valves unless, in the opinion of the City, a longer section may be satisfactorily handled. Chlorine shall be applied by solution fed at one end of the section with a valve or hydrant at the opposite end opened sufficiently to permit a flow through during chlorine application. The chlorine solution shall be fed into the pipeline already mixed by an automatically proportioning applicator so as to provide a steady application rate of not less than 60 PPM chlorine. Hydrants along the chlorinated section shall be opened during application until the presence of chlorine has definitely been detected. When a chlorine concentration of not less than 50 PPM has been established throughout the line, the valves shall be closed and the line left undisturbed for 24 hours. The line shall then be thoroughly flushed and water samples taken for approval by the City. Flushing period must be approved by the City. The Developer shall exercise special care in flushing to avoid damage to surrounding property. Should the initial treatment result in an unsatisfactory bacteriological test, the original chlorination procedure shall be repeated by the Developer until satisfactory results are obtained.

### **HYDRANT TESTING**

Upon connection of new water main extension to the existing system, all new fire hydrants shall be flow tested to confirm fire flow projections.

**SANITARY SEWER CROSSINGS****Required Separation Between Water Lines and Sanitary Sewers**

The basic separation requirements apply to sewers of 24-inch diameter or less; larger sewers may create special hazards because of flow volumes and joint types. The special construction requirements given are for the normal conditions found with sewage and water systems. More stringent requirements may be necessary in areas of high ground water, unstable soil conditions, etc.

**A. Horizontal Separation (Parallel)**

A minimum horizontal separation of ten (10) feet between gravity sanitary sewers and any existing potable water lines shall be maintained, whenever possible. The distance shall be measured edge to edge.

**B. Unusual Conditions (Parallel)**

When local conditions prevent a horizontal separation as described previously, a gravity sewer may be laid closer than 10 feet to a water line provided:

- a. It is laid in a separate trench; or, it is laid in the same trench with the water line that is located at one side on a bench of undisturbed earth; and
- b. In either case, the elevation of the crown of the gravity sewer must be at least 18 inches below the invert of the water line. When this vertical separation cannot be obtained, the gravity sewer shall be constructed of materials and joints that are equivalent to water main standards of construction and shall be pressure tested to assure water tightness prior to backfilling.

**C. Vertical Separation (Perpendicular)**

Sewer lines crossing water lines shall be laid below the water lines to provide a separation of at least 18 inches between the invert of the water pipe and the crown of the sewer, whenever possible.

**D. Unusual Conditions (Perpendicular)**

When local conditions prevent a vertical separation the following construction shall be used:

- a. Gravity sewers passing over or under water lines shall be:

1. Constructed of material described in this section. The one segment of the maximum standard length of pipe, (but no less than 18 feet long) shall be used with the pipes centered to maximize joint separation.
  2. Standard gravity sewer material encased in concrete or in a 1/4" thick continuous steel casing with all voids pressure-grouted with sand-cement grout.
  3. The length of sewer pipe shall be centered at the point of crossing so that the joints will be equi-distant and as far as possible from the water line. The sewer pipe shall be the longest standard length available from the manufacturer.
- b. Water lines passing under gravity sewers, in addition, shall be protected by providing:
1. A vertical separation of at least 18 inches between the invert of the sewer and the crown of the water line;
  2. Adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking of the water lines; and
  3. The length of sewer pipe shall be centered at the point of crossing so that the joints will be equi-distant and as far as possible from the water line. The sewer pipe shall be the longest standard length available from the manufacturer.
- c. Pressure sewers shall only be constructed under water lines with ductile iron pipe or standard sewer pipe in a steel casing for a distance of at least ten (10) feet on each side of the crossing.

**SUMMARY:**

Any material, design, standard or testing not specifically addressed within these standards shall be as per the current edition of American Public Works Association Standard Specifications for Road, Bridge, and Municipal Construction, Washington State Department of Transportation and the American Water Works Association Standards, both of which are hereby adopted by this reference.



**DOMESTIC WATER MAIN EXTENSIONS CHECKLIST**

1. Developer submits legal description of proposed development.
2. City provides standards, conditions and specifications.
3. Developer submits water distribution plan designed by registered civil engineer licensed in Washington State.
4. Developer signs Domestic Water Service Extension Agreement.
5. If the project is in full compliance with the water system comprehensive plan, as determined by the City engineer, administrative approval is sufficient.
6. After the water distribution plan is accepted, City enters into agreement with the Developer for water main extension, which will include a right-of-way Excavation Permit.
7. Water main extension to be constructed by a licensed and bonded contractor to City standards as certified by a licensed engineer. The construction contract management shall be at the Developer's expense. At the City's option, the project inspectors may be City staff or may be contracted for by the City. (See Appendix B, Exhibit 2)
8. Contractor posts required bonds and insurance.
9. City inspects and observes testing of water main prior to approval.
10. Developer conveys system to City for operation and maintenance.
11. All services from the new water main extension are installed.
12. After two years, City inspects improvements and, if appropriate, releases bond/returns deposit balance.

**DOMESTIC WATER MAIN EXTENSION  
AS-BUILT DRAWINGS**

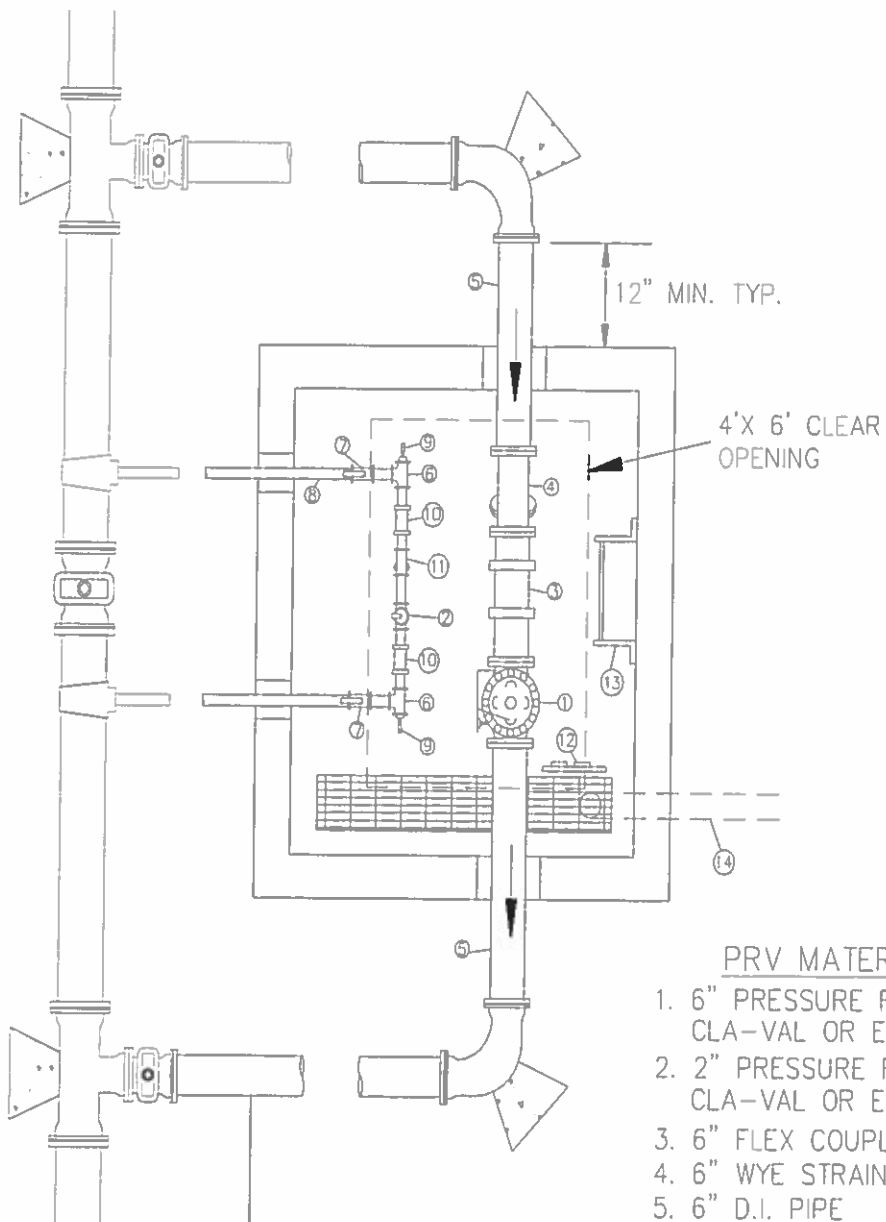
As-built drawings of all improvements deeded or conveyed to the City of Chelan shall be provided. As-built drawings shall show all modifications made during construction. They shall also show precisely the location of all buried utilities, including the measured distance to all sewer tees or wyes, and the distance from valves to fittings. The location of water and sewer facilities shall be indicated by showing measured distances to monuments or other approved permanent reference.

As-built drawings for water improvements shall include a copy of the Engineer's Certificate of Completion form, as required by Washington State Department of Health.

As-built drawings turned over to the City upon acceptance of the utilities shall meet the drafting standards in Section 8.

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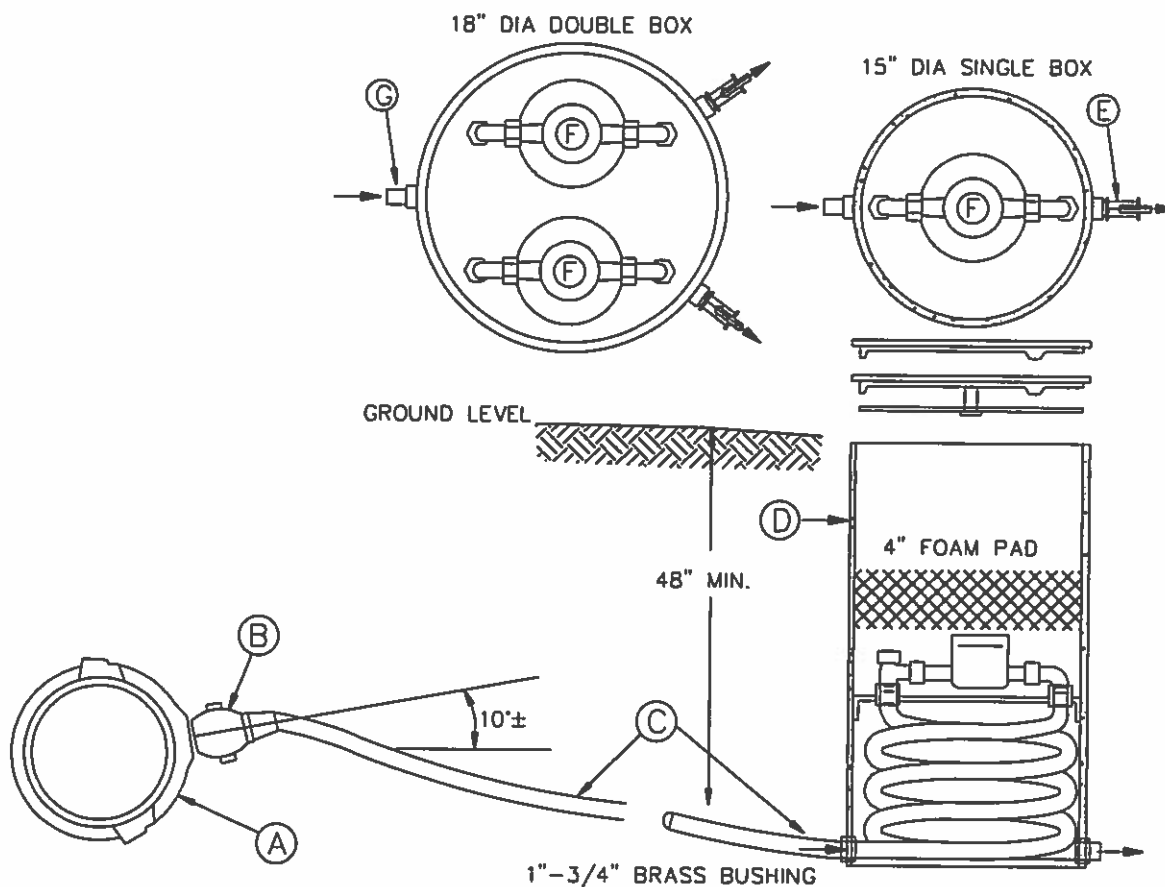
**PRESSURE REDUCING STATION**PRV MATERIALS LIST

1. 6" PRESSURE REDUCING VALVE, CLA-VAL OR EQUAL.
2. 2" PRESSURE REDUCING VALVE CLA-VAL OR EQUAL.
3. 6" FLEX COUPLER
4. 6" WYE STRAINER, 1/8" SCREEN
5. 6" D.I. PIPE
6. 2" TEE (THREADED)
7. 2" THREADED BRONZE BALL VALVE W/ LEVER HANDLE
8. 2" PIPE
9. 1/4" GAUGE COCK & PRESSURE GAUGE
10. 2" FLEX COUPLER
11. 2" WYE STRAINER WITH 20 MESH SCREEN
12. GAUGE ASSEMBLY
13. LADDER
14. DRAIN LINE

ID-069

## 3/4"-1" SINGLE and DOUBLE WATER SERVICE~

## 1" - 3/4" WATER METER SERVICE

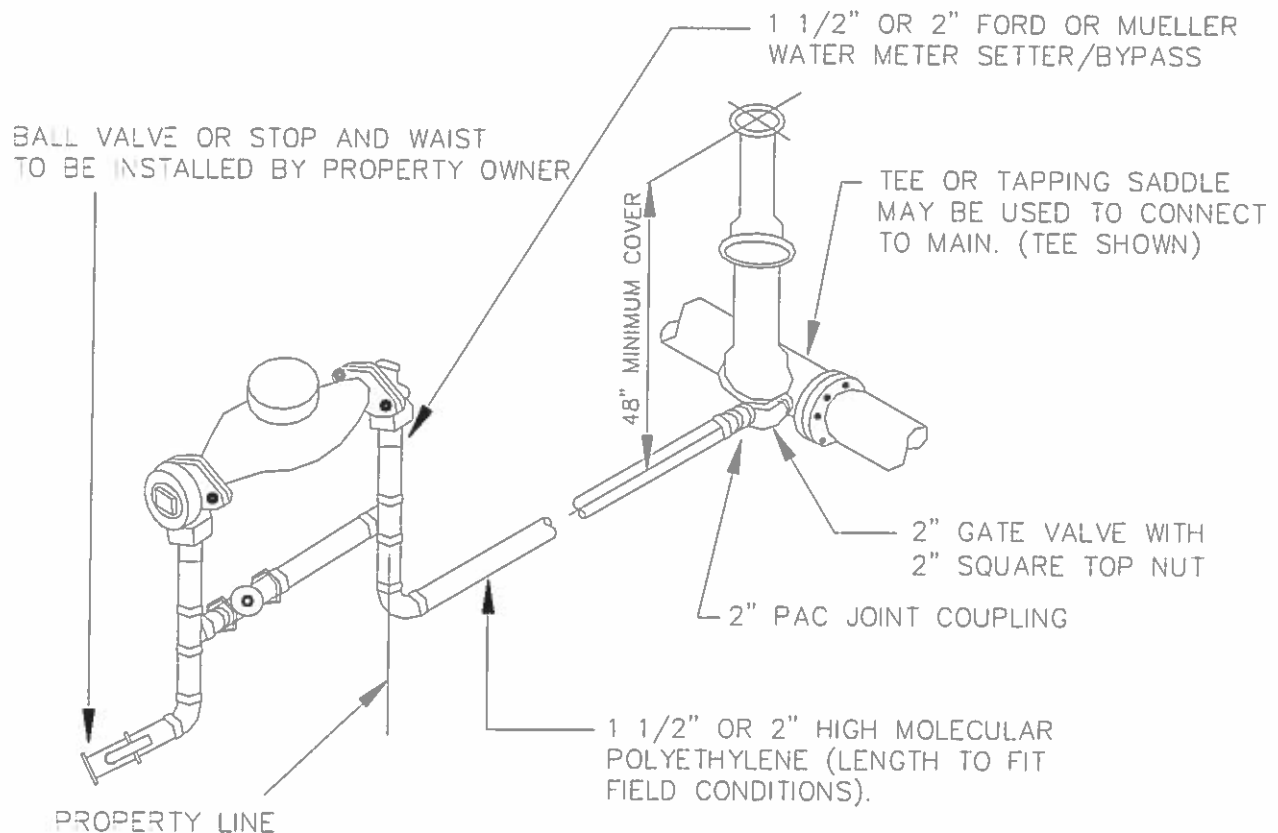


- A. 1" SADDLE, ROMAC 101S OR 202S OR EQUAL.  
 B. 1" CORPORATION STOP, MUELLER OR APPROVED EQUAL.  
 C. 1" HDPE COPPER TUBE SIZE WITH A WORKING PRESSURE OF 200 PSI OR EQUAL  
 D. 3/4" MUELLER METER COIL BOX.  
 E. PRIVATE ISOLATION VALVE(S) TO BE INSTALLED BY PROPERTY OWNER DOWNSTREAM OF METER BOX  
 F. SENSUS TRPO GALLON READ METER BY CITY  
 G. DOUBLE METER, 1 1/2" SUPPLY LINE AND FITTINGS

ID-019

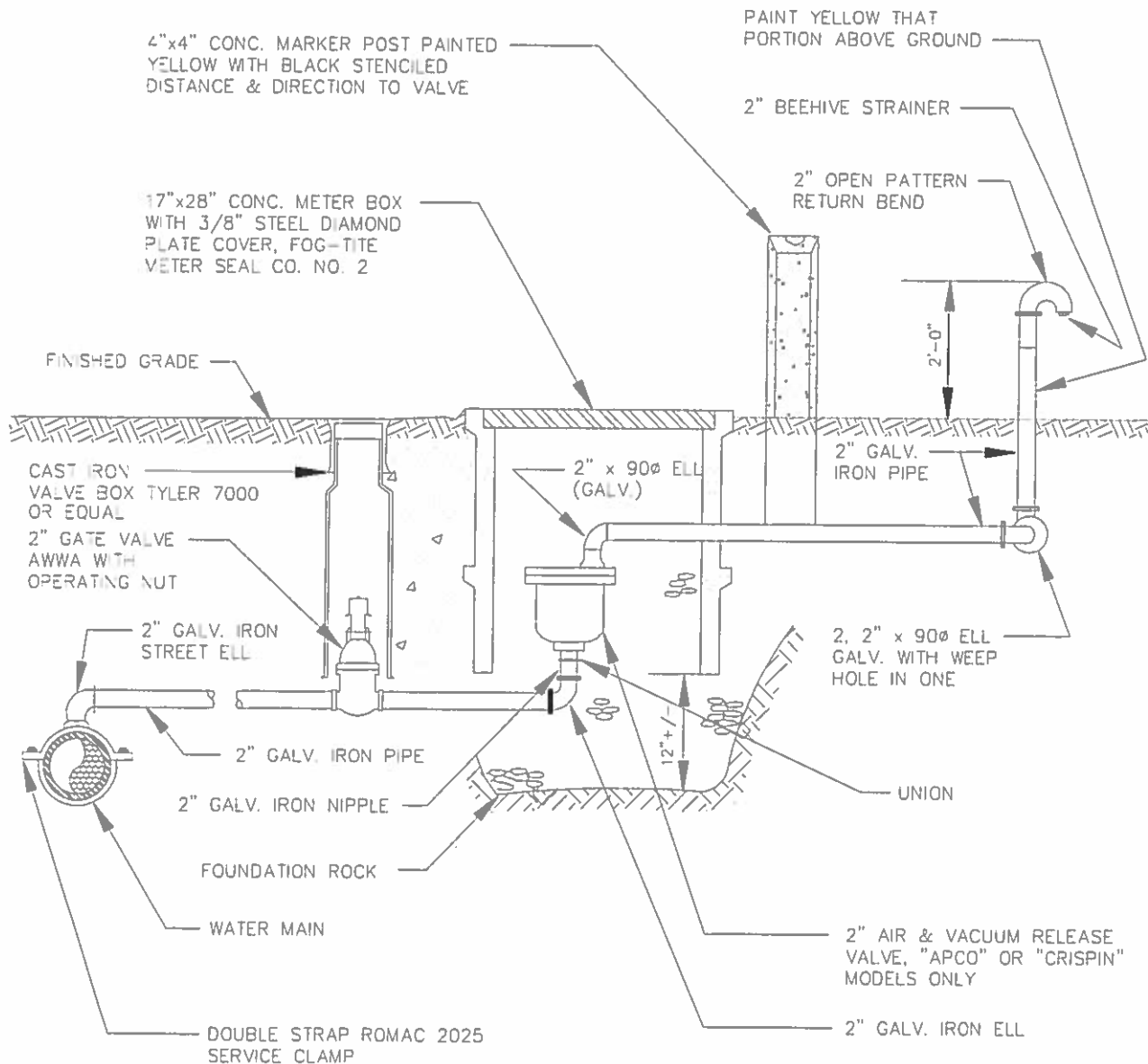
NOTES:

1. MATERIAL SUBSTITUTIONS OR DETERMINATION OF EQUAL ARE DISCRETION OF THE PUBLIC WORKS DIRECTOR.
2. SERVICE LINE TO BE 90' OF MAIN.
3. ALUMINUM BACKED LOCATE TAPE OVER SERVICE LINE FOR LOCATION AND TONING WIRE
4. DRAWING NOT TO SCALE.
5. ALL HARDWARE SUPPLIED BY DEVELOPER UNLESS NOTED OTHERWISE.

**1-1/2-2" SERVICE CONNECTION DETAIL**NOTES:

1. USE "PAC" JOINT ON COUPLINGS
2. ANY METERS DAMAGED OR CLOGGED DURING CONSTRUCTION SHALL BE REPLACED BY THE CITY AND BACKCHARGED TO THE DEVELOPER.
3. USE METER SETTER WITH 1" BYPASS LOCKING ANGLE STOP & CHECK VALVE.
4. LOCATE METER TO PROPERTY LINE, INSTALL NEW METER BOX-H2 PRE-CAST BOTTOM SECTION # WCB AND TOP SECTION # WCT. METER LIDS ARE TO BE H2 PRE-CAST 2019 IN TRAFFIC AREAS OR 2020 IN NON TRAFFIC AREAS.
5. SENUS TOUCH READ GALLON WATER METER.

ID-021

**AIR & VACUUM RELEASE ASSEMBLY**

NOTE: AIR & VACUUM VALVE ASSEMBLY MUST BE INSTALLED AT HIGHEST POINT OF LINE. IF HIGH POINT FALLS IN A LOCATION WHERE ASSEMBLY CANNOT BE INSTALLED, PROVIDE ADDITIONAL DEPTH OF LINE TO CREATE HIGH POINT AT A LOCATION WHERE ASSEMBLY CAN BE INSTALLED.

GUARDPOSTS TO BE INSTALLED AS NEEDED.

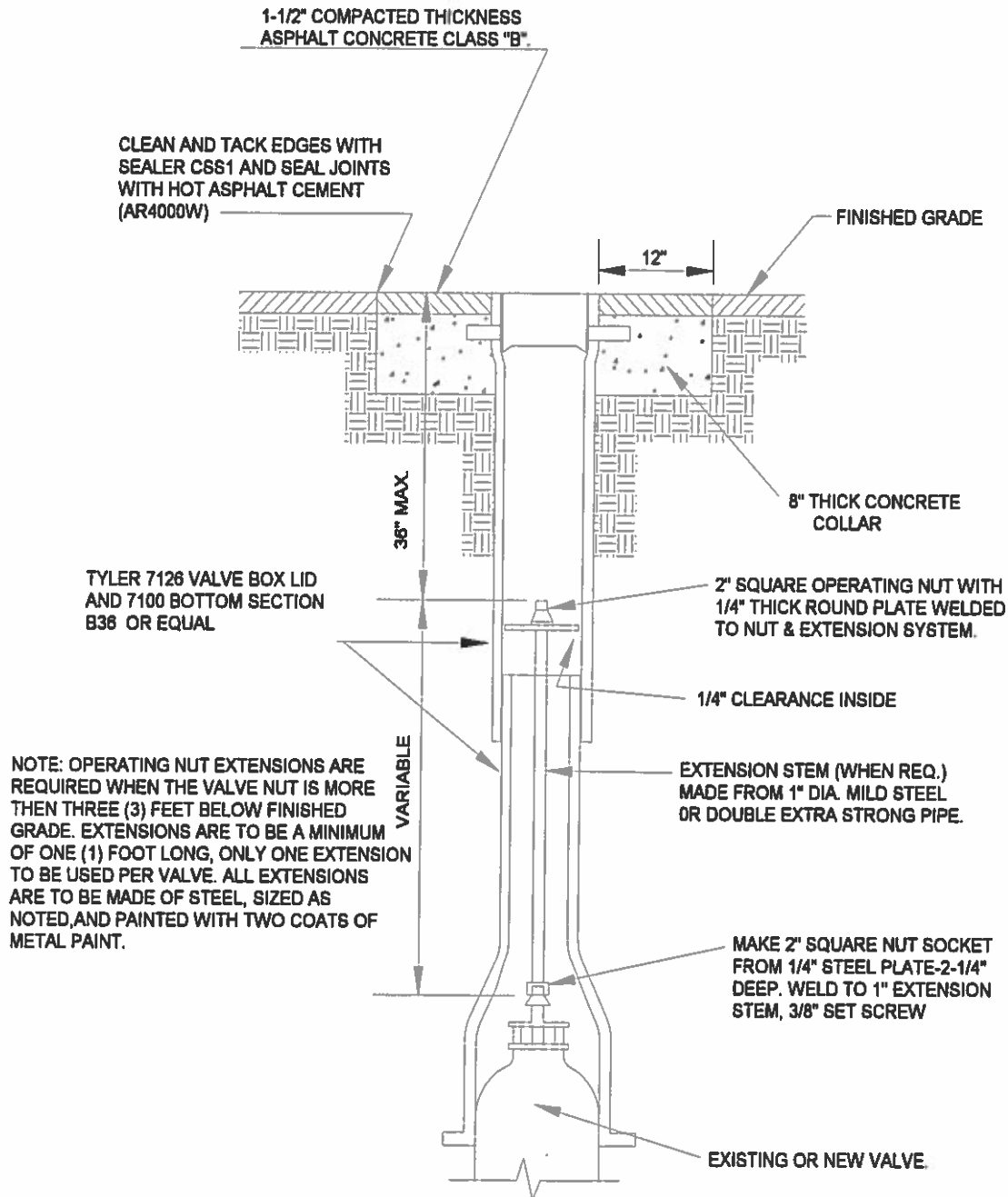
DRAWING NOT TO SCALE.

ID 001

**WATER VALVE BOX SETTING**

All existing concrete valve boxes shall be replaced with cast iron boxes and adjusted to grade.

All existing cast iron valve boxes shall be adjusted to grade with cast iron components. Alignment of the valve box shall be the developer's responsibility and care shall be taken to ensure that the valve may be operated.



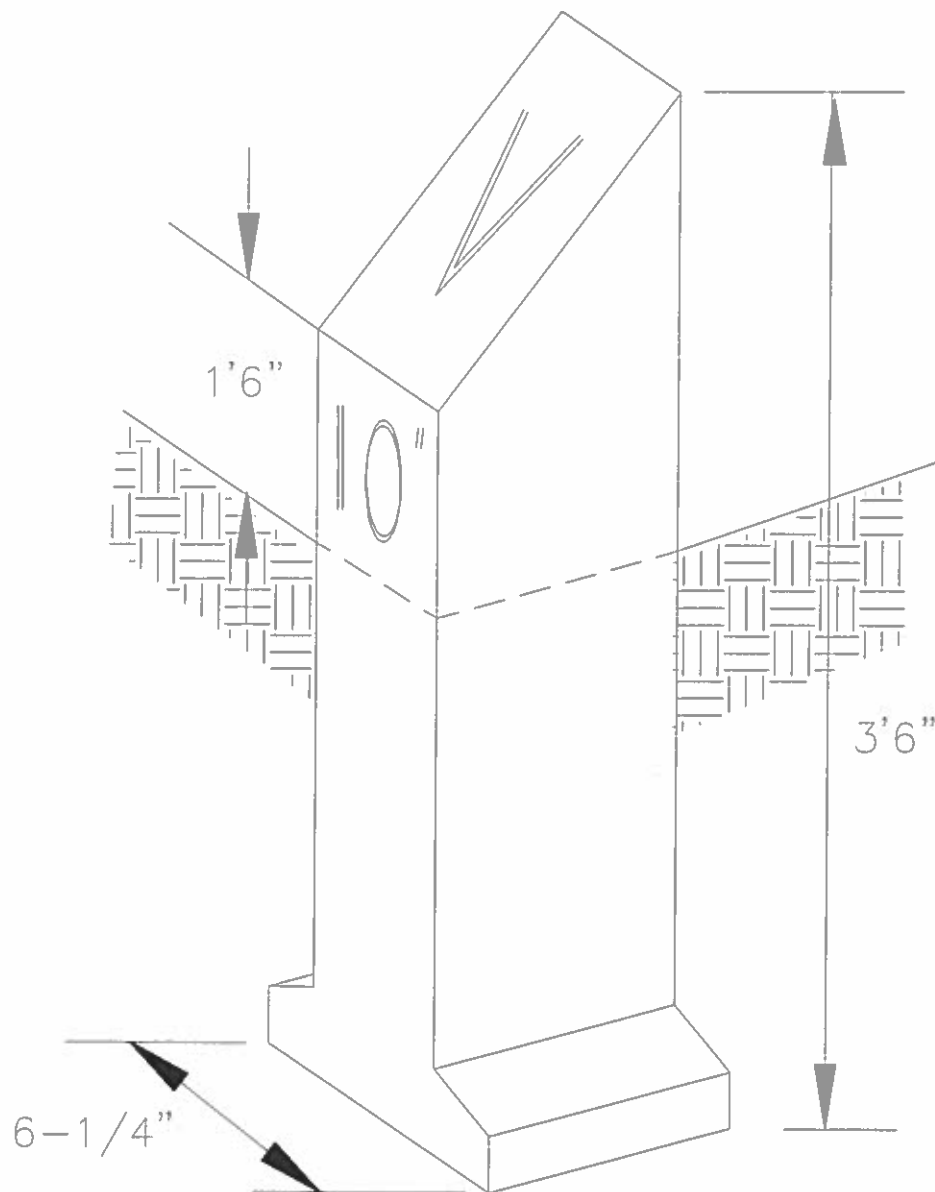
ID-048



## VALVE MARKER POST

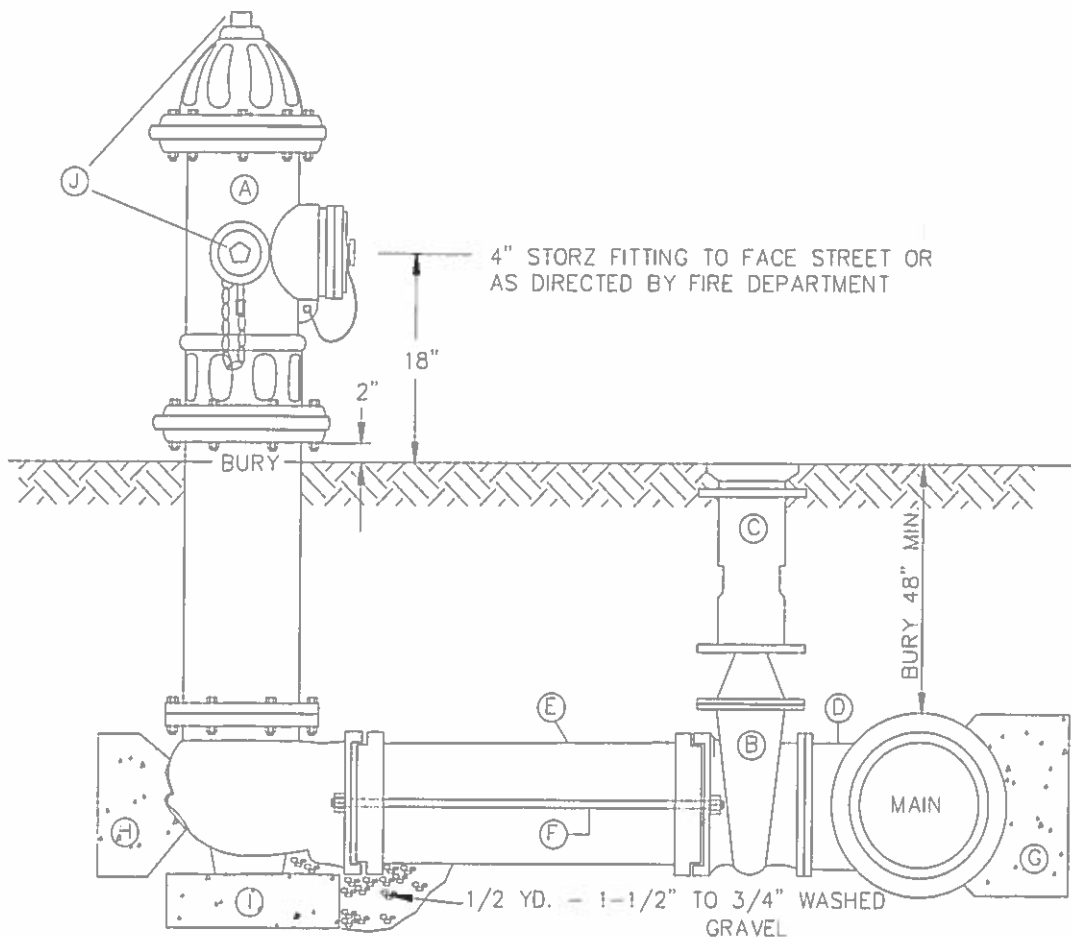
VALVE MARKER POST SHALL BE EQUAL TO FOG-TITE, WITH TWO COATS OF HIGH GLOSS YELLOW PAINT. PAINT DISTANCE FROM THE VALVE MARKER TO THE VALVE ON THE POST WITH BLACK ENAMEL PAINT.

VALVE MARKER POST TO BE USED FOR ALL MAINLINE VALVES OUTSIDE PAVED AREAS.



# VALVE MARKER POST

ID-051

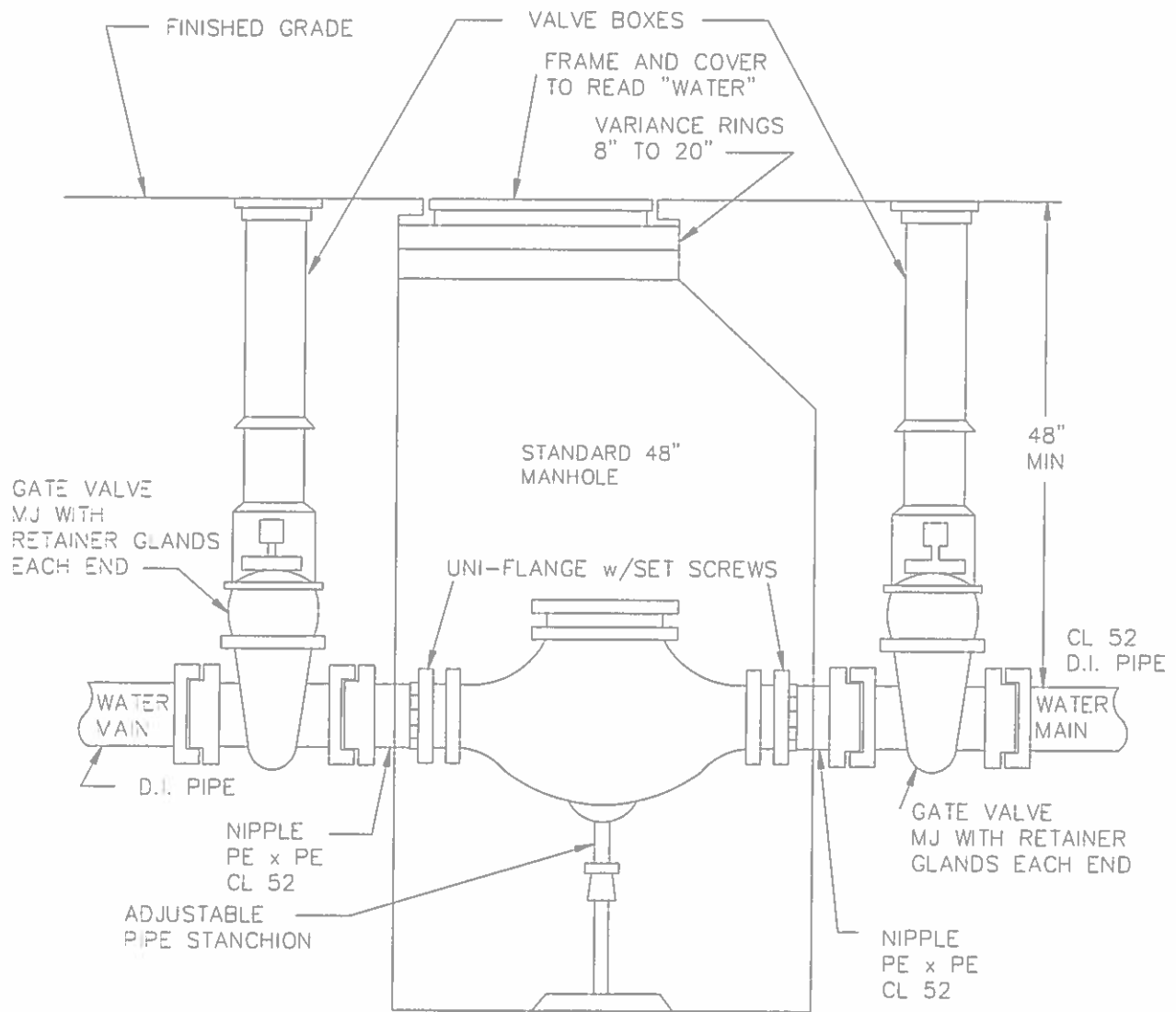
**FIRE HYDRANT ASSEMBLY**

- A. ONE 5-1/4" M.V.O. HYDRANT WITH TWO 2-1/2" N.S.T. AND ONE 4 1/2" PUMPER N.S.T. THE 4 1/2" OUTLET SHALL BE FITTED WITH A 4-INCH HIGH-STRENGTH ALUMINUM ALLOY TEFLON COATED LOCKING STORZ ADAPTER WITH RUBBER GASKET AND SET SCREW. THE STORZ ADAPTER SHALL BE PROVIDED WITH AN APPROVED ALUMINUM ALLOY PRESSURE CAP ATTACHED TO THE HYDRANT BARREL WITH AN APPROVED CABLE. THE HYDRANT SHALL BE MUELLER CENTURION OR EQUAL. PAINT HYDRANT TRAFFIC YELLOW, # 1072 FARWEST PAINT CO.
- B. 6" RESILIENT SEAT GATE VALVE, FL x MJ
- C. CAST IRON VALVE BOX, TYLER OR EQUAL
- D. ONE CAST IRON TEE - M.J. x FL.
- E. PIPE / SPOOL AS NEEDED - DUCTILE IRON
- F. TWO 3/4" GALVANIZED STEEL SHACKLES. MEGALUG INSTEAD OF SHACKLES IS ACCEPTABLE.
- G. CONCRETE THRUST BLOCK, 4 SF THRUST AREA. (SEE 2-13)
- H. CONCRETE THRUST BLOCK, 6 SF THRUST AREA. (SEE 2-13)
- I. 12"x12"x4" CONCRETE BLOCK. (SEE 2-13)
- J. 1 1/2" PANEL OP NUT AND PORT COVER NUT

ID-011

**SINGLE CHECK VALVE ASSEMBLY**

TO BE USED AS BYPASS AROUND PUMP STATION OR PRV WHEN NEEDED

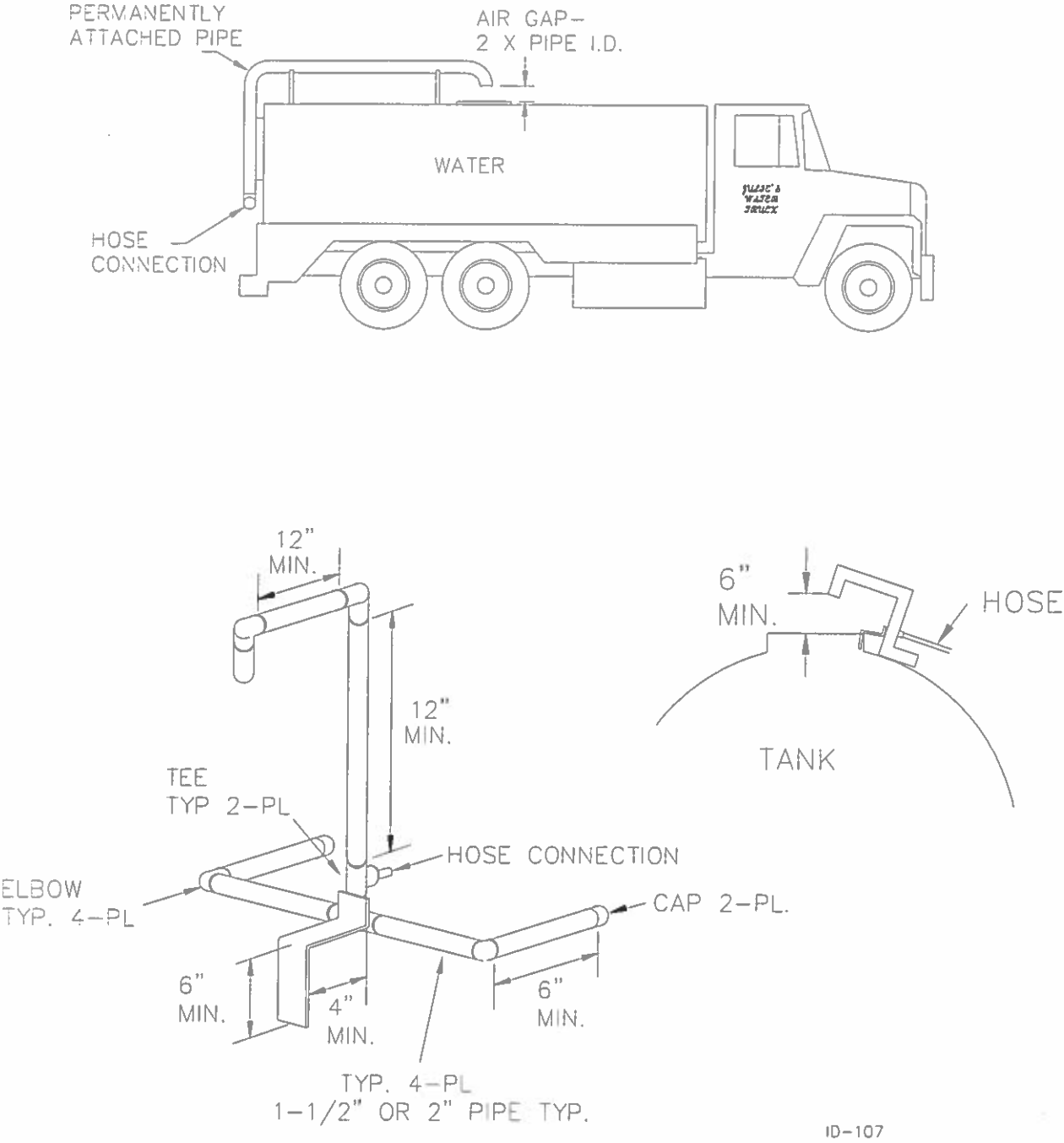


NOTE: CHECK VALVE ASSEMBLY TO BE INSTALLED  
AS INDICATED ON INDIVIDUAL DESIGN

ID-004

SPRAY TANK FILLER PIPE

WATER TRUCK WITH AIR GAP

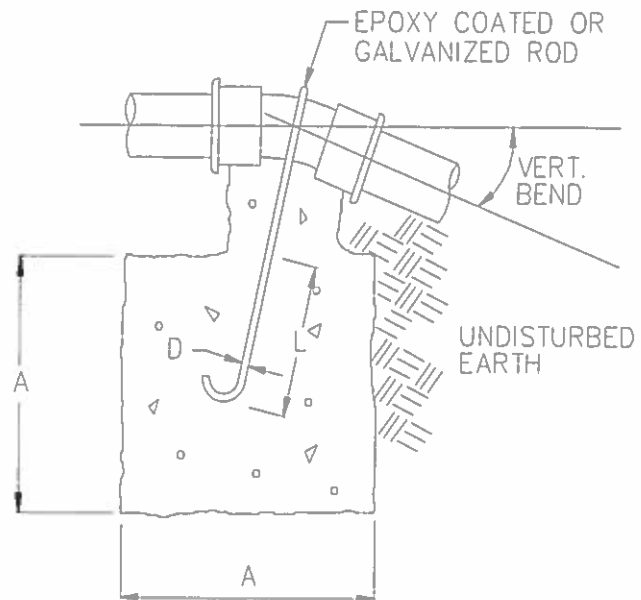
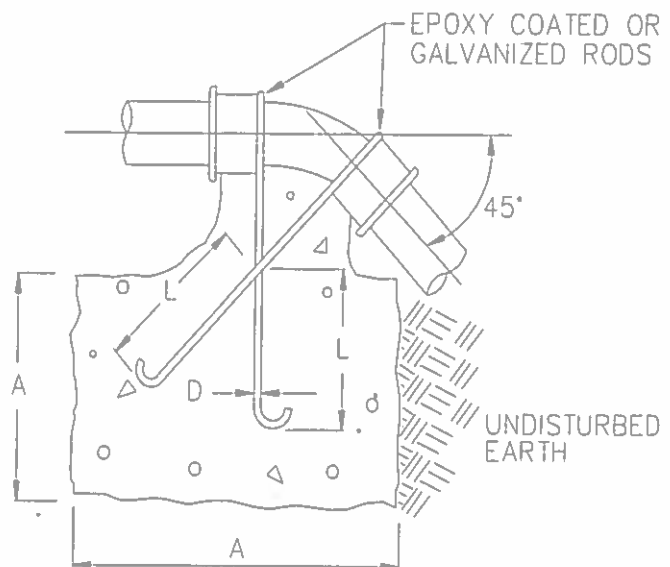


ID-107

**CONCRETE BLOCKING - VERTICAL**

## VERTICAL BLOCKING

VERTICAL BLOCKING FOR 11 1/4° & 22 1/2° BENDS					
PIPE SIZE	V B	CU FT	A	D	L
4"	11 1/4° 22 1/2°	8 11	2.0' 2.2'	3/4"	1.5' 2.0'
6"	11 1/4° 22 1/2°	11 25	2.2' 2.9'	3/4"	2.0'
8"	11 1/4° 22 1/2°	16 47	2.5' 3.6'	3/4"	2.0'
12"	11 1/4° 22 1/2°	32 88	3.2' 4.5'	3/4" 7/8"	2.0' 3.0'
16"	11 1/4° 22 1/2°	70 184	4.1' 5.7'	7/8" 1 1/8"	3.0' 4.0'
20"	11 1/4° 22 1/2°	91 225	4.5' 6.1'	7/8" 1 1/4"	3.0' 4.0'
24"	11 1/4° 22 1/2°	128 320	5.0' 6.8'	1" 1 3/8"	3.5' 4.5'
VERTICAL BLOCKING FOR 45° BENDS					
4"	45°	30	3.1'	3/4"	2.0'
6"		68	4.1'		
8"		123	5.0'		
12"		232	6.1'	3/4"	2.5'
16"		478	7.8'	1 1/8"	4.0'
20"		560	8.2'	1 1/4"	
24"		820	9.4'	1 3/8"	4.5'

VERTICAL BLOCKING  
FOR 11 1/4°, 22 1/2°VERTICAL BLOCKING  
FOR 45° BENDS

NOTE: CONCRETE BLOCKING BASED ON 200 PSI PRESSURE AND 2500 PSI CONCRETE.  
 PROVIDE POLYETHYLENE SHEETING TO COVER BOLTS AND JOINTS FOR DISMANTLING.

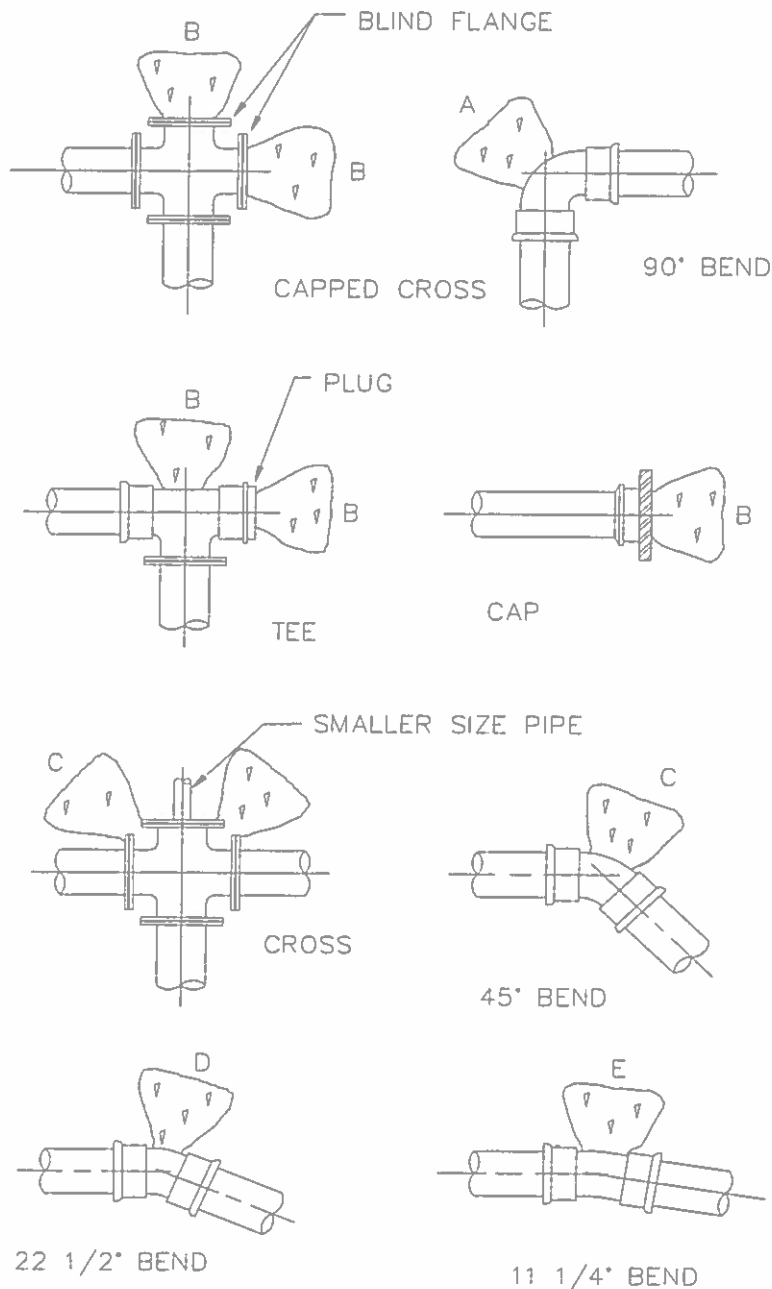
ID-020

**THRUST BLOCK TABLE**

MIN. BEARING AREA AGAINST UNDISTURBED SOIL SQUARE FEET					
PIPE SIZE	A (FT. <sup>2</sup> )	B (FT. <sup>2</sup> )	C (FT. <sup>2</sup> )	D (FT. <sup>2</sup> )	E (FT. <sup>2</sup> )
3"	3	2	2	2	2
6"	4	4	2	2	2
8"	7	6	4	2	2
10"	11	10	6	3	2
12"	16	14	9	5	3
14"	22	19	12	6	3
16"	29	25	16	8	4
18"	36	31	20	10	5
20"	45	39	24	13	6
22"	54	47	29	15	8
24"	64	56	35	18	9
28"	87	76	48	24	12
30"	101	87	55	28	14
36"	145	125	78	40	20
42"	197	171	107	55	27
48"	257	223	140	71	36
<p><b>NOTE:</b> Bearing area of conc. thrust block based on 200 psi pressure and safe soil bearing load of 2,000 pounds per square foot.</p> <p>Areas must be adjusted for other pipe sizes, pressures and soil conditions.</p> <p>Concrete blocking shall be cast in place and have a minimum of 1/4 square foot bearing against the fitting.</p> <p>Block shall bear against fittings only and shall be clear of joints to permit taking up or dismantling of joint.</p> <p>Contractor shall install blocking adequate to withstand full test pressure as well as to continuously withstand operation pressure under all conditions of service.</p>					

**CONCRETE BLOCKING - HORIZONTAL**

- NOTE:
- See thrust block table on page 2-12 for bearing areas.
  - Provide Polyethylene sheeting to cover bolts and joints for dismantling.



NOTES: PROVIDE POLYETHYLENE SHEETING TO COVER BOLTS AND JOINTS FOR DISMANTLING.

ID-023

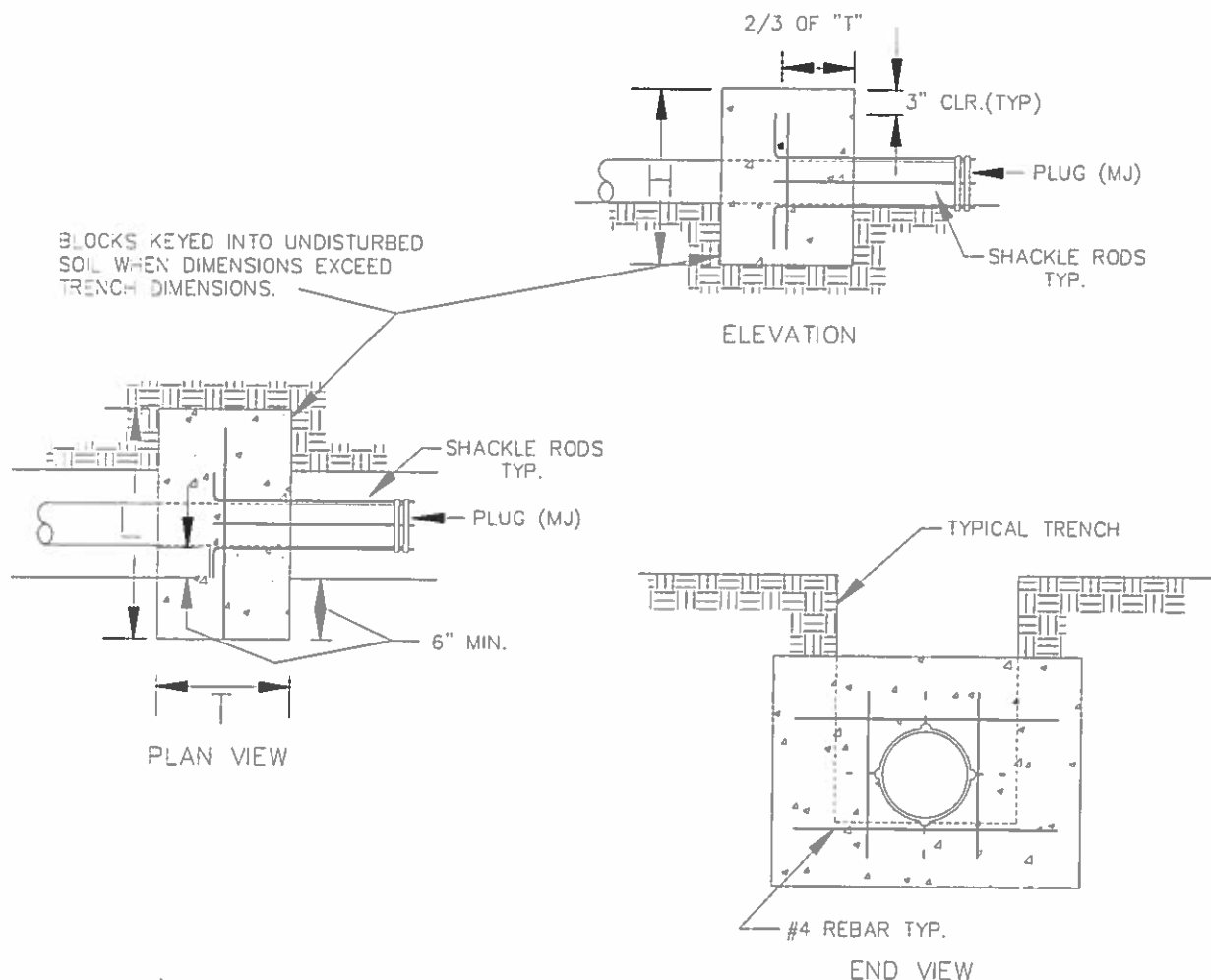
**DEADMAN THRUST BLOCKING**

SIZING TABLE				MIN. BLOCK LENGTH (L)						
PIPE DIA	T (min)	H (min)	SHACKLE RODS	SOIL CONDITION						
				PIPE DIA	SOFT CLAY	SILT	SAND Y SILT	SAND	SAND Y CLAY	HARD CLAY
6"	18"	30"	(4)#5 (½"dia)	6"	30"	30"	30"	30"	30"	30"
8"	18"	36"		8"	42"	38"	36"	34"	32"	32"
10"	18"	46"		10"	54"	48"	40"	38"	37"	36"
12"	24"	48"		12"	72"	64"	50"	47"	44"	42"
14"	36"	50"		14"	96"	80"	62"	56"	50"	47"
16"	42"	52"		16"	120"	100"	72"	65"	58"	53"

**BLOCK SIZES GOOD TO 300 psi TEST PRESSURE**

**NOTES:**

- This standard detail is for deadman blocking only.
- Concrete block shall be per APWA specification 7-11.3(13) 1988.
- Maintain 18" minimum cover over the top of block.
- Bottom of block is to be on undisturbed soil.
- Trench to be backfilled with crushed rock compacted to 95% density on all sides of block and a distance of 4' min. in front of block to full depth of block.
- Upon extension of water main, shackle rods are to be cut, remove plug. Concrete block to remain in place.
- For soil conditions not shown, block is to be designed by engineer.

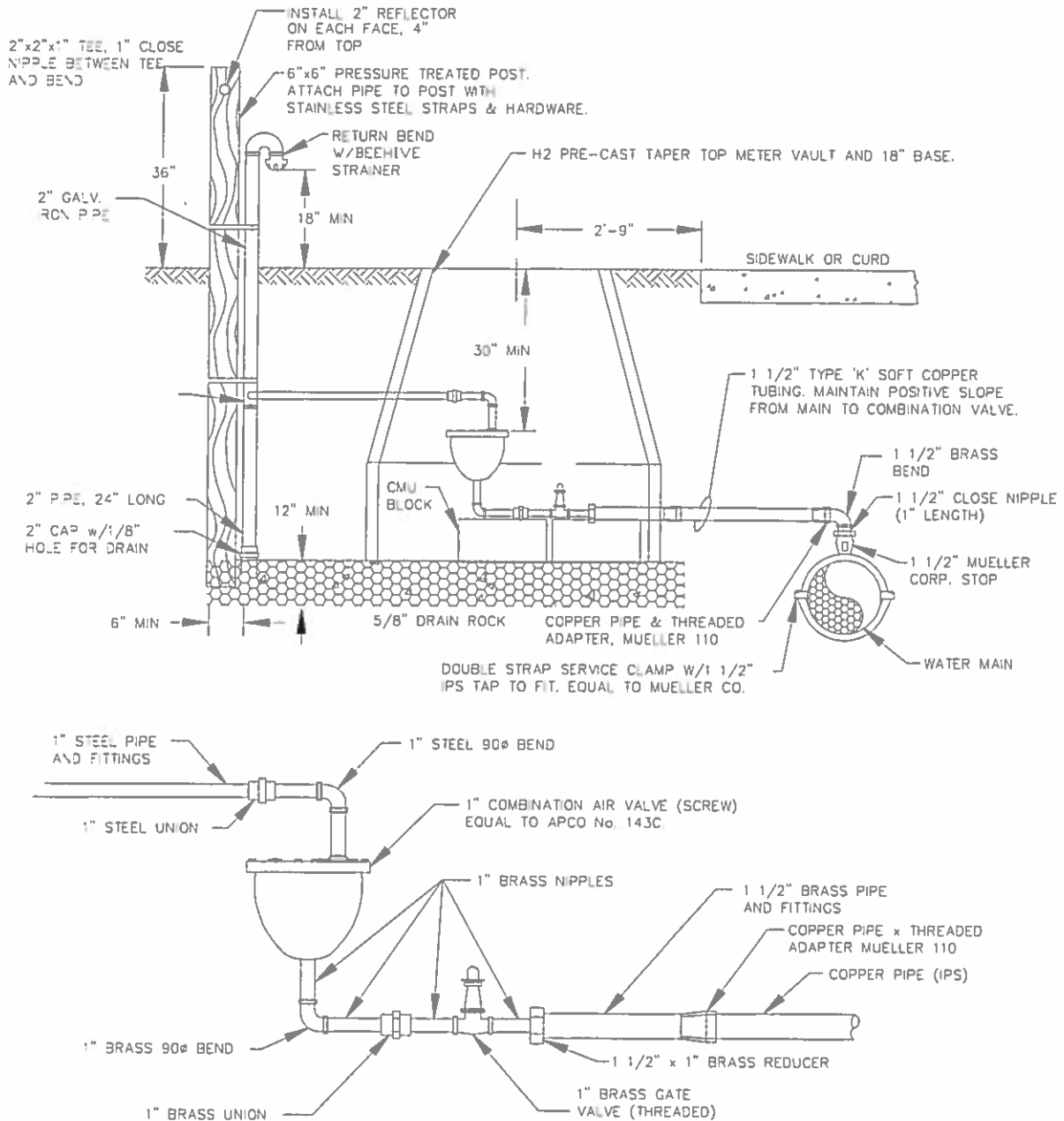


ID-050

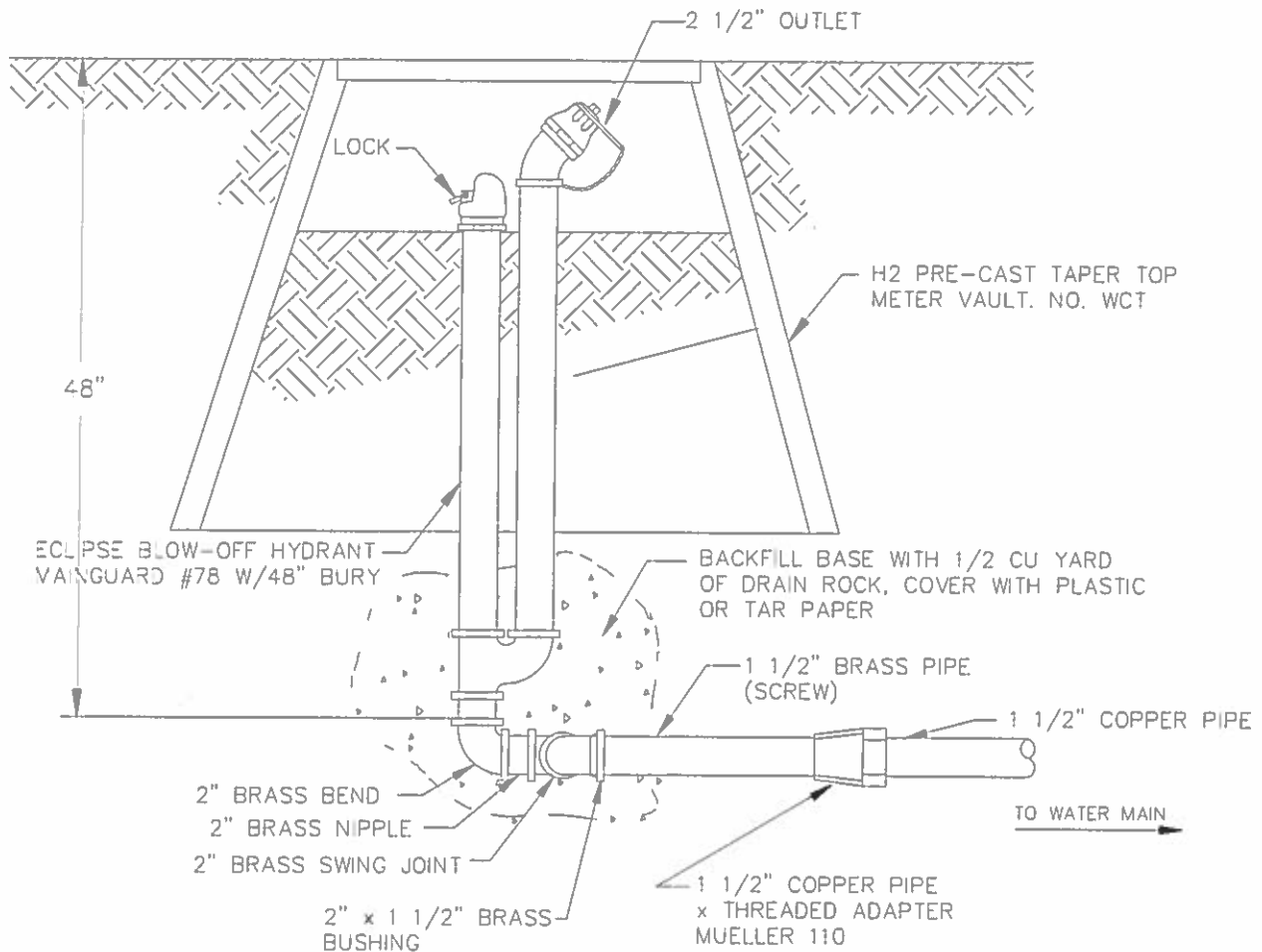


**1" COMBINATION AIR VALVE**

**NOTE:** Air valve assembly shall be installed at highest point of line.



10-002

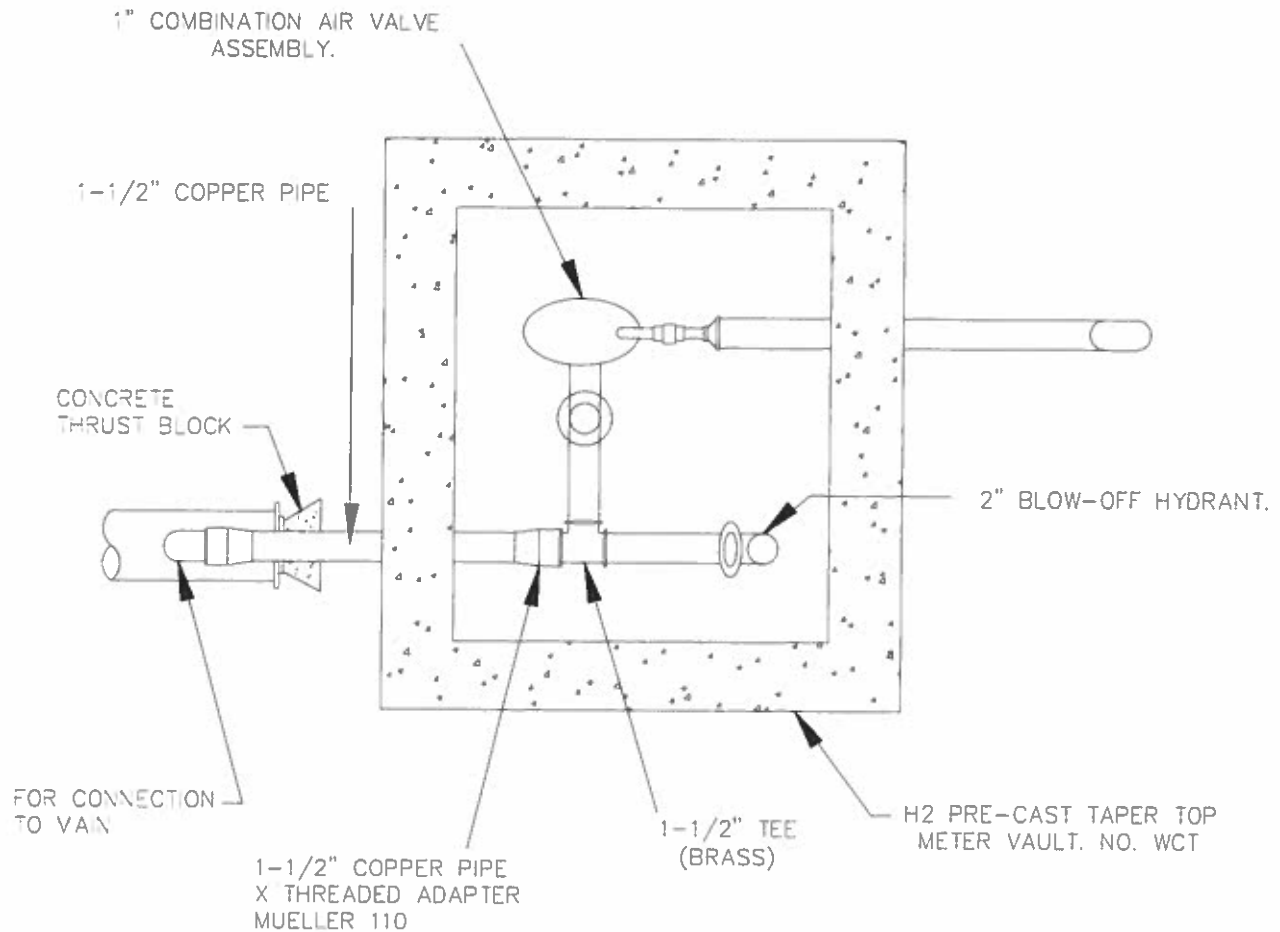
**BLOW-OFF HYDRANT FOR DEAD END MAINS****NOTES**

1. INSTALL STANDARD MARKER POST IDENTIFYING VALVE LOCATION
2. SET METER BOX FLUSH WITH SIDEWALK OR CURB LOCATED IN LAWN AREA.  
SET METER BOX APPROX. 2" ABOVE FINISHED GRADE IF IN LANDSCAPING AREA.
3. ALL FITTINGS TO BE BRASS UNLESS OTHERWISE NOTED.

ID-003

**COMBINATION AIR VALVE & BLOW-OFF ASSEMBLIES**

- NOTE: • Install standard marker post identifying valve location.  
 • Set meter box flush with sidewalk or curb in located in lawn area. Set meter box approx. 2" above finished grade is in landscaping area.  
 • All fittings to be brass unless otherwise noted.



ID-046

**RESTRAINED PIPE JOINT REQUIREMENTS**

RESTRAINED JOINTS TO ADHERE TO THE FOLLOWING REQUIREMENTS OR AS RECOMMENDED BY THE MANUFACTURER IF MORE STRINGENT.

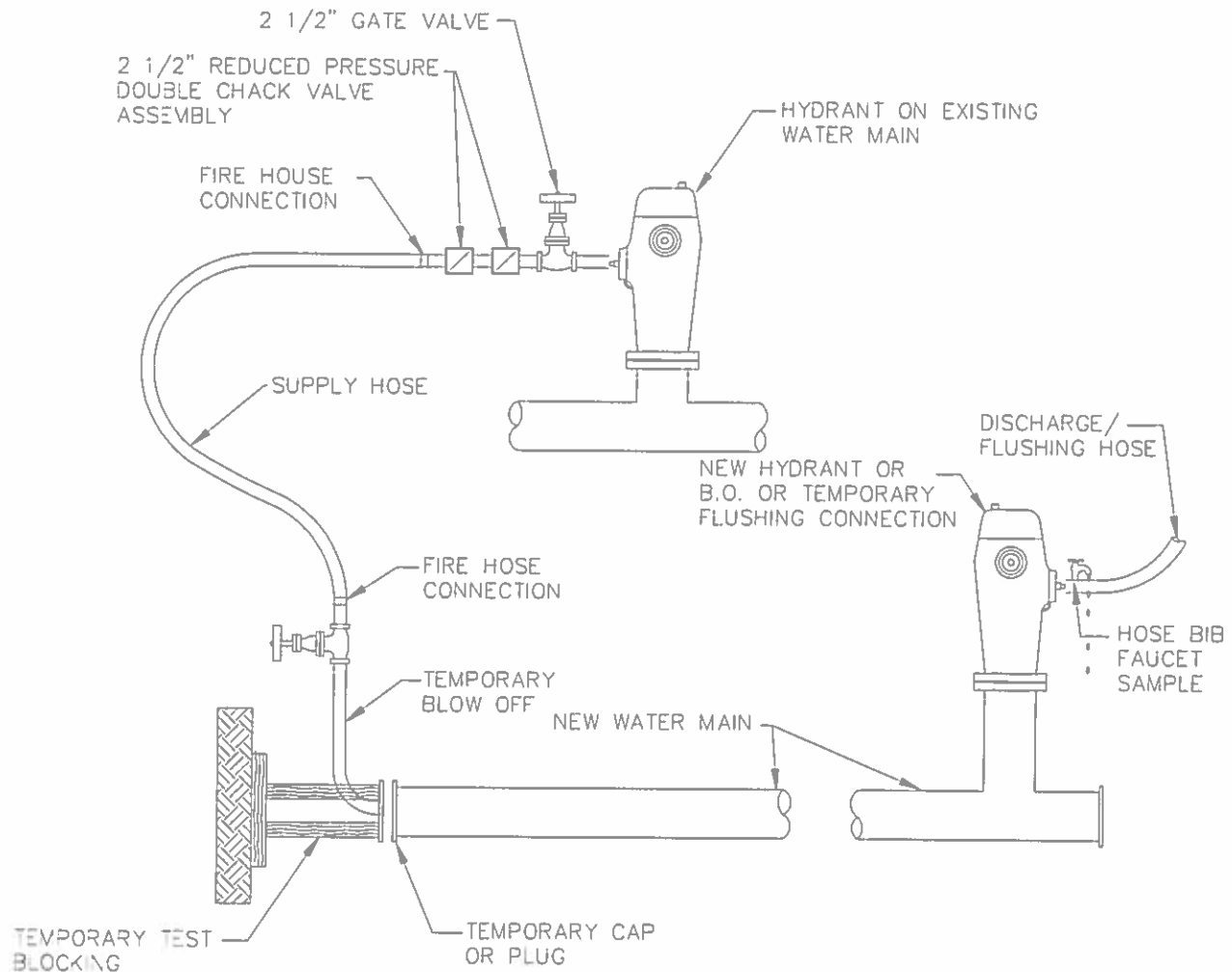
RESTRAINED JOINTS ARE REQUIRED: ON ADJACENT RUNS OF PIPE AT ALL BENDS AND PLUGS.  
ON RUNS CONNECTED TO TEES AND CROSSES ONLY OPPOSITE THRUST BLOCKS.  
ON ALL PIPE PLACED IN CASING PIPES.

**MATERIALS:** DUCTILE IRON PIPE WILL BE USED WITH ALL RESTRAINED JOINTS. ALL METHODS OF RESTRAINED JOINTS SHALL BE APPROVED BY THE CITY.

LENGTH OF RESTRAINED JOINT PIPE FROM EACH SIDE OF FITTING

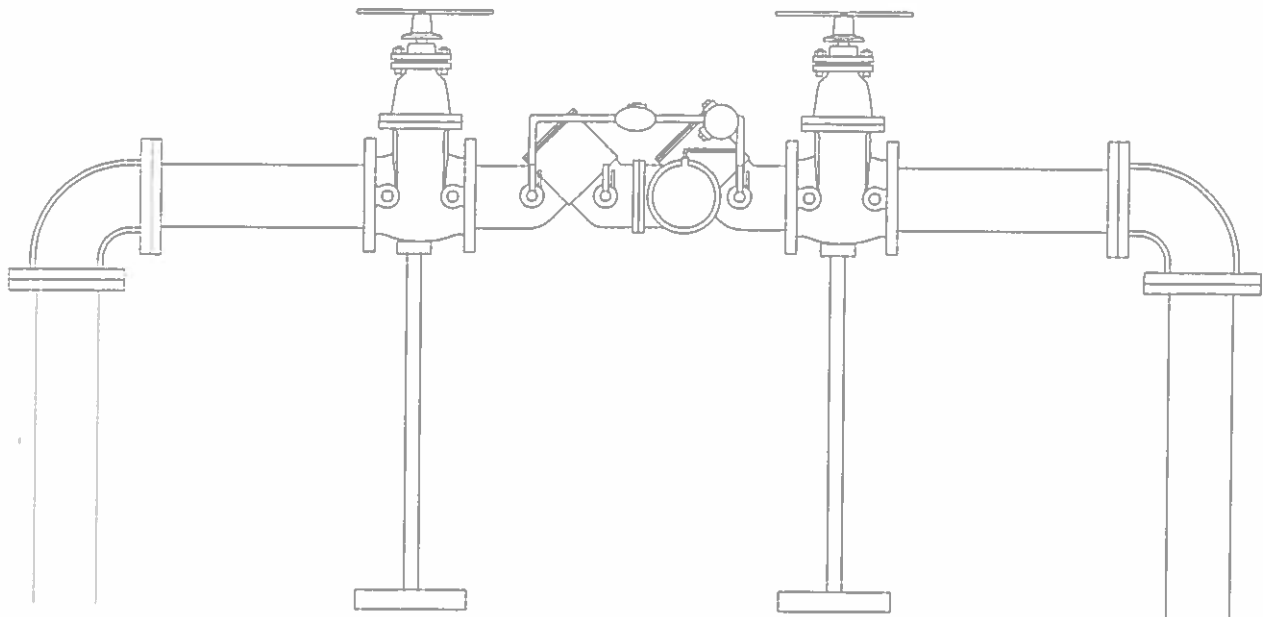
PIPE DIA	CROSS. PLUG. TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND
6"	38' (49')	22' (28')	18' (18')	18' (18')	18' (18')
8" & 10"	53' (69')	34' (44')	20' (26')	18' (18')	18' (18')

VALUES IN PARENTHESES WILL BE USED FOR PIPE WITH POLYETHYLENE WRAPPING, WHERE BENDS REQUIRE TWO FITTINGS AS SHOWN ON CONTRACT DRAWINGS, LENGTH OF PIPE WITH RESTRAINED JOINTS SHALL BE AS SPECIFIED FOR THE NEXT ANGLE GREATER THAN THE SUM OF THE ANGLES FORMED BY THE FITTINGS BUT NOT GREATER THAN FOR A 90° BEND.

**FILLING OF NEW WATER MAINS****NOTES:**

1. DO NOT DISPOSE OF CHLORINATED WATER INTO STREAMS, LAKES, OR WETLANDS.
2. INSPECTION OF TEMPORARY CONNECTION REQUIRED BEFORE FILLING WATERMAIN
3. CONTRACTOR TO PROVIDE VALVES FOR TESTING PURPOSES WHERE NEEDED.

ID-010

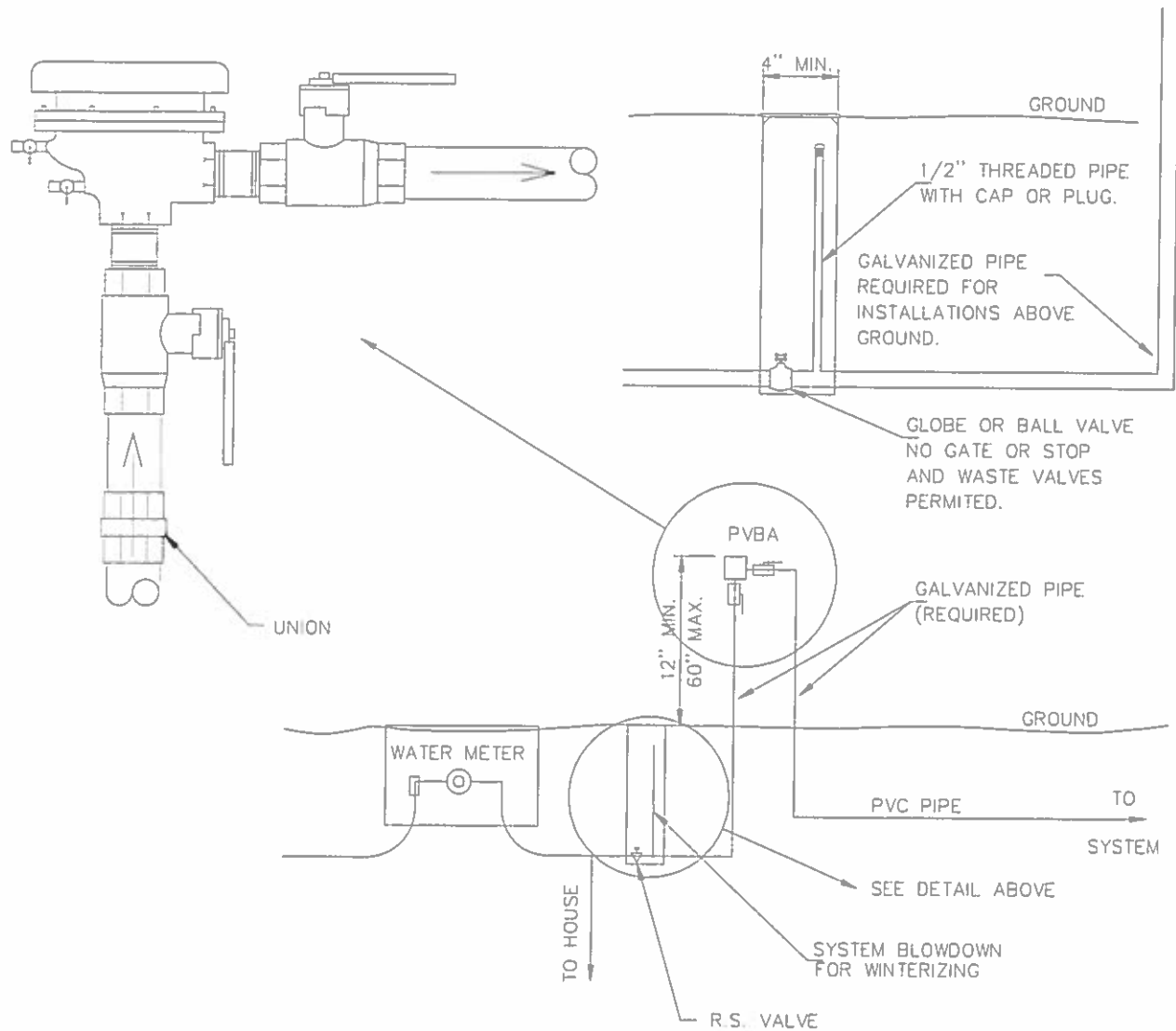
**DETECTOR CHECK VALVE INSTALLATION**

## NOTES:

- 1) MUST BE ON THE LATEST DEPT. OF HEALTH APPROVED LIST OF BACKFLOW PREVENTION ASSEMBLIES.
- 2) A CITY OF CHELAN CROSS CONNECTION SPECIALIST MUST BE PRESENT DURING INSTALLATION.
- 3) A MIN. 3" DIA. FLOOR DRAIN IS REQUIRED.

TD-106

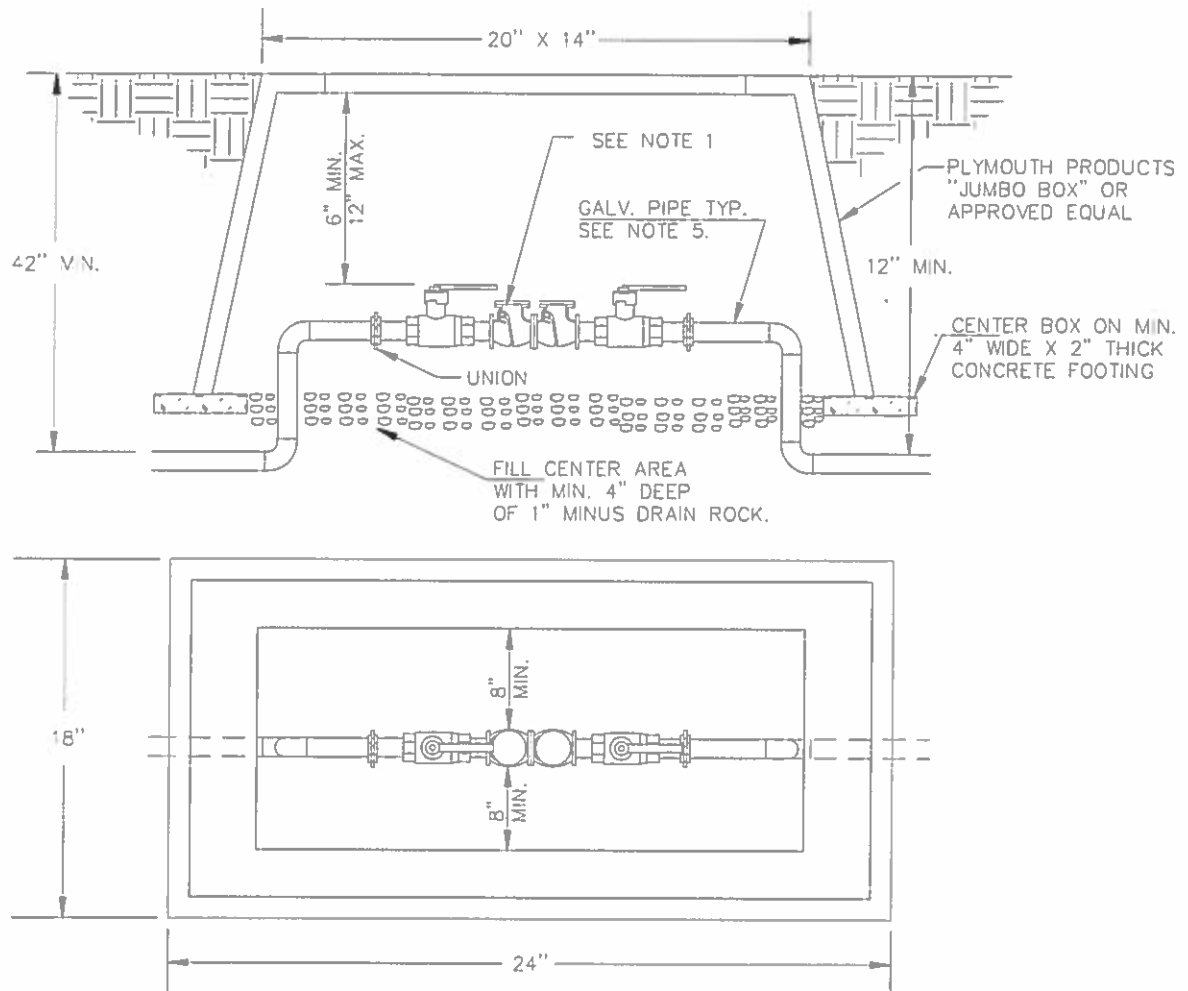
## PVBA INSTALLATION



## NOTES:

- 1) PVBA MAY BE INSTALLED ON LOW HAZARD POTABLE WATER SUPPLY SYSTEMS ONLY.
- 2) A CITY OF CHELAN CROSS CONNECTION SPECIALIST MUST BE PRESENT DURING INSTALLATION.
- 3) PVBA MUST BE INSTALLED NOT LESS THAN 12" ABOVE THE HIGHEST POINT OF USE AND NOT MORE THAN 60" HIGH.

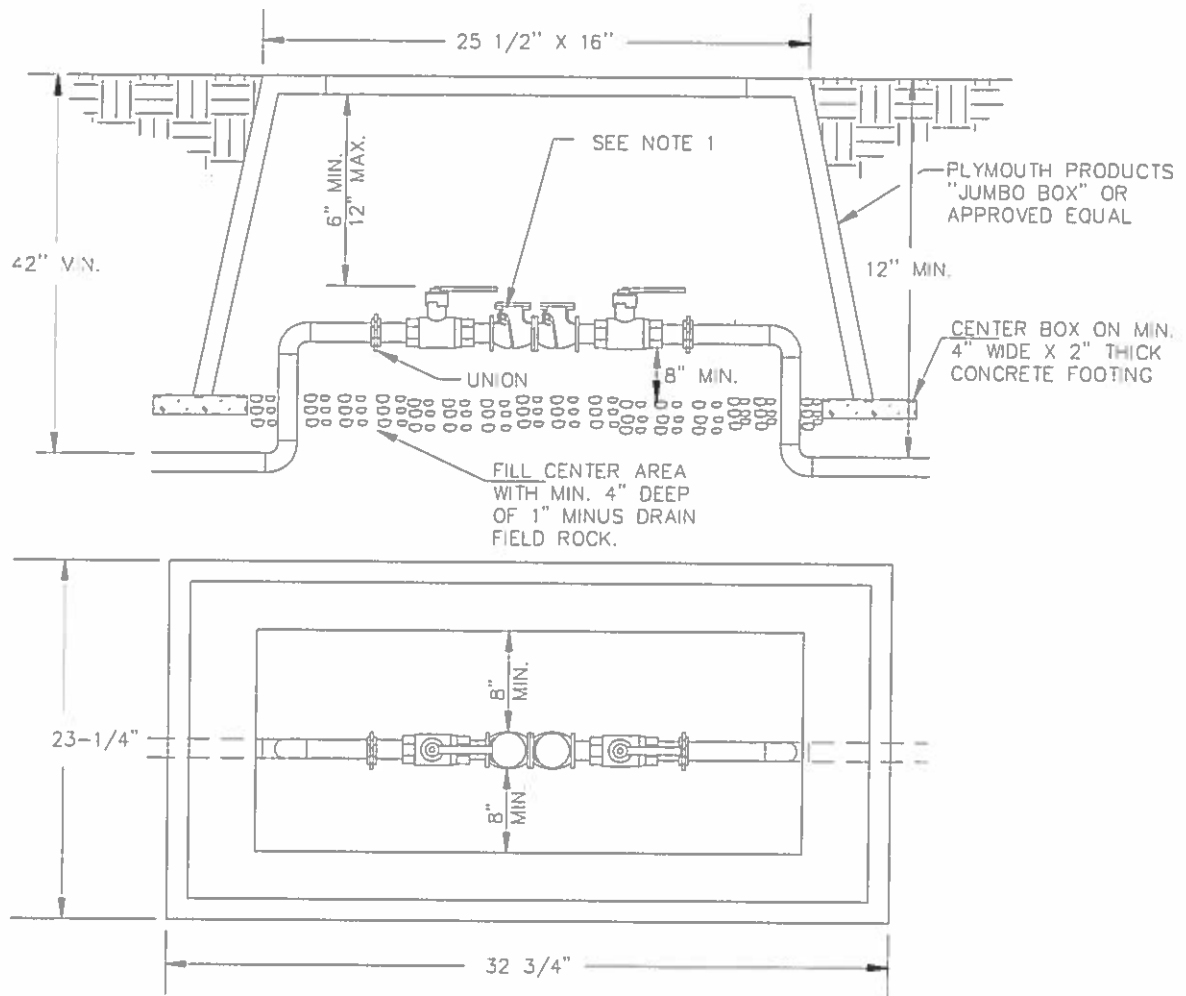
ID-077

**DOUBLE CHECK VALVE ASSEMBLY INSTALLATION 3/4" TO 1"****NOTES:**

- 1) MUST BE ON THE LATEST DEPT. OF HEALTH APPROVED LIST OF BACKFLOW PREVENTION ASSEMBLIES.
- 2) MAY BE INSTALLED BELOW GROUND IN AN APPROVED VAULT.
- 3) A CITY OF CHELAN CROSS CONNECTION SPECIALIST MUST BE PRESENT DURING INSTALLATION.
- 4) FREEZE PROTECTION IS THE RESPONSIBILITY OF THE OWNER.
- 5) RISERS AND ALL PIPE IN BOX TO BE GALVANIZED.
- 6) A LADDER IS REQUIRED IF ACCESS OPENING TO FLOOR EXCEEDS 36"

ID-079

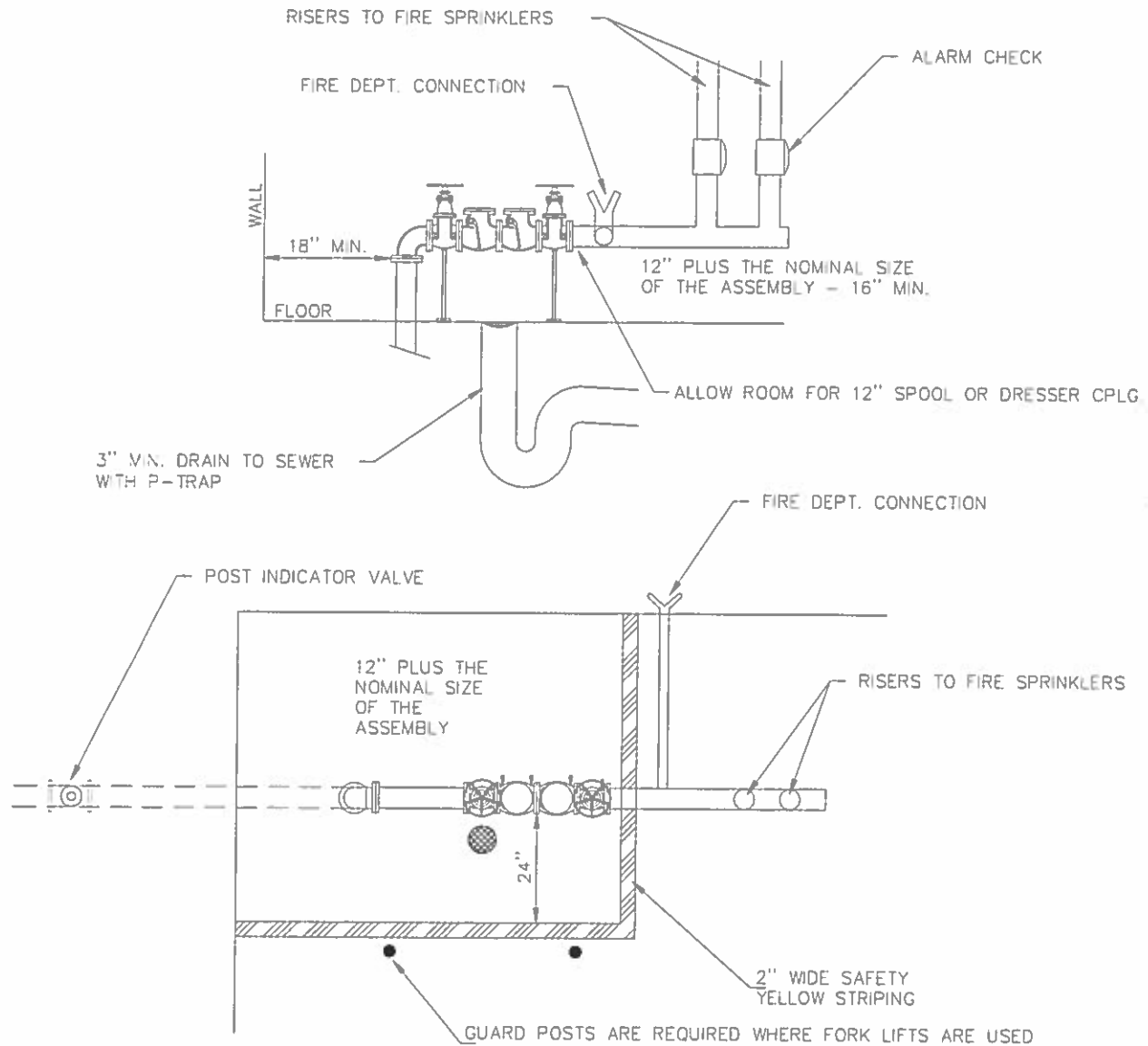


**DOUBLE CHECK VALVE ASSEMBLY INSTALLATION 1-1/4" TO 2-1/2"**

## NOTES:

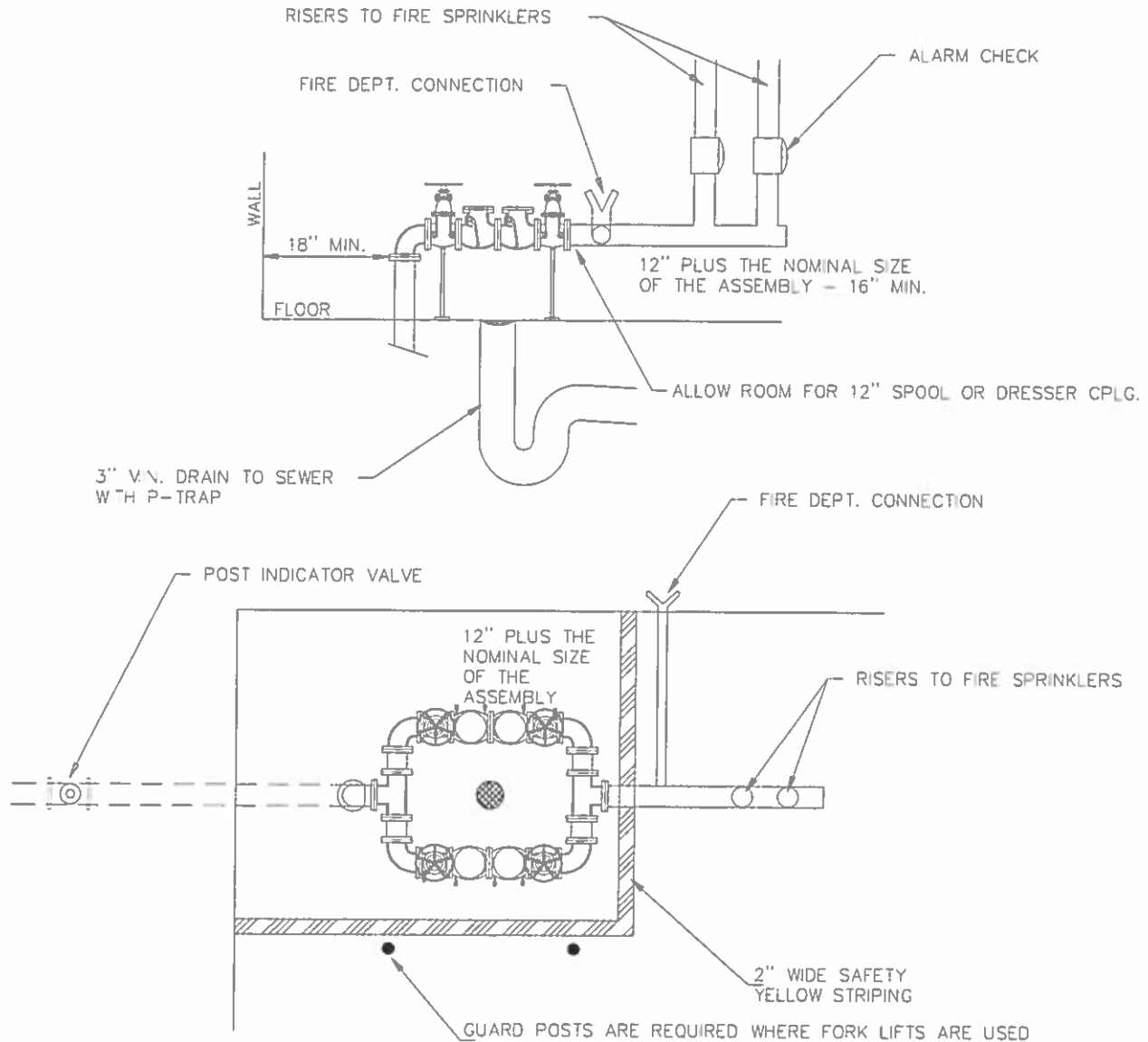
- 1) MUST BE ON THE LATEST DEPT. OF HEALTH APPROVED LIST OF BACKFLOW PREVENTION ASSEMBLIES.
- 2) MAY BE INSTALLED BELOW GROUND IN AN APPROVED VAULT.
- 3) A CITY OF CHELAN CROSS CONNECTION SPECIALIST MUST BE PRESENT DURING INSTALLATION.
- 4) FREEZE PROTECTION IS THE RESPONSIBILITY OF THE OWNER.
- 5) RISERS AND ALL PIPE IN BOX TO BE GALVANIZED.
- 6) A LADDER IS REQUIRED IF ACCESS OPENING TO FLOOR EXCEEDS 36"

10-080

**DOUBLE CHECK VALVE ASSEMBLY INSTALLATION 3" & LARGER IN BUILDING****NOTES:**

- 1) MUST BE ON THE LATEST DEPT. OF HEALTH APPROVED LIST OF BACKFLOW PREVENTION ASSEMBLIES.
- 2) A CITY OF CHELAN CROSS CONNECTION SPECIALIST MUST BE PRESENT DURING INSTALLATION.
- 3) A MIN. 3" DIA. FLOOR DRAIN IS REQUIRED.

ID-081

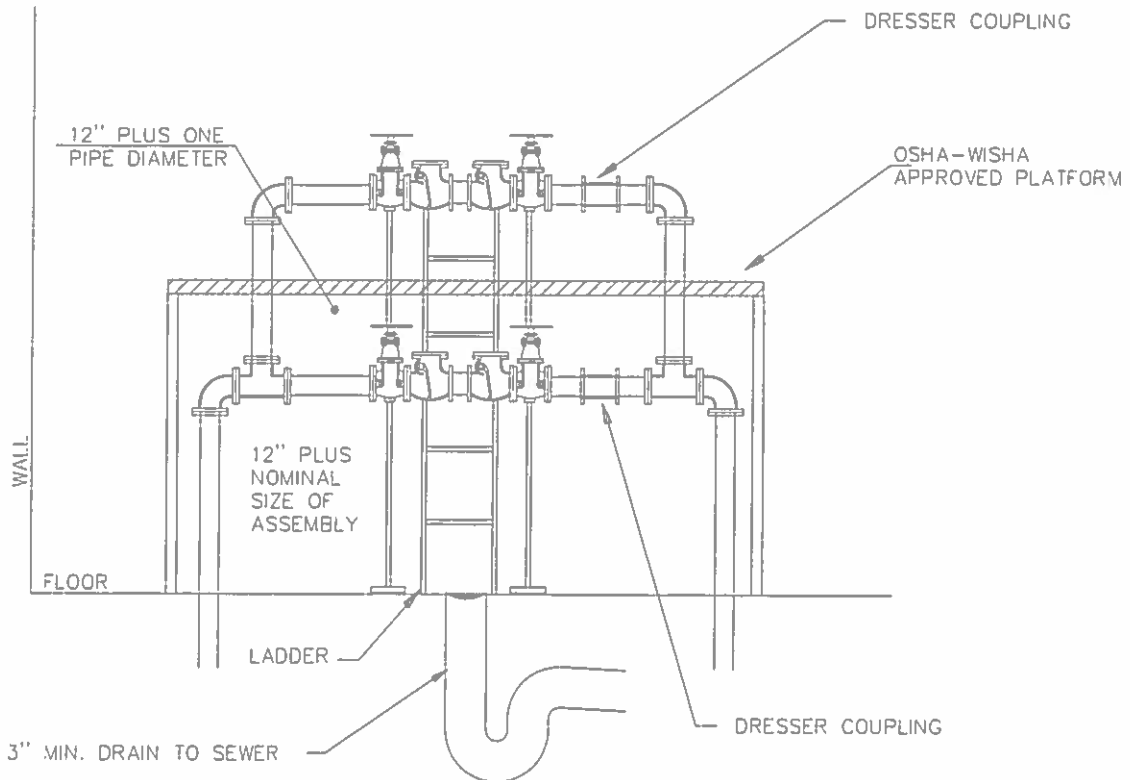
**SIDE BY SIDE DCVA DUAL INSTALLATION 3" & LARGER IN BUILDING**

## NOTES:

- 1) MUST BE ON THE LATEST DEPT. OF HEALTH APPROVED LIST OF BACKFLOW PREVENTION ASSEMBLIES.
- 2) A CITY OF CHELAN CROSS CONNECTION SPECIALIST MUST BE PRESENT DURING INSTALLATION.
- 3) A MIN. 3" DIA. FLOOR DRAIN IS REQUIRED.

ID-082

## VERTICAL APPLICATION DCVA DUAL INSTALLATION 3" &amp; LARGER IN BUILDING



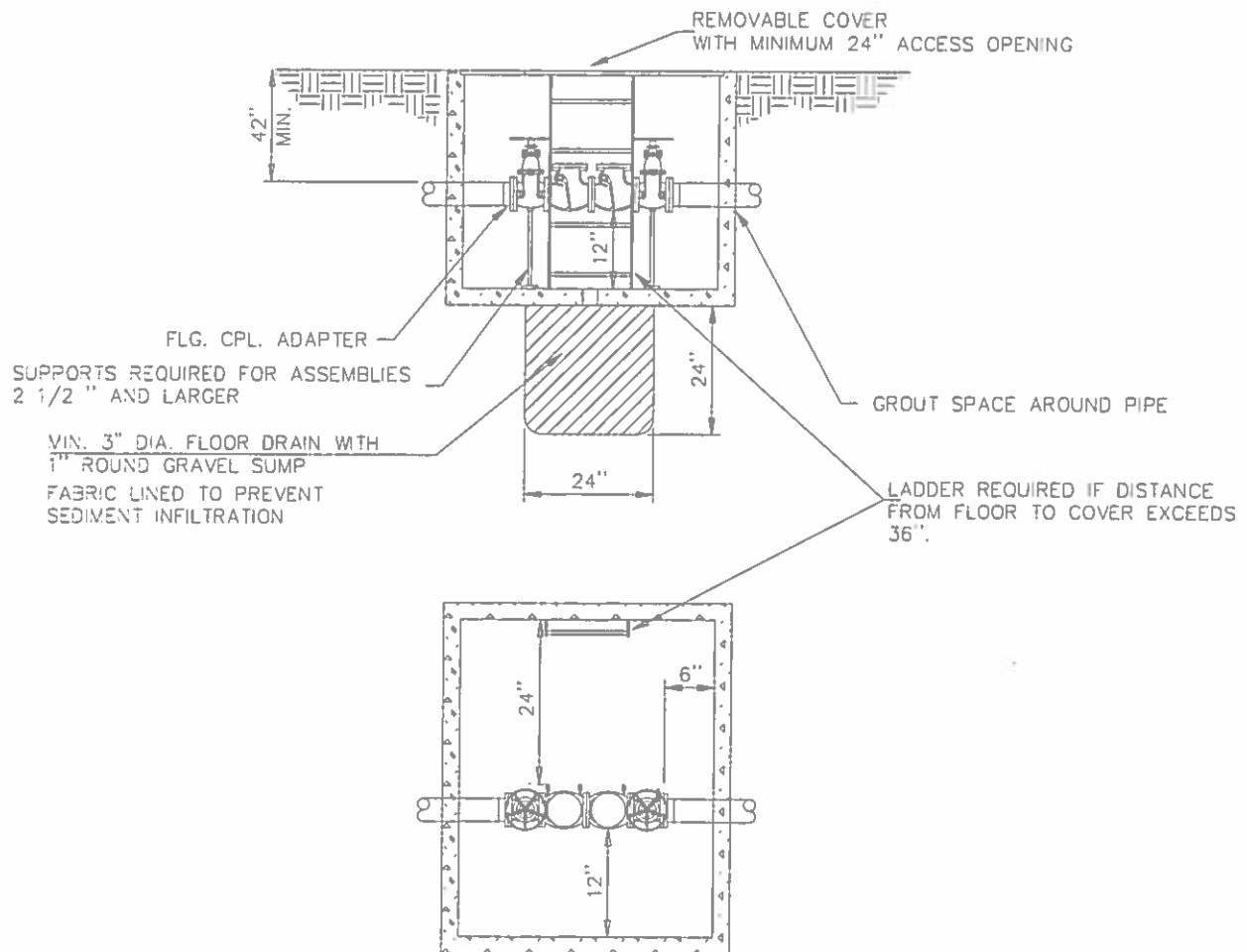
## NOTES:

- 1) MUST BE ON THE LATEST DEPT. OF HEALTH APPROVED LIST OF BACKFLOW PREVENTION ASSEMBLIES.
- 2) MAY BE INSTALLED BELOW GROUND IN AN APPROVED VAULT.
- 3) A CITY OF CHELAN CROSS CONNECTION SPECIALIST MUST BE PRESENT DURING INSTALLATION.
- 4) FREEZE PROTECTION IS THE RESPONSIBILITY OF THE OWNER.
- 5) A MIN. 3" DIA. FLOOR DRAIN IS REQUIRED.
- 6) A LADDER IS REQUIRED IF THE DISTANCE FROM THE ACCESS OPENING TO THE FLOOR EXCEEDS 36".
- 7) A SPACE EQUALING 12" PLUS ONE PIPE DIAMETER IS REQUIRED BETWEEN ASSEMBLIES.
- 8) AN OSHA-WISHA APPROVED PLATFORM MUST BE ERECTED FOR MAINTENANCE AND TESTING WHEN INSTALLED 60" ABOVE FLOOR LEVEL.
- 9) GUARD POST ARE REQUIRED IN AREAS WHERE FORK LIFTS ARE USED

ID-083

- 1) MUST BE ON THE LATEST DEPT. OF HEALTH APPROVED LIST OF BACKFLOW PREVENTION ASSEMBLIES.
- 2) VAY BE INSTALLED BELOW GROUND IN AN APPROVED VAULT.
- 3) A CITY OF CHELAN CROSS CONNECTION SPECIALIST MUST BE PRESENT DURING INSTALLATION.
- 4) FREEZE PROTECTION IS THE RESPONSIBILITY OF THE OWNER.
- 5) A V.V. 3" DIA. FLOOR DRAIN IS REQUIRED.
- 6) A LADDER IS REQUIRED IF ACCESS OPENING TO FLOOR EXCEEDS 36"

2-27

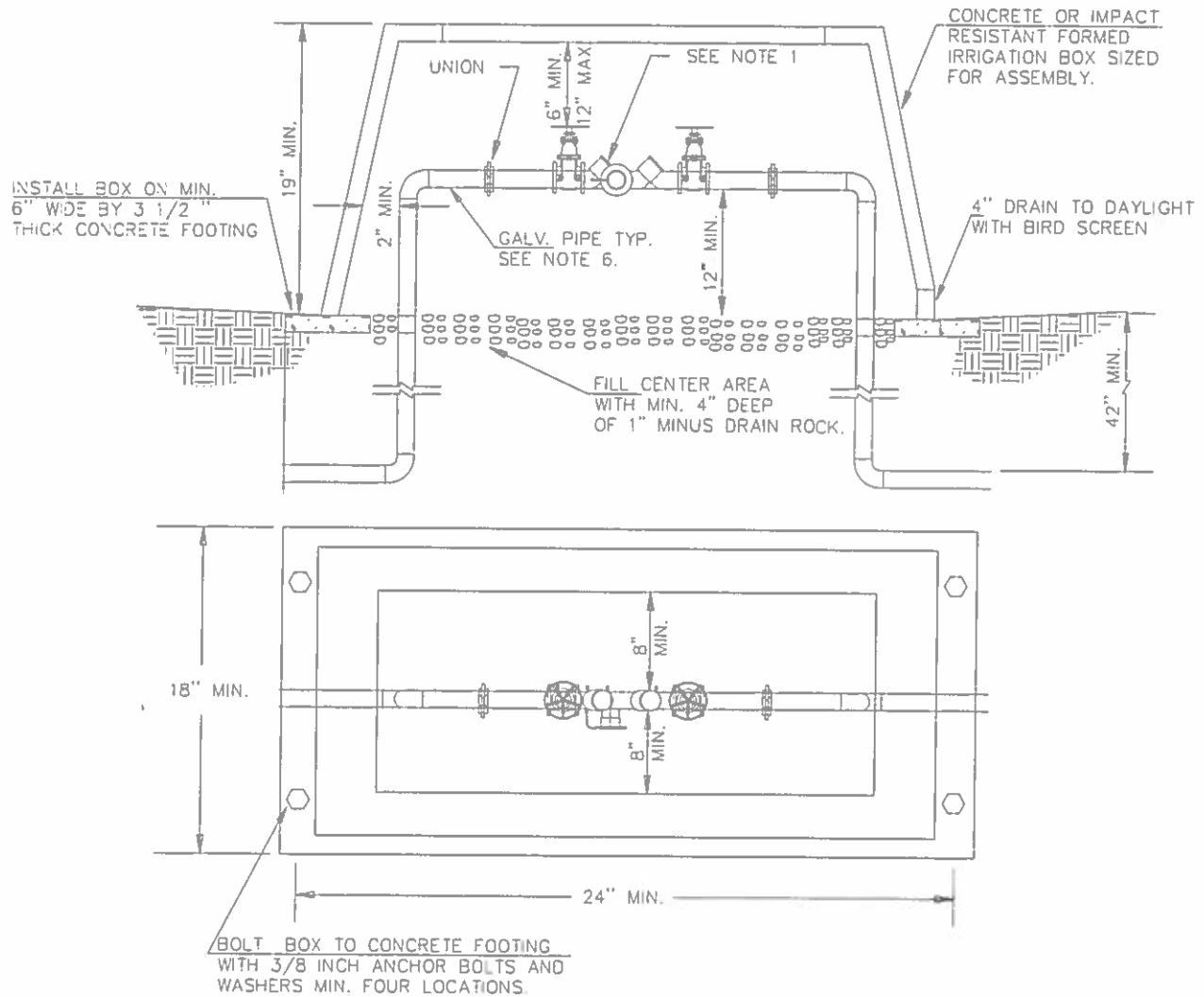
**DOUBLE CHECK VALVE ASSEMBLY INSTALLATION 3" & LARGER IN VAULT**

## NOTES:

- 1) MUST BE ON THE LATEST DEPT. OF HEALTH APPROVED LIST OF BACKFLOW PREVENTION ASSEMBLIES.
- 2) MAY BE INSTALLED BELOW GROUND IN AN APPROVED VAULT.
- 3) A CITY OF CHELAN CROSS CONNECTION SPECIALIST MUST BE PRESENT DURING INSTALLATION.
- 4) FREEZE PROTECTION IS THE RESPONSIBILITY OF THE OWNER.
- 5) A MIN. 3" DIA. FLOOR DRAIN IS REQUIRED.
- 6) A LADDER IS REQUIRED IF ACCESS OPENING TO FLOOR EXCEEDS 36"

ID-085

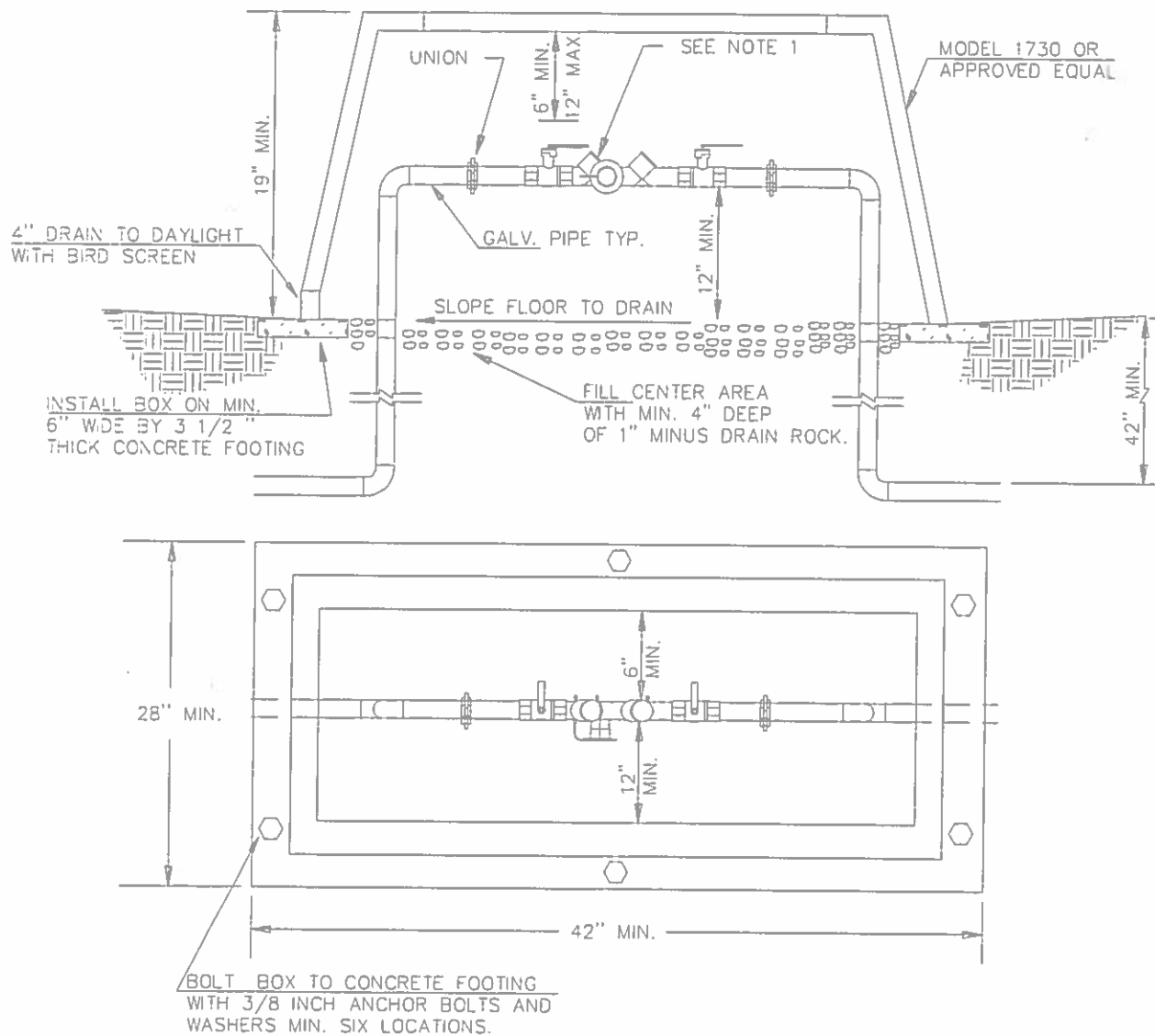
## REDUCED PRESSURE BACKFLOW ASSEMBLY INSTALLATION 3/4" TO 1"



## NOTES:

- 1) MUST BE ON THE LATEST DEPT. OF HEALTH APPROVED LIST OF BACKFLOW PREVENTION ASSEMBLIES.
- 2) MUST BE INSTALLED ABOVE GROUND MIN. 12 INCHES.
- 3) A CITY OF CHELAN CROSS CONNECTION SPECIALIST MUST BE PRESENT DURING INSTALLATION.
- 4) WHEN INSTALLED INSIDE A BUILDING, A FLOOR DRAIN SIZED TO ACCEPT MAXIMUM DISCHARGE FROM THE RELIEF ASSEMBLY IS REQUIRED.
- 5) FREEZE PROTECTION IS THE RESPONSIBILITY OF THE OWNER.
- 6) RISERS AND ALL PIPE IN BOX TO BE GALVANIZED STEEL.

ID-086

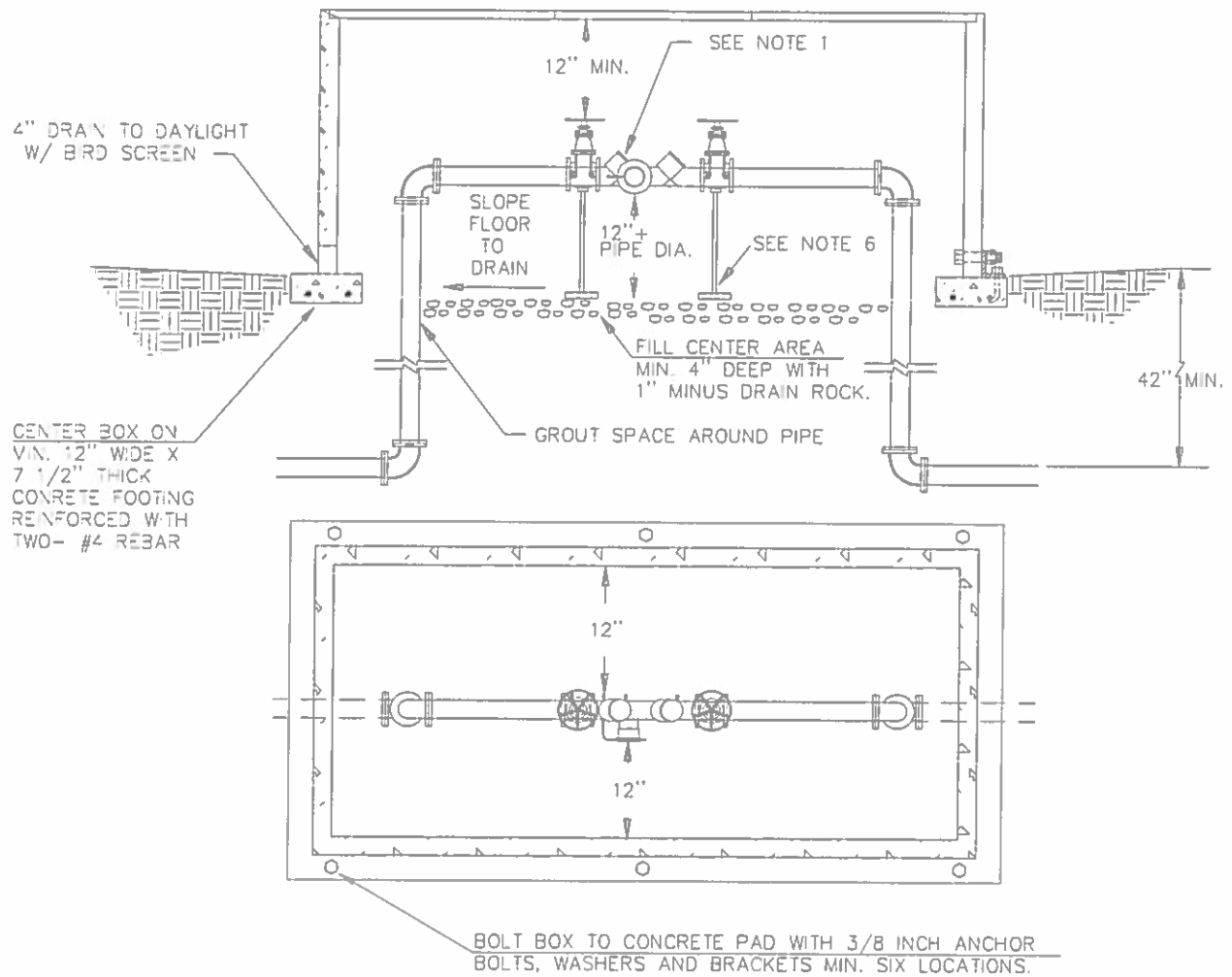
**REDUCED PRESSURE BACKFLOW ASSEMBLY INSTALLATION 1-1/4" TO 2"**

## NOTES:

- 1) MUST BE ON THE LATEST DEPT. OF HEALTH APPROVED LIST OF BACKFLOW PREVENTION ASSEMBLIES.
- 2) MUST BE INSTALLED ABOVE GROUND MIN. 12 INCHES.
- 3) A CITY OF CHELAN CROSS CONNECTION SPECIALIST MUST BE PRESENT DURING INSTALLATION.
- 4) WHEN INSTALLED INSIDE A BUILDING, A FLOOR DRAIN SIZED TO ACCEPT MAXIMUM DISCHARGE FROM THE RELIEF ASSEMBLY IS REQUIRED.
- 5) FREEZE PROTECTION IS THE RESPONSIBILITY OF THE OWNER.

ID-087

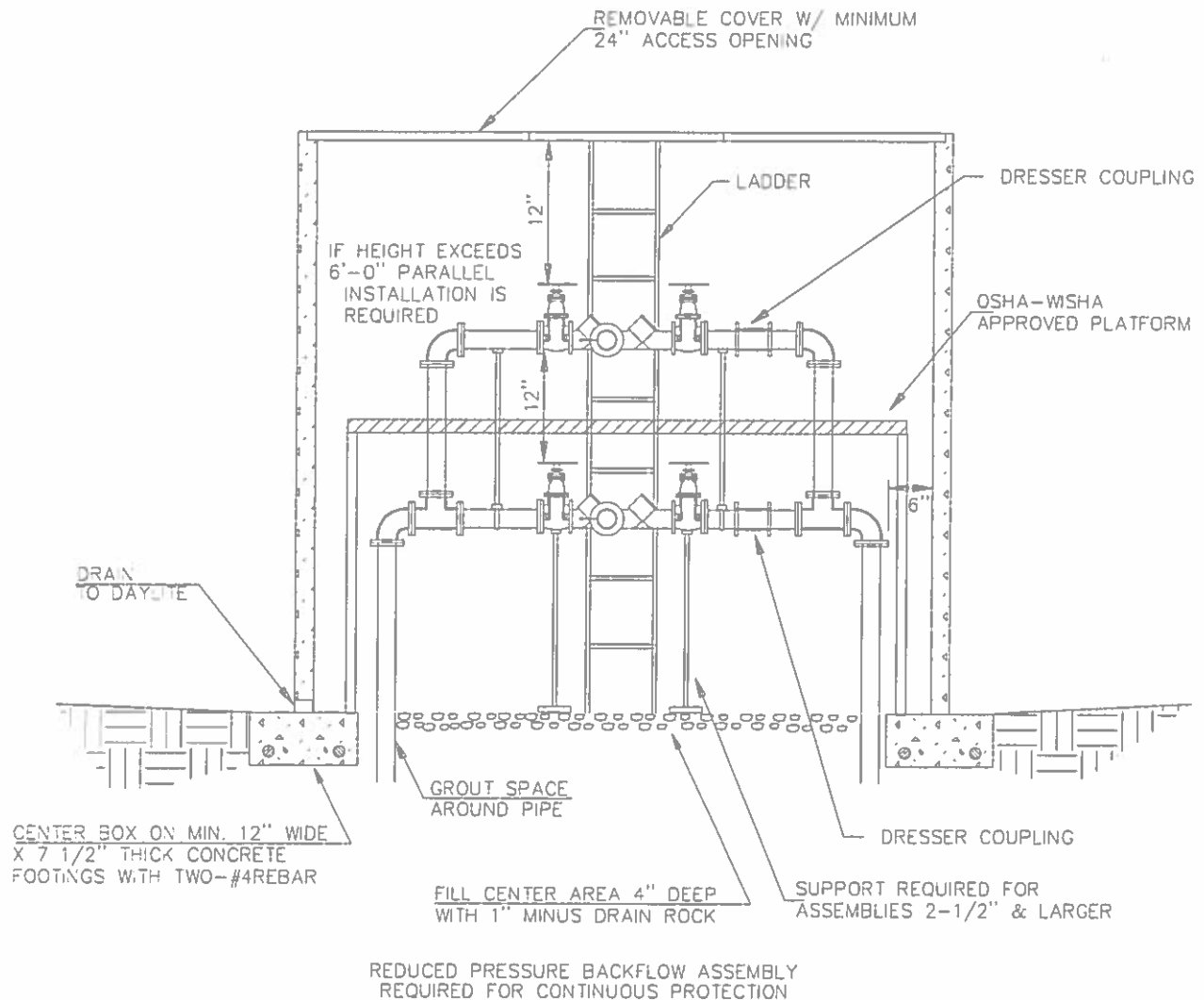


**REDUCED PRESSURE BACKFLOW ASSEMBLY INSTALLATION 2-1/2" AND LARGER**

## NOTES:

- 1) MUST BE ON THE LATEST DEPT. OF HEALTH APPROVED LIST OF BACKFLOW PREVENTION ASSEMBLIES.
- 2) MUST BE INSTALLED ABOVE GROUND, MIN. 12" PLUS PIPE DIAMETER.
- 3) A CITY OF CHELAN CROSS CONNECTION SPECIALIST MUST BE PRESENT DURING INSTALLATION.
- 4) WHEN INSTALLED INSIDE A BUILDING, A FLOOR DRAIN SIZED TO ACCEPT MAXIMUM DISCHARGE FROM THE RELIEF ASSEMBLY IS REQUIRED.
- 5) FREEZE PROTECTION IS THE RESPONSIBILITY OF THE OWNER.
- 6) SEE DWG. PAGE 10-14 FOR PIPE SUPPORTS. SET SUPPORTS ON CONCRETE BLOCKS.

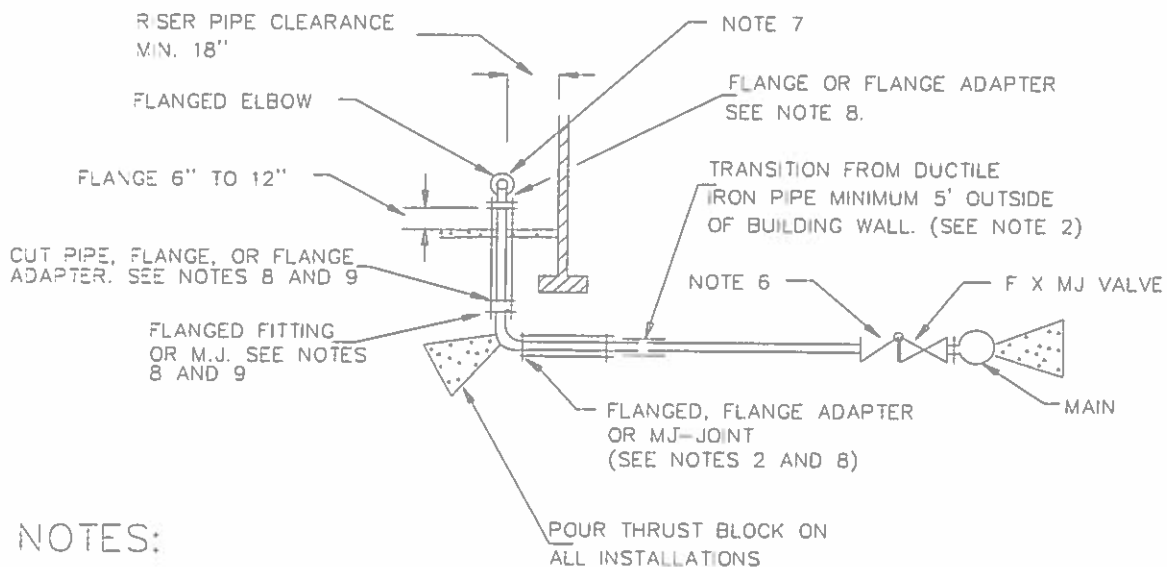
ID-088

**REDUCED PRESSURE BACKFLOW ASSEMBLY DUAL INSTALLATION****NOTES:**

- 1) MUST BE ON THE LATEST DEPT. OF HEALTH APPROVED LIST OF BACKFLOW PREVENTION ASSEMBLIES.
- 2) MUST BE INSTALLED ABOVE GROUND.
- 3) A CITY OF CHELAN CROSS CONNECTION SPECIALIST MUST BE PRESENT DURING INSTALLATION.
- 4) WHEN INSTALLED INSIDE A BUILDING, A FLOOR DRAIN SIZED TO ACCEPT DISCHARGE FROM BOTH ASSEMBLIES IS REQUIRED.
- 5) FREEZE PROTECTION IS THE RESPONSIBILITY OF THE OWNER.
- 6) SUFFICIENT CLEARANCE IS REQUIRED FROM THE TOP OF THE VALVE STEM WHEN FULLY OPEN TO THE BOTTOM OF THE TOP ASSEMBLY.
- 7) AN OSHA-WISHA APPROVED PLATFORM MUST BE ERECTED FOR MAINTENANCE AND TESTING.
- 8) GUARD POSTS ARE REQUIRED IN AREAS WHERE FORK LIFTS ARE USED

ID-089

## FIRE LINE INTO BUILDING

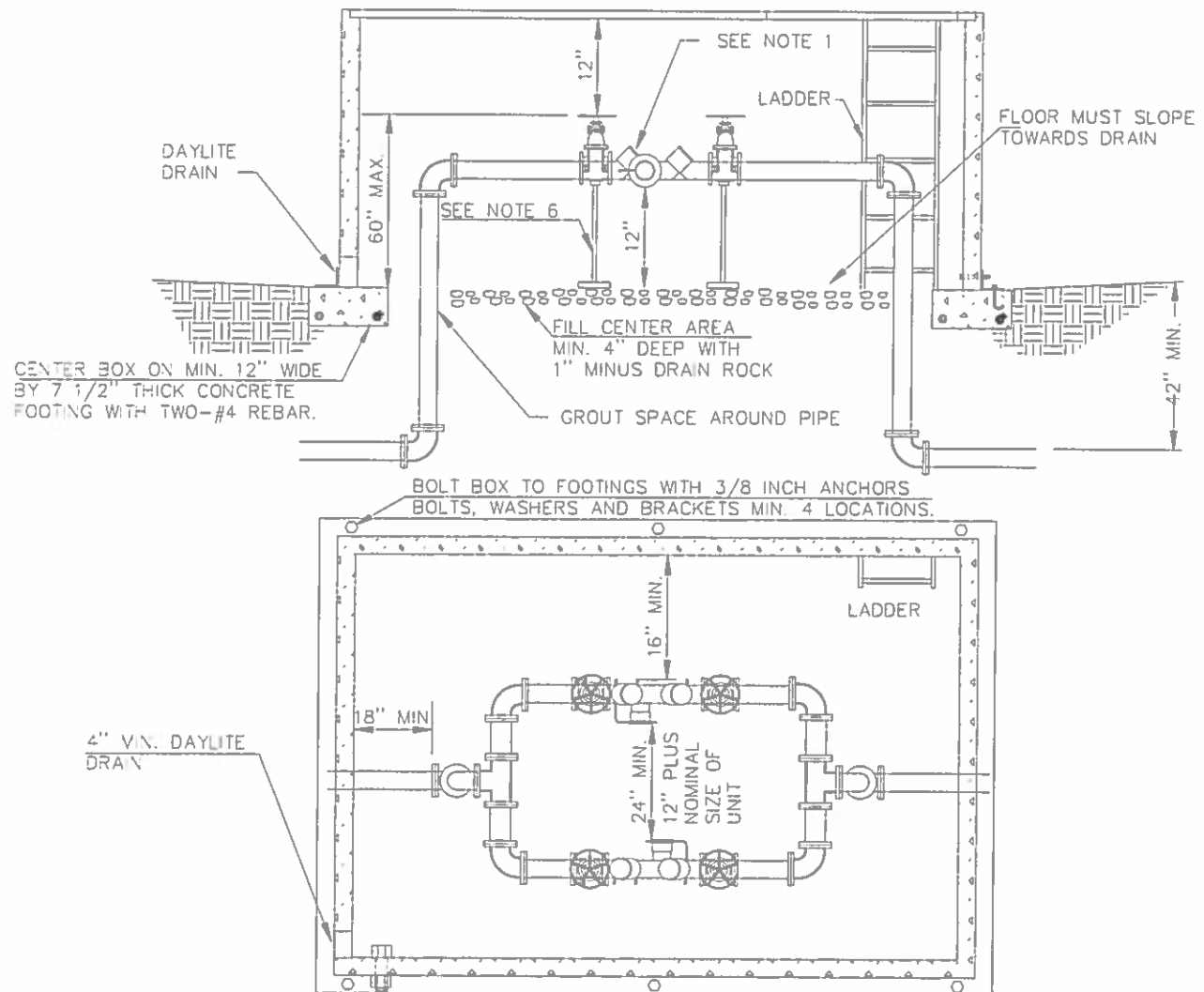


## NOTES:

1. ENGINEERING INSPECTOR WILL INSPECT TO THE BACKFLOW DEVICE OUTSIDE OF THE BUILDING, OR TO THE FLANGE ABOVE THE BUILDING FLOOR.
2. JOINT TO BE FLANGED, OR FLANGE ADAPTER, EXCEPT MJ JOINT MAY BE USED WHEN BEND IS SHACKLED TO A RETAINER GLAND LOCATED A MINIMUM OF 5 FEET OUTSIDE OF THE BUILDING.
3. CONSTRUCT A THRUST BLOCK ON THE 90° BEND UNDER THE FLOOR SIZED FOR THE SIZE OF PIPE AND TYPE OF FILL. SIZE TO BE 1.34 TIMES THAT CALLED FOR IN STD. DWG. PAGES 2-12 AND 2-13.
4. FITTINGS AND PIPE WITHIN THE BUILDING LIMITS, AND TO A MINIMUM 5 FEET OUTSIDE OF THE BUILDING, SHALL BE AWWA CAST OR DUCTILE IRON.
5. PRESSURE TEST ALL FIRE LINE INSTALLATIONS AT 200 PSI FOR 2 HOURS.
6. SINGLE SOFT SEAT CHECK VALVE REQUIRED WHEN THE DISTANCE (LENGTH) FROM THE MAIN TO THE FLANGE ABOVE THE FLOOR IS GREATER THAN 50 FT.
7. APPROVED DOUBLE DETECTOR CHECK VALVE ASSEMBLY REQUIRED SEE PAGE 2-21
8. FLANGE ADAPTER TO BE 250 PSI RATED DUCTILE OR CAST IRON "UNION FLANGE" AS MFG. BY UNION FOUNDRY CO., UNIFLANGE OR EQUAL.
9. ALTERNATE MJ X 90° BEND MAY BE USED PROVIDED THAT 250 PSI RATED STEEL TIE RODS ARE UTILIZED TO ABOVE FLOOR FITTING. USE 2 RODS FOR 4"-6" PIPE, 3 RODS FOR 8", AND 4 RODS FOR 10"+. FOLLOWING ASSEMBLY, COAT ALL ROD ASSEMBLIES WITH BITUMASTIC SEALANT.

ID-090

## SIDE BY SIDE RPBA DUAL INSTALLATION 3" OR LARGER



## RPBA DUAL INSTALLATION

REDUCED PRESSURE BACKFLOW ASSEMBLY  
FOR ASSEMBLIES 3" AND LARGER

## NOTES:

- 1) MUST BE ON THE LATEST DEPT. OF HEALTH APPROVED LIST OF BACKFLOW PREVENTION ASSEMBLIES.
- 2) MUST BE INSTALLED ABOVE GROUND.
- 3) A CITY OF CHELAN CROSS CONNECTION SPECIALIST MUST BE PRESENT DURING INSTALLATION.
- 4) WHEN INSTALLED INSIDE A BUILDING, A FLOOR DRAIN SIZED TO ACCEPT MAXIMUM DISCHARGE FROM BOTH RELIEF ASSEMBLIES IS REQUIRED.
- 5) FREEZE PROTECTION IS THE RESPONSIBILITY OF THE OWNER.
- 6) SEE DWG. PAGE 10-14 FOR PIPE SUPPORTS. SET SUPPORTS ON CONCRETE BLOCKS.

ID-109

# **APPENDIX C**

## **Water Quality Monitoring**



## Water Quality Monitoring Schedule

**System:** CHELAN WATER DEPT CITY OF  
**Contact:** Troy A Brooks

**PWS ID:** 12300 J  
**Group:** A - Comm

**Region:** EASTERN  
**County:** CHELAN

**NOTE:** To receive credit for compliance samples, you must fill out laboratory and sample paperwork completely, send your samples to a laboratory accredited by Washington State to conduct the analyses, AND ensure the results are submitted to DOH Office of Drinking Water. There is often a lag time between when you collect your sample, when we credit your system with meeting the monitoring requirement, and when we generate the new monitoring requirement.

### *Coliform Monitoring Requirements*

	May 2019	Jun 2019	Jul 2019	Aug 2019	Sep 2019	Oct 2019	Nov 2019	Dec 2019	Jan 2020	Feb 2020	Mar 2020	Apr 2020
<b>Coliform Monitoring Population</b>	8570	9355	9306	9306	8594	8128	8137	8128	8128	8159	8128	8137
<b>Number of Routine Samples Required</b>	9	9	9	10	10	10	10	10	9	9	9	9

- Collect samples from representative points throughout the distribution system.
- Collect required repeat samples following an unsatisfactory sample. In addition, collect a sample from each operating groundwater source.
- For systems that chlorinate, record chlorine residual (measured when the coliform sample is collected) on the coliform lab slip.

### *Chemical Monitoring Requirements*

#### *Distribution Monitoring*

## Water Quality Monitoring Schedule

<u>Test Panel/Analyte</u>	<u># Samples Required</u>	<u>Compliance Period</u>	<u>Frequency</u>	<u>Last Sample Date</u>	<u>Next Sample Due</u>
Lead and Copper	20	Jan 2017 - Dec 2019	standard - 3 year	04/04/2016	<b>Jul 2019</b> -
Asbestos	1	Jan 2011 - Dec 2019	standard - 9 year	10/11/2017	
Total Trihalomethane (THM)	2	Jan 2019 - Mar 2019	quarterly	03/19/2019	
Total Trihalomethane (THM)	2	Apr 2019 - Jun 2019	quarterly	03/19/2019	<b>May 2019</b> -
Total Trihalomethane (THM)	2	Jul 2019 - Sep 2019	quarterly	03/19/2019	<b>Aug 2019</b>
Total Trihalomethane (THM)	2	Oct 2019 - Dec 2019	quarterly	03/19/2019	<b>Nov 2019</b>
Halo-Acetic Acids (HAA5)	2	Jan 2019 - Mar 2019	quarterly	03/19/2019	
Halo-Acetic Acids (HAA5)	2	Apr 2019 - Jun 2019	quarterly	03/19/2019	<b>May 2019</b>
Halo-Acetic Acids (HAA5)	2	Jul 2019 - Sep 2019	quarterly	03/19/2019	<b>Aug 2019</b>
Halo-Acetic Acids (HAA5)	2	Oct 2019 - Dec 2019	quarterly	03/19/2019	<b>Nov 2019</b>

### Notes on Distribution System Chemical Monitoring

For *Lead and Copper*:

- Collect samples from the COLD WATER side of a KITCHEN or BATHROOM faucet that is used daily.
- Before sampling, make sure the water has sat unused in the pipes for at least 6 hours, but no more than 12 hours (e.g. overnight).
- If you are sampling from a faucet that has hot water, make sure cold water is the last water to run through the faucet before it sits overnight.
- If your sampling frequency is annual or every 3 years, collect samples between June 1 and September 30.

For *Asbestos*: Collect the sample from one of your routine coliform sampling sites in an area of your distribution system that has asbestos concrete pipe.

For *Disinfection Byproducts (HAA5 and THM)*: Collect the samples at the locations identified in your Disinfection Byproducts (DBP) monitoring plan.

## Water Quality Monitoring Schedule

### Source Monitoring

- Collect 'source' chemical monitoring samples from a tap after all treatment (if any), but before entering the distribution system.
- Washington State grants monitoring waivers for various test panels /analytes. Please note that we may require some monitoring as a condition of some waivers. We have granted complete waivers for dioxin, endothal, glyphosate, diquat, and insecticides.
- Nitrate, arsenic, iron, and other individual inorganics are included as part of a Complete Inorganic (IOC) analysis when it is collected.

Source S03	LAKE CHELAN	Surface	Use - Permanent	Susceptibility - High		
<u>Test Panel/Analyte</u>	<u># Samples Required</u>	<u>Compliance Period</u>	<u>Frequency</u>	<u>Last Sample Date</u>	<u>Next Sample Due</u>	
Nitrate	1	Jan 2019 - Dec 2019	standard - 1 year	08/28/2018	<b>Aug 2019</b>	
Complete Inorganic (IOC)	1	Jan 2017 - Dec 2019	waiver - 3 year	10/11/2016	<b>Jun 2019</b>	~
Arsenic	1	Jan 2017 - Dec 2019	standard - 3 year	10/11/2016	<b>Oct 2019</b>	
Volatile Organics (VOC)	1	Jan 2017 - Dec 2022	waiver - 6 year	07/11/2016	Jul 2022	
Herbicides	1	Jan 2014 - Dec 2022	waiver - 9 year	10/10/2018		
Herbicides	1	Jan 2019 - Mar 2019	increased - quarterly	10/10/2018	<del>Jan 2019</del>	<del>Past Due</del>
Herbicides	1	Apr 2019 - Jun 2019	increased - quarterly	10/10/2018	<del>Apr 2019</del>	<del>Past Due</del>
Herbicides	1	Jul 2019 - Sep 2019	increased - quarterly	10/10/2018	<b>Jul 2019</b>	~
Pesticides	0	Jan 2017 - Dec 2019	waiver - 3 year	03/06/2012		
Soil Fumigants	0	Jan 2017 - Dec 2019	waiver - 3 year	10/13/2010		
Gross Alpha	1	Jan 2014 - Dec 2019	standard - 6 year	04/14/2015		
Radium 228	1	Jan 2014 - Dec 2019	standard - 6 year	04/14/2015		





## Water Quality Monitoring Schedule

### Other Information

#### Other Reporting Schedules

##### Due Date

Measure chlorine residuals and submit monthly reports if your system uses continuous chlorination:	monthly
Submit Consumer Confidence Report (CCR) to customers and ODW (Community systems only):	07/01/2019
Submit CCR certification form to ODW (Community systems only):	10/01/2019
Submit Water Use Efficiency report online to ODW and to customers (Community and other municipal water systems only):	07/01/2019
Send notices of lead and copper sample results to the customers sampled:	30 days after you receive the laboratory results
Submit Certification of customer notification of lead and copper results to ODW:	90 days after you notify customers

#### Special Notes

None

#### Eastern Regional Water Quality Monitoring Contacts

For questions regarding chemical monitoring:	Stan Hoffman: (509) 329-2132: or Stan.Hoffman@doh.wa.gov
For questions regarding DBPs:	Stan Hoffman: (509) 329-2132 or Stan.Hoffman@doh.wa.gov
For questions regarding coliform bacteria and microbial issues:	Joseph Perkins: (509) 329-2134 or Joseph.Perkins@doh.wa.gov

#### Additional Notes

The information on this monitoring schedule is valid as of the date in the upper left corner on the first page. However, the information may change with subsequent updates in our water quality monitoring database as we receive new data or revise monitoring schedules. There is often a lag time between when you collect your sample and when we credit your system with meeting the monitoring requirement.

We have not designed this monitoring schedule to display all compliance requirements. The purpose of this schedule is to assist water systems with planning for most water quality monitoring, and to allow systems to compare their records with DOH ODW records. Please be aware that this monitoring schedule does not include constituents that require a special monitoring frequency, such as monitoring affiliated with treatment.

Any inaccuracies on this schedule will not relieve the water system owner and operator of the requirement to comply with applicable regulations.

If you have any questions about your monitoring requirements, please contact the regional office staff listed above.

Source	Lab Number	Sample Number	Sample Collection Date	Analyte Group Code	Analyte Group Name	Test Panel Code	Test Panel Name	Exceedances
Dist	105	10769	5/8/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	10775	5/8/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	10770	5/8/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	10768	5/8/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	10765	5/8/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	10767	5/8/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	10766	5/8/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	10776	5/8/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	10774	5/8/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	10772	5/8/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	10773	5/8/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	89	86179	4/16/2018	DBP	DISINFECTION BY PRODUCTS	HAA5	HALO-ACETIC ACIDS	No
Dist	89	86178	4/16/2018	DBP	DISINFECTION BY PRODUCTS	HAA5	HALO-ACETIC ACIDS	No
Dist	89	77650	4/16/2018	DBP	DISINFECTION BY PRODUCTS	THM	TOTAL TRIHALOMETHANE	No
Dist	89	77651	4/16/2018	DBP	DISINFECTION BY PRODUCTS	THM	TOTAL TRIHALOMETHANE	No
Dist	105	8046	4/11/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	8039	4/11/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	8045	4/11/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	8036	4/11/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	8038	4/11/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	8041	4/11/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	8040	4/11/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	8037	4/11/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	8044	4/11/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	8042	4/11/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	8047	4/11/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	5448	3/13/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	5444	3/13/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	5450	3/13/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	5441	3/13/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	5440	3/13/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	5445	3/13/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	5449	3/13/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	5447	3/13/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	5442	3/13/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	5443	3/13/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	5446	3/13/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	3062	2/12/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	3057	2/12/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	3056	2/12/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	3055	2/12/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	3058	2/12/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No

Source	Lab Number	Sample Number	Sample Collection Date	Analyte Group Code	Analyte Group Name	Test Panel Code	Test Panel Name	Exceedances
Dist	105	3053	2/12/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	3063	2/12/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	3061	2/12/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	3060	2/12/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	3059	2/12/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	89	86068	1/31/2018	DBP	DISINFECTION BY PRODUCTS	HAA5	HALO-ACETIC ACIDS	No
Dist	89	86069	1/31/2018	DBP	DISINFECTION BY PRODUCTS	HAA5	HALO-ACETIC ACIDS	No
Dist	89	77523	1/31/2018	DBP	DISINFECTION BY PRODUCTS	THM	TOTAL TRIHALOMETHANE	No
Dist	89	77525	1/31/2018	DBP	DISINFECTION BY PRODUCTS	THM	TOTAL TRIHALOMETHANE	No
Dist	105	786	1/10/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	788	1/10/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	783	1/10/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	785	1/10/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	787	1/10/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	789	1/10/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	790	1/10/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	793	1/10/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	791	1/10/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No
Dist	105	784	1/10/2018	MICRO	MICROBIOLOGICAL	COLI_AP	ABSENCE / PRESENCE	No

# City of Chelan

## 2017 Annual Drinking Water Quality Report

We're very pleased to provide you with this year's Annual Quality Water Report. We want to keep you informed about the excellent water and services we have delivered to you over the past year. Our goal is and always has been, to provide to you a safe and dependable supply of drinking water. Our water source is surface water from Lake Chelan.

I'm pleased to report that our drinking water is safe and meets federal and state requirements.

If you have any questions about this report or concerning your water utility, please contact. The City Water Department at 409 S. Washington St. or call 509-682-5919. We want our valued customers to be informed about their water utility. If you want to learn more, please attend any of our regularly scheduled meetings. They are held on the 2<sup>nd</sup> and 4<sup>th</sup> Tuesday of each month at 6:00 PM, at City Council Chambers.

City of Chelan routinely monitors for constituents in your drinking water according to Federal and State laws. This table shows the results of our monitoring for the period of January 1<sup>st</sup> to December 31<sup>st</sup>, 2017.

In this table, you will find many terms and abbreviations you might not be familiar with. To help you better understand these terms we've provided the following definitions:

Non-Detects (ND) - laboratory analysis indicates that the constituent is not present.

Parts per million (ppm) or Milligrams per liter (mg/l) - one part per million corresponds to one minute in two years or a single penny in \$10,000.

Parts per billion (ppb) or Micrograms per liter - one part per billion corresponds to oneminute in 2,000 years, or a single penny in \$10,000,000.

Nephelometric Turbidity Unit (NTU) - nephelometric turbidity unit is a measure of the clarity of water. Turbidity in excess of 5 NTU is just noticeable to the average person.

Treatment Technique (TT) - A treatment technique is a required process intended to reduce the level of a contaminant in drinking water.

Maximum Contaminant Level - The "Maximum Allowed" (MCL) is the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

Maximum Contaminant Level Goal - The "Goal" (MCLG) is the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

Contaminant	Violation	Level Detected	Unit Measurement	MCLG	MCL	Likely Source of Contamination
I. Total Coliform Bacteria	N	0	sample	0	presence	Naturally present in the environment
2. Fecal coliform and E. coli	N	0	sample	0	presence	Human and animal fecal waste
3. Turbidity	N	.03	Ntu	10	3.0	Soil runoff
14. Copper	N	<ND	sample	.02	1.3	Next test 2020
17. Lead	N	<ND	sample	.002	.015	Next test 2020
19.Total Nitrate (as Nitrogen)	N	.07	mg/L 2	5	10	Runoff from fertilizer use; leaching from sceptic tanks, sewage; erosion of natural deposit
55. Benzene	N	ND	ppb	.5	5	Discharge from factories; leaching from gas storage tanks and landfills
27. Chloroform	N	0.0	ug/L	.5	5	DOH/ higher MCL standard
HAAS	N	15.2	ug/L		60	Disinfection by-products
Total Trihalomethanes	N	17.4	ug/L		80	Disinfection by-products

As you can see by the table, our system had no violations. We're proud that your drinking water meets or exceeds all Federal and State requirements.

All drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline at 1-800426-4791.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbiological contaminants are available from the Safe Drinking Water Hotline (800426-4791).

We at the City of Chelan Water Department work around the clock to provide top quality water to every tap. We ask that all our customers help us protect our water sources, which are the heart of our community, our way of life and our children's future.

Troy A. Brooks Water Treatment Plant Operator.

Lee Reynolds Assistant Water Treatment Plant Operator

Dwane Van Epps, Public Works Director

Larry Sweeney, Assistant Public Works Director

If you, or someone you know is on a kidney dialysis machine please call our office at 682-8030.

(Si usted no sabe leer ingles porfavor digale a alguien que le lea este papel para que usted entienda lo que muchas gracias.)

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### Backflow Prevention

Pursuant to Washington State Department of Health requirements. The City of Chelan shall require all customers receiving potable water from the City of Chelan's water distribution system to comply with all state and local regulations requiring approved backflow assembly devices. In accordance with these regulations to protect the City of Chelan water distribution system, public health and safety. These approved devices shall be installed, maintained, and tested annually by an approved and licensed backflow Assembly Tester at the customer's expense and liability.

The annual test report shall be submitted to the City of Chelan's Cross Connection Control Manager. Information for approved backflow assembly device requirements and approved installation, may be obtained through the City of Chelan Public Works Department, Cross Connection Control Manager.

Cross Connection personnel will begin inspecting all service connections for proper backflow assembly installations. Beginning with the high hazard areas first. These sites are marinas and piers, industrial sites, mechanic shops, fire sprinkler systems, medical and dental facilities, pools and spas, restaurant equipment and ice machines, mortuaries, commercial laundries and underground irrigation systems.

To schedule an inspection, please call, 682.5919 or 682.8030

Thank you for your support in keeping our drinking water safe.

## Coliform Monitoring Plan for: City of Chelan

### A. System Information

<b>Water System Name</b> City of Chelan	<b>County</b> Chelan	<b>System I.D. Number</b> 12300J
<b>Attach copy of current WFI</b>		
<b>Number of Routine Samples Required Monthly by Regulation:</b> 10, March through August 9, September through February	<b>Number of Sample Sites Needed to Represent the Distribution System:</b> 10	

### B. Routine and Repeat Sample Locations

<b>Location/Address for</b> <b><u>Routine</u> Sample Sites</b>	<b>Location/Address for</b> <b><u>Repeat</u> Sample Sites</b>
<b>X1. Chelan Hills Reservoir sample station</b>	<b>1-1. Chelan Hills Reservoir</b>
	<b>1-2. 313 Henderson Road</b>
	<b>1-3. 318 Highpoint Place</b>
	<b>1-4. 332 Highpoint Place</b>
<b>X2. Boyd Road Booster Pump Station</b>	<b>2-1. Boyd Road BPS</b>
	<b>2-2. 318 Highpoint Place</b>
	<b>2-3. 424 Butte Road</b>
	<b>2-4. 422 Butte Road</b>
<b>X3. Pinnacle Reservoir sample station</b>	<b>3-1. Pinnacle Reservoir</b>
	<b>3-2. 207 Pinnacle Place</b>
	<b>3-3. 202 Pinnacle Place</b>
	<b>3-4. Pinnacle BPS</b>

**B. Routine & Repeat Sample Locations - continued**

<u>Location/Address for routine sample sites</u>	<u>Location/Address for repeat sample sites</u>
X4. Darnell Booster Pump Station	4-1. Darnell BPS 4-2. 619 W. Manson Hwy (RV Park office) 4-3. 137 Hwy 150 (vet clinic) 4-4. 105 Madisen Lane
X5. 135 E. Johnson Ave (City Hall)	5-1. 135 E. Johnson 5-2. 144 E. Johnson (post office) 5-3. 123 E. Johnson (KOZI bldg) 5-4. 207 N. Emerson (sheriff dept)
X6. Lakeside Booster Pump Station	6-1. Lakeside BPS 6-2. 1902 W. Woodin, Unit 212 (Pleasant View Condos) 6-3. 1932 W. Woodin 6-4. 1526 W. Woodin
X7. Farnham Booster Pump Station	7-1. Farnham BPS 7-2. 607 S. Sanders 7-3. 206 E. Farnham 7-4. South Chelan Reservoir sample station
X8. Willmorth Booster Pump Station	8-1. Willmorth BPS 8-2. 108 Apple Blossom Drive (Wal Mart) 8-3. 855 Willmorth Drive 8-4. 23660 Hwy 97A
X9. 50 Chelan Falls Hwy (Public Works)	9-1. 50 Chelan Falls Hwy 9-2. 66 Chelan Falls Hwy (Lake Interiors) 9-3. 40 E. Shop Ave (Phil Green) 9-4. 100 Gala Ave (Chelan Mini Storage)
X10. 204 N. Navarre	10-1. 204 N. Navarre 10-2. 214 N. Navarre 10-3. 110 N. Navarre 10-4. 217 N. Navarre

### C. Routine Sample Rotation Schedule

Month	Routine Site(s)	Month	Routine Site(s)
January	X1 – X9	July	X1 – X10
February	X1 – X8, X10	August	X1 – X10
March	X1 – X10	September	X1 – X9
April	X1 – X10	October	X1 – X8, X10
May	X1 – X10	November	X1 – X9
June	X1 – X10	December	X1 – X8, X10

### D. Month Following Unsatisfactory Samples

Regulations require a minimum of 5 routine samples in the month following an unsatisfactory routine sample. Since we collect 9 or 10 samples per month, this requirement is addressed.

### E. Preparation Information

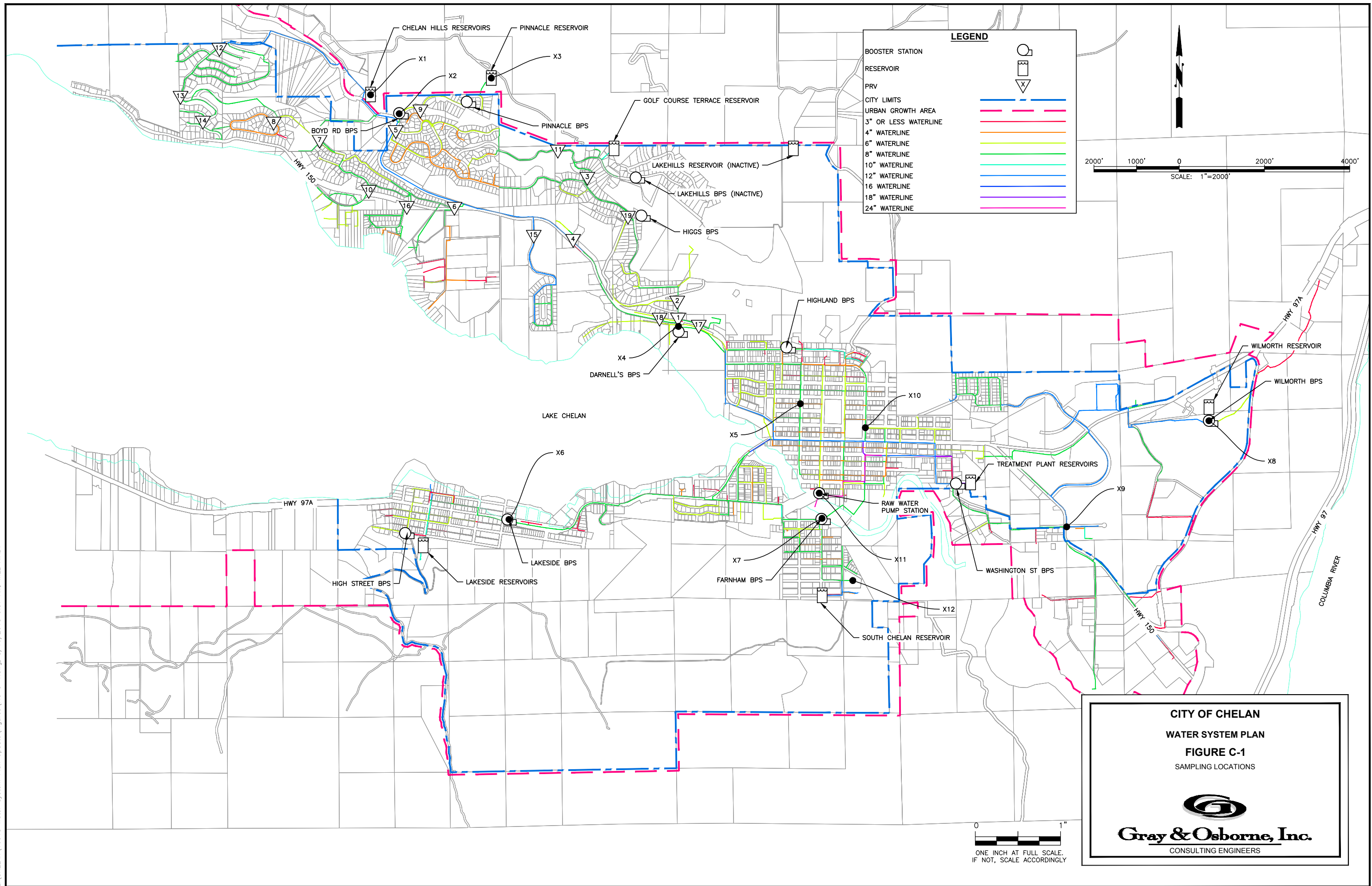
<b>System Name</b> City of Chelan	<b>Date Plan Completed</b> August 9, 2010	<b>Dates Modified</b> NA
<b>Name of Plan Preparer</b> Troy Brooks	<b>Position</b> Water Filtration Plant Operator	<b>Daytime Phone #</b> ( 509 ) 682-5919
<b>State Reviewer</b>	<b>Date Last Review</b>	

### F. System Map

See attached – 1 system map, 10 routine/repeat sample site maps



L:\CHELAN\16018 Water System Plan Update\Figures\FIG C-1.dwg, 8/16/2018 9:37 AM, WILL KIRBY

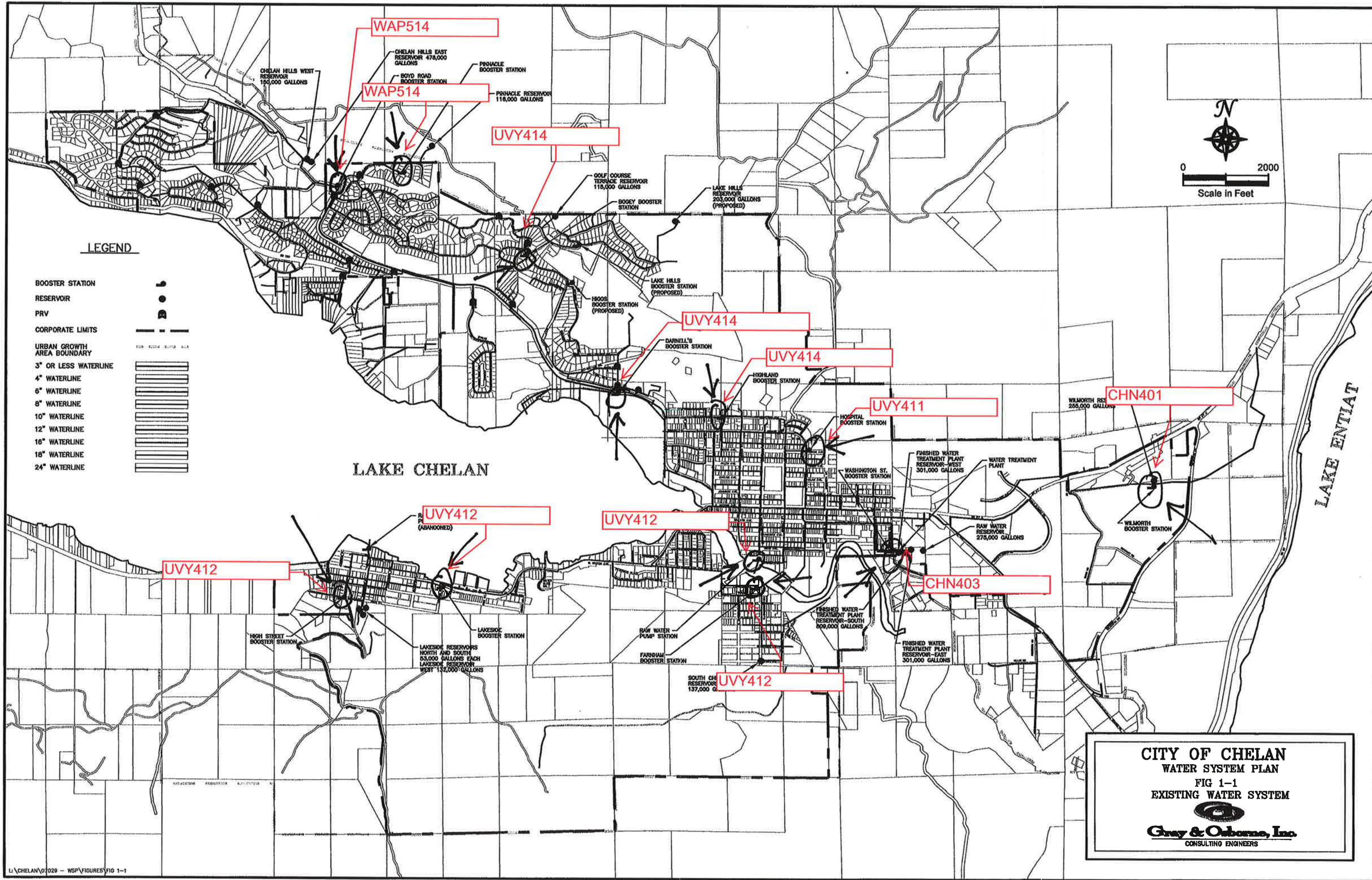


## **APPENDIX D**

### **Power Outages**

Year	Average Outage (hr/customer) for Each Feeder						
	CHN 401	CHN403	WAP 514	UVY 411	UVY 412	UVY 414	Average
2018	2.98	0.55	0	6.42	0	0.93	1.81
2017	1.72	1.57	0	2.71	2.72	1.62	1.72
2016	3.88	1.57	0	1.91	2.72	1.12	1.87
2015	23.51	48.64	0	17.33	20.93	25.94	22.73
2014	3.16	1.45	0.85	0.91	2.21	4.25	2.14
2013	1.06	1.18	0	2.55	2.59	6.05	2.24
<b>Average All Years</b>	<b>6.05</b>	<b>9.16</b>	<b>0.14</b>	<b>5.31</b>	<b>5.20</b>	<b>6.65</b>	<b>5.42</b>
<b>Average Years (minus 2015)</b>	<b>2.56</b>	<b>1.26</b>	<b>0.17</b>	<b>2.90</b>	<b>2.05</b>	<b>2.79</b>	<b>1.96</b>





CITY OF CHELAN  
WATER SYSTEM PLAN  
FIG 1-1  
EXISTING WATER SYSTEM





**APPENDIX E**

**Modeling and Fire Flow Data**

BASE MODEL  
CONNECTIONS

KEY:	
Demand 1	Residential
Demand 2	Multi Family
Demand 3	Commercial
Demand 4	Municipal
Demand 5	School

ID (Char)	Demand 1 (gpm)	Demand 2 (gpm)	Demand 3 (gpm)	Demand 4 (gpm)	Demand 5 (gpm)	ZONE
J-100	0					Lakeside
J-102	8			1		Main
J-103	0					Main
J-107	6	0				South Chelan
J-108	9					South Chelan
J-109	12					South Chelan
J-110	12					South Chelan
J-111	7					South Chelan
J112						Darnells
J-112	8	3				South Chelan
J114						Darnells
J116						Darnells
J-116	0					South Chelan
J118	6					Darnells
J-118	2	1			1	Main
J-119	3					Main
J-12	1		1			Main
J120	9					Darnells
J-120	0	0				Main
J-121	2		1			Main
J122	4					Darnells
J-122	2					Main
J-123	1					Main
J124						Darnells
J-124	6					Lakeside
J-125	2					Lakeside
J126	2					Darnells
J-127	0					Lakeside
J128						Darnells
J-128	11					Lakeside
J-129	11	2				Lakeside
J-13	1		2			Main
J130						Darnells
J-130	0					Main
J-131	2		1			Main
J132						Darnells
J-132	6		1			Main

BASE MODEL  
CONNECTIONS

J134	7						Darnells
J-134	0						Darnells
J-135	0						Darnells
J136	11						Darnells
J-136	0						Darnells
J138	14						Darnells
J-14	0	0	2				Main
J140							Darnells
J-140	2						Darnells
J-141	7						Darnells
J142	6						Darnells
J-142	8						Darnells
J-143	8						Darnells
J144	4						Darnells
J146	5						Darnells
J-146	0						Boyd
J-147	1						Boyd
J148	2						Darnells
J-15	0						Main
J150	9						Darnells
J-150	0						Darnells
J-151	10						Boyd
J152	0	2					Darnells
J-152	6						Darnells
J-153	3						Darnells
J154	0	5					Darnells
J-154	14						Darnells
J-155	14						Darnells
J156							Darnells
J158	3						Darnells
J-158	2						Darnells
J-159	0						Darnells
J-16	1		1				Main
J160	8						Darnells
J-160	1						Darnells
J-161	4						Darnells
J162							Darnells
J-162	9						Darnells
J-163	11						Darnells
J164							Darnells
J-164	17						Darnells
J-165	9						Darnells
J166	3						Darnells
J168	3						Darnells
J-169	3						Darnells
J-17	0		1				Main
J170	4		1				Darnells

BASE MODEL  
CONNECTIONS

J-170	2						Darnells
J-171	1						Darnells
J172	3						Darnells
J-172	0						Darnells
J-173	0						Darnells
J174	10						Darnells
J-175	0						Darnells
J176	6						Darnells
J-176	4	1					Darnells
J178	1						Darnells
J-178	0						Darnells
J-179	0		4	1			Main
J-18	1		1		1		Main
J-180	0						Main
J-181	2	3	1	1			Main
J182	5						Darnells
J-182	3		2				Main
J-183	6	1					Main
J184	2						Darnells
J-184	10						Main
J-185	3						Main
J186	2						Darnells
J-186	0			1			Main
J-187	0						Main
J188	4						Darnells
J-188	3						Main
J-189	4		1				Main
J-19	0	1				2	Main
J190			1				Darnells
J-190	2		4				Main
J-191	0						Main
J192							Darnells
J-192	0						Main
J194	4						Darnells
J196	4						Darnells
J-196	3						Main
J-197	1						Main
J198							Darnells
J20	11						Darnells
J-20	0		2				Main
J200							Darnells
J-200	8	1					Main
J202	3						Darnells
J-202	2						Main
J204	2						Darnells
J-205	0						Darnells
J206							Boyd



BASE MODEL  
CONNECTIONS

J-206	0						Darnells
J-207	1						Darnells
J208	8						Boyd
J-208	3			1			Darnells
J-209	7						Darnells
J-21	0						Main
J210	4						Boyd
J-210	3						Darnells
J-211	5						Darnells
J212							Boyd
J-212	3						Darnells
J214	2						Darnells
J218	3						Darnells
J-218	0	4					Darnells
J-219	0						Darnells
J-22	0		4				Main
J220							Boyd
J-220	5						Lakeside
J222	3						Boyd
J-223	1						Darnells
J224	8						Boyd
J-224	3						Darnells
J-225	5						Golf Course
J226							Boyd
J228	3						Boyd
J-228	4						Main
J-229	0						Main
J-23	0						Main
J230							Boyd
J-230	5						Main
J232	3						Boyd
J-233	0						Darnells
J234	7						Boyd
J-235	2	0	1				Darnells
J236	7						Boyd
J-237	0						Darnells
J238							Boyd
J-238	0						Darnells
J-239	0	4					Darnells
J-24	0	0	2				Main
J240	8						Darnells
J-240	0	4					Darnells
J-241	0	6					Darnells
J242	13						Darnells
J-242	0						Darnells
J-243	5						Darnells
J244	4						Darnells

BASE MODEL  
CONNECTIONS

J-244	2						Main
J-245	0						Main
J246							Darnells
J-246	3						Golf Course
J248							Darnells
J-25	0		4				Main
J250	10						Darnells
J252	6						Darnells
J-253	0						Main
J254	9						Darnells
J256	4						Darnells
J-256	2						Main
J-257	0	0	1				Darnells
J258	3						Darnells
J-258	5						Darnells
J-259	6	0					Darnells
J-26	0		2				Main
J260	5						Darnells
J-260	7						Boyd
J262	4						Darnells
J264							Darnells
J-264	0						Boyd
J266							Darnells
J268	2						Darnells
J-268	0						Boyd
J-269	0						Boyd
J-27	2	1	3	1			Main
J270	5						Darnells
J272	6						Darnells
J274							Darnells
J-274	5	1					Main
J278	2						Darnells
J-278	4	4					Main
J-28	1			1			Main
J280							Darnells
J-280	4						Darnells
J-281	3						Darnells
J282							Darnells
J-282	7						Darnells
J-283	3						Boyd
J284							Golf Course
J-284	0						Darnells
J-285	0						Darnells
J286							Golf Course
J-286	4						Boyd
J-287	9						Darnells
J288	11						Darnells

BASE MODEL  
CONNECTIONS

J-288	2	1				Lakeside
J-289	0					Main
J-29	1					Main
J290	8					Darnells
J-290	0	0		1		Lakeside
J292	2	1				Darnells
J294	5					Golf Course
J-295	5					Lakeside
J296	3					Boyd
J-297	11					Darnells
J298	9					Boyd
J-298	11		1			Darnells
J30	2					Darnells
J-30	0					Main
J300	4					Boyd
J302	6					Darnells
J-302	0					Darnells
J-303	0					Darnells
J304	6					Darnells
J-304	4					Golf Course
J-305	2					golf Course
J306	2					Darnells
J-307	0					Darnells
J308						Darnells
J-309	0					Main
J-31	6					Main
J310						Darnells
J-310	0					Main
J-311	0		1			Main
J312						Darnells
J-312	1		3			Main
J-313	1		1			Main
J314	5					Darnells
J-314	0		6			Main
J316						Darnells
J318	1	5				Darnells
J-319	0					Main
J-32	15	1				Main
J320						Main
J-321	0					Darnells
J324						Darnells
J-325	0			2		Main
J326						Main
J328			1			Main
J330	2					Main
J332	1	3		1		Main
J334	9	1				Main

BASE MODEL  
CONNECTIONS

J-335	1						South Chelan
J336			1				Darnells
J338	2						Darnells
J-34	6						Main
J340	3						Darnells
J-340	5						Darnells
J-341	0						Darnells
J342	2		1				Darnells
J-342	5						Darnells
J344	1						Darnells
J-345	0						Darnells
J346	7						Darnells
J348	10						Darnells
J350							Darnells
J352							Darnells
J354							Darnells
J356	2						Darnells
J358	11						Darnells
J36							Darnells
J360	9						Darnells
J362	9						Darnells
J364	11						Darnells
J366	2						Darnells
J368			1				Darnells
J370	2						Darnells
J372	7						Darnells
J374	14						Darnells
J376	1				1		Main
J378	9	7					Main
J38							Darnells
J-38	4		1				Main
J382	8	2					Main
J384	2	1					Main
J386	5						Main
J388							Main
J-39	0						Main
J390	2	2	1				Main
J392	3						Main
J394	4						Main
J396	2						Main
J40							Darnells
J-40	5						Main
J402	3	1					Main
J404	2						Main
J406	5						Main
J408	9	3					Main
J-41	1						Main

BASE MODEL  
CONNECTIONS

J410							Main
J412			4				Main
J414	5						Main
J416	3						Main
J418	8	4					Main
J42	7						Darnells
J-42	2						Main
J420	8	1					Main
J422	8	3	1				Main
J424	14						Main
J426	12						Main
J428	10	1					Main
J-43	0	0					Main
J430	2	1					Main
J432	8						Main
J434	12						Main
J436	10	1	1				Main
J438	9	4	2				Main
J44	4	0	1				Darnells
J-44	0						Main
J440	6		5	5			Main
J442	5		2	1			Main
J444			19	1			Main
J446		1	11				Main
J448			16				Main
J-45	0		1				Main
J450			15				Main
J452	6	1	3				Main
J454	2	1	5	0	2		Main
J456	6		5				Main
J458	10	1	1				Main
J46							Darnells
J-46	0						Main
J460	6	1	3				Main
J462	9	1					Main
J464	9	1	1				Main
J466	13	1					Main
J468	8		2				Main
J-47	1		4				Main
J470	5		6				Main
J472	8	3	1				Main
J474	4						Main
J476	9	3					Main
J478	13	1					Main
J48	4						Darnells
J-48	0						Main
J480	9						Main

BASE MODEL  
CONNECTIONS

J482	8	1	1			Main
J484	2		5			Main
J486			2			Washington
J488	4		4			Main
J-49	0					Main
J490	11	1				Main
J492				1		Main
J496	6			1		Main
J498	7					Main
J50						Darnells
J-50	0					Main
J500						Main
J502						Washington
J504	7					Washington
J506	3					Washington
J508	12					Washington
J-51	4		1	1		Main
J510	2					Washington
J512	2					Washington
J514	8		1			Washington
J518	1		1			Washington
J-52	4		1			Main
J520	1		1			Washington
J522	2		1			Washington
J524	4		1			Washington
J526	2					Washington
J528	3		1			Washington
J-53	5	1				Main
J530	2		2			Washington
J532						Washington
J534	8					Washington
J536			1			Washington
J-54	0					Main
J540	1					Washington
J542	2		1			Washington
J544	5					Washington
J546						Washington
J548	3		1			Washington
J-55	0					Main
J550						Washington
J552	6					Washington
J554	8					Washington
J556	3		1			Washington
J558			5			Washington
J-56	0					Main
J560	2					Washington
J562						Washington

BASE MODEL  
CONNECTIONS

J564						1	Washington
J566							Washington
J568	6						Washington
J-57	0						Main
J570	15						Washington
J572	10						Washington
J574	8						Washington
J576	8						Washington
J578	7						Washington
J-58	4	1					Main
J580	8						Washington
J582	9						Washington
J584	19						Washington
J586	5						Washington
J588			1				Washington
J-59	0						Main
J590							Washington
J592			1				Washington
J594							Washington
J596	1						Washington
J598							Washington
J-60	3						Main
J600					2		Washington
J602							Washington
J604							Washington
J606	2						Washington
J608	3						Washington
J-61	2						Main
J610	3						Washington
J612	3						washington
J614	1						Washington
J616	5						Washington
J618	2						Washington
J-62	4						Main
J620	2						Washington
J622			2				Washington
J624	3		1				Washington
J626	3		2				Washington
J628	11						Main
J-63	0						Main
J630	6	3					Main
J634	4	8					South Chelan
J636	0						South Chelan
J-64	8	1					Main
J642		3	2				South Chelan
J644	3	1					South Chelan
J646	3	1					South Chelan

BASE MODEL  
CONNECTIONS

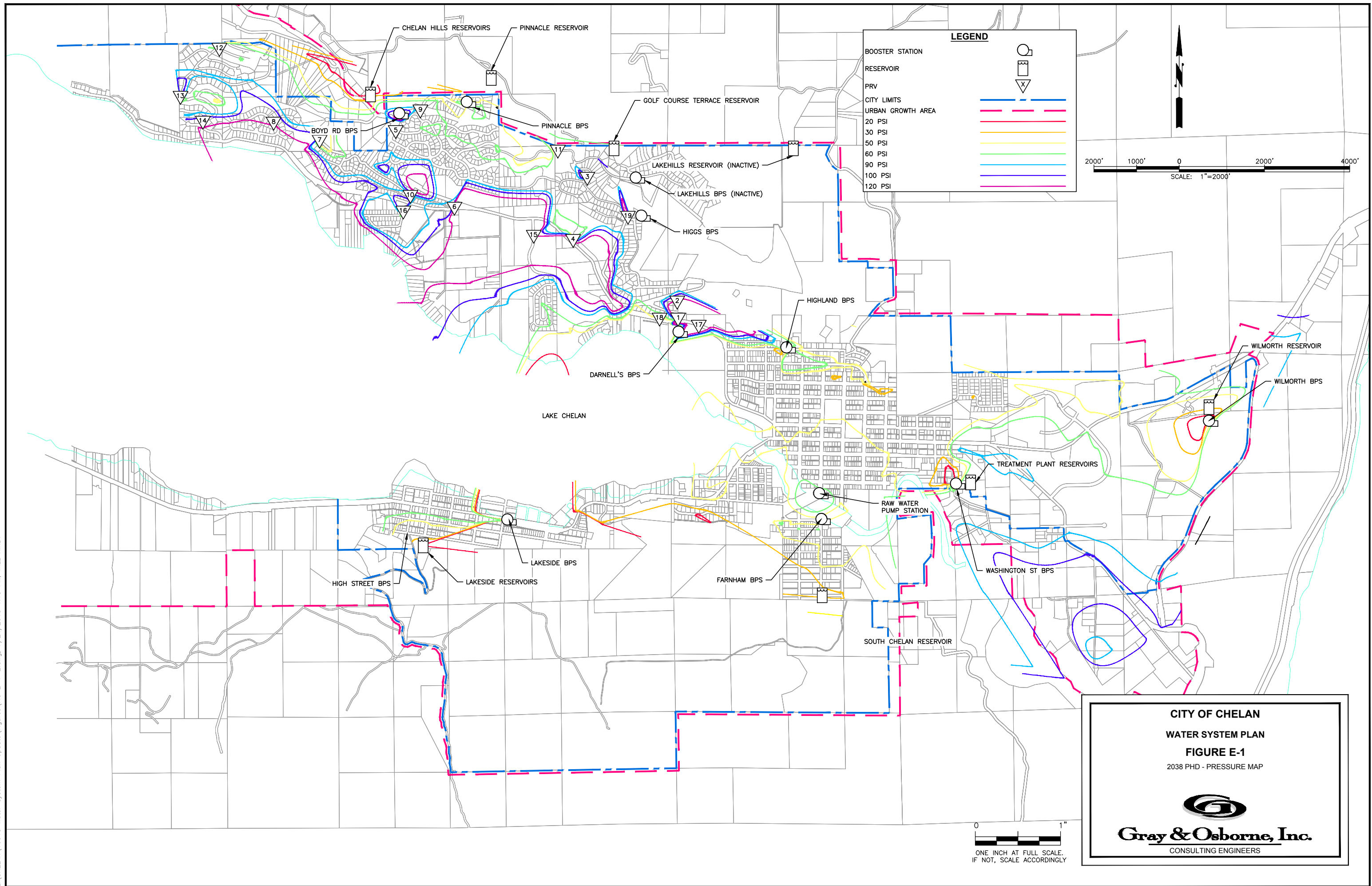
J648	10	1				South Chelan
J650	7	1				South Chelan
J654						South Chelan
J656	1			1		Main
J658						Main
J-66	1		1			Main
J660	10	3				South Chelan
J662	1					South Chelan
J664						Main
J666	1					Main
J668	3					South Chelan
J-67	3	1				Main
J670	5					South Chelan
J672	8					South Chelan
J674						South Chelan
J676	1	1		1		Main
J-68	5	1	1			Main
J680	18	6				Main
J682	9	1				Main
J684	7		1	2		Main
J686						Main
J688	11					Main
J-69	0	1				Main
J690	2					Main
J692						Main
J694	3	4				Main
J696	2		3			Main
J698	2					Main
J-70	0					Main
J700	2	2	3			Main
J702	6					Main
J704	3		3			Main
J706						Main
J708						Lakeside
J-71	1		2			Main
J710		1	1			Main
J712	9		1			Lakeside
J714	2	2				Lakeside
J716	10					Lakeside
J-72	0			1		Main
J720		1	4			Lakeside
J722	7					Lakeside
J724	6					Lakeside
J726	4					Main
J728	0.00					Main
J-73	0.00		1			Main
J730						Darnells



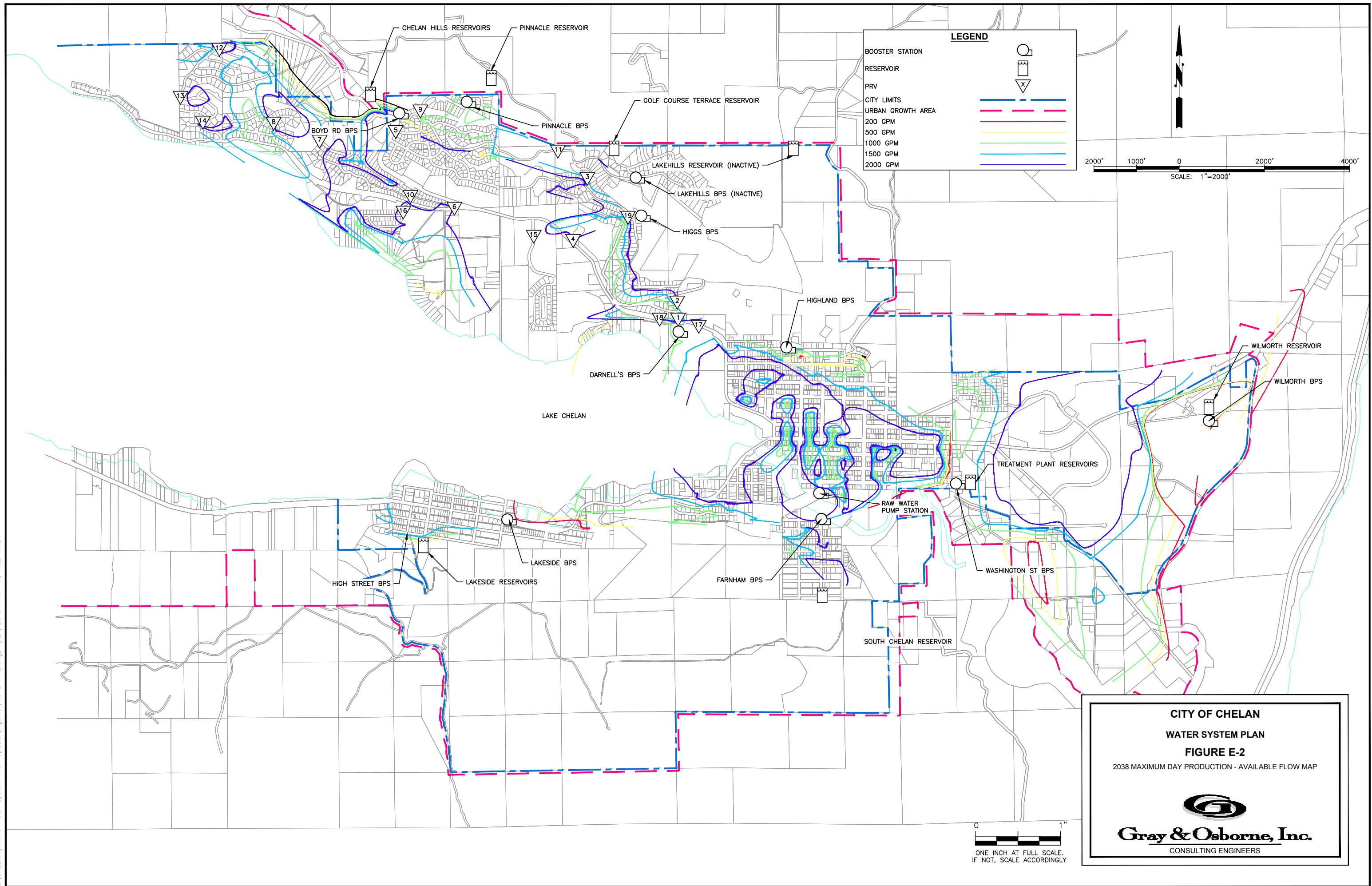
BASE MODEL  
CONNECTIONS

J732							Darnells
J736							Boyd
J738							Darnells
J-74	1						Main
J740							Darnells
J742							Darnells
J744							Darnells
J746							Darnells
J748							Darnells
J-75	1						Main
J750							Darnells
J-76	0						Main
J-77	9						Main
J-78	7						Main
J-79	3		1				Main
J80	1	2					Main
J-80	6		1				Main
J-81	4		2				Main
J-82	10	1	4				Main
J-85	6						Main
J-86	7	1					Main
J-87	5	3					Main
J-88	3	1					Main
J-89	1						Main
J-90	0						Main
J-91	0			1			Main
J-92	5	2					Main
J-93	5	1	6				Main
J-94	8		1				Lakeside
J-95	6	2	1	1			Lakeside
J-96	6						Lakeside
J-97	9	2					Lakeside
J-98	11		2				Lakeside
J-99	5	2					Lakeside

L:\CHELAN\16018 Water System Plan Update\Figures\FIG E-1-2.dwg, 7/24/2018 1:15 PM, WILL KIRBY



L:\CHELAN\16018 Water System Plan Update\Figures\FIG E-1-2.dwg, 7/24/2018 1:40 PM, WILL KIRBY



ID (Char)	Demand 1 (gpm)	Demand 2 (gpm)	Demand 3 (gpm)	Demand 4 (gpm)	Demand 5 (gpm)	ZONE
J-100	0.00	0.00	0.00	0.00	0.00	Lakeside
J-102	5.41	0.00	0.00	8.70	0.00	Main
J-103	0.00	0.00	0.00	0.00	0.00	Main
J-107	3.89	0.00	0.00	0.00	0.00	South Chelan
J-108	5.84	0.00	0.00	0.00	0.00	South Chelan
J-109	7.79	0.00	0.00	0.00	0.00	South Chelan
J-110	7.79	0.00	0.00	0.00	0.00	South Chelan
J-111	4.54	0.00	0.00	0.00	0.00	South Chelan
J112	0.00	0.00	0.00	0.00	0.00	Darnells
J-112	5.19	4.69	0.00	0.00	0.00	South Chelan
J114	0.00	0.00	0.00	0.00	0.00	Darnells
J116	0.00	0.00	0.00	0.00	0.00	Darnells
J-116	0.00	0.00	0.00	0.00	0.00	South Chelan
J118	5.31	0.00	0.00	0.00	0.00	Darnells
J-118	1.35	1.31	0.00	0.00	3.62	Main
J-119	2.03	0.00	0.00	0.00	0.00	Main
J-12	0.68	0.00	0.81	0.00	0.00	Main
J120	7.96	0.00	0.00	0.00	0.00	Darnells
J-120	0.00	0.00	0.00	0.00	0.00	Main
J-121	1.35	0.00	0.81	0.00	0.00	Main
J122	3.54	0.00	0.00	0.00	0.00	Darnells
J-122	1.35	0.00	0.00	0.00	0.00	Main
J-123	0.68	0.00	0.00	0.00	0.00	Main
J124	0.00	0.00	0.00	0.00	0.00	Darnells
J-124	4.43	0.00	0.00	0.00	0.00	Lakeside
J-125	1.48	0.00	0.00	0.00	0.00	Lakeside
J126	1.77	0.00	0.00	0.00	0.00	Darnells
J-127	0.00	0.00	0.00	0.00	0.00	Lakeside
J128	0.00	0.00	0.00	0.00	0.00	Darnells
J-128	8.12	0.00	0.00	0.00	0.00	Lakeside
J-129	8.12	0.26	0.00	0.00	0.00	Lakeside
J-13	0.68	0.00	1.62	0.00	0.00	Main
J130	0.00	0.00	0.00	0.00	0.00	Darnells
J-130	0.00	0.00	0.00	0.00	0.00	Main
J-131	1.35	0.00	0.81	0.00	0.00	Main
J132	0.00	0.00	0.00	0.00	0.00	Darnells
J-132	4.05	0.00	0.81	0.00	0.00	Main
J134	6.19	0.00	0.00	0.00	0.00	Darnells
J-134	0.00	0.00	0.00	0.00	0.00	Darnells
J-135	0.00	0.00	0.00	0.00	0.00	Darnells
J136	9.73	0.00	0.00	0.00	0.00	Darnells
J-136	0.00	0.00	0.00	0.00	0.00	Darnells
J138	12.38	0.00	0.00	0.00	0.00	Darnells
J-14	0.00	0.00	1.62	0.00	0.00	Main
J140	0.00	0.00	0.00	0.00	0.00	Darnells
J-140	1.77	0.00	0.00	0.00	0.00	Darnells
J-141	6.19	0.00	0.00	0.00	0.00	Darnells
J142	5.31	0.00	0.00	0.00	0.00	Darnells
J-142	7.08	0.00	0.00	0.00	0.00	Darnells
J-143	7.08	0.00	0.00	0.00	0.00	Darnells
J144	3.54	0.00	0.00	0.00	0.00	Darnells
J146	4.42	0.00	0.00	0.00	0.00	Darnells
J-146	0.00	0.00	0.00	0.00	0.00	Boyd
J-147	0.77	0.00	0.00	0.00	0.00	Boyd
J148	1.77	0.00	0.00	0.00	0.00	Darnells
J-15	0.00	0.00	0.00	0.00	0.00	Main
J150	7.96	0.00	0.00	0.00	0.00	Darnells
J-150	0.00	0.00	0.00	0.00	0.00	Darnells
J-151	7.72	0.00	0.00	0.00	0.00	Boyd

J152	0.00	2.11	0.00	0.00	0.00	Darnells
J-152	5.31	0.00	0.00	0.00	0.00	Darnells
J-153	2.65	0.00	0.00	0.00	0.00	Darnells
J154	0.00	5.27	0.00	0.00	0.00	Darnells
J-154	12.38	0.00	0.00	0.00	0.00	Darnells
J-155	12.38	0.00	0.00	0.00	0.00	Darnells
J156	0.00	0.00	0.00	0.00	0.00	Darnells
J158	2.65	0.00	0.00	0.00	0.00	Darnells
J-158	1.77	0.00	0.00	0.00	0.00	Darnells
J-159	0.00	0.00	0.00	0.00	0.00	Darnells
J-16	0.68	0.00	0.81	0.00	0.00	Main
J160	7.08	0.00	0.00	0.00	0.00	Darnells
J-160	0.88	0.00	0.00	0.00	0.00	Darnells
J-161	3.54	0.00	0.00	0.00	0.00	Darnells
J162	0.00	0.00	0.00	0.00	0.00	Darnells
J-162	7.96	0.00	0.00	0.00	0.00	Darnells
J-163	9.73	0.00	0.00	0.00	0.00	Darnells
J164	0.00	0.00	0.00	0.00	0.00	Darnells
J-164	15.04	0.00	0.00	0.00	0.00	Darnells
J-165	7.96	0.00	0.00	0.00	0.00	Darnells
J166	2.65	0.00	0.00	0.00	0.00	Darnells
J168	2.65	0.00	0.00	0.00	0.00	Darnells
J-169	2.65	0.00	0.00	0.00	0.00	Darnells
J-17	0.00	0.00	0.81	0.00	0.00	Main
J170	3.54	0.00	1.70	0.00	0.00	Darnells
J-170	1.77	0.00	0.00	0.00	0.00	Darnells
J-171	0.88	0.00	0.00	0.00	0.00	Darnells
J172	2.65	0.00	0.00	0.00	0.00	Darnells
J-172	0.00	0.00	0.00	0.00	0.00	Darnells
J-173	0.00	0.00	0.00	0.00	0.00	Darnells
J174	8.85	0.00	0.00	0.00	0.00	Darnells
J-175	0.00	0.00	0.00	0.00	0.00	Darnells
J176	5.31	0.00	0.00	0.00	0.00	Darnells
J-176	3.54	1.05	0.00	0.00	0.00	Darnells
J178	0.88	0.00	0.00	0.00	0.00	Darnells
J-178	0.00	0.00	0.00	0.00	0.00	Darnells
J-179	0.00	0.00	3.24	8.70	0.00	Main
J-18	0.68	0.00	0.81	0.00	3.62	Main
J-180	0.00	0.00	0.00	0.00	0.00	Main
J-181	1.35	3.94	0.81	8.70	0.00	Main
J182	4.42	0.00	0.00	0.00	0.00	Darnells
J-182	2.03	0.00	1.62	0.00	0.00	Main
J-183	4.05	1.31	0.00	0.00	0.00	Main
J184	1.77	0.00	0.00	0.00	0.00	Darnells
J-184	6.76	0.00	0.00	0.00	0.00	Main
J-185	2.03	0.00	0.00	0.00	0.00	Main
J186	1.77	0.00	0.00	0.00	0.00	Darnells
J-186	0.00	0.00	0.00	8.70	0.00	Main
J-187	0.00	0.00	0.00	0.00	0.00	Main
J188	3.54	0.00	0.00	0.00	0.00	Darnells
J-188	2.03	0.00	0.00	0.00	0.00	Main
J-189	2.70	0.00	0.81	0.00	0.00	Main
J-19	0.00	1.31	0.00	0.00	7.24	Main
J190	0.00	0.00	1.70	0.00	0.00	Darnells
J-190	1.35	0.00	3.24	0.00	0.00	Main
J-191	0.00	0.00	0.00	0.00	0.00	Main
J192	0.00	0.00	0.00	0.00	0.00	Darnells
J-192	0.00	0.00	0.00	0.00	0.00	Main
J194	3.54	0.00	0.00	0.00	0.00	Darnells
J196	3.54	0.00	0.00	0.00	0.00	Darnells

J-196	2.03	0.00	0.00	0.00	0.00	Main
J-197	0.68	0.00	0.00	0.00	0.00	Main
J198	0.00	0.00	0.00	0.00	0.00	Darnells
J20	9.73	0.00	0.00	0.00	0.00	Darnells
J-20	0.00	0.00	1.62	0.00	0.00	Main
J200	0.00	0.00	0.00	0.00	0.00	Darnells
J-200	5.41	1.31	0.00	0.00	0.00	Main
J202	2.65	0.00	0.00	0.00	0.00	Darnells
J-202	1.35	0.00	0.00	0.00	0.00	Main
J204	1.77	0.00	0.00	0.00	0.00	Darnells
J-205	0.00	0.00	0.00	0.00	0.00	Darnells
J206	0.00	0.00	0.00	0.00	0.00	Boyd
J-206	0.00	0.00	0.00	0.00	0.00	Darnells
J-207	0.88	0.00	0.00	0.00	0.00	Darnells
J208	6.17	0.00	0.00	0.00	0.00	Boyd
J-208	2.65	0.00	0.00	1.01	0.00	Darnells
J-209	6.19	0.00	0.00	0.00	0.00	Darnells
J-21	0.00	0.00	0.00	0.00	0.00	Main
J210	3.09	0.00	0.00	0.00	0.00	Boyd
J-210	2.65	0.00	0.00	0.00	0.00	Darnells
J-211	4.42	0.00	0.00	0.00	0.00	Darnells
J212	0.00	0.00	0.00	0.00	0.00	Boyd
J-212	2.65	0.00	0.00	0.00	0.00	Darnells
J214	1.77	0.00	0.00	0.00	0.00	Darnells
J218	2.65	0.00	0.00	0.00	0.00	Darnells
J-218	0.00	4.21	0.00	0.00	0.00	Darnells
J-219	0.00	0.00	0.00	0.00	0.00	Darnells
J-22	0.00	0.00	3.24	0.00	0.00	Main
J220	0.00	0.00	0.00	0.00	0.00	Boyd
J-220	3.69	0.00	0.00	0.00	0.00	Lakeside
J222	2.32	0.00	0.00	0.00	0.00	Boyd
J-223	0.88	0.00	0.00	0.00	0.00	Darnells
J224	6.17	0.00	0.00	0.00	0.00	Boyd
J-224	2.65	0.00	0.00	0.00	0.00	Darnells
J-225	5.13	0.00	0.00	0.00	0.00	Golf Course
J226	0.00	0.00	0.00	0.00	0.00	Boyd
J228	2.32	0.00	0.00	0.00	0.00	Boyd
J-228	2.70	0.00	0.00	0.00	0.00	Main
J-229	0.00	0.00	0.00	0.00	0.00	Main
J-23	0.00	0.00	0.00	0.00	0.00	Main
J230	0.00	0.00	0.00	0.00	0.00	Boyd
J-230	3.38	0.00	0.00	0.00	0.00	Main
J232	2.32	0.00	0.00	0.00	0.00	Boyd
J-233	0.00	0.00	0.00	0.00	0.00	Darnells
J234	5.40	0.00	0.00	0.00	0.00	Boyd
J-235	1.77	0.00	1.70	0.00	0.00	Darnells
J236	5.40	0.00	0.00	0.00	0.00	Boyd
J-237	0.00	0.00	0.00	0.00	0.00	Darnells
J238	0.00	0.00	0.00	0.00	0.00	Boyd
J-238	0.00	0.00	0.00	0.00	0.00	Darnells
J-239	0.00	4.21	0.00	0.00	0.00	Darnells
J-24	0.00	0.00	1.62	0.00	0.00	Main
J240	7.08	0.00	0.00	0.00	0.00	Darnells
J-240	0.00	4.21	0.00	0.00	0.00	Darnells
J-241	0.00	6.32	0.00	0.00	0.00	Darnells
J242	11.50	0.00	0.00	0.00	0.00	Darnells
J-242	0.00	0.00	0.00	0.00	0.00	Darnells
J-243	4.42	0.00	0.00	0.00	0.00	Darnells
J244	3.54	0.00	0.00	0.00	0.00	Darnells
J-244	1.35	0.00	0.00	0.00	0.00	Main

J-245	0.00	0.00	0.00	0.00	0.00	Main
J246	0.00	0.00	0.00	0.00	0.00	Darnells
J-246	3.08	0.00	0.00	0.00	0.00	Golf Course
J248	0.00	0.00	0.00	0.00	0.00	Darnells
J-25	0.00	0.00	130.22	0.00	0.00	Main
J250	8.85	0.00	0.00	0.00	0.00	Darnells
J252	5.31	0.00	0.00	0.00	0.00	Darnells
J-253	0.00	0.00	0.00	0.00	0.00	Main
J254	7.96	0.00	0.00	0.00	0.00	Darnells
J256	3.54	0.00	0.00	0.00	0.00	Darnells
J-256	1.35	0.00	0.00	0.00	0.00	Main
J-257	0.00	0.00	1.70	0.00	0.00	Darnells
J258	2.65	0.00	0.00	0.00	0.00	Darnells
J-258	4.42	0.00	0.00	0.00	0.00	Darnells
J-259	5.31	0.00	0.00	0.00	0.00	Darnells
J-26	0.00	0.00	1.62	0.00	0.00	Main
J260	4.42	0.00	0.00	0.00	0.00	Darnells
J-260	5.40	0.00	0.00	0.00	0.00	Boyd
J262	3.54	0.00	0.00	0.00	0.00	Darnells
J264	0.00	0.00	0.00	0.00	0.00	Darnells
J-264	0.00	0.00	0.00	0.00	0.00	Boyd
J266	0.00	0.00	0.00	0.00	0.00	Darnells
J268	1.77	0.00	0.00	0.00	0.00	Darnells
J-268	0.00	0.00	0.00	0.00	0.00	Boyd
J-269	0.00	0.00	0.00	0.00	0.00	Boyd
J-27	1.35	1.31	2.43	8.70	0.00	Main
J270	4.42	0.00	0.00	0.00	0.00	Darnells
J272	5.31	0.00	0.00	0.00	0.00	Darnells
J274	0.00	0.00	0.00	0.00	0.00	Darnells
J-274	3.38	1.31	0.00	0.00	0.00	Main
J278	1.77	0.00	0.00	0.00	0.00	Darnells
J-278	2.70	5.25	0.00	0.00	0.00	Main
J-28	0.68	0.00	0.00	8.70	0.00	Main
J280	0.00	0.00	0.00	0.00	0.00	Darnells
J-280	3.54	0.00	0.00	0.00	0.00	Darnells
J-281	2.65	0.00	0.00	0.00	0.00	Darnells
J282	0.00	0.00	0.00	0.00	0.00	Darnells
J-282	6.19	0.00	0.00	0.00	0.00	Darnells
J-283	2.32	0.00	0.00	0.00	0.00	Boyd
J284	0.00	0.00	0.00	0.00	0.00	Golf Course
J-284	0.00	0.00	0.00	0.00	0.00	Darnells
J-285	0.00	0.00	0.00	0.00	0.00	Darnells
J286	0.00	0.00	0.00	0.00	0.00	Golf Course
J-286	3.09	0.00	0.00	0.00	0.00	Boyd
J-287	7.96	0.00	0.00	0.00	0.00	Darnells
J288	9.73	0.00	0.00	0.00	0.00	Darnells
J-288	1.48	0.13	0.00	0.00	0.00	Lakeside
J-289	0.00	0.00	0.00	0.00	0.00	Main
J-29	0.68	0.00	0.00	0.00	0.00	Main
J290	7.08	0.00	0.00	0.00	0.00	Darnells
J-290	0.00	0.00	0.00	0.91	0.00	Lakeside
J292	1.77	1.05	0.00	0.00	0.00	Darnells
J294	5.13	0.00	0.00	0.00	0.00	Golf Course
J-295	3.69	0.00	0.00	0.00	0.00	Lakeside
J296	2.32	0.00	0.00	0.00	0.00	Boyd
J-297	9.73	0.00	0.00	0.00	0.00	Darnells
J298	6.95	0.00	0.00	0.00	0.00	Boyd
J-298	9.73	0.00	1.70	0.00	0.00	Darnells
J30	1.77	0.00	0.00	0.00	0.00	Darnells
J-30	0.00	0.00	0.00	0.00	0.00	Main

J300	3.09	0.00	0.00	0.00	0.00	Boyd
J302	5.31	0.00	0.00	0.00	0.00	Darnells
J-302	0.00	0.00	0.00	0.00	0.00	Darnells
J-303	0.00	0.00	0.00	0.00	0.00	Darnells
J304	5.31	0.00	0.00	0.00	0.00	Darnells
J-304	4.10	0.00	0.00	0.00	0.00	Golf Course
J-305	2.05	0.00	0.00	0.00	0.00	golf Course
J306	1.77	0.00	0.00	0.00	0.00	Darnells
J-307	0.00	0.00	0.00	0.00	0.00	Darnells
J308	0.00	0.00	0.00	0.00	0.00	Darnells
J-309	0.00	0.00	0.00	0.00	0.00	Main
J-31	4.05	0.00	0.00	0.00	0.00	Main
J310	0.00	0.00	0.00	0.00	0.00	Darnells
J-310	0.00	0.00	0.00	0.00	0.00	Main
J-311	0.00	0.00	28.60	0.00	0.00	Main
J312	0.00	0.00	0.00	0.00	0.00	Darnells
J-312	0.68	0.00	2.43	0.00	0.00	Main
J-313	0.68	0.00	0.81	0.00	0.00	Main
J314	4.42	0.00	0.00	0.00	0.00	Darnells
J-314	0.00	0.00	4.87	0.00	0.00	Main
J316	0.00	0.00	0.00	0.00	0.00	Darnells
J318	0.88	5.27	0.00	0.00	0.00	Darnells
J-319	0.00	0.00	0.00	0.00	0.00	Main
J-32	10.14	1.31	0.00	0.00	0.00	Main
J320	0.00	0.00	0.00	0.00	0.00	Main
J-321	0.00	0.00	0.00	0.00	0.00	Darnells
J324	0.00	0.00	0.00	0.00	0.00	Darnells
J-325	0.00	0.00	0.00	17.41	0.00	Main
J326	0.00	0.00	0.00	0.00	0.00	Main
J328	0.00	0.00	0.81	0.00	0.00	Main
J330	1.35	0.00	0.00	0.00	0.00	Main
J332	0.68	3.94	0.00	8.70	0.00	Main
J334	6.08	1.31	0.00	0.00	0.00	Main
J-335	0.65	0.00	0.00	0.00	0.00	South Chelan
J336	0.00	0.00	1.70	0.00	0.00	Darnells
J338	1.77	0.00	0.00	0.00	0.00	Darnells
J-34	4.05	0.00	0.00	0.00	0.00	Main
J340	2.65	0.00	0.00	0.00	0.00	Darnells
J-340	4.42	0.00	0.00	0.00	0.00	Darnells
J-341	0.00	0.00	0.00	0.00	0.00	Darnells
J342	1.77	0.00	1.70	0.00	0.00	Darnells
J-342	4.42	0.00	0.00	0.00	0.00	Darnells
J344	0.88	0.00	0.00	0.00	0.00	Darnells
J-345	0.00	0.00	0.00	0.00	0.00	Darnells
J346	6.19	0.00	0.00	0.00	0.00	Darnells
J348	8.85	0.00	0.00	0.00	0.00	Darnells
J350	0.00	0.00	0.00	0.00	0.00	Darnells
J352	0.00	0.00	0.00	0.00	0.00	Darnells
J354	0.00	0.00	0.00	0.00	0.00	Darnells
J356	1.77	0.00	0.00	0.00	0.00	Darnells
J358	9.73	0.00	0.00	0.00	0.00	Darnells
J36	0.00	0.00	0.00	0.00	0.00	Darnells
J360	7.96	0.00	0.00	0.00	0.00	Darnells
J362	7.96	0.00	0.00	0.00	0.00	Darnells
J364	9.73	0.00	0.00	0.00	0.00	Darnells
J366	1.77	0.00	0.00	0.00	0.00	Darnells
J368	0.00	0.00	1.70	0.00	0.00	Darnells
J370	1.77	0.00	0.00	0.00	0.00	Darnells
J372	6.19	0.00	0.00	0.00	0.00	Darnells
J374	12.38	0.00	0.00	0.00	0.00	Darnells



J376	0.68	0.00	0.00	8.70	0.00	Main
J378	6.08	9.19	0.00	0.00	0.00	Main
J38	0.00	0.00	0.00	0.00	0.00	Darnells
J-38	2.70	0.00	0.81	0.00	0.00	Main
J382	5.41	2.63	0.00	0.00	0.00	Main
J384	1.35	1.31	0.00	0.00	0.00	Main
J386	3.38	0.00	0.00	0.00	0.00	Main
J388	0.00	0.00	0.00	0.00	0.00	Main
J-39	0.00	0.00	0.00	0.00	0.00	Main
J390	1.35	2.63	0.81	0.00	0.00	Main
J392	2.03	0.00	0.00	0.00	0.00	Main
J394	2.70	0.00	0.00	0.00	0.00	Main
J396	1.35	0.00	0.00	0.00	0.00	Main
J40	0.00	0.00	0.00	0.00	0.00	Darnells
J-40	3.38	0.00	0.00	0.00	0.00	Main
J402	2.03	1.31	0.00	0.00	0.00	Main
J404	1.35	0.00	0.00	0.00	0.00	Main
J406	3.38	0.00	0.00	0.00	0.00	Main
J408	6.08	3.94	0.00	0.00	0.00	Main
J-41	0.68	0.00	0.00	0.00	0.00	Main
J410	0.00	0.00	0.00	0.00	0.00	Main
J412	0.00	0.00	3.24	0.00	0.00	Main
J414	3.38	0.00	0.00	0.00	0.00	Main
J416	2.03	0.00	0.00	0.00	0.00	Main
J418	5.41	5.25	0.00	0.00	0.00	Main
J42	6.19	0.00	0.00	0.00	0.00	Darnells
J-42	1.35	0.00	0.00	0.00	0.00	Main
J420	5.41	1.31	0.00	0.00	0.00	Main
J422	5.41	3.94	0.81	0.00	0.00	Main
J424	9.46	0.00	0.00	0.00	0.00	Main
J426	8.11	0.00	0.00	0.00	0.00	Main
J428	6.76	1.31	0.00	0.00	0.00	Main
J-43	0.00	0.00	0.00	0.00	0.00	Main
J430	1.35	1.31	0.00	0.00	0.00	Main
J432	5.41	0.00	0.00	0.00	0.00	Main
J434	8.11	0.00	0.00	0.00	0.00	Main
J436	6.76	1.31	0.81	0.00	0.00	Main
J438	6.08	5.25	1.62	0.00	0.00	Main
J44	3.54	0.00	1.70	0.00	0.00	Darnells
J-44	0.00	0.00	0.00	0.00	0.00	Main
J440	4.05	0.00	4.06	43.52	0.00	Main
J442	3.38	0.00	1.62	8.70	0.00	Main
J444	0.00	0.00	15.41	8.70	0.00	Main
J446	0.00	1.31	8.92	0.00	0.00	Main
J448	0.00	0.00	12.98	0.00	0.00	Main
J-45	0.00	0.00	0.81	0.00	0.00	Main
J450	0.00	0.00	12.17	0.00	0.00	Main
J452	4.05	1.31	2.43	0.00	0.00	Main
J454	1.35	1.31	4.06	0.00	7.24	Main
J456	4.05	0.00	4.06	0.00	0.00	Main
J458	6.76	1.31	0.81	0.00	0.00	Main
J46	0.00	0.00	0.00	0.00	0.00	Darnells
J-46	0.00	0.00	0.00	0.00	0.00	Main
J460	4.05	1.31	2.43	0.00	0.00	Main
J462	6.08	1.31	0.00	0.00	0.00	Main
J464	6.08	1.31	0.81	0.00	0.00	Main
J466	8.79	1.31	0.00	0.00	0.00	Main
J468	5.41	0.00	1.62	0.00	0.00	Main
J-47	0.68	0.00	3.24	0.00	0.00	Main
J470	3.38	0.00	4.87	0.00	0.00	Main

J472	5.41	3.94	0.81	0.00	0.00	Main
J474	2.70	0.00	0.00	0.00	0.00	Main
J476	6.08	3.94	0.00	0.00	0.00	Main
J478	8.79	1.31	0.00	0.00	0.00	Main
J48	3.54	0.00	0.00	0.00	0.00	Darnells
J-48	0.00	0.00	0.00	0.00	0.00	Main
J480	6.08	0.00	0.00	0.00	0.00	Main
J482	5.41	1.31	0.81	0.00	0.00	Main
J484	1.35	0.00	4.06	0.00	0.00	Main
J486	0.00	0.00	1.64	0.00	0.00	Washington
J488	2.70	0.00	3.24	0.00	0.00	Main
J-49	0.00	0.00	0.00	0.00	0.00	Main
J490	7.43	1.31	0.00	0.00	0.00	Main
J492	0.00	0.00	0.00	8.70	0.00	Main
J496	4.05	0.00	0.00	8.70	0.00	Main
J498	4.73	0.00	0.00	0.00	0.00	Main
J50	0.00	0.00	0.00	0.00	0.00	Darnells
J-50	0.00	0.00	0.00	0.00	0.00	Main
J500	0.00	0.00	0.00	0.00	0.00	Main
J502	0.00	0.00	0.00	0.00	0.00	Washington
J504	1.72	0.00	0.00	0.00	0.00	Washington
J506	0.74	0.00	0.00	0.00	0.00	Washington
J508	2.94	0.00	0.00	0.00	0.00	Washington
J-51	2.70	0.00	0.81	8.70	0.00	Main
J510	0.49	0.00	0.00	0.00	0.00	Washington
J512	0.49	0.00	0.00	0.00	0.00	Washington
J514	1.96	0.00	0.82	0.00	0.00	Washington
J518	0.25	0.00	0.82	0.00	0.00	Washington
J-52	2.70	0.00	0.81	0.00	0.00	Main
J520	0.25	0.00	0.82	0.00	0.00	Washington
J522	0.49	0.00	130.92	0.00	0.00	Washington
J524	0.98	0.00	0.82	0.00	0.00	Washington
J526	0.49	0.00	0.00	0.00	0.00	Washington
J528	0.74	0.00	0.82	0.00	0.00	Washington
J-53	3.38	1.31	0.00	0.00	0.00	Main
J530	0.49	0.00	1.64	0.00	0.00	Washington
J532	0.00	0.00	0.00	0.00	0.00	Washington
J534	1.96	0.00	0.00	0.00	0.00	Washington
J536	0.00	0.00	0.82	0.00	0.00	Washington
J-54	0.00	0.00	0.00	0.00	0.00	Main
J540	0.25	0.00	0.00	0.00	0.00	Washington
J542	0.49	0.00	0.82	0.00	0.00	Washington
J544	1.23	0.00	0.00	0.00	0.00	Washington
J546	0.00	0.00	0.00	0.00	0.00	Washington
J548	0.74	0.00	0.82	0.00	0.00	Washington
J-55	0.00	0.00	0.00	0.00	0.00	Main
J550	0.00	0.00	0.00	0.00	0.00	Washington
J552	1.47	0.00	0.00	0.00	0.00	Washington
J554	1.96	0.00	0.00	0.00	0.00	Washington
J556	0.74	0.00	0.82	0.00	0.00	Washington
J558	0.00	0.00	4.11	0.00	0.00	Washington
J-56	0.00	0.00	0.00	0.00	0.00	Main
J560	0.49	0.00	0.00	0.00	0.00	Washington
J562	0.00	0.00	0.00	0.00	0.00	Washington
J564	0.00	0.00	0.00	0.00	0.11	Washington
J566	0.00	0.00	0.00	0.00	0.00	Washington
J568	1.47	0.00	0.00	0.00	0.00	Washington
J-57	0.00	0.00	0.00	0.00	0.00	Main
J570	3.68	0.00	0.00	0.00	0.00	Washington
J572	2.45	0.00	0.00	0.00	0.00	Washington

J574	1.96	0.00	0.00	0.00	0.00	Washington
J576	1.96	0.00	0.00	0.00	0.00	Washington
J578	1.72	0.00	0.00	0.00	0.00	Washington
J-58	2.70	1.31	0.00	0.00	0.00	Main
J580	1.96	0.00	0.00	0.00	0.00	Washington
J582	2.21	0.00	0.00	0.00	0.00	Washington
J584	4.66	0.00	0.00	0.00	0.00	Washington
J586	1.23	0.00	0.00	0.00	0.00	Washington
J588	0.00	0.00	0.82	0.00	0.00	Washington
J-59	0.00	0.00	0.00	0.00	0.00	Main
J590	0.00	0.00	0.00	0.00	0.00	Washington
J592	0.00	0.00	0.82	0.00	0.00	Washington
J594	0.00	0.00	0.00	0.00	0.00	Washington
J596	0.25	0.00	0.00	0.00	0.00	Washington
J598	0.00	0.00	0.00	0.00	0.00	Washington
J-60	2.03	0.00	0.00	0.00	0.00	Main
J600	0.00	0.00	0.00	1.92	0.00	Washington
J602	0.00	0.00	0.00	0.00	0.00	Washington
J604	0.00	0.00	0.00	0.00	0.00	Washington
J606	0.49	0.00	0.00	0.00	0.00	Washington
J608	0.74	0.00	0.00	0.00	0.00	Washington
J-61	1.35	0.00	0.00	0.00	0.00	Main
J610	0.74	0.00	0.00	0.00	0.00	Washington
J612	0.74	0.00	0.00	0.00	0.00	washington
J614	0.25	0.00	0.00	0.00	0.00	Washington
J616	1.23	0.00	0.00	0.00	0.00	Washington
J618	0.49	0.00	0.00	0.00	0.00	Washington
J-62	2.70	0.00	0.00	0.00	0.00	Main
J620	0.49	0.00	0.00	0.00	0.00	Washington
J622	0.00	0.00	1.64	0.00	0.00	Washington
J624	0.74	0.00	0.82	0.00	0.00	Washington
J626	0.74	0.00	1.64	0.00	0.00	Washington
J628	7.43	0.00	0.00	0.00	0.00	Main
J-63	0.00	0.00	0.00	0.00	0.00	Main
J630	4.05	3.94	0.00	0.00	0.00	Main
J634	2.60	14.59	0.00	0.00	0.00	South Chelan
J636	0.00	0.00	0.00	0.00	0.00	South Chelan
J-64	5.41	1.31	0.00	0.00	0.00	Main
J642	0.00	4.69	6.18	0.00	0.00	South Chelan
J644	1.95	1.56	0.00	0.00	0.00	South Chelan
J646	1.95	1.56	0.00	0.00	0.00	South Chelan
J648	6.49	1.56	0.00	0.00	0.00	South Chelan
J650	4.54	1.56	0.00	0.00	0.00	South Chelan
J654	0.00	0.00	0.00	0.00	0.00	South Chelan
J656	0.68	0.00	0.00	8.70	0.00	Main
J658	0.00	0.00	0.00	0.00	0.00	Main
J-66	0.68	0.00	0.81	0.00	0.00	Main
J660	6.49	4.69	0.00	0.00	0.00	South Chelan
J662	0.65	0.00	0.00	0.00	0.00	South Chelan
J664	0.00	0.00	0.00	0.00	0.00	Main
J666	0.68	0.00	0.00	0.00	0.00	Main
J668	1.95	0.00	0.00	0.00	0.00	South Chelan
J-67	2.03	1.31	0.00	0.00	0.00	Main
J670	3.24	0.00	0.00	0.00	0.00	South Chelan
J672	5.19	0.00	0.00	0.00	0.00	South Chelan
J674	0.00	0.00	0.00	0.00	0.00	South Chelan
J676	0.68	1.31	0.00	8.70	0.00	Main
J-68	3.38	1.31	0.81	0.00	0.00	Main
J680	12.16	7.88	0.00	0.00	0.00	Main
J682	6.08	1.31	0.00	0.00	0.00	Main

J684	4.73	0.00	0.81	17.41	0.00	Main
J686	0.00	0.00	0.00	0.00	0.00	Main
J688	7.43	0.00	0.00	0.00	0.00	Main
J-69	0.00	1.31	0.00	0.00	0.00	Main
J690	1.35	0.00	0.00	0.00	0.00	Main
J692	0.00	0.00	0.00	0.00	0.00	Main
J694	2.03	5.25	0.00	0.00	0.00	Main
J696	1.35	0.00	24.35	0.00	0.00	Main
J698	1.35	0.00	0.00	0.00	0.00	Main
J-70	0.00	0.00	0.00	0.00	0.00	Main
J700	1.35	2.63	2.43	0.00	0.00	Main
J702	4.05	0.00	0.00	0.00	0.00	Main
J704	2.03	0.00	2.43	0.00	0.00	Main
J706	0.00	0.00	0.00	0.00	0.00	Main
J708	0.00	0.00	0.00	0.00	0.00	Lakeside
J-71	0.68	0.00	1.62	0.00	0.00	Main
J710	0.00	1.31	0.81	0.00	0.00	Main
J712	6.64	0.00	2.06	0.00	0.00	Lakeside
J714	1.48	0.26	0.00	0.00	0.00	Lakeside
J716	7.38	0.00	0.00	0.00	0.00	Lakeside
J-72	0.00	0.00	0.00	8.70	0.00	Main
J720	0.00	36.81	8.25	0.00	0.00	Lakeside
J722	5.17	0.00	0.00	0.00	0.00	Lakeside
J724	4.43	0.00	0.00	0.00	0.00	Lakeside
J726	2.70	0.00	0.00	0.00	0.00	Main
J728	0.00	0.00	0.00	0.00	0.00	Main
J-73	0.00	0.00	0.81	0.00	0.00	Main
J730	0.00	0.00	0.00	0.00	0.00	Darnells
J732	0.00	0.00	0.00	0.00	0.00	Darnells
J736	0.00	0.00	0.00	0.00	0.00	Boyd
J738	0.00	0.00	0.00	0.00	0.00	Darnells
J-74	0.68	0.00	0.00	0.00	0.00	Main
J740	0.00	0.00	0.00	0.00	0.00	Darnells
J742	0.00	0.00	0.00	0.00	0.00	Darnells
J744	0.00	0.00	0.00	0.00	0.00	Darnells
J746	0.00	0.00	0.00	0.00	0.00	Darnells
J748	0.00	0.00	0.00	0.00	0.00	Darnells
J-75	0.68	0.00	0.00	0.00	0.00	Main
J750	0.00	0.00	0.00	0.00	0.00	Darnells
J-76	0.00	0.00	0.00	0.00	0.00	Main
J-77	6.08	0.00	0.00	0.00	0.00	Main
J-78	4.73	0.00	0.00	0.00	0.00	Main
J-79	2.03	0.00	0.81	0.00	0.00	Main
J80	0.68	2.63	0.00	0.00	0.00	Main
J-80	4.05	0.00	0.81	0.00	0.00	Main
J-81	2.70	0.00	1.62	0.00	0.00	Main
J-82	6.76	1.31	3.24	0.00	0.00	Main
J-85	4.05	0.00	0.00	0.00	0.00	Main
J-86	4.73	1.31	0.00	0.00	0.00	Main
J-87	3.38	3.94	0.00	0.00	0.00	Main
J-88	2.03	1.31	0.00	0.00	0.00	Main
J-89	0.68	0.00	0.00	0.00	0.00	Main
J-90	0.00	0.00	0.00	0.00	0.00	Main
J-91	0.00	0.00	0.00	8.70	0.00	Main
J-92	3.38	2.63	0.00	0.00	0.00	Main
J-93	3.38	1.31	4.87	0.00	0.00	Main
J-94	5.90	0.00	2.06	0.00	0.00	Lakeside
J-95	4.43	0.26	2.06	0.91	0.00	Lakeside
J-96	4.43	0.00	0.00	0.00	0.00	Lakeside
J-97	6.64	0.26	0.00	0.00	0.00	Lakeside

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J-98	8.12		0.00		4.13		0.00		0.00	Lakeside
J-99	3.69	—	0.26	—	0.00	—	0.00	—	0.00	Lakeside

ID (Char)	Demand 1 (gpm)	Demand 2 (gpm)	Demand 3 (gpm)	Demand 4 (gpm)	Demand 5 (gpm)	ZONE
J-100	0.00	0.00	0.00	0.00	0.00	Lakeside
J-102	10.64	0.00	0.00	17.41	0.00	Main
J-103	0.00	0.00	0.00	0.00	0.00	Main
J-107	7.66	0.00	0.00	0.00	0.00	South Chelan
J-108	11.49	0.00	0.00	0.00	0.00	South Chelan
J-109	15.32	0.00	0.00	0.00	0.00	South Chelan
J-110	15.32	0.00	0.00	0.00	0.00	South Chelan
J-111	8.93	0.00	0.00	0.00	0.00	South Chelan
J112	0.00	0.00	0.00	0.00	0.00	Darnells
J-112	10.21	9.37	0.00	0.00	0.00	South Chelan
J114	0.00	0.00	0.00	0.00	0.00	Darnells
J116	0.00	0.00	0.00	0.00	0.00	Darnells
J-116	0.00	0.00	0.00	0.00	0.00	South Chelan
J118	10.44	0.00	0.00	0.00	0.00	Darnells
J-118	2.66	2.63	0.00	0.00	7.24	Main
J-119	3.99	0.00	0.00	0.00	0.00	Main
J-12	1.33	0.00	1.62	0.00	0.00	Main
J120	15.66	0.00	0.00	0.00	0.00	Darnells
J-120	0.00	0.00	0.00	0.00	0.00	Main
J-121	2.66	0.00	1.62	0.00	0.00	Main
J122	6.96	0.00	0.00	0.00	0.00	Darnells
J-122	2.66	0.00	0.00	0.00	0.00	Main
J-123	1.33	0.00	0.00	0.00	0.00	Main
J124	0.00	0.00	0.00	0.00	0.00	Darnells
J-124	8.71	0.00	0.00	0.00	0.00	Lakeside
J-125	2.90	0.00	0.00	0.00	0.00	Lakeside
J126	3.48	0.00	0.00	0.00	0.00	Darnells
J-127	0.00	0.00	0.00	0.00	0.00	Lakeside
J128	0.00	0.00	0.00	0.00	0.00	Darnells
J-128	15.97	0.00	0.00	0.00	0.00	Lakeside
J-129	15.97	0.52	0.00	0.00	0.00	Lakeside
J-13	1.33	0.00	3.24	0.00	0.00	Main
J130	0.00	0.00	0.00	0.00	0.00	Darnells
J-130	0.00	0.00	0.00	0.00	0.00	Main
J-131	2.66	0.00	1.62	0.00	0.00	Main
J132	0.00	0.00	0.00	0.00	0.00	Darnells
J-132	7.98	0.00	1.62	0.00	0.00	Main
J134	12.18	0.00	0.00	0.00	0.00	Darnells
J-134	0.00	0.00	0.00	0.00	0.00	Darnells
J-135	0.00	0.00	0.00	0.00	0.00	Darnells
J136	19.14	0.00	0.00	0.00	0.00	Darnells
J-136	0.00	0.00	0.00	0.00	0.00	Darnells
J138	24.36	0.00	0.00	0.00	0.00	Darnells
J-14	0.00	0.00	3.24	0.00	0.00	Main
J140	0.00	0.00	0.00	0.00	0.00	Darnells
J-140	3.48	0.00	0.00	0.00	0.00	Darnells
J-141	12.18	0.00	0.00	0.00	0.00	Darnells
J142	10.44	0.00	0.00	0.00	0.00	Darnells
J-142	13.92	0.00	0.00	0.00	0.00	Darnells
J-143	13.92	0.00	0.00	0.00	0.00	Darnells
J144	6.96	0.00	0.00	0.00	0.00	Darnells
J146	8.70	0.00	0.00	0.00	0.00	Darnells
J-146	0.00	0.00	0.00	0.00	0.00	Boyd
J-147	1.52	0.00	0.00	0.00	0.00	Boyd
J148	3.48	0.00	0.00	0.00	0.00	Darnells
J-15	0.00	0.00	0.00	0.00	0.00	Main
J150	15.66	0.00	0.00	0.00	0.00	Darnells
J-150	0.00	0.00	0.00	0.00	0.00	Darnells
J-151	15.18	0.00	0.00	0.00	0.00	Boyd

J152	0.00	4.21	0.00	0.00	0.00	Darnells
J-152	10.44	0.00	0.00	0.00	0.00	Darnells
J-153	5.22	0.00	0.00	0.00	0.00	Darnells
J154	0.00	10.53	0.00	0.00	0.00	Darnells
J-154	24.36	0.00	0.00	0.00	0.00	Darnells
J-155	24.36	0.00	0.00	0.00	0.00	Darnells
J156	0.00	0.00	0.00	0.00	0.00	Darnells
J158	5.22	0.00	0.00	0.00	0.00	Darnells
J-158	3.48	0.00	0.00	0.00	0.00	Darnells
J-159	0.00	0.00	0.00	0.00	0.00	Darnells
J-16	1.33	0.00	1.62	0.00	0.00	Main
J160	13.92	0.00	0.00	0.00	0.00	Darnells
J-160	1.74	0.00	0.00	0.00	0.00	Darnells
J-161	6.96	0.00	0.00	0.00	0.00	Darnells
J162	0.00	0.00	0.00	0.00	0.00	Darnells
J-162	15.66	0.00	0.00	0.00	0.00	Darnells
J-163	19.14	0.00	0.00	0.00	0.00	Darnells
J164	0.00	0.00	0.00	0.00	0.00	Darnells
J-164	29.58	0.00	0.00	0.00	0.00	Darnells
J-165	15.66	0.00	0.00	0.00	0.00	Darnells
J166	5.22	0.00	0.00	0.00	0.00	Darnells
J168	5.22	0.00	0.00	0.00	0.00	Darnells
J-169	5.22	0.00	0.00	0.00	0.00	Darnells
J-17	0.00	0.00	1.62	0.00	0.00	Main
J170	6.96	0.00	3.39	0.00	0.00	Darnells
J-170	3.48	0.00	0.00	0.00	0.00	Darnells
J-171	1.74	0.00	0.00	0.00	0.00	Darnells
J172	5.22	0.00	0.00	0.00	0.00	Darnells
J-172	0.00	0.00	0.00	0.00	0.00	Darnells
J-173	0.00	0.00	0.00	0.00	0.00	Darnells
J174	17.40	0.00	0.00	0.00	0.00	Darnells
J-175	0.00	0.00	0.00	0.00	0.00	Darnells
J176	10.44	0.00	0.00	0.00	0.00	Darnells
J-176	6.96	2.11	0.00	0.00	0.00	Darnells
J178	1.74	0.00	0.00	0.00	0.00	Darnells
J-178	0.00	0.00	0.00	0.00	0.00	Darnells
J-179	0.00	0.00	6.49	17.41	0.00	Main
J-18	1.33	0.00	1.62	0.00	7.24	Main
J-180	0.00	0.00	0.00	0.00	0.00	Main
J-181	2.66	7.88	1.62	17.41	0.00	Main
J182	8.70	0.00	0.00	0.00	0.00	Darnells
J-182	3.99	0.00	3.24	0.00	0.00	Main
J-183	7.98	2.63	0.00	0.00	0.00	Main
J184	3.48	0.00	0.00	0.00	0.00	Darnells
J-184	13.30	0.00	0.00	0.00	0.00	Main
J-185	3.99	0.00	0.00	0.00	0.00	Main
J186	3.48	0.00	0.00	0.00	0.00	Darnells
J-186	0.00	0.00	0.00	17.41	0.00	Main
J-187	0.00	0.00	0.00	0.00	0.00	Main
J188	6.96	0.00	0.00	0.00	0.00	Darnells
J-188	3.99	0.00	0.00	0.00	0.00	Main
J-189	5.32	0.00	1.62	0.00	0.00	Main
J-19	0.00	2.63	0.00	0.00	14.49	Main
J190	0.00	0.00	3.39	0.00	0.00	Darnells
J-190	2.66	0.00	6.49	0.00	0.00	Main
J-191	0.00	0.00	0.00	0.00	0.00	Main
J192	0.00	0.00	0.00	0.00	0.00	Darnells
J-192	0.00	0.00	0.00	0.00	0.00	Main
J194	6.96	0.00	0.00	0.00	0.00	Darnells
J196	6.96	0.00	0.00	0.00	0.00	Darnells

J-196	3.99	0.00	0.00	0.00	0.00	Main
J-197	1.33	0.00	0.00	0.00	0.00	Main
J198	0.00	0.00	0.00	0.00	0.00	Darnells
J20	19.14	0.00	0.00	0.00	0.00	Darnells
J-20	0.00	0.00	3.24	0.00	0.00	Main
J200	0.00	0.00	0.00	0.00	0.00	Darnells
J-200	10.64	2.63	0.00	0.00	0.00	Main
J202	5.22	0.00	0.00	0.00	0.00	Darnells
J-202	2.66	0.00	0.00	0.00	0.00	Main
J204	3.48	0.00	0.00	0.00	0.00	Darnells
J-205	0.00	0.00	0.00	0.00	0.00	Darnells
J206	0.00	0.00	0.00	0.00	0.00	Boyd
J-206	0.00	0.00	0.00	0.00	0.00	Darnells
J-207	1.74	0.00	0.00	0.00	0.00	Darnells
J208	12.15	0.00	0.00	0.00	0.00	Boyd
J-208	5.22	0.00	0.00	2.03	0.00	Darnells
J-209	12.18	0.00	0.00	0.00	0.00	Darnells
J-21	0.00	0.00	0.00	0.00	0.00	Main
J210	6.07	0.00	0.00	0.00	0.00	Boyd
J-210	5.22	0.00	0.00	0.00	0.00	Darnells
J-211	8.70	0.00	0.00	0.00	0.00	Darnells
J212	0.00	0.00	0.00	0.00	0.00	Boyd
J-212	5.22	0.00	0.00	0.00	0.00	Darnells
J214	3.48	0.00	0.00	0.00	0.00	Darnells
J218	5.22	0.00	0.00	0.00	0.00	Darnells
J-218	0.00	8.42	0.00	0.00	0.00	Darnells
J-219	0.00	0.00	0.00	0.00	0.00	Darnells
J-22	0.00	0.00	6.49	0.00	0.00	Main
J220	0.00	0.00	0.00	0.00	0.00	Boyd
J-220	7.26	0.00	0.00	0.00	0.00	Lakeside
J222	4.55	0.00	0.00	0.00	0.00	Boyd
J-223	1.74	0.00	0.00	0.00	0.00	Darnells
J224	12.15	0.00	0.00	0.00	0.00	Boyd
J-224	5.22	0.00	0.00	0.00	0.00	Darnells
J-225	10.08	0.00	0.00	0.00	0.00	Golf Course
J226	0.00	0.00	0.00	0.00	0.00	Boyd
J228	4.55	0.00	0.00	0.00	0.00	Boyd
J-228	5.32	0.00	0.00	0.00	0.00	Main
J-229	0.00	0.00	0.00	0.00	0.00	Main
J-23	0.00	0.00	0.00	0.00	0.00	Main
J230	0.00	0.00	0.00	0.00	0.00	Boyd
J-230	6.65	0.00	0.00	0.00	0.00	Main
J232	4.55	0.00	0.00	0.00	0.00	Boyd
J-233	0.00	0.00	0.00	0.00	0.00	Darnells
J234	10.63	0.00	0.00	0.00	0.00	Boyd
J-235	3.48	0.00	3.39	0.00	0.00	Darnells
J236	10.63	0.00	0.00	0.00	0.00	Boyd
J-237	0.00	0.00	0.00	0.00	0.00	Darnells
J238	0.00	0.00	0.00	0.00	0.00	Boyd
J-238	0.00	0.00	0.00	0.00	0.00	Darnells
J-239	0.00	8.42	0.00	0.00	0.00	Darnells
J-24	0.00	0.00	3.24	0.00	0.00	Main
J240	13.92	0.00	0.00	0.00	0.00	Darnells
J-240	0.00	8.42	0.00	0.00	0.00	Darnells
J-241	0.00	12.64	0.00	0.00	0.00	Darnells
J242	22.62	0.00	0.00	0.00	0.00	Darnells
J-242	0.00	0.00	0.00	0.00	0.00	Darnells
J-243	8.70	0.00	0.00	0.00	0.00	Darnells
J244	6.96	0.00	0.00	0.00	0.00	Darnells
J-244	2.66	0.00	0.00	0.00	0.00	Main



J-245	0.00	0.00	0.00	0.00	0.00	Main
J246	0.00	0.00	0.00	0.00	0.00	Darnells
J-246	6.05	0.00	0.00	0.00	0.00	Golf Course
J248	0.00	0.00	0.00	0.00	0.00	Darnells
J-25	0.00	0.00	260.45	0.00	0.00	Main
J250	17.40	0.00	0.00	0.00	0.00	Darnells
J252	10.44	0.00	0.00	0.00	0.00	Darnells
J-253	0.00	0.00	0.00	0.00	0.00	Main
J254	15.66	0.00	0.00	0.00	0.00	Darnells
J256	6.96	0.00	0.00	0.00	0.00	Darnells
J-256	2.66	0.00	0.00	0.00	0.00	Main
J-257	0.00	0.00	3.39	0.00	0.00	Darnells
J258	5.22	0.00	0.00	0.00	0.00	Darnells
J-258	8.70	0.00	0.00	0.00	0.00	Darnells
J-259	10.44	0.00	0.00	0.00	0.00	Darnells
J-26	0.00	0.00	3.24	0.00	0.00	Main
J260	8.70	0.00	0.00	0.00	0.00	Darnells
J-260	10.63	0.00	0.00	0.00	0.00	Boyd
J262	6.96	0.00	0.00	0.00	0.00	Darnells
J264	0.00	0.00	0.00	0.00	0.00	Darnells
J-264	0.00	0.00	0.00	0.00	0.00	Boyd
J266	0.00	0.00	0.00	0.00	0.00	Darnells
J268	3.48	0.00	0.00	0.00	0.00	Darnells
J-268	0.00	0.00	0.00	0.00	0.00	Boyd
J-269	0.00	0.00	0.00	0.00	0.00	Boyd
J-27	2.66	2.63	4.87	17.41	0.00	Main
J270	8.70	0.00	0.00	0.00	0.00	Darnells
J272	10.44	0.00	0.00	0.00	0.00	Darnells
J274	0.00	0.00	0.00	0.00	0.00	Darnells
J-274	6.65	2.63	0.00	0.00	0.00	Main
J278	3.48	0.00	0.00	0.00	0.00	Darnells
J-278	5.32	10.50	0.00	0.00	0.00	Main
J-28	1.33	0.00	0.00	17.41	0.00	Main
J280	0.00	0.00	0.00	0.00	0.00	Darnells
J-280	6.96	0.00	0.00	0.00	0.00	Darnells
J-281	5.22	0.00	0.00	0.00	0.00	Darnells
J282	0.00	0.00	0.00	0.00	0.00	Darnells
J-282	12.18	0.00	0.00	0.00	0.00	Darnells
J-283	4.55	0.00	0.00	0.00	0.00	Boyd
J284	0.00	0.00	0.00	0.00	0.00	Golf Course
J-284	0.00	0.00	0.00	0.00	0.00	Darnells
J-285	0.00	0.00	0.00	0.00	0.00	Darnells
J286	0.00	0.00	0.00	0.00	0.00	Golf Course
J-286	6.07	0.00	0.00	0.00	0.00	Boyd
J-287	15.66	0.00	0.00	0.00	0.00	Darnells
J288	19.14	0.00	0.00	0.00	0.00	Darnells
J-288	2.90	0.26	0.00	0.00	0.00	Lakeside
J-289	0.00	0.00	0.00	0.00	0.00	Main
J-29	1.33	0.00	0.00	0.00	0.00	Main
J290	13.92	0.00	0.00	0.00	0.00	Darnells
J-290	0.00	0.00	0.00	1.82	0.00	Lakeside
J292	3.48	2.11	0.00	0.00	0.00	Darnells
J294	10.08	0.00	0.00	0.00	0.00	Golf Course
J-295	7.26	0.00	0.00	0.00	0.00	Lakeside
J296	4.55	0.00	0.00	0.00	0.00	Boyd
J-297	19.14	0.00	0.00	0.00	0.00	Darnells
J298	13.66	0.00	0.00	0.00	0.00	Boyd
J-298	19.14	0.00	3.39	0.00	0.00	Darnells
J30	3.48	0.00	0.00	0.00	0.00	Darnells
J-30	0.00	0.00	0.00	0.00	0.00	Main

J300	6.07	0.00	0.00	0.00	0.00	Boyd
J302	10.44	0.00	0.00	0.00	0.00	Darnells
J-302	0.00	0.00	0.00	0.00	0.00	Darnells
J-303	0.00	0.00	0.00	0.00	0.00	Darnells
J304	10.44	0.00	0.00	0.00	0.00	Darnells
J-304	8.07	0.00	0.00	0.00	0.00	Golf Course
J-305	4.03	0.00	0.00	0.00	0.00	golf Course
J306	3.48	0.00	0.00	0.00	0.00	Darnells
J-307	0.00	0.00	0.00	0.00	0.00	Darnells
J308	0.00	0.00	0.00	0.00	0.00	Darnells
J-309	0.00	0.00	0.00	0.00	0.00	Main
J-31	7.98	0.00	0.00	0.00	0.00	Main
J310	0.00	0.00	0.00	0.00	0.00	Darnells
J-310	0.00	0.00	0.00	0.00	0.00	Main
J-311	0.00	0.00	57.20	0.00	0.00	Main
J312	0.00	0.00	0.00	0.00	0.00	Darnells
J-312	1.33	0.00	4.87	0.00	0.00	Main
J-313	1.33	0.00	1.62	0.00	0.00	Main
J314	8.70	0.00	0.00	0.00	0.00	Darnells
J-314	0.00	0.00	9.73	0.00	0.00	Main
J316	0.00	0.00	0.00	0.00	0.00	Darnells
J318	1.74	10.53	0.00	0.00	0.00	Darnells
J-319	0.00	0.00	0.00	0.00	0.00	Main
J-32	19.94	2.63	0.00	0.00	0.00	Main
J320	0.00	0.00	0.00	0.00	0.00	Main
J-321	0.00	0.00	0.00	0.00	0.00	Darnells
J324	0.00	0.00	0.00	0.00	0.00	Darnells
J-325	0.00	0.00	0.00	34.81	0.00	Main
J326	0.00	0.00	0.00	0.00	0.00	Main
J328	0.00	0.00	1.62	0.00	0.00	Main
J330	2.66	0.00	0.00	0.00	0.00	Main
J332	1.33	7.88	0.00	17.41	0.00	Main
J334	11.97	2.63	0.00	0.00	0.00	Main
J-335	1.28	0.00	0.00	0.00	0.00	South Chelan
J336	0.00	0.00	3.39	0.00	0.00	Darnells
J338	3.48	0.00	0.00	0.00	0.00	Darnells
J-34	7.98	0.00	0.00	0.00	0.00	Main
J340	5.22	0.00	0.00	0.00	0.00	Darnells
J-340	8.70	0.00	0.00	0.00	0.00	Darnells
J-341	0.00	0.00	0.00	0.00	0.00	Darnells
J342	3.48	0.00	3.39	0.00	0.00	Darnells
J-342	8.70	0.00	0.00	0.00	0.00	Darnells
J344	1.74	0.00	0.00	0.00	0.00	Darnells
J-345	0.00	0.00	0.00	0.00	0.00	Darnells
J346	12.18	0.00	0.00	0.00	0.00	Darnells
J348	17.40	0.00	0.00	0.00	0.00	Darnells
J350	0.00	0.00	0.00	0.00	0.00	Darnells
J352	0.00	0.00	0.00	0.00	0.00	Darnells
J354	0.00	0.00	0.00	0.00	0.00	Darnells
J356	3.48	0.00	0.00	0.00	0.00	Darnells
J358	19.14	0.00	0.00	0.00	0.00	Darnells
J36	0.00	0.00	0.00	0.00	0.00	Darnells
J360	15.66	0.00	0.00	0.00	0.00	Darnells
J362	15.66	0.00	0.00	0.00	0.00	Darnells
J364	19.14	0.00	0.00	0.00	0.00	Darnells
J366	3.48	0.00	0.00	0.00	0.00	Darnells
J368	0.00	0.00	3.39	0.00	0.00	Darnells
J370	3.48	0.00	0.00	0.00	0.00	Darnells
J372	12.18	0.00	0.00	0.00	0.00	Darnells
J374	24.36	0.00	0.00	0.00	0.00	Darnells

J376	1.33	0.00	0.00	17.41	0.00	Main
J378	11.97	18.38	0.00	0.00	0.00	Main
J38	0.00	0.00	0.00	0.00	0.00	Darnells
J-38	5.32	0.00	1.62	0.00	0.00	Main
J382	10.64	5.25	0.00	0.00	0.00	Main
J384	2.66	2.63	0.00	0.00	0.00	Main
J386	6.65	0.00	0.00	0.00	0.00	Main
J388	0.00	0.00	0.00	0.00	0.00	Main
J-39	0.00	0.00	0.00	0.00	0.00	Main
J390	2.66	5.25	1.62	0.00	0.00	Main
J392	3.99	0.00	0.00	0.00	0.00	Main
J394	5.32	0.00	0.00	0.00	0.00	Main
J396	2.66	0.00	0.00	0.00	0.00	Main
J40	0.00	0.00	0.00	0.00	0.00	Darnells
J-40	6.65	0.00	0.00	0.00	0.00	Main
J402	3.99	2.63	0.00	0.00	0.00	Main
J404	2.66	0.00	0.00	0.00	0.00	Main
J406	6.65	0.00	0.00	0.00	0.00	Main
J408	11.97	7.88	0.00	0.00	0.00	Main
J-41	1.33	0.00	0.00	0.00	0.00	Main
J410	0.00	0.00	0.00	0.00	0.00	Main
J412	0.00	0.00	6.49	0.00	0.00	Main
J414	6.65	0.00	0.00	0.00	0.00	Main
J416	3.99	0.00	0.00	0.00	0.00	Main
J418	10.64	10.50	0.00	0.00	0.00	Main
J42	12.18	0.00	0.00	0.00	0.00	Darnells
J-42	2.66	0.00	0.00	0.00	0.00	Main
J420	10.64	2.63	0.00	0.00	0.00	Main
J422	10.64	7.88	1.62	0.00	0.00	Main
J424	18.61	0.00	0.00	0.00	0.00	Main
J426	15.95	0.00	0.00	0.00	0.00	Main
J428	13.30	2.63	0.00	0.00	0.00	Main
J-43	0.00	0.00	0.00	0.00	0.00	Main
J430	2.66	2.63	0.00	0.00	0.00	Main
J432	10.64	0.00	0.00	0.00	0.00	Main
J434	15.95	0.00	0.00	0.00	0.00	Main
J436	13.30	2.63	1.62	0.00	0.00	Main
J438	11.97	10.50	3.24	0.00	0.00	Main
J44	6.96	0.00	3.39	0.00	0.00	Darnells
J-44	0.00	0.00	0.00	0.00	0.00	Main
J440	7.98	0.00	8.11	87.04	0.00	Main
J442	6.65	0.00	3.24	17.41	0.00	Main
J444	0.00	0.00	30.82	17.41	0.00	Main
J446	0.00	2.63	17.84	0.00	0.00	Main
J448	0.00	0.00	25.95	0.00	0.00	Main
J-45	0.00	0.00	1.62	0.00	0.00	Main
J450	0.00	0.00	24.33	0.00	0.00	Main
J452	7.98	2.63	4.87	0.00	0.00	Main
J454	2.66	2.63	8.11	0.00	14.49	Main
J456	7.98	0.00	8.11	0.00	0.00	Main
J458	13.30	2.63	1.62	0.00	0.00	Main
J46	0.00	0.00	0.00	0.00	0.00	Darnells
J-46	0.00	0.00	0.00	0.00	0.00	Main
J460	7.98	2.63	4.87	0.00	0.00	Main
J462	11.97	2.63	0.00	0.00	0.00	Main
J464	11.97	2.63	1.62	0.00	0.00	Main
J466	17.28	2.63	0.00	0.00	0.00	Main
J468	10.64	0.00	3.24	0.00	0.00	Main
J-47	1.33	0.00	6.49	0.00	0.00	Main
J470	6.65	0.00	9.73	0.00	0.00	Main

J472	10.64	7.88	1.62	0.00	0.00	Main
J474	5.32	0.00	0.00	0.00	0.00	Main
J476	11.97	7.88	0.00	0.00	0.00	Main
J478	17.28	2.63	0.00	0.00	0.00	Main
J48	6.96	0.00	0.00	0.00	0.00	Darnells
J-48	0.00	0.00	0.00	0.00	0.00	Main
J480	11.97	0.00	0.00	0.00	0.00	Main
J482	10.64	2.63	1.62	0.00	0.00	Main
J484	2.66	0.00	8.11	0.00	0.00	Main
J486	0.00	0.00	3.28	0.00	0.00	Washington
J488	5.32	0.00	6.49	0.00	0.00	Main
J-49	0.00	0.00	0.00	0.00	0.00	Main
J490	14.63	2.63	0.00	0.00	0.00	Main
J492	0.00	0.00	0.00	17.41	0.00	Main
J496	7.98	0.00	0.00	17.41	0.00	Main
J498	9.31	0.00	0.00	0.00	0.00	Main
J50	0.00	0.00	0.00	0.00	0.00	Darnells
J-50	0.00	0.00	0.00	0.00	0.00	Main
J500	0.00	0.00	0.00	0.00	0.00	Main
J502	0.00	0.00	0.00	0.00	0.00	Washington
J504	3.38	0.00	0.00	0.00	0.00	Washington
J506	1.45	0.00	0.00	0.00	0.00	Washington
J508	5.79	0.00	0.00	0.00	0.00	Washington
J-51	5.32	0.00	1.62	17.41	0.00	Main
J510	0.96	0.00	0.00	0.00	0.00	Washington
J512	0.96	0.00	0.00	0.00	0.00	Washington
J514	3.86	0.00	1.64	0.00	0.00	Washington
J518	0.48	0.00	1.64	0.00	0.00	Washington
J-52	5.32	0.00	1.62	0.00	0.00	Main
J520	0.48	0.00	1.64	0.00	0.00	Washington
J522	0.96	0.00	261.85	0.00	0.00	Washington
J524	1.93	0.00	1.64	0.00	0.00	Washington
J526	0.96	0.00	0.00	0.00	0.00	Washington
J528	1.45	0.00	1.64	0.00	0.00	Washington
J-53	6.65	2.63	0.00	0.00	0.00	Main
J530	0.96	0.00	3.28	0.00	0.00	Washington
J532	0.00	0.00	0.00	0.00	0.00	Washington
J534	3.86	0.00	0.00	0.00	0.00	Washington
J536	0.00	0.00	1.64	0.00	0.00	Washington
J-54	0.00	0.00	0.00	0.00	0.00	Main
J540	0.48	0.00	0.00	0.00	0.00	Washington
J542	0.96	0.00	1.64	0.00	0.00	Washington
J544	2.41	0.00	0.00	0.00	0.00	Washington
J546	0.00	0.00	0.00	0.00	0.00	Washington
J548	1.45	0.00	1.64	0.00	0.00	Washington
J-55	0.00	0.00	0.00	0.00	0.00	Main
J550	0.00	0.00	0.00	0.00	0.00	Washington
J552	2.89	0.00	0.00	0.00	0.00	Washington
J554	3.86	0.00	0.00	0.00	0.00	Washington
J556	1.45	0.00	1.64	0.00	0.00	Washington
J558	0.00	0.00	8.21	0.00	0.00	Washington
J-56	0.00	0.00	0.00	0.00	0.00	Main
J560	0.96	0.00	0.00	0.00	0.00	Washington
J562	0.00	0.00	0.00	0.00	0.00	Washington
J564	0.00	0.00	0.00	0.00	0.23	Washington
J566	0.00	0.00	0.00	0.00	0.00	Washington
J568	2.89	0.00	0.00	0.00	0.00	Washington
J-57	0.00	0.00	0.00	0.00	0.00	Main
J570	7.24	0.00	0.00	0.00	0.00	Washington
J572	4.82	0.00	0.00	0.00	0.00	Washington

J574	3.86	0.00	0.00	0.00	0.00	Washington
J576	3.86	0.00	0.00	0.00	0.00	Washington
J578	3.38	0.00	0.00	0.00	0.00	Washington
J-58	5.32	2.63	0.00	0.00	0.00	Main
J580	3.86	0.00	0.00	0.00	0.00	Washington
J582	4.34	0.00	0.00	0.00	0.00	Washington
J584	9.16	0.00	0.00	0.00	0.00	Washington
J586	2.41	0.00	0.00	0.00	0.00	Washington
J588	0.00	0.00	1.64	0.00	0.00	Washington
J-59	0.00	0.00	0.00	0.00	0.00	Main
J590	0.00	0.00	0.00	0.00	0.00	Washington
J592	0.00	0.00	1.64	0.00	0.00	Washington
J594	0.00	0.00	0.00	0.00	0.00	Washington
J596	0.48	0.00	0.00	0.00	0.00	Washington
J598	0.00	0.00	0.00	0.00	0.00	Washington
J-60	3.99	0.00	0.00	0.00	0.00	Main
J600	0.00	0.00	0.00	3.85	0.00	Washington
J602	0.00	0.00	0.00	0.00	0.00	Washington
J604	0.00	0.00	0.00	0.00	0.00	Washington
J606	0.96	0.00	0.00	0.00	0.00	Washington
J608	1.45	0.00	0.00	0.00	0.00	Washington
J-61	2.66	0.00	0.00	0.00	0.00	Main
J610	1.45	0.00	0.00	0.00	0.00	Washington
J612	1.45	0.00	0.00	0.00	0.00	washington
J614	0.48	0.00	0.00	0.00	0.00	Washington
J616	2.41	0.00	0.00	0.00	0.00	Washington
J618	0.96	0.00	0.00	0.00	0.00	Washington
J-62	5.32	0.00	0.00	0.00	0.00	Main
J620	0.96	0.00	0.00	0.00	0.00	Washington
J622	0.00	0.00	3.28	0.00	0.00	Washington
J624	1.45	0.00	1.64	0.00	0.00	Washington
J626	1.45	0.00	3.28	0.00	0.00	Washington
J628	14.63	0.00	0.00	0.00	0.00	Main
J-63	0.00	0.00	0.00	0.00	0.00	Main
J630	7.98	7.88	0.00	0.00	0.00	Main
J634	5.11	29.18	0.00	0.00	0.00	South Chelan
J636	0.00	0.00	0.00	0.00	0.00	South Chelan
J-64	10.64	2.63	0.00	0.00	0.00	Main
J642	0.00	9.37	12.36	0.00	0.00	South Chelan
J644	3.83	3.12	0.00	0.00	0.00	South Chelan
J646	3.83	3.12	0.00	0.00	0.00	South Chelan
J648	12.76	3.12	0.00	0.00	0.00	South Chelan
J650	8.93	3.12	0.00	0.00	0.00	South Chelan
J654	0.00	0.00	0.00	0.00	0.00	South Chelan
J656	1.33	0.00	0.00	17.41	0.00	Main
J658	0.00	0.00	0.00	0.00	0.00	Main
J-66	1.33	0.00	1.62	0.00	0.00	Main
J660	12.76	9.37	0.00	0.00	0.00	South Chelan
J662	1.28	0.00	0.00	0.00	0.00	South Chelan
J664	0.00	0.00	0.00	0.00	0.00	Main
J666	1.33	0.00	0.00	0.00	0.00	Main
J668	3.83	0.00	0.00	0.00	0.00	South Chelan
J-67	3.99	2.63	0.00	0.00	0.00	Main
J670	6.38	0.00	0.00	0.00	0.00	South Chelan
J672	10.21	0.00	0.00	0.00	0.00	South Chelan
J674	0.00	0.00	0.00	0.00	0.00	South Chelan
J676	1.33	2.63	0.00	17.41	0.00	Main
J-68	6.65	2.63	1.62	0.00	0.00	Main
J680	23.93	15.75	0.00	0.00	0.00	Main
J682	11.97	2.63	0.00	0.00	0.00	Main

J684	9.31	0.00	1.62	34.81	0.00	Main
J686	0.00	0.00	0.00	0.00	0.00	Main
J688	14.63	0.00	0.00	0.00	0.00	Main
J-69	0.00	2.63	0.00	0.00	0.00	Main
J690	2.66	0.00	0.00	0.00	0.00	Main
J692	0.00	0.00	0.00	0.00	0.00	Main
J694	3.99	10.50	0.00	0.00	0.00	Main
J696	2.66	0.00	48.70	0.00	0.00	Main
J698	2.66	0.00	0.00	0.00	0.00	Main
J-70	0.00	0.00	0.00	0.00	0.00	Main
J700	2.66	5.25	4.87	0.00	0.00	Main
J702	7.98	0.00	0.00	0.00	0.00	Main
J704	3.99	0.00	4.87	0.00	0.00	Main
J706	0.00	0.00	0.00	0.00	0.00	Main
J708	0.00	0.00	0.00	0.00	0.00	Lakeside
J-71	1.33	0.00	3.24	0.00	0.00	Main
J710	0.00	2.63	1.62	0.00	0.00	Main
J712	13.07	0.00	4.13	0.00	0.00	Lakeside
J714	2.90	0.52	0.00	0.00	0.00	Lakeside
J716	14.52	0.00	0.00	0.00	0.00	Lakeside
J-72	0.00	0.00	0.00	17.41	0.00	Main
J720	0.00	73.62	16.51	0.00	0.00	Lakeside
J722	10.16	0.00	0.00	0.00	0.00	Lakeside
J724	8.71	0.00	0.00	0.00	0.00	Lakeside
J726	5.32	0.00	0.00	0.00	0.00	Main
J728	0.00	0.00	0.00	0.00	0.00	Main
J-73	0.00	0.00	1.62	0.00	0.00	Main
J730	0.00	0.00	0.00	0.00	0.00	Darnells
J732	0.00	0.00	0.00	0.00	0.00	Darnells
J736	0.00	0.00	0.00	0.00	0.00	Boyd
J738	0.00	0.00	0.00	0.00	0.00	Darnells
J-74	1.33	0.00	0.00	0.00	0.00	Main
J740	0.00	0.00	0.00	0.00	0.00	Darnells
J742	0.00	0.00	0.00	0.00	0.00	Darnells
J744	0.00	0.00	0.00	0.00	0.00	Darnells
J746	0.00	0.00	0.00	0.00	0.00	Darnells
J748	0.00	0.00	0.00	0.00	0.00	Darnells
J-75	1.33	0.00	0.00	0.00	0.00	Main
J750	0.00	0.00	0.00	0.00	0.00	Darnells
J-76	0.00	0.00	0.00	0.00	0.00	Main
J-77	11.97	0.00	0.00	0.00	0.00	Main
J-78	9.31	0.00	0.00	0.00	0.00	Main
J-79	3.99	0.00	1.62	0.00	0.00	Main
J80	1.33	5.25	0.00	0.00	0.00	Main
J-80	7.98	0.00	1.62	0.00	0.00	Main
J-81	5.32	0.00	3.24	0.00	0.00	Main
J-82	13.30	2.63	6.49	0.00	0.00	Main
J-85	7.98	0.00	0.00	0.00	0.00	Main
J-86	9.31	2.63	0.00	0.00	0.00	Main
J-87	6.65	7.88	0.00	0.00	0.00	Main
J-88	3.99	2.63	0.00	0.00	0.00	Main
J-89	1.33	0.00	0.00	0.00	0.00	Main
J-90	0.00	0.00	0.00	0.00	0.00	Main
J-91	0.00	0.00	0.00	17.41	0.00	Main
J-92	6.65	5.25	0.00	0.00	0.00	Main
J-93	6.65	2.63	9.73	0.00	0.00	Main
J-94	11.62	0.00	4.13	0.00	0.00	Lakeside
J-95	8.71	0.52	4.13	1.82	0.00	Lakeside
J-96	8.71	0.00	0.00	0.00	0.00	Lakeside
J-97	13.07	0.52	0.00	0.00	0.00	Lakeside

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J-98	15.97		0.00		8.25		0.00		0.00	Lakeside
J-99	7.26	—	0.52	—	0.00	—	0.00	—	0.00	Lakeside

**APPENIDX F**  
**Preliminary Cost Estimates**



**City of Chelan**  
**Main Zone Water Improvements**  
**(May 2018 ENR Seattle Construction Cost Index #11472)**  
**May 31, 2018**

**Washington St 12-inch Loop and Booster Station Improvements**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$14,000.00	\$14,000.00
2.	Traffic Control	1 LS	\$2,000.00	\$2,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$1,000.00	\$1,000.00
6.	Connect to Existing	1 LS	\$15,000.00	\$15,000.00
7.	Foundation Material	5 CY	\$40.00	\$200.00
8.	Bank Run Gravel for Trench Backfill	10 CY	\$35.00	\$350.00
9.	12-inch Ductile Iron Pipe	20 LF	\$90.00	\$1,800.00
10.	Booster Station Upgrades	1 LS	\$115,000.00	\$115,000.00
11.	Surface Restoration	25 SY	\$40.00	\$1,000.00
Subtotal				\$152,350.00
Contingency (25%)				\$38,087.50
Subtotal				\$190,437.50
Sales Tax at 8.2%				\$15,615.88
Total Estimated Construction Cost				\$207,000.00
Engineering, Construction Management (25%)				\$52,000.00
<b>Total Estimated Cost:</b>				<b>\$259,000.00</b>

**Annual Main Zone Pipe Replacement**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$397,000.00	\$397,000.00
2.	Traffic Control	1 LS	\$85,000.00	\$85,000.00
3.	Temporary Erosion Control	1 LS	\$20,000.00	\$20,000.00
4.	SPCC Plan	1 LS	\$20,000.00	\$20,000.00
5.	Trench Excavation Safety Systems	1 LS	\$40,000.00	\$40,000.00
6.	Connect to Existing	150 EA	\$2,000.00	\$300,000.00
7.	Foundation Material	300 CY	\$40.00	\$12,000.00
8.	Bank Run Gravel for Trench Backfill	3,500 CY	\$35.00	\$122,500.00
9.	8-inch Ductile Iron Pipe	29,500 LF	\$60.00	\$1,770,000.00
10.	Additional Water Main Fittings	10,000 LBS	\$3.00	\$30,000.00
11.	8-inch Gate Valve	150 EA	\$1,500.00	\$225,000.00
12.	Reconnect Service	400 EA	\$1,000.00	\$400,000.00
13.	Reconnect Hydrant	75 EA	\$2,000.00	\$150,000.00
14.	Surface Restoration	20,000 SY	\$40.00	\$800,000.00
Subtotal				\$4,371,500.00
Contingency (25%)				\$1,092,875.00
Subtotal				\$5,464,375.00
Sales Tax at 8.2%				\$448,078.75
Total Estimated Construction Cost				\$5,913,000.00
Engineering, Construction Management (25%)				\$1,479,000.00
<b>Total Estimated Cost:</b>				<b>\$7,392,000.00</b>
<b>Total Estimated Cost (Annually over 20 years)</b>				<b>\$369,600.00</b>

**Replace 8" Submarine Line**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$54,000.00	\$54,000.00
2.	Traffic Control	1 LS	\$15,000.00	\$15,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$1,000.00	\$1,000.00
6.	Connect to Existing	2 EA	\$5,000.00	\$10,000.00
7.	Foundation Material	10 CY	\$40.00	\$400.00
8.	Bank Run Gravel for Trench Backfill	50 CY	\$35.00	\$1,750.00
9.	12-inch Ductile Iron Pipe, on Bridge	750 LF	\$600.00	\$450,000.00
10.	12-inch Ductile Iron Pipe	300 LF	\$90.00	\$27,000.00
11.	Additional Water Main Fittings	1,000 LBS	\$3.00	\$3,000.00
12.	12-inch Gate Valve	5 EA	\$1,800.00	\$9,000.00
13.	Abandon submarine line	1 LS	\$5,000.00	\$5,000.00
14.	Surface Restoration	320 SY	\$40.00	\$12,800.00
Subtotal				\$590,950.00
Contingency (25%)				\$147,737.50
Subtotal				\$738,687.50
Sales Tax at 8.2%				\$60,572.38
Total Estimated Construction Cost				\$800,000.00
Engineering, Construction Management (25%)				\$200,000.00
<b>Total Estimated Cost:</b>				<b>\$1,000,000.00</b>

**Sanders Street Transmission Main Upsize to 10"**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$31,000.00	\$31,000.00
2.	Traffic Control	1 LS	\$28,000.00	\$28,000.00
3.	Temporary Erosion Control	1 LS	\$2,000.00	\$2,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$5,000.00	\$5,000.00
6.	Connect to Existing	11 EA	\$7,000.00	\$77,000.00
7.	Foundation Material	20 CY	\$40.00	\$800.00
8.	Bank Run Gravel for Trench Backfill	150 CY	\$35.00	\$5,250.00
9.	10-inch Ductile Iron Pipe	1,200 LF	\$85.00	\$102,000.00
10.	Additional Water Main Fittings	2,000 LBS	\$3.00	\$6,000.00
11.	10-inch Gate Valve	10 EA	\$1,500.00	\$15,000.00
12.	8-inch Gate Valve	8 EA	\$1,500.00	\$12,000.00
13.	Reconnect Hydrant	4 EA	\$2,000.00	\$8,000.00
14.	Surface Restoration	1,200 SY	\$40.00	\$48,000.00
Subtotal				\$341,050.00
Contingency (25%)				\$85,262.50
Subtotal				\$426,312.50
Sales Tax at 8.2%				\$34,957.63
Total Estimated Construction Cost				\$462,000.00
Engineering, Construction Management (25%)				\$116,000.00
<b>Total Estimated Cost:</b>				<b>\$578,000.00</b>

**Chelan High School 10" Loop**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$15,000.00	\$15,000.00
2.	Traffic Control	1 LS	\$6,000.00	\$6,000.00
3.	Temporary Erosion Control	1 LS	\$2,000.00	\$2,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$5,000.00	\$5,000.00
6.	Connect to Existing	2 EA	\$7,000.00	\$14,000.00
7.	Foundation Material	10 CY	\$40.00	\$400.00
8.	Bank Run Gravel for Trench Backfill	100 CY	\$35.00	\$3,500.00
9.	10-inch Ductile Iron Pipe	850 LF	\$85.00	\$72,250.00
10.	Additional Water Main Fittings	1,000 LBS	\$3.00	\$3,000.00
11.	10-inch Gate Valve	3 EA	\$1,500.00	\$4,500.00
12.	Reconnect Hydrant	4 EA	\$2,000.00	\$8,000.00
13.	Surface Restoration	800 SY	\$40.00	\$32,000.00
Subtotal				\$166,650.00
Contingency (25%)				\$41,662.50
Subtotal				\$208,312.50
Sales Tax at 8.2%				\$17,081.63
Total Estimated Construction Cost				\$226,000.00
Engineering, Construction Management (25%)				\$57,000.00
<b>Total Estimated Cost:</b>				<b>\$283,000.00</b>

**Webster Ave Transmission Main Upsize to 10"**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$39,000.00	\$39,000.00
2.	Traffic Control	1 LS	\$35,000.00	\$35,000.00
3.	Temporary Erosion Control	1 LS	\$5,000.00	\$5,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$5,000.00	\$5,000.00
6.	Connect to Existing	14 EA	\$7,000.00	\$98,000.00
7.	Foundation Material	20 CY	\$40.00	\$800.00
8.	Bank Run Gravel for Trench Backfill	200 CY	\$35.00	\$7,000.00
9.	10-inch Ductile Iron Pipe	1,700 LF	\$85.00	\$144,500.00
10.	Additional Water Main Fittings	2,000 LBS	\$3.00	\$6,000.00
11.	10-inch Gate Valve	20 EA	\$1,500.00	\$30,000.00
12.	8-inch Gate Valve	10 EA	\$1,500.00	\$15,000.00
13.	Reconnect Service	15 EA	\$1,000.00	\$15,000.00
14.	Reconnect Hydrant	4 EA	\$2,000.00	\$8,000.00
15.	Surface Restoration	400 SY	\$40.00	\$16,000.00
Subtotal				\$425,300.00
Contingency (25%)				\$106,325.00
Subtotal				\$531,625.00
Sales Tax at 8.2%				\$43,593.25
Total Estimated Construction Cost				\$576,000.00
Engineering, Construction Management (25%)				\$144,000.00
<b>Total Estimated Cost:</b>				<b>\$720,000.00</b>

**Woodin Ave Transmission Main Upsize to 16"**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$138,000.00	\$138,000.00
2.	Traffic Control	1 LS	\$25,000.00	\$25,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$1,000.00	\$1,000.00
6.	Connect to Existing	15 EA	\$7,000.00	\$105,000.00
7.	Foundation Material	80 CY	\$40.00	\$3,200.00
8.	Bank Run Gravel for Trench Backfill	900 CY	\$35.00	\$31,500.00
9.	16-inch Ductile Iron Pipe	6,900 LF	\$120.00	\$828,000.00
10.	Additional Water Main Fittings	3,000 LBS	\$3.00	\$9,000.00
11.	16-inch Gate Valve	18 EA	\$3,000.00	\$54,000.00
12.	8-inch Gate Valve	7 EA	\$1,500.00	\$10,500.00
13.	6-inch Gate Valve	7 EA	\$1,200.00	\$8,400.00
14.	Reconnect Service	40 EA	\$1,000.00	\$40,000.00
15.	Reconnect Hydrant	6 EA	\$2,000.00	\$12,000.00
16.	Surface Restoration	6,300 SY	\$40.00	\$252,000.00
Subtotal				\$1,519,600.00
Contingency (25%)				\$379,900.00
Subtotal				\$1,899,500.00
Sales Tax at 8.2%				\$155,759.00
Total Estimated Construction Cost				\$2,056,000.00
Engineering, Construction Management (25%)				\$514,000.00
<b>Total Estimated Cost:</b>				<b>\$2,570,000.00</b>

**Highland Avenue Transmission Main Upsize to 12"**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$29,000.00	\$29,000.00
2.	Traffic Control	1 LS	\$5,000.00	\$5,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$5,000.00	\$5,000.00
6.	Connect to Existing	5 EA	\$7,000.00	\$35,000.00
7.	Foundation Material	20 CY	\$40.00	\$800.00
8.	Bank Run Gravel for Trench Backfill	170 CY	\$35.00	\$5,950.00
9.	12-inch Ductile Iron Pipe	1,400 LF	\$90.00	\$126,000.00
10.	Additional Water Main Fittings	1,000 LBS	\$3.00	\$3,000.00
11.	12-inch Gate Valve	6 EA	\$1,800.00	\$10,800.00
12.	8-inch Gate Valve	3 EA	\$1,500.00	\$4,500.00
13.	Reconnect Service	32 EA	\$1,000.00	\$32,000.00
14.	Reconnect Hydrant	3 EA	\$2,000.00	\$6,000.00
15.	Surface Restoration	1,400 SY	\$40.00	\$56,000.00
Subtotal				\$321,050.00
Contingency (25%)				\$80,262.50
Subtotal				\$401,312.50
Sales Tax at 8.2%				\$32,907.63
Total Estimated Construction Cost				\$435,000.00
Engineering, Construction Management (25%)				\$109,000.00
<b>Total Estimated Cost:</b>				<b>\$544,000.00</b>



**Clifford Street Transmission Main Upsize to 10"**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$10,000.00	\$10,000.00
2.	Traffic Control	1 LS	\$10,000.00	\$10,000.00
3.	Temporary Erosion Control	1 LS	\$2,000.00	\$2,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$5,000.00	\$5,000.00
6.	Connect to Existing	3 EA	\$7,000.00	\$21,000.00
7.	Foundation Material	10 CY	\$40.00	\$400.00
8.	Bank Run Gravel for Trench Backfill	50 CY	\$35.00	\$1,750.00
9.	10-inch Ductile Iron Pipe	350 LF	\$85.00	\$29,750.00
10.	Additional Water Main Fittings	1,000 LBS	\$3.00	\$3,000.00
11.	10-inch Gate Valve	4 EA	\$1,500.00	\$6,000.00
12.	8-inch Gate Valve	1 EA	\$1,500.00	\$1,500.00
13.	Reconnect Hydrant	1 EA	\$2,000.00	\$2,000.00
14.	Surface Restoration	400 SY	\$40.00	\$16,000.00
Subtotal				\$109,400.00
Contingency (25%)				\$27,350.00
Subtotal				\$136,750.00
Sales Tax at 8.2%				\$11,213.50
Total Estimated Construction Cost				\$148,000.00
Engineering, Construction Management (25%)				\$37,000.00
<b>Total Estimated Cost:</b>				<b>\$185,000.00</b>

**Spader Bay PRV Station**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$10,000.00	\$10,000.00
2.	Traffic Control	1 LS	\$4,000.00	\$4,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	2 EA	\$5,000.00	\$10,000.00
7.	Foundation Material	20 CY	\$40.00	\$800.00
8.	Bank Run Gravel for Trench Backfill	200 CY	\$35.00	\$7,000.00
9.	8-inch Ductile Iron Pipe	50 LF	\$60.00	\$3,000.00
10.	Additional Water Main Fittings	1,000 LBS	\$3.00	\$3,000.00
11.	PRV Station	1 LS	\$50,000.00	\$50,000.00
12.	Darnell's Booster Station Control Upgrade	1 LS	\$10,000.00	\$10,000.00
13.	Surface Restoration	100 SY	\$40.00	\$4,000.00
Subtotal				\$105,800.00
Contingency (25%)				\$26,450.00
Subtotal				\$132,250.00
Sales Tax at 8.2%				\$10,844.50
Total Estimated Construction Cost				\$144,000.00
Engineering, Construction Management (25%)				\$36,000.00
<b>Total Estimated Cost:</b>				<b>\$180,000.00</b>

**City of Chelan**  
**Lakeside Zone Water Improvements**  
**(May 2018 ENR Seattle Construction Cost Index #11472)**  
**May 31, 2018**

**Lakeside Waterline Upgrades**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1.	Mobilization and Demobilization	1 LS	\$78,000.00	\$78,000.00
2.	Traffic Control	1 LS	\$13,000.00	\$13,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	10 EA	\$5,000.00	\$50,000.00
7.	Foundation Material	60 CY	\$40.00	\$2,400.00
8.	Bank Run Gravel for Trench Backfill	675 CY	\$35.00	\$23,625.00
9.	8-inch Ductile Iron Pipe	5,700 LF	\$60.00	\$342,000.00
10.	Additional Water Main Fittings	1,000 LBS	\$3.00	\$3,000.00
11.	8-inch Gate Valve	30 EA	\$1,500.00	\$45,000.00
12.	Reconnect Service	75 EA	\$1,000.00	\$75,000.00
13.	Reconnect Hydrant	10 EA	\$2,000.00	\$20,000.00
12.	Surface Restoration	5,000 SY	\$40.00	\$200,000.00
Subtotal				\$856,025.00
Contingency (25%)				\$214,006.25
Subtotal				\$1,070,031.25
Sales Tax at 8.2%				\$87,742.56
Total Estimated Construction Cost				\$1,158,000.00
Engineering, Construction Management (25%)				\$290,000.00
<b>Total Estimated Cost:</b>				<b>\$1,448,000.00</b>

**High Street Booster Station**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>		<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1	LS	\$8,000.00	\$8,000.00
2.	Traffic Control	1	LS	\$2,000.00	\$2,000.00
3.	Temporary Erosion Control	1	LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1	LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1	LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	2	EA	\$7,000.00	\$14,000.00
7.	Foundation Material	5	CY	\$40.00	\$200.00
8.	Bank Run Gravel for Trench Backfill	10	CY	\$35.00	\$350.00
9.	Booster Pump Station	1	LS	\$30,000.00	\$30,000.00
10.	Electrical	1	LS	\$25,000.00	\$25,000.00
11.	Surface Restoration	20	SY	\$40.00	\$800.00
Subtotal					\$84,350.00
Contingency (25%)					\$21,087.50
Subtotal					\$105,437.50
Sales Tax at 8.2%					\$8,645.88
Total Estimated Construction Cost					\$115,000.00
Engineering, Construction Management (25%)					\$29,000.00
<b>Total Estimated Cost:</b>					<b>\$144,000.00</b>

**City of Chelan**  
**Hospital Zone Water Improvements**  
**(May 2018 ENR Seattle Construction Cost Index #11472)**  
**May 31, 2018**

**Hospital Zone Waterline Upgrades**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$43,000.00	\$43,000.00
2.	Traffic Control	1 LS	\$17,000.00	\$17,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	15 EA	\$5,000.00	\$75,000.00
7.	Foundation Material	30 CY	\$40.00	\$1,200.00
8.	Bank Run Gravel for Trench Backfill	320 CY	\$35.00	\$11,200.00
9.	8-inch Ductile Iron Pipe	2,700 LF	\$60.00	\$162,000.00
10.	Additional Water Main Fittings	1,000 LBS	\$3.00	\$3,000.00
11.	8-inch Gate Valve	8 EA	\$1,500.00	\$12,000.00
12.	Reconnect Service	40 EA	\$1,000.00	\$40,000.00
13.	Reconnect Hydrant	5 EA	\$2,000.00	\$10,000.00
12.	Surface Restoration	2,400 SY	\$40.00	\$96,000.00
Subtotal				\$474,400.00
Contingency (25%)				\$118,600.00
Subtotal				\$593,000.00
Sales Tax at 8.2%				\$48,626.00
Total Estimated Construction Cost				\$642,000.00
Engineering, Construction Management (25%)				\$161,000.00
<b>Total Estimated Cost:</b>				<b>\$803,000.00</b>

**City of Chelan**  
**Darnell's Zone Water Improvements**  
**(May 2018 ENR Seattle Construction Cost Index #11472)**  
**May 31, 2018**

**Key Bay Waterline Upgrades**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1.	Mobilization and Demobilization	1 LS	\$39,000.00	\$39,000.00
2.	Traffic Control	1 LS	\$13,000.00	\$13,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	3 EA	\$5,000.00	\$15,000.00
7.	Foundation Material	40 CY	\$40.00	\$1,600.00
8.	Bank Run Gravel for Trench Backfill	400 CY	\$35.00	\$14,000.00
9.	8-inch Ductile Iron Pipe	3,300 LF	\$60.00	\$198,000.00
10.	Additional Water Main Fittings	1,000 LBS	\$3.00	\$3,000.00
11.	8-inch Gate Valve	12 EA	\$1,500.00	\$18,000.00
12.	Reconnect Service	5 EA	\$1,000.00	\$5,000.00
13.	Reconnect Hydrant	1 EA	\$2,000.00	\$2,000.00
12.	Surface Restoration	3,000 SY	\$40.00	\$120,000.00
Subtotal				\$432,600.00
Contingency (25%)				\$108,150.00
Subtotal				\$540,750.00
Sales Tax at 8.2%				\$44,341.50
Total Estimated Construction Cost				\$586,000.00
Engineering, Construction Management (25%)				\$147,000.00
<b>Total Estimated Cost:</b>				<b>\$733,000.00</b>

**Key Bay Loop and PRV Station**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>		<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1	LS	\$33,000.00	\$33,000.00
2.	Traffic Control	1	LS	\$13,000.00	\$13,000.00
3.	Temporary Erosion Control	1	LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1	LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1	LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	2	EA	\$7,000.00	\$14,000.00
7.	Foundation Material	20	CY	\$40.00	\$800.00
8.	Bank Run Gravel for Trench Backfill	250	CY	\$35.00	\$8,750.00
9.	12-inch Ductile Iron Pipe	2,000	LF	\$90.00	\$180,000.00
10.	Additional Water Main Fittings	1,000	LBS	\$3.00	\$3,000.00
11.	12-inch Gate Valve	6	EA	\$1,800.00	\$10,800.00
12.	PRV Station	1	LS	\$20,000.00	\$20,000.00
13.	Surface Restoration	2,000	SY	\$40.00	\$80,000.00
Subtotal					\$367,350.00
Contingency (25%)					\$91,837.50
Subtotal					\$459,187.50
Sales Tax at 8.2%					\$37,653.38
Total Estimated Construction Cost					\$497,000.00
Engineering, Construction Management (25%)					\$125,000.00
<b>Total Estimated Cost:</b>					<b>\$622,000.00</b>

**Eldorado Loop Upgrade**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>		<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1	LS	\$39,000.00	\$39,000.00
2.	Traffic Control	1	LS	\$5,000.00	\$5,000.00
3.	Temporary Erosion Control	1	LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1	LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1	LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	2	EA	\$5.00	\$10.00
7.	Foundation Material	30	CY	\$40.00	\$1,200.00
8.	Bank Run Gravel for Trench Backfill	370	CY	\$35.00	\$12,950.00
9.	8-inch Ductile Iron Pipe	3,100	LF	\$60.00	\$186,000.00
10.	Additional Water Main Fittings	1,000	LBS	\$3.00	\$3,000.00
11.	8-inch Gate Valve	14	EA	\$1,500.00	\$21,000.00
12.	Reconnect Service	30	EA	\$1,000.00	\$30,000.00
13.	Reconnect Hydrant	6	EA	\$2,000.00	\$12,000.00
14.	Surface Restoration	2,800	SY	\$40.00	\$112,000.00
Subtotal					\$426,160.00
Contingency (25%)					\$106,540.00
Subtotal					\$532,700.00
Sales Tax at 8.2%					\$43,681.40
Total Estimated Construction Cost					\$577,000.00
Engineering, Construction Management (25%)					\$145,000.00
<b>Total Estimated Cost:</b>					<b>\$722,000.00</b>



**Highpoint Place Waterline Upgrade**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$29,000.00	\$29,000.00
2.	Traffic Control	1 LS	\$5,000.00	\$5,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	2 EA	\$5,000.00	\$10,000.00
7.	Foundation Material	20 CY	\$40.00	\$800.00
8.	Bank Run Gravel for Trench Backfill	220 CY	\$35.00	\$7,700.00
9.	12-inch Ductile Iron Pipe	1,850 LF	\$90.00	\$166,500.00
10.	Additional Water Main Fittings	1,000 LBS	\$3.00	\$3,000.00
11.	12-inch Gate Valve	10 EA	\$1,800.00	\$18,000.00
12.	Reconnect Service	9 EA	\$1,000.00	\$9,000.00
13.	Reconnect Hydrant	2 EA	\$2,000.00	\$4,000.00
14.	Surface Restoration	1,600 SY	\$40.00	\$64,000.00
Subtotal				\$321,000.00
Contingency (25%)				\$80,250.00
Subtotal				\$401,250.00
Sales Tax at 8.2%				\$32,902.50
Total Estimated Construction Cost				\$435,000.00
Engineering, Construction Management (25%)				\$109,000.00
<b>Total Estimated Cost:</b>				<b>\$544,000.00</b>

**Monte Carlo Drive Waterline Upgrade**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$19,000.00	\$19,000.00
2.	Traffic Control	1 LS	\$5,000.00	\$5,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	2 EA	\$5,000.00	\$10,000.00
7.	Foundation Material	20 CY	\$40.00	\$800.00
8.	Bank Run Gravel for Trench Backfill	165 CY	\$35.00	\$5,775.00
9.	8-inch Ductile Iron Pipe	1,400 LF	\$60.00	\$84,000.00
10.	Additional Water Main Fittings	1,000 LBS	\$3.00	\$3,000.00
11.	8-inch Gate Valve	5 EA	\$1,500.00	\$7,500.00
12.	Reconnect Service	15 EA	\$1,000.00	\$15,000.00
13.	Reconnect Hydrant	2 EA	\$2,000.00	\$4,000.00
14.	Surface Restoration	1,200 SY	\$40.00	\$48,000.00
Subtotal				\$206,075.00
Contingency (25%)				\$51,518.75
Subtotal				\$257,593.75
Sales Tax at 8.2%				\$21,122.69
Total Estimated Construction Cost				\$279,000.00
Engineering, Construction Management (25%)				\$70,000.00
<b>Total Estimated Cost:</b>				<b>\$349,000.00</b>

## Lake Chelan Shores Condos Waterline Upgrades

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>		<u>UNIT PRICE</u>	<u>AMOUNT</u>
1.	Mobilization and Demobilization	1	LS	\$39,000.00	\$39,000.00
2.	Traffic Control	1	LS	\$17,000.00	\$17,000.00
3.	Temporary Erosion Control	1	LS	\$5,000.00	\$5,000.00
4.	SPCC Plan	1	LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1	LS	\$5,000.00	\$5,000.00
6.	Connect to Existing	5	EA	\$5,000.00	\$25,000.00
7.	Foundation Material	30	CY	\$40.00	\$1,200.00
8.	Bank Run Gravel for Trench Backfill	300	CY	\$35.00	\$10,500.00
9.	8-inch Ductile Iron Pipe	600	LF	\$60.00	\$36,000.00
10.	10-inch Ductile Iron Pipe	1,700	LF	\$85.00	\$144,500.00
11.	Additional Water Main Fittings	2,000	LBS	\$3.00	\$6,000.00
12.	8-inch Gate Valve	13	EA	\$1,500.00	\$19,500.00
13.	10-inch Gate Valve	11	EA	\$1,500.00	\$16,500.00
14.	Reconnect Service	5	EA	\$1,000.00	\$5,000.00
15.	Reconnect Hydrant	6	EA	\$2,000.00	\$12,000.00
16.	Surface Restoration	2,100	SY	\$40.00	\$84,000.00
Subtotal					\$427,200.00
Contingency (25%)					\$106,800.00
Subtotal					\$534,000.00
Sales Tax at 8.2%					\$43,788.00
Total Estimated Construction Cost					\$578,000.00
Engineering, Construction Management (25%)					\$145,000.00
<b>Total Estimated Cost:</b>					<b>\$723,000.00</b>

Darnells Booster Pump Station Improvements

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1.	Mobilization and Demobilization	1 LS	\$13,000.00	\$13,000.00
2.	Additional Pump	1 LS	\$75,000.00	\$75,000.00
3.	Piping Modifications	1 LS	\$10,000.00	\$10,000.00
4.	Electrical and Telemetry	1 LS	\$45,000.00	\$45,000.00
Subtotal				\$143,000.00
Contingency (25%)				\$35,750.00
Subtotal				\$178,750.00
Sales Tax at 8.2%				\$14,657.50
Total Estimated Construction Cost				\$194,000.00
Engineering, Construction Management (25%)				\$49,000.00
<b>Total Estimated Cost:</b>				<b>\$243,000.00</b>

**City of Chelan**  
**Boyd Zone Water Improvements**  
**(May 2018 ENR Seattle Construction Cost Index #11472)**  
**May 31, 2018**

**Pinnacle PI Waterline Upgrade**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1.	Mobilization and Demobilization	1 LS	\$21,000.00	\$21,000.00
2.	Traffic Control	1 LS	\$5,000.00	\$5,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	3 EA	\$5,000.00	\$15,000.00
7.	Foundation Material	20 CY	\$40.00	\$800.00
8.	Bank Run Gravel for Trench Backfill	200 CY	\$35.00	\$7,000.00
9.	8-inch Ductile Iron Pipe	1,700 LF	\$60.00	\$102,000.00
10.	Additional Water Main Fittings	1,000 LBS	\$3.00	\$3,000.00
11.	8-inch Gate Valve	4 EA	\$1,500.00	\$6,000.00
12.	Reconnect Service	7 EA	\$1,000.00	\$7,000.00
13.	Reconnect Hydrant	2 EA	\$2,000.00	\$4,000.00
14.	Surface Restoration	1,500 SY	\$40.00	\$60,000.00
Subtotal				\$234,800.00
Contingency (25%)				\$58,700.00
Subtotal				\$293,500.00
Sales Tax at 8.2%				\$24,067.00
Total Estimated Construction Cost				\$318,000.00
Engineering, Construction Management (25%)				\$80,000.00
<b>Total Estimated Cost:</b>				<b>\$398,000.00</b>

**Junior Pt Waterline Upgrade**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$7,000.00	\$7,000.00
2.	Traffic Control	1 LS	\$2,000.00	\$2,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	3 EA	\$5,000.00	\$15,000.00
7.	Foundation Material	10 CY	\$40.00	\$400.00
8.	Bank Run Gravel for Trench Backfill	50 CY	\$35.00	\$1,750.00
9.	8-inch Ductile Iron Pipe	400 LF	\$60.00	\$24,000.00
10.	Additional Water Main Fittings	500 LBS	\$3.00	\$1,500.00
11.	8-inch Gate Valve	1 EA	\$1,500.00	\$1,500.00
12.	Reconnect Service	6 EA	\$1,000.00	\$6,000.00
13.	Reconnect Hydrant	1 EA	\$2,000.00	\$2,000.00
14.	Surface Restoration	400 SY	\$40.00	\$16,000.00
Subtotal				\$81,150.00
Contingency (25%)				\$20,287.50
Subtotal				\$101,437.50
Sales Tax at 8.2%				\$8,317.88
Total Estimated Construction Cost				\$110,000.00
Engineering, Construction Management (25%)				\$28,000.00
<b>Total Estimated Cost:</b>				<b>\$138,000.00</b>

**Stehekin Way Waterline Upgrade**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>		<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1	LS	\$32,000.00	\$32,000.00
2.	Traffic Control	1	LS	\$10,000.00	\$10,000.00
3.	Temporary Erosion Control	1	LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1	LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1	LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	6	EA	\$5,000.00	\$30,000.00
7.	Foundation Material	30	CY	\$40.00	\$1,200.00
8.	Bank Run Gravel for Trench Backfill	300	CY	\$35.00	\$10,500.00
9.	8-inch Ductile Iron Pipe	2,300	LF	\$60.00	\$138,000.00
10.	Additional Water Main Fittings	1,000	LBS	\$3.00	\$3,000.00
11.	8-inch Gate Valve	14	EA	\$1,500.00	\$21,000.00
12.	Reconnect Service	20	EA	\$1,000.00	\$20,000.00
13.	Reconnect Hydrant	2	EA	\$2,000.00	\$4,000.00
14.	Surface Restoration	2,000	SY	\$40.00	\$80,000.00
Subtotal					\$353,700.00
Contingency (25%)					\$88,425.00
Subtotal					\$442,125.00
Sales Tax at 8.2%					\$36,254.25
Total Estimated Construction Cost					\$479,000.00
Engineering, Construction Management (25%)					\$120,000.00
<b>Total Estimated Cost:</b>					<b>\$599,000.00</b>

**Crescent St Waterline Upgrade**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$9,000.00	\$9,000.00
2.	Traffic Control	1 LS	\$5,000.00	\$5,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	2 EA	\$5,000.00	\$10,000.00
7.	Foundation Material	10 CY	\$40.00	\$400.00
8.	Bank Run Gravel for Trench Backfill	80 CY	\$35.00	\$2,800.00
9.	8-inch Ductile Iron Pipe	600 LF	\$60.00	\$36,000.00
10.	Additional Water Main Fittings	500 LBS	\$3.00	\$1,500.00
11.	8-inch Gate Valve	2 EA	\$1,500.00	\$3,000.00
12.	Reconnect Service	8 EA	\$1,000.00	\$8,000.00
13.	Reconnect Hydrant	1 EA	\$2,000.00	\$2,000.00
14.	Surface Restoration	500 SY	\$40.00	\$20,000.00
Subtotal				\$101,700.00
Contingency (25%)				\$25,425.00
Subtotal				\$127,125.00
Sales Tax at 8.2%				\$10,424.25
Total Estimated Construction Cost				\$138,000.00
Engineering, Construction Management (25%)				\$35,000.00
<b>Total Estimated Cost:</b>				<b>\$173,000.00</b>



**PRV Station No. 9 Upgrade**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$6,000.00	\$6,000.00
2.	Traffic Control	1 LS	\$1,000.00	\$1,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	1 LS	\$2,000.00	\$2,000.00
7.	Foundation Material	10 CY	\$40.00	\$400.00
8.	PRV Station	1 LS	\$50,000.00	\$50,000.00
9.	Surface Restoration	25 SY	\$40.00	\$1,000.00
Subtotal				\$64,400.00
Contingency (25%)				\$16,100.00
Subtotal				\$80,500.00
Sales Tax at 8.2%				\$6,601.00
Total Estimated Construction Cost				\$88,000.00
Engineering, Construction Management (25%)				\$22,000.00
<b>Total Estimated Cost:</b>				<b>\$110,000.00</b>

**New Pinnacle Reservoir**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Debolization	1 LS	\$22,000.00	\$22,000.00
2.	Temporary Erosion Control	1 LS	\$4,500.00	\$4,500.00
3.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
4.	Trench Excavation and Safety Systems	1 LS	\$5,000.00	\$5,000.00
5.	Pinnacle Reservoir No. 2	1 LS	\$85,000.00	\$85,000.00
6.	Site Piping	1 LS	\$30,000.00	\$30,000.00
7.	Foundation Material	30 TN	\$40.00	\$1,200.00
8.	Bank Run Gravel for Trench Backfill	40 TN	\$35.00	\$1,400.00
9.	CSTC	70 TN	\$45.00	\$3,150.00
10.	Site Work	1 LS	\$20,000.00	\$20,000.00
11.	Surface Restoration	1 LS	\$5,000.00	\$5,000.00
12.	Retaining Wall	1 LS	\$20,000.00	\$20,000.00
13.	Electrical and Telemetry	1 LS	\$30,000.00	\$30,000.00
14.	Tree Removal	4 EA	\$2,000.00	\$8,000.00
Subtotal				\$236,250.00
Contingency (25%)				\$59,062.50
Subtotal				\$295,312.50
Sales Tax at 8.2%				\$24,215.63
Total Estimated Construction Cost				\$320,000.00
Engineering, Construction Management (25%)				\$80,000.00
<b>Total Estimated Cost:</b>				<b>\$400,000.00</b>

**Pinnacle Booster Station Improvements**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$36,000.00	\$36,000.00
2.	Traffic Control	1 LS	\$5,000.00	\$5,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$10,000.00	\$10,000.00
6.	Connect to Existing	2 EA	\$7,000.00	\$14,000.00
7.	Foundation Material	5 CY	\$40.00	\$200.00
8.	Bank Run Gravel for Trench Backfill	10 CY	\$35.00	\$350.00
9.	Booster Pump Station	1 LS	\$110,000.00	\$110,000.00
10.	Electrical	1 LS	\$220,000.00	\$220,000.00
11.	Surface Restoration	25 SY	\$40.00	\$1,000.00
Subtotal				\$398,550.00
Contingency (25%)				\$99,637.50
Subtotal				\$498,187.50
Sales Tax at 8.2%				\$40,851.38
Total Estimated Construction Cost				\$540,000.00
Engineering, Construction Management (25%)				\$135,000.00
<b>Total Estimated Cost:</b>				<b>\$675,000.00</b>

**City of Chelan**  
**Golf Course Drive Zone Water Improvements**  
**(May 2018 ENR Seattle Construction Cost Index #11472)**  
**May 31, 2018**

**PRV Station No. 1 Replacement**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>		<u>UNIT PRICE</u>	<u>AMOUNT</u>
1.	Mobilization and Demobilization	1	LS	\$25,000.00	\$25,000.00
2.	Traffic Control	1	LS	\$9,000.00	\$9,000.00
3.	Temporary Erosion Control	1	LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1	LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1	LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	2	EA	\$5,000.00	\$10,000.00
7.	Foundation Material	20	CY	\$40.00	\$800.00
8.	Bank Run Gravel for Trench Backfill	200	CY	\$35.00	\$7,000.00
9.	8-inch Ductile Iron Pipe	1,600	LF	\$60.00	\$96,000.00
10.	Additional Water Main Fittings	1,000	LBS	\$3.00	\$3,000.00
11.	8-inch Gate Valve	6	EA	\$1,500.00	\$9,000.00
12.	Reconnect Hydrant	2	EA	\$2,000.00	\$4,000.00
13.	PRV Station	1	LS	\$50,000.00	\$50,000.00
14.	Surface Restoration	1,500	SY	\$40.00	\$60,000.00
Subtotal					\$277,800.00
Contingency (25%)					\$69,450.00
Subtotal					\$347,250.00
Sales Tax at 8.2%					\$28,474.50
Total Estimated Construction Cost					\$376,000.00
Engineering, Construction Management (25%)					\$94,000.00
<b>Total Estimated Cost:</b>					<b>\$470,000.00</b>

**Golf Course PI Waterline Upgrade**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>		<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1	LS	\$13,000.00	\$13,000.00
2.	Traffic Control	1	LS	\$5,000.00	\$5,000.00
3.	Temporary Erosion Control	1	LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1	LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1	LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	2	EA	\$5,000.00	\$10,000.00
7.	Foundation Material	10	CY	\$40.00	\$400.00
8.	Bank Run Gravel for Trench Backfill	100	CY	\$35.00	\$3,500.00
9.	8-inch Ductile Iron Pipe	900	LF	\$60.00	\$54,000.00
10.	Additional Water Main Fittings	500	LBS	\$3.00	\$1,500.00
11.	8-inch Gate Valve	6	EA	\$1,500.00	\$9,000.00
12.	Reconnect Service	8	EA	\$1,000.00	\$8,000.00
13.	Reconnect Hydrant	1	EA	\$2,000.00	\$2,000.00
14.	Surface Restoration	800	SY	\$40.00	\$32,000.00
Subtotal					\$142,400.00
Contingency (25%)					\$35,600.00
Subtotal					\$178,000.00
Sales Tax at 8.2%					\$14,596.00
Total Estimated Construction Cost					\$193,000.00
Engineering, Construction Management (25%)					\$49,000.00
<b>Total Estimated Cost:</b>					<b>\$242,000.00</b>

**Golf Course Rd PRV Station**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$23,000.00	\$23,000.00
2.	Traffic Control	1 LS	\$9,000.00	\$9,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	2 EA	\$5,000.00	\$10,000.00
7.	Foundation Material	20 CY	\$40.00	\$800.00
8.	Bank Run Gravel for Trench Backfill	170 CY	\$35.00	\$5,950.00
9.	8-inch Ductile Iron Pipe	1,400 LF	\$60.00	\$84,000.00
10.	Additional Water Main Fittings	1,000 LBS	\$3.00	\$3,000.00
11.	8-inch Gate Valve	5 EA	\$1,500.00	\$7,500.00
12.	PRV Station	1 LS	\$50,000.00	\$50,000.00
13.	Surface Restoration	1,300 SY	\$40.00	\$52,000.00
Subtotal				\$249,250.00
Contingency (25%)				\$62,312.50
Subtotal				\$311,562.50
Sales Tax at 8.2%				\$25,548.13
Total Estimated Construction Cost				\$338,000.00
Engineering, Construction Management (25%)				\$85,000.00
<b>Total Estimated Cost:</b>				<b>\$423,000.00</b>

**City of Chelan**  
**Orchard View Zone Water Improvements**  
**(May 2018 ENR Seattle Construction Cost Index #11472)**  
**May 31, 2018**

**Butte Rd Loop Upgrades**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1.	Mobilization and Demobilization	1 LS	\$47,000.00	\$47,000.00
2.	Traffic Control	1 LS	\$10,000.00	\$10,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	9 EA	\$5,000.00	\$45,000.00
7.	Foundation Material	40 CY	\$40.00	\$1,600.00
8.	Bank Run Gravel for Trench Backfill	400 CY	\$35.00	\$14,000.00
9.	8-inch Ductile Iron Pipe	3,400 LF	\$60.00	\$204,000.00
10.	Additional Water Main Fittings	1,000 LBS	\$3.00	\$3,000.00
11.	8-inch Gate Valve	24 EA	\$1,500.00	\$36,000.00
12.	Reconnect Service	24 EA	\$1,000.00	\$24,000.00
13.	Reconnect Hydrant	3 EA	\$2,000.00	\$6,000.00
14.	Surface Restoration	3,000 SY	\$40.00	\$120,000.00
Subtotal				\$514,600.00
Contingency (25%)				\$128,650.00
Subtotal				\$643,250.00
Sales Tax at 8.2%				\$52,746.50
Total Estimated Construction Cost				\$696,000.00
Engineering, Construction Management (25%)				\$174,000.00
<b>Total Estimated Cost:</b>				<b>\$870,000.00</b>

**Lookout and Pyramid Loop Upgrades**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$26,000.00	\$26,000.00
2.	Traffic Control	1 LS	\$5,000.00	\$5,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	4 EA	\$5,000.00	\$20,000.00
7.	Foundation Material	20 CY	\$40.00	\$800.00
8.	Bank Run Gravel for Trench Backfill	250 CY	\$35.00	\$8,750.00
9.	8-inch Ductile Iron Pipe	1,900 LF	\$60.00	\$114,000.00
10.	Additional Water Main Fittings	1,000 LBS	\$3.00	\$3,000.00
11.	8-inch Gate Valve	6 EA	\$1,500.00	\$9,000.00
12.	Reconnect Service	20 EA	\$1,000.00	\$20,000.00
13.	Reconnect Hydrant	2 EA	\$2,000.00	\$4,000.00
14.	Surface Restoration	1,700 SY	\$40.00	\$68,000.00
Subtotal				\$282,550.00
Contingency (25%)				\$70,637.50
Subtotal				\$353,187.50
Sales Tax at 8.2%				\$28,961.38
Total Estimated Construction Cost				\$383,000.00
Engineering, Construction Management (25%)				\$96,000.00
<b>Total Estimated Cost:</b>				<b>\$479,000.00</b>



**Orchard View Dr Waterline Upgrades**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$28,000.00	\$28,000.00
2.	Traffic Control	1 LS	\$10,000.00	\$10,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	6 EA	\$5,000.00	\$30,000.00
7.	Foundation Material	20 CY	\$40.00	\$800.00
8.	Bank Run Gravel for Trench Backfill	250 CY	\$35.00	\$8,750.00
9.	8-inch Ductile Iron Pipe	1,900 LF	\$60.00	\$114,000.00
10.	Additional Water Main Fittings	1,000 LBS	\$3.00	\$3,000.00
11.	8-inch Gate Valve	15 EA	\$1,500.00	\$22,500.00
12.	Reconnect Service	19 EA	\$1,000.00	\$19,000.00
13.	Reconnect Hydrant	2 EA	\$2,000.00	\$4,000.00
14.	Surface Restoration	1,700 SY	\$40.00	\$68,000.00
Subtotal				\$312,050.00
Contingency (25%)				\$78,012.50
Subtotal				\$390,062.50
Sales Tax at 8.2%				\$31,985.13
Total Estimated Construction Cost				\$423,000.00
Engineering, Construction Management (25%)				\$106,000.00
<b>Total Estimated Cost:</b>				<b>\$529,000.00</b>

**Stormy Way Waterline Upgrade**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>		<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1	LS	\$16,000.00	\$16,000.00
2.	Traffic Control	1	LS	\$5,000.00	\$5,000.00
3.	Temporary Erosion Control	1	LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1	LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1	LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	3	EA	\$5,000.00	\$15,000.00
7.	Foundation Material	20	CY	\$40.00	\$800.00
8.	Bank Run Gravel for Trench Backfill	150	CY	\$35.00	\$5,250.00
9.	8-inch Ductile Iron Pipe	1,200	LF	\$60.00	\$72,000.00
10.	Additional Water Main Fittings	1,000	LBS	\$3.00	\$3,000.00
11.	8-inch Gate Valve	4	EA	\$1,500.00	\$6,000.00
12.	Reconnect Service	7	EA	\$1,000.00	\$7,000.00
13.	Reconnect Hydrant	1	EA	\$2,000.00	\$2,000.00
14.	Surface Restoration	1,000	SY	\$40.00	\$40,000.00
Subtotal					\$176,050.00
Contingency (25%)					\$44,012.50
Subtotal					\$220,062.50
Sales Tax at 8.2%					\$18,045.13
Total Estimated Construction Cost					\$239,000.00
Engineering, Construction Management (25%)					\$60,000.00
<b>Total Estimated Cost:</b>					<b>\$299,000.00</b>

**PRV Station No. 5 Upgrade**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$6,000.00	\$6,000.00
2.	Traffic Control	1 LS	\$1,000.00	\$1,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$5,000.00	\$5,000.00
6.	Connect to Existing	1 LS	\$2,000.00	\$2,000.00
7.	Foundation Material	10 CY	\$40.00	\$400.00
8.	PRV Station	1 LS	\$50,000.00	\$50,000.00
9.	Surface Restoration	25 SY	\$40.00	\$1,000.00
Subtotal				\$67,400.00
Contingency (25%)				\$16,850.00
Subtotal				\$84,250.00
Sales Tax at 8.2%				\$6,908.50
Total Estimated Construction Cost				\$92,000.00
Engineering, Construction Management (25%)				\$23,000.00
<b>Total Estimated Cost:</b>				<b>\$115,000.00</b>

**City of Chelan**  
**Boyd Zone Water Improvements**  
**(May 2018 ENR Seattle Construction Cost Index #11472)**  
**May 31, 2018**

**Wilmorth Rd Transmission Main**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>		<u>UNIT PRICE</u>	<u>AMOUNT</u>
1.	Mobilization and Demobilization	1	LS	\$60,000.00	\$60,000.00
2.	Traffic Control	1	LS	\$10,000.00	\$10,000.00
3.	Temporary Erosion Control	1	LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1	LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1	LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	4	EA	\$5,000.00	\$20,000.00
7.	Foundation Material	40	CY	\$40.00	\$1,600.00
8.	Bank Run Gravel for Trench Backfill	500	CY	\$35.00	\$17,500.00
9.	12-inch Ductile Iron Pipe	3,800	LF	\$90.00	\$342,000.00
10.	Additional Water Main Fittings	1,000	LBS	\$3.00	\$3,000.00
11.	12-inch Gate Valve	15	EA	\$1,800.00	\$27,000.00
12.	Reconnect Service	3	EA	\$1,000.00	\$3,000.00
13.	Hydrant Assembly	10	EA	\$4,000.00	\$40,000.00
14.	Surface Restoration	3,400	SY	\$40.00	\$136,000.00
Subtotal					\$664,100.00
Contingency (25%)					\$166,025.00
Subtotal					\$830,125.00
Sales Tax at 8.2%					\$68,070.25
Total Estimated Construction Cost					\$899,000.00
Engineering, Construction Management (25%)					\$225,000.00
<b>Total Estimated Cost:</b>					<b>\$1,124,000.00</b>

**Isenhart Rd Waterline Upgrades**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$42,000.00	\$42,000.00
2.	Traffic Control	1 LS	\$10,000.00	\$10,000.00
3.	Temporary Erosion Control	1 LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1 LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1 LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	3 EA	\$5,000.00	\$15,000.00
7.	Foundation Material	30 CY	\$40.00	\$1,200.00
8.	Bank Run Gravel for Trench Backfill	350 CY	\$35.00	\$12,250.00
9.	12-inch Ductile Iron Pipe	2,800 LF	\$90.00	\$252,000.00
10.	Additional Water Main Fittings	1,000 LBS	\$3.00	\$3,000.00
11.	12-inch Gate Valve	8 EA	\$1,800.00	\$14,400.00
12.	Reconnect Service	1 EA	\$1,000.00	\$1,000.00
13.	Hydrant Assembly	3 EA	\$4,000.00	\$12,000.00
14.	Surface Restoration	2,500 SY	\$40.00	\$100,000.00
Subtotal				\$466,850.00
Contingency (25%)				\$116,712.50
Subtotal				\$583,562.50
Sales Tax at 8.2%				\$47,852.13
Total Estimated Construction Cost				\$632,000.00
Engineering, Construction Management (25%)				\$158,000.00
<b>Total Estimated Cost:</b>				<b>\$790,000.00</b>

**Washington St and Shop Ave Transmission Main Upgrades**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>		<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1	LS	\$55,000.00	\$55,000.00
2.	Traffic Control	1	LS	\$17,000.00	\$17,000.00
3.	Temporary Erosion Control	1	LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1	LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1	LS	\$2,000.00	\$2,000.00
6.	Connect to Existing	6	EA	\$5,000.00	\$30,000.00
7.	Foundation Material	40	CY	\$40.00	\$1,600.00
8.	Bank Run Gravel for Trench Backfill	450	CY	\$35.00	\$15,750.00
9.	12-inch Ductile Iron Pipe	3,500	LF	\$90.00	\$315,000.00
10.	8-inch Ductile Iron Pipe	100	LF	\$60.00	\$6,000.00
11.	Additional Water Main Fittings	1,000	LBS	\$3.00	\$3,000.00
12.	12-inch Gate Valve	12	EA	\$1,800.00	\$21,600.00
13.	8-inch Gate Valve	2	EA	\$1,500.00	\$3,000.00
14.	Reconnect Service	12	EA	\$1,000.00	\$12,000.00
15.	Reconnect Hydrant	2	EA	\$2,000.00	\$4,000.00
14.	Surface Restoration	3,000	SY	\$40.00	\$120,000.00
Subtotal					\$607,950.00
Contingency (25%)					\$151,987.50
Subtotal					\$759,937.50
Sales Tax at 8.2%					\$62,314.88
Total Estimated Construction Cost					\$823,000.00
Engineering, Construction Management (25%)					\$206,000.00
<b>Total Estimated Cost:</b>					<b>\$1,029,000.00</b>

**Wilmorth Reservoir No. 2**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1 LS	\$43,000.00	\$43,000.00
2.	Traffic Control	1 LS	\$5,000.00	\$5,000.00
3.	Temporary Erosion Control	1 LS	\$10,000.00	\$10,000.00
4.	SPCC Plan	1 LS	\$2,000.00	\$2,000.00
5.	Trench Excavation Safety Systems	1 LS	\$5,000.00	\$5,000.00
6.	Connect to Existing	1 LS	\$5,000.00	\$5,000.00
7.	Foundation Material	100 CY	\$40.00	\$4,000.00
8.	Bank Run Gravel for Trench Backfill	100 CY	\$35.00	\$3,500.00
9.	12-inch Ductile Iron Pipe	700 LF	\$90.00	\$63,000.00
10.	Additional Water Main Fittings	1,000 LBS	\$3.00	\$3,000.00
11.	12-inch Gate Valve	2 EA	\$1,800.00	\$3,600.00
12.	Site Work	1 LS	\$50,000.00	\$50,000.00
13.	132,000-gallon Concrete Reservoir	1 LS	\$250,000.00	\$250,000.00
14.	Surface Restoration	750 SY	\$40.00	\$30,000.00
Subtotal				\$477,100.00
Contingency (25%)				\$119,275.00
Subtotal				\$596,375.00
Sales Tax at 8.2%				\$48,902.75
Total Estimated Construction Cost				\$646,000.00
Engineering, Construction Management (25%)				\$162,000.00
<b>Total Estimated Cost:</b>				<b>\$808,000.00</b>

**Wilmorth Booster Station Improvements**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>		<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1.	Mobilization and Demobilization	1	LS	\$36,000.00	\$36,000.00
2.	Traffic Control	1	LS	\$5,000.00	\$5,000.00
3.	Temporary Erosion Control	1	LS	\$1,000.00	\$1,000.00
4.	SPCC Plan	1	LS	\$1,000.00	\$1,000.00
5.	Trench Excavation Safety Systems	1	LS	\$10,000.00	\$10,000.00
6.	Connect to Existing	2	EA	\$7,000.00	\$14,000.00
7.	Foundation Material	5	CY	\$40.00	\$200.00
8.	Bank Run Gravel for Trench Backfill	10	CY	\$35.00	\$350.00
9.	Booster Pump Station	1	LS	\$110,000.00	\$110,000.00
10.	Electrical	1	LS	\$220,000.00	\$220,000.00
11.	Surface Restoration	25	SY	\$40.00	\$1,000.00
Subtotal					\$398,550.00
Contingency (25%)					\$99,637.50
Subtotal					\$498,187.50
Sales Tax at 8.2%					\$40,851.38
Total Estimated Construction Cost					\$540,000.00
Engineering, Construction Management (25%)					\$135,000.00
<b>Total Estimated Cost:</b>					<b>\$675,000.00</b>



**City of Chelan**  
**Water Treatment Plant Improvements**  
**(May 2018 ENR Seattle Construction Cost Index #11472)**  
**July 9, 2018**

**WTP Interior and Exterior Valve & Instrumentation Replacement**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1	Mobilization and Demobilization	1 LS	\$ 72,100	\$72,100.00
2	6-inch Butterfly Valve	1 EA	\$ 1,700	\$1,700.00
3	8-inch Butterfly Valve	5 EA	\$ 1,900	\$9,500.00
4	10-inch Butterfly Valve	1 EA	\$ 2,000	\$2,000.00
5	12-inch Butterfly Valve	3 EA	\$ 2,300	\$6,900.00
6	14-inch Butterfly Valve	1 EA	\$ 2,800	\$2,800.00
7	16-inch Butterfly Valve	10 EA	\$ 3,100	\$31,000.00
8	18-inch Butterfly Valve	6 EA	\$ 4,200	\$25,200.00
9	24-inch Butterfly Valve	10 EA	\$ 6,300	\$63,000.00
10	30-inch Butterfly Valve	1 EA	\$ 12,200	\$12,200.00
11	Installation	1 LS	\$ 105,000	\$105,000.00
12	Structural Modifications	1 LS	\$ 150,000	\$150,000.00
13	Site Surface Rehabilitation	1 LS	\$ 75,000	\$75,000.00
14	Laser Turbidimeters	7 EA	\$ 9,000	\$63,000.00
15	SC200 Controller	1 EA	\$ 3,000	\$3,000.00
16	16-inch Flow Meter	2 EA	\$ 3,500	\$7,000.00
17	18-inch Flow Meter	1 EA	\$ 3,500	\$3,500.00
18	24-Inch Flow Meter	3 EA	\$ 4,500	\$13,500.00
19	Flow Meter Installation	1 LS	\$ 21,000	\$21,000.00
20	Electrical	1 LS	\$ 50,000	\$50,000.00
21	Programming and Integration	1 LS	\$ 10,000	\$10,000.00
Subtotal				\$727,400.00
Contingency (30%)				\$218,220.00
Subtotal				\$945,620.00
Sales Tax at 9%				\$85,105.80
Total Estimated Construction Cost				\$1,031,000.00
Engineering, Construction Management (25%)				\$258,000.00
<b>Total Estimated Cost:</b>				<b>\$1,289,000.00</b>

**WTP Backwash Basin Cover Installation**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1	Mobilization and Demobilization	1 LS	\$ 20,000	\$20,000.00
2	FRP Basin Cover	1 EA	\$ 75,000	\$75,000.00
3	FRP Basin Cover Insulation	1 EA	\$ 35,000	\$35,000.00
4	Cover Installation	1 LS	\$ 35,000	\$35,000.00
5	Electrical	1 LS	\$ 10,000	\$10,000.00
Subtotal				\$175,000.00
Contingency (30%)				\$52,500.00
Subtotal				\$227,500.00
Sales Tax at 9%				\$20,475.00
Total Estimated Construction Cost				\$248,000.00
Engineering, Construction Management (25%)				\$62,000.00
<b>Total Estimated Cost:</b>				<b>\$310,000.00</b>

**WTP Treatment System Improvements**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1	Mobilization and Demobilization	1 LS	\$ 784,000	\$784,000.00
2	Site Improvements	1 LS	\$ 300,000	\$300,000.00
3	WTP Filter Building Improvements	1 LS	\$ 1,500,000	\$1,500,000.00
4	Piping and Mechanical	1 LS	\$ 1,200,000	\$1,200,000.00
5	Blower Modifications / Rehabilitation	1 LS	\$ 75,000	\$75,000.00
6	Auxiliary Generator Modifications	1 LS	\$ 75,000	\$75,000.00
7	Additional Raw Water Storage Facilities	1 LS	\$ 1,500,000	\$1,500,000.00
8	Additional Finished Water Storage Facilities	1 LS	\$ 2,000,000	\$2,000,000.00
9	Electrical	1 LS	\$ 400,000	\$400,000.00
10	Programming & Integration	1 LS	\$ 75,000	\$75,000.00
Subtotal				\$7,909,000.00
Contingency (30%)				\$2,372,700.00
Subtotal				\$10,281,700.00
Sales Tax at 9%				\$925,353.00
Total Estimated Construction Cost				\$11,208,000.00
Engineering, Construction Management (25%)				\$2,802,000.00
<b>Total Estimated Cost:</b>				<b>\$14,010,000.00</b>

**WTP Chemical Dosing System Improvements**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1	Mobilization and Demobilization	1 LS	\$ 52,000	\$52,000.00
2	Alum Dosing System Modifications	1 LS	\$ 100,000	\$100,000.00
3	FilterAit Dosing System Modifications	1 LS	\$ 100,000	\$100,000.00
4	Chemical Room HVAC Modifications	1 LS	\$ 45,000	\$45,000.00
5	Electrical	1 LS	\$ 200,000	\$250,000.00
6	Programming & Integration	1 LS	\$ 20,000	\$20,000.00
Subtotal				\$567,000.00
Contingency (30%)				\$170,100.00
Subtotal				\$737,100.00
Sales Tax at 9%				\$66,339.00
Total Estimated Construction Cost				\$804,000.00
Engineering, Construction Management (25%)				\$201,000.00
<b>Total Estimated Cost:</b>				<b>\$1,005,000.00</b>

**WTP Raw Water Pump Station Improvements**

<b><u>NO.</u></b>	<b><u>ITEM</u></b>	<b><u>QUANTITY</u></b>	<b><u>UNIT PRICE</u></b>	<b><u>AMOUNT</u></b>
1	Mobilization and Demobilization	1 LS	\$ 34,000	\$34,000.00
2	Site Security Improvements	1 LS	\$ 100,000	\$100,000.00
3	250 HP Pump VFD Motor Starter	1 LS	\$ 45,000	\$45,000.00
4	Generator Connection Relocation	1 LS	\$ 45,000	\$45,000.00
5	Electrical	1 LS	\$ 100,000	\$100,000.00
6	Programming & Integration	1 LS	\$ 20,000	\$20,000.00
Subtotal				\$344,000.00
Contingency (30%)				\$103,200.00
Subtotal				\$447,200.00
Sales Tax at 9%				\$40,248.00
Total Estimated Construction Cost				\$488,000.00
Engineering, Construction Management (25%)				\$122,000.00
<b>Total Estimated Cost:</b>				<b>\$610,000.00</b>

**APPENDIX G**  
**Watershed Plan**

Final Review Draft  
WRIA 47 Lake Chelan Detailed Implementation Plan

Funded through Grant #G1400521 from the Washington State Department of Ecology

## **1.0 Introduction**

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This document presents the Phase 4 Detailed Implementation Plan (DIP) for the Lake Chelan Watershed. The Lake Chelan Watershed is designated as Water Resource Inventory Area (WRIA) 47. The completion of this DIP within the first year of Phase 4 Implementation fulfills the requirements for a detailed implementation plan as set forth by the Revised Code of Washington (RCW) 90.82.043 and 90.82.048. The main purpose of this DIP is to guide the implementation of the WRIA 47 Watershed Management Plan developed by the WRIA 47 Lake Chelan Watershed Planning Unit (LCWPU). The plan addresses the implementation of water management strategies, and projects that address water quality, water quantity, and habitat in the watershed.

The Phase 3 Watershed Management Plan prescribes numerous projects, studies, management strategies, and recommendations. This DIP focuses on how these actions will be accomplished, including identifying responsible entities, potential funding sources, and timeline and schedule for implementation. This document is not intended to be a stand-alone document; rather, it is intended to be used in conjunction with the Phase 3 Watershed Plan along with the Water Quantity Assessment, Water Quality Assessment, and Habitat Assessment (RH2, 2012). This is a working implementation plan that is expected to grow and evolve as projects are implemented, data are collected, and issues are better understood by the LCWPU. It is expected that new actions will be added and some existing actions eliminated as they become obsolete as time progresses, and as the LCWPU develops its planning and management expertise.

The actions in this document have been prioritized by the WRIA 47 LCWPU so that they can be implemented in a coordinated manner without duplication of effort by other entities. When successfully implemented, the actions described in this implementation plan will result in a coordinated water resource management effort that merges agricultural and domestic water needs with water resource protection and conservation on a watershed wide scale. Ideally, the actions will be implemented by the entities involved in a timely manner but this will ultimately depend on the availability of funding, staff resources, technical capability, and priorities of the implementing entities.

## **1.1 Setting (Basin Overview)**

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### **General Characteristics**

The area occupied by the Lake Chelan WRIA 47 comprises 1,044 square miles, of which 90 percent (937 square miles) includes Lake Chelan and its tributary sub-basins; the remaining 10 percent consists of sub-basins that drain to the Columbia River. One primary tributary, the Stehekin River, and one secondary tributary, Railroad Creek, discharge 85 percent of WRIA 47 runoff into Lake Chelan. The management area consists of ten sub-basins shown

on **Figure 1**. Approximately 1.8 percent (19 square miles) of WRIA 47 lies within Okanogan County. A more detailed summary of the WRIA 47 characteristics is presented in the Phase 2 Water Quantity Assessment (RH2, 2009).

### **Topography and Vegetation**

WRIA 47 has physical and vegetation characteristics similar to other east-slope Cascade watersheds. The watershed includes glaciers and rugged mountains at the highest elevations, dense fir and open ponderosa pine forests, wide expanses of shrub-steppe, and narrow riparian zones in lower elevations. Elevations in WRIA 47 range from 700 feet above mean seal level (MSL) at the Columbia River to 9,511 feet MSL at Bonanza Peak. Landforms consist of the classic U-shaped, glacially-carved valleys of Lake Chelan, the Stehekin River, and smaller tributaries in the higher elevation sub-basins, which are surrounded by high ridges and steep cliffs. Lower elevation sub-basins are narrower incised valleys that are tributaries to Lake Chelan and the Columbia River, bounded by rolling hills near the lake's terminus at the City of Chelan, and gravel terraces along the Columbia River.

The lake consists of two basins: the Lucerne basin, which is deep (1,500 feet) and fjord-like, and extends north from The Narrows north of Manson for approximately 40 miles to the Stehekin River; and the Wapato basin, which is relatively wide and shallow in comparison (maximum depth of 400 feet) and extends for approximately 15 miles south of The Narrows to the lake outlet at the head of the Chelan River.

### **Geology**

Bedrock comprises much of the exposed surficial geologic units on the steeper slopes above terraces and hills of the lower basin, and forms the slopes and ridges of the upper basin above 1,600 feet in WRIA 47. Glacial episodes deposited relatively broad layers of fine to coarse-grained sediment in the valley floors and partially on the valley sidewalls or in patches on ridges. Lakeshore, river, and landslide deposits are found primarily along river and creek bottoms and at the base of slopes. The glacial and post-glacial deposits contain most of the available groundwater in WRIA 47, and nearly all developed and irrigated lands are underlain by unconsolidated geologic units.

### **Hydrology**

Precipitation that is not lost to evapotranspiration runs off steep slopes into stream channels, minor tributaries and primary tributaries of the Stehekin River and Railroad Creek, where they ultimately discharge out of Lake Chelan into the Chelan River and finally into the Columbia River.

Primary and tributary streams to Lake Chelan experience peak runoff during the spring melt in May to July, and low flows during September through February. Water in Lake Chelan is generally stored during the runoff period and released during the low flow season to generate hydroelectric power, resulting in a flattened hydrograph compared to natural flows.

Average annual inflow to Lake Chelan is estimated to be approximately 1.6 million acre-feet (af), equivalent to a constant flow of approximately 2,200 cubic feet per second (cfs). The Stehekin River accounts for 65 percent of the total inflow to the lake, Railroad Creek contributes 10 percent and approximately 50 other smaller tributaries contribute another 25 percent of the surface inflow (FERC, 2001). Precipitation that falls directly on the lake contributes 4.4 percent of the total inflow to the lake, or approximately 70,000 af per year.

## **Groundwater**

Groundwater in WRIA 47 is replenished from precipitation falling in the basin and infiltrating into porous surficial deposits. The broader and hilly terrain of the lower watershed sub-basins promotes groundwater recharge. In contrast, steep, thinly covered bedrock areas promote runoff and little recharge into bedrock fractures. Groundwater is recharged artificially via seepage from irrigation drains, via return flow infiltrating from irrigated lands, and via seepage from Wapato, Roses, and Dry Lakes in the Manson Lakes Sub-basin. Groundwater elevations and yield to wells in these areas are expected to be artificially high relative to non-irrigation conditions.

## **Population**

The 2010 Washington State Census data determined a population of 12,730 within WRIA 47 (excluding the Okanogan County portion of the watershed). The Census forecasted a population of 13,104 for 2008 and 15,650 by 2025. The highest population density in WRIA 47 exists along the lake shoreline. Most residents work within the watershed and live within the Wapato Main Stem and Manson Lakes Sub-basins.

## **Land Use**

Most of the watershed is under federal management, primarily by the U.S. Forest Service and National Park Service; approximately 87 percent of the Lake Chelan watershed is in federal, state, and local-government ownership. The remaining 13 percent is in private ownership. Hillsides above the lakeshore and lower elevation uplands are irrigated for orchard, vineyard, and pasture. Lake Chelan is managed for multiple uses including power, recreation, irrigation, potable water supply, historic and cultural preservation, fisheries, wildlife, and habitat.

## **Water Rights**

The Washington State Department of Ecology's (Ecology) water rights records indicate that more than 800 active certificated water rights are authorized in WRIA 47, consisting of 700 surface water rights and 100 groundwater rights. There are 133 surface water permits and 30 groundwater permits. The database identifies 530 surface water claims and 148 groundwater claims. Approximately 50,000 af of water rights and claims are filed with Ecology for water in Lake Chelan sub-basins within WRIA 47, and more than 350,000 af of water rights and claims are filed for water in Columbia River sub-basins within WRIA 47.

In 1992, Chelan County Public Utility District No. 1 (Chelan PUD) and Ecology prepared an agreement in which the Chelan PUD water right Certificate 319 authorizes Chelan PUD to withdraw 4,000 cfs from the Chelan River for hydroelectric power generation with an unspecified annual use. Permit 548 established a reservation of 33,000 af per year for above-dam diversion for irrigation and domestic use in the watershed. The agreement creates a 20,000 af reservation of new water right from unused portion of Certificate 319 for use only within Chelan WRIA 47.

In 2014, CCNR initiated the development of a Coordinated Cost Reimbursement Program (CCRP) that would facilitate the processing of water right applications on file with Ecology. Initial steps more precisely quantified the availability of water rights in the Chelan PUD water right reservation (approximately 7,000 to 11,000 af) and the amount of water in 158 new water right applications on file with Ecology (approximately 10,000 af). The CCRP will

continue in the next several years and will serve to meet water right planning and water quantity actions of the Watershed Plan.

## **Water Use**

Approximately 89 percent of households receive water from WRIA 47 surface water sources provided by 12 Group A Community systems, with 11 percent from groundwater (7 percent from exempt wells, 4 percent from 63 Group B systems). Approximately 2,500 af of water is used each year for residential consumption. Much of the wastewater from WRIA 47 is collected, treated, and discharged to the Columbia River.

Approximately 16,000 af of water is used for irrigation in the Wapato Main Stem sub-basin, and 5,000 af of water is used for irrigation in Columbia River sub-basins, primarily for orchard crops.

Approximately 350 af of water is used in the Wapato Main Stem sub-basin for commercial and industrial use.

## **Lake Chelan Project**

Lake Chelan is a regulated reservoir under a Federal Energy Regulatory Commission (FERC) license that was initially authorized in 1926 and re-authorized on November 6, 2006. The Lake Chelan Hydroelectric Project FERC Project No. 637 consists of Lake Chelan, a 1,486-foot-deep, 55-mile-long natural glacial lake that was raised 21 feet by the construction of the 40-foot-high, 490-foot-long concrete gravity dam in 1926. Lake Chelan is a 32,560-acre reservoir at normal maximum water surface elevation of 1,100 feet MSL, with a gross storage capacity of 15.8 million af and a useable storage of 677,400 af.

Chelan PUD establishes target elevations to be achieved between May 1 and October 1, based on seasonal runoff and operational objectives including:

- Maintaining minimum instream flows in the Chelan River;
- Reducing high flows in the Chelan River; and
- Providing usable lake levels for recreation (between 1,090 and 1,098).

The minimum flow varies depending on the time of year and whether it is a dry, normal, or wet water year.

Approximately 2,000 acres of project land lie within the Lake Chelan Project boundary. About 1,300 acres of the Project lands are inundated and project facilities occupy the other 700 acres. The Project lands are owned by the US Forest Service, National Park Service, several state agencies, Chelan PUD, and private property owners. Approximately 465.5 acres are inundated federal lands.

## **1.2 Background of Watershed Planning In WRIA 47**

In 1998, the Washington State Legislature passed the Watershed Planning Act (Chapter 90.82 RCW), which provides for locally-based watershed planning in each of the state's 62 WRIs. Watershed Planning consists of four phases of work:



1. *Phase 1* – organization of the Watershed Planning Unit
2. *Phase 2* – assessment of existing conditions and development of technical assessments of water resources
3. *Phase 3* – development and adoption of the Watershed Plan
4. *Phase 4* – development of an implementation plan to carry out the recommendations and obligations outlined in the Watershed Plan

From 1991 to 2007, water quality planning activities were conducted by the Lake Chelan Water Quality Committee (LCWQC), which included Chelan County, the City of Chelan, the Lake Chelan Sewer District, the Lake Chelan Reclamation District, Chelan PUD, and the U.S. Forest Service.

In October 2007, the LCWPU was formed, largely by members of the LCWQC, and has continued the objectives and activities of the LCWQC under the Watershed Planning Act, RCW 90.82.

### **LCWPU Membership and Procedures**

The following entities are members of the WRIA 47 LCWPU.

- Chelan County
- City of Chelan
- Lake Chelan Reclamation District
- Chelan PUD
- Chelan-Douglas Health District
- Washington Department of Ecology
- Washington Department of Fish and Wildlife
- Washington Department of Health
- Washington Department of Natural Resources
- U.S. Army Corps of Engineers
- U.S. Forest Service
- Interested individuals

The initiating governments view watershed planning as a complement to other water resource management efforts in WRIA 47, including implementing regulatory actions as part of re-licensing the Chelan Dam and work done by the LCWQC.

### **Phase 2 Water Quantity Assessment**

The Phase 2 Water Quantity Assessment (RH2, 2009) prepared an updated water balance used existing information to estimate input (precipitation and imported water from outside the basin), and water loss (evapotranspiration, recharge to groundwater and consumptive loss from beneficial uses). The water balance was estimated for natural and developed conditions and average, dry/warm and wet/cool years.

The Water Quantity Assessment report presented the following findings and recommendations:

- The water balance estimates indicate that most of the physically available water (precipitation runoff, shallow groundwater recharge, imported water) entering WRIA 47 is discharged through the Lake Chelan reservoir and used for power generation.
- The lack of stream flow and groundwater data is responsible for large variation in water balance estimates for the sub-basins. Evaluation of the shift in water resource use in these sub-basins will require additional data and analysis to quantify.
- Irrigation water use is very efficient and the incremental improvements in irrigation efficiency are unlikely to significantly increase water availability in the basin.
- Commercial and industrial water use are minor components of the water balance; increased efficiency or reuse of commercial and industrial water are unlikely to significantly increase water availability in the basin.
- Much of the domestic water used in WRIA 47 either returns as groundwater storage and base flow seepage into Lake Chelan, or is exported from the basin to the Columbia River as treated wastewater; domestic consumption is a minor component of water balance.
- Converting the use of water from irrigation use to domestic use could substantially affect groundwater recharge and base flow in the sub-basins, since the consumptive loss of domestic water is low relative to total water present.
- Compilation of current use and estimates of future use are based on limited documentation of actual beneficial uses and return flows.

## **Phase 2 Water Quality Assessment**

The Phase 2 Water Quality Assessment reviewed water quality data from previous assessments and summarized the results in two separate technical memos prepared in 2009: Assessment of Water Quality Issues within WRIA 47 (AMEC, 2009a); and Review and Summary of Existing Water Quality Studies within WRIA 47 (AMEC, 2009b).

A Total Maximum Daily Load (TMDL) for phosphorous in Lake Chelan was approved by Ecology and the Environmental Protection Agency (EPA) in 1993. The Lake Chelan DDT/PCB TMDL to address the DDT and PCB contamination contained in the tissues of fish in the Lake Chelan watershed was initiated in 2003 and completed in 2006. The TMDL identified potential actions designed to prevent DDT and PCB inputs to Lake Chelan and Roses Lake. Monitoring fish tissue concentrations will be the primary strategy to track progress of the TMDL implementation approach.

Water quality concerns within WRIA 47 include elevated concentrations of organochlorine pesticides, PCBs, and dioxins/furans within fish tissues, and elevated water quality constituents including phosphorous, pH, dissolved oxygen, and invasive exotic plants. Water quality monitoring data for WRIA 47 were obtained to meet study-specific objectives and contain few consistently measured parameters; this limits the ability to evaluate long-term trends in water quality in WRIA 47. This lack of adequate monitoring data led to LCWPU recommendation to develop and implement a long-term monitoring plan (LTMP). The

LCWPU recommended developing a water quality model to evaluate water clarity/eutrophication, and a bioaccumulation food-web model to model toxics transfer between sediment, water, and the aquatic food chain.

AMEC prepared the LTMP (AMEC, 2009c) and associated Quality Assurance Project Plan (QAPP) for water quality modeling (AMEC, 2009d). The LTMP and provides an initial framework for the plan that focuses on the calibration and application of two models: 1) CE-QUAL-W2, a water quality model to support evaluation of water quality conditions including water clarity and eutrophication; and 2) the Lake Chelan food web bioaccumulation food web model. The QAPP for the CE-QUAL-W2 model will guide the collection, management, and interpretation of data used in the model. Due to funding cuts, a QAPP for the food web model was put on hold, pending future funding.

## **Phase 2 Habitat Assessment**

The habitat assessment addressed both aquatic habitat and fish species. While fishery management often involves habitat restoration and/or other habitat considerations, it may also include methods and processes distinct from habitat management. However, both habitat and non-habitat management components are vital to fish management in WRIA 47 and are the subjects of public interest and past restoration efforts.

Factors impacting fish populations in the watershed include habitat degradation and loss; land development, conversion, and management; agricultural practices; fish-passage barriers; dam operations; flooding; species introductions; interspecific breeding; competition for resources; disease; harvest; and hatchery and stocking operations. Impacts and their effects on aquatic habitat in the watershed are described in the Phase 2 Habitat Component (Watershed Company, 2011).

## **Other WRIA 47 Planning Activities**

Other planning activities not conducted under WRIA 47 watershed Planning have similar water quality, water quantity, and habitat management objectives and activities that overlap with those of WRIA 47 watershed planning. These activities include the Chelan County Shoreline Master Program (SMP) update; Chelan County in-lieu fee program development; Chelan PUD FERC license activities under the Lake Chelan Settlement Agreement; and development of the Northwest Power and Conservation Council Lake Chelan Sub-basin Plan. Details regarding these plans are presented in the WRIA 47 Watershed Plan (RH2, 2012).

To accelerate or expedite processing the backlog of water right applications, CCNR and the LCWPU are proposing an approach that would collectively process the new water right applications under a coordinated cost-reimbursement program (CCRP) authorized under Revised Code of Washington (RCW) 90.03.265(3). The CCRP is an expansion of the successful cost-reimbursement program used throughout the state. The cost-reimbursement program allows applicants for new water rights to pay for the review, analysis, and processing of their water right application in addition to any other pending senior applications that propose new withdrawal or diversion from the same body of water as the cost-reimbursement applicant. The application is reviewed and processed by a consultant under contract with Ecology and Ecology reviews the consultant's analysis and recommendation to either authorize or reject the application. The standard cost-reimbursement approach typically is used for applications related to a single aquifer or

surface water body. The CCRP looks at an entire basin and draws all interested applicants together to collectively fund review and processing of all applications within the basin to reduce the individual cost and accelerate the review and approval process.

Ecology has funded the initial review and quantification of the existing water rights and pending applications in the Chelan basin. Additional funding is necessary to proceed with public participation to develop the CCRP in the Chelan basin. Ecology and the Chelan PUD need to resolve the uncertainty in accounting for valid water right claims and exempt wells that would reduce the amount of water remaining in the reserve.

### **Phase 3 Watershed Plan**

Preliminary objectives for watershed planning in WRIA 47 were developed by the LCWPU during Phase 1 in 2008. WRIA 47 water quantity and quality conditions and challenges to meet the LCWPU objectives were identified during Phase 2 Watershed Planning, which included water quantity assessment and compilation of water quality conditions. Recommendations from the Phase 2 assessments were developed and carried forward into the Phase 3 watershed planning effort. A summary habitat assessment, compiled during Phase 3, identified watershed planning-related objectives and conditions to protect and enhance fish habitat in WRIA 47, and recommendations from habitat assessment activities are included in the Phase 3 watershed planning effort. The LCWPU reviewed and refined recommendations to meet the objectives developed in Phase 2 and 3, and the Phase 3 watershed planning recommendations are summarized in this section.

### **Water Quantity Recommended Actions**

- Improve the documentation of beneficial water use, inchoate rights, municipal water supply, irrigation water use, and irrigation return flow to update water balance estimates and monitor the effects of changes in water use to improve estimates of future water availability in WRIA 47.
- Initiate surface water and groundwater monitoring in the Wapato, Manson, and lower Lucerne sub-basins to provide data to support water quality and habitat monitoring and improvement plans in WRIA 47.
- Use improved water balance estimates to support implementation of water quality studies and water quality management.
- Promote joint comprehensive analysis and prioritization of future municipal/domestic use by large and small Group A systems, Group B systems, future irrigation use, and future commercial/industrial use.
- Evaluate regional growth patterns, regional demands, inchoate water rights and water system connections for future/expanded service areas.
- Evaluate potential future irrigation demands and transfers of water rights following conversion of agricultural land prior to transfer for other purposes.

- Prioritize and establish quantities for the current 20,000 af Chelan PUD water right reservation and any future Chelan PUD water right reservations when needed.
- Identify an adequate domestic water and fire-fighting supply as airport and planned developments proceed in the Howard Flats sub-basin.

### **Water Quality Recommended Actions**

- Calibrate the CE-QUAL-2K water quality model with the first year of data to initiate the LTMP.
- Prepare a QAPP for the food web bioaccumulation model to support the characterization and monitoring objectives of the LTMP.
- Initiate the LTMP using the initial modeling results to advance the implementation of the TMDLs for phosphorous and DDT/PCB.
- Evaluate the feasibility and benefits of including benzene as part of the LTMP.
- Inform and educate agencies and the public regarding LTMP objectives and findings to support watershed protection in WRIA 47.
- Evaluate the feasibility and priority for extending sanitary sewer to rural areas along the north and south shores and around the Manson Lakes.
- Evaluate the feasibility and benefits for establishing an On-site Wastewater Management District to improve rural septic system performance in removing both bacteria and nutrients.
- Evaluate the feasibility and benefit of managing irrigation drain return flows that discharge to surface water.
- Promote land use practices and regulations for stormwater and clearing/grading to reduce unmanaged stormwater and sediment discharge to surface water.

### **Habitat Recommended Actions**

- Support the Lake Chelan Fishery Plan (LCFP) objectives to improve understanding of Lake Chelan fisheries and fisheries management, and address competing management approaches.
- Support the monitoring and understanding of habitat and species interactions and reproduction by coordinating LTMP activities with Lake Chelan Fishery Forum (LCFF) activities to implement the LCFP.
- Support habitat restoration efforts to improve limiting factors for both fish and wildlife.
- Support developing a detailed implementation plan that includes prioritized fish and wildlife actions.

### **Phase 4 Detailed Implementation Plan**

The next step in the watershed management planning process prioritizes the potential actions and develops a strategy to achieve the desired future conditions identified by the

Watershed Plan in a DIP. The DIP (this document) outlines a comprehensive approach for accomplishing the goals of the WRIA 47 LCWPU. The DIP will be periodically revisited to update progress in implementation, adjust planning objectives as conditions or regulations in the watershed change, and reorganize priorities according to changes in demand, feasibility, and funding availability.

RCW 90.82.043 and 90.82.048 provides guidance to the Planning Unit regarding DIP content and process. The DIP must cover the following elements:

- Strategies to provide for sufficient water for beneficial uses identified in the watershed.
- Timelines to achieve these strategies.
- Interim milestones to measure progress.
- Coordination and oversight responsibilities.
- Needed inter-local agreements and administrative approvals.
- Specific funding mechanisms.

Furthermore, the watershed management planning entity must consult with other local and state entities to ensure that no efforts proposed in the DIP are duplicative or inconsistent with their work.

## **Purpose**

The Detailed Implementation Plan outlines a framework for conserving, improving and protecting the water quantity, quality, and habitat conditions of the Lake Chelan watershed through the implementation of the WRIA 47 Watershed Plan recommendations. The five priority recommendations of the watershed plan are as follows:

- A. Implement the LTMP.**
- B. Improve the water balance estimates in the Wapato Basin to support the LTMP.**
- C. Improve the estimates and locations of the current and future proposed beneficial uses of water in WRIA 47.**
- D. Support wildlife and fisheries monitoring and management objectives of the LCFP and LCFF.**
- E. Support land use planning activities, such as Shoreline Master Program, Chelan County in-lieu fee program, FERC licensing activities, and county infrastructure planning that share watershed planning objectives with the WRIA 47 Watershed Plan.**

The completion of this DIP also fulfills the requirement in RCW 90.82.043 to submit the implementation plan to Ecology as a condition of receiving continued funding for Phase 4 Implementation.

## **Approach and Implementation Strategy**

The DIP is meant to be a reasonable approach to achieving the principle recommendations of the watershed plan in a realistic timeframe under known physical, political, social and economic limitations. It is based on the LCWPU's belief that using the best available science, local knowledge, working collaboratively to address issues and encouraging voluntary actions is the best way to achieve shared objectives. Furthermore, an adaptive management approach will be used to address new water related issues as they arise in the watershed. As new data are collected this approach will allow the recommendations and strategies of the implementation plan to evolve in a way to best suit the objectives of the watershed plan.

The implementation approach realistically considers the priority of an implementation task against the availability of funding and the readiness to implement the task. Rather than establishing a sequential implementation for all potential tasks, the LCWPU has transferred the recommended actions from the Watershed Plan into a prioritized list for each of the principle watershed recommendations. Part of the implementation strategy includes identifying and securing funding, and developing the project feasibility. These prioritized recommended actions are expected to develop and be implemented somewhat concurrently as funding and personnel become available.

The approach consists of the prioritization of each potential project actions within each of the five principle recommendations and identifying the subtasks to implement each action. The subtasks include:

- Identifying the project sponsor;
- Completing a sufficient statement of technical feasibility, schedule, and cost-benefit analysis;
- Identifying permitting and operation requirements, and confirming permitting requirements through coordination with agencies; and
- Developing a project cost and identifying the funding source.

The implementation approach creates an implementation table that summarizes the status of the prioritized projects, and will be annually updated. This planning tool will help the LCWPU identify the progress and level of commitment to each action and help refine or reorganize the priorities of the implementation plan.

This compilation of the status of each potential task as they develop will further the prioritization of the actions and help the LCWPU identify the initial and subsequent actions as they become readily implementable. These first actions may not be considered the highest priority, but completing several early actions will promote the success of the LCWPU and its activities in the watershed and build a sustainable planning effort. Successful project completion will also demonstrate the ability for the LCWPU to complete worthy projects and build on its credibility for pursuing the more challenging projects in the watershed.

The strategy keeps the LCWPU focused on the primary recommendations to increase and protect sustainable water supply in the watershed which meets the requirements of RCW 90.82. The implementation strategy involves periodic review of the prioritized actions, and aggressively pursuing available and potentially innovative funding and partnerships with funding and management agencies, for example, the Office of Columbia River (OCR) and FERC.

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## **Permitting**

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The implementation actions will require little or no permitting, as most of the actions involve data collection and analysis or supporting existing agency programs that align with the Watershed Plan objectives. Working with Ecology to develop a coordinated cost reimbursement program will require preparing water rights documentation, which are not permits, but do describe compliance with water laws and rules. The implementation tables summarize permitting requirements.

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## **Coordination and Oversight**

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The LCWPU is the primary entity responsible for oversight of the implementation of the WRIA 47 Watershed Plan. While the LCWPU is ultimately responsible for approving and providing overall direction for implementation projects, the Chelan County Natural Resource Department (CCNRD)(as the Lead Agency) is responsible for convening the LCWPU, preparing meeting summaries, administering implementation grant funds, keeping track of the Phase 4 projects and budgets and handling day to day tasks.

The CCNRD coordinates but does not direct the activities of the LCWPU. The LCWPU provides overall direction for implementation, development of requests for proposals from contractors, approval for contractor selection, development and approval of scopes of work and project reviews and approvals. The LCWPU is also responsible for development and approval for revisions to the WRIA 47 Watershed Plan and DIP. The LCWPU and CCNRD's roles in coordination and implementation are further defined by a number of implementation actions defined in the watershed plan.

The CCNRD has received outside technical support (primarily, RH2 Engineering, Inc., in East Wenatchee) to develop each phase of watershed planning and likely will continue to rely on this or similar support to oversee and support the activities of the LCWPU to implement the watershed plan.

Ecology will continue to provide regulatory guidance to ensure compliance of the implementation phase with the objectives of RCW 90.82. Ecology also oversees financial responsibility for watershed planning funds and financially supports watershed planning activities from other State funding sources.

Members of the LCWPU may identify specific actions and act as a Project Sponsor to: promote activities; document action status; identify and coordinate the initial LCWPU effort in funding applications; and communicate interim status of the action to the LCWPU. Much of the implementation progress will depend on the Project Sponsor to initiate the funding and feasibility process and energize the other LCWPU members towards implementing the project.

Agreements, rules, and ordinances that would be needed to implement an action will be developed in detail as part of initial implementation. Most of the implementation actions do not require agreements or already have these agreements in place. Many actions, such as water level and water quality monitoring, consist of data collection and analysis and do not require agreement between agencies. Some actions will require agreements and compliance with rules. For example, implementing the long term monitoring plan actions will require concurrence with Ecology to confirm the monitoring objectives to align with TMDL implementation. Development of the Coordinated Cost Reimbursement Program will



require agreement between Ecology, Chelan County, and Chelan PUD. Actions that overlap rules or other existing plans, such as the Lake Chelan Dam FERC license, Lake Chelan Fishery Plan, City of Chelan Comprehensive Plan, or Chelan County Growth Management Plan will require coordination, agreement, and compliance with the existing license, plan, or rules. In most cases, this effort would be limited to simple letters of agreement confirming and outlining how implementation actions would comply with the existing rules and ordinances. These cases are summarized in the implementation tables.

The Watershed Plan and DIP was developed through coordination with the members of the planning unit, and communicated the Plan and DIP to other agencies within Chelan County and Washington State through public meetings and meetings with LCWPU members. The DIP identifies specific agencies and organizations for current and future consulting and collaborating on coordination of implementation action efforts and to prevent overlap or competing objectives. For example, completing the LTMP will require coordination with Ecology and the EPA to meet objectives of the TMDL Implementation. Completing water balance estimates, water rights analysis, and the coordinated cost reimbursement program will require coordination with Ecology and Chelan PUD. Actions that will require coordination are summarized on the implementation tables.

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### **Planned Future Uses of Inchoate Water Rights**

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RCW 90.82.043 requires that the DIP contain strategies to provide sufficient water for production agriculture; commercial, industrial, and residential use; and instream flows, along with timelines to achieve these strategies and interim milestones to measure progress.

The Phase 2 Water Quantity Assessment described and quantified the current water use, the potential future water use and the amount of water rights in WRIA 47. Preliminary evaluation of the available groundwater rights in the Chelan PUD water right reserve and quantity of water right applications on file with Ecology has been completed in preparation for developing a Coordinated Cost Reimbursement Program for WRIA 47. The primary inchoate rights are held by Chelan PUD in their water right reservation, and by the City of Chelan to meet projected future municipal as described in comprehensive water plans.

The development of the CCRP will addresses future water uses for agriculture; commercial, industrial, and residential use. The Chelan PUD FERC license is the primary management that affects and promotes instream flows, and Chelan PUD is the senior right holder in the basin with the largest influence on how water use and management will provide sufficient water to meet instream flow requirements.

The DIP contains recommended actions in the Implementation Tables that pertain to managing and developing inchoate rights in WRIA 47.

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### **Funding Options**

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This section meets the requirements to define “specific funding mechanisms” (per RCW 90.82.043[3]) for implementation of the WRIA 47 Watershed Management Plan recommended actions. The following funding mechanisms are considered: 1) Phase 4

Implementation grant funds; 2) resources committed by implementing entities; and, 3) other grant funding.

The LCWPU recognizes that implementation is subject to budgetary constraints and that no entity is obligated to implement an action without adequate funding. In reality, since there is insufficient funding through Watershed Planning Phase 4 to implement all the actions, the resources to implement actions will come primarily from the obligated / responsible entities defined in the Watershed Management Plan and from additional grant sources. The LCWPU may consider hiring a grant writer to assist with applying for potentially available funds.

The implementation tables include potential funding sources for each of the actions. No attempt has been made to quantify the likelihood of gaining funding or the level of completion for of these sources.

#### **Phase 4 Watershed Planning Funds**

Phase 4 Watershed Planning Implementation funds provided by the State Legislature have historically included:

- Up to \$25,000 for the first 3 years of implementation, with a 10-percent required match (\$2,500 per year). Second year funding is conditioned on the completion of an approved DIP.
- At the end of 3 years, up to \$12,500 for the fourth and fifth years of implementation, with a 10-percent required match (\$1,250 per year).

Phase 4 Implementation funds (potentially available through 2019) will be utilized primarily by the CCNRD to administer and facilitate implementation of the WRIA 47 Watershed Management Plan and implement priority projects.

#### **Coordinating Funding with Other Implementation Processes**

The LCWPU will seek coordination of grant funding with other planning processes. For example, funding of water actions and projects would occur through Chelan County Lead Entity for Salmon Recovery and through other money that comes through the Upper Columbia Salmon Recovery Board (UCSRB). Members of the LCWPU are participating in the LCFP and LCFF, and the Chelan PUD largely funds FERC-related projects that may have similar objectives to the WRIA 47 Watershed Plan. The OCR funds projects that occur in the mainstem of the Columbia and its tributaries, where the projects benefit both instream and out of stream uses. The OCR may participate in projects within WRIA 47 which contributes to water quality, habitat and beneficial use in the Columbia River.

#### **Review of Grant Funding Sources**

In order to aid in the implementation of actions prescribed in this Implementation Plan, specifically for those policy statements, management strategies, and projects that will not be funded through Phase 4 Watershed Planning Biennium Grant funds, additional funding sources must be sought. The most common additional funding sources include:

- Specific grants that may be available through the Washington State Departments of Ecology, Fish and Wildlife, and Health. These will vary over time. Several granting sources are identified in the implementation tables.

- The OCR is actively seeking projects to fund water projects to benefit instream and out of stream uses of water. The OCR grants provides funding in exchange for quantifiable amounts of water either returned to the Columbia River Basin for federal funding sources for monitoring, pollution prevention and control, watershed and drinking water source protection, wetlands and wildlife.
- Chelan PUD to support FERC licensing requirements to benefit shoreline habitat, water quality, fisheries, and water availability.
- Centennial Clean Water Funds available through Ecology.
- The Northwest Power and Conservation Council funding of habitat restoration projects and public involvement and education through the Bonneville Power Administration (BPA).
- Boise State University's Environmental Finance Center has partnered with the EPA's Environmental Finance Program to provide a searchable database containing funding options for a variety of environmental protection programs including watershed planning. The database can be found at the following Boise State website: <http://efc.boisestate.edu/searchmenu.asp>. Some of the grants listed in the table may not be applicable to the watershed, so some level of scrutiny must be applied when referencing this table for viable funding options.
- Salmon recovery funding sources, particularly from the UCSRB. The UCSRB Implementation Schedule identified several strategies and actions for Chelan River including increase irrigation efficiency, and removing obstructions in Stemilt Creek. Collaboration between the LCWPU and UCSRB is implied in mutual objectives, and receiving participation funds from UCSRB may increase the opportunities for WRIA 47 Phase 4 implementation.
- CCNR funding to facilitate management and leadership of watershed, land use, water availability projects and policies.

## Implementation Schedule

Implementation of the plan actions by recommendation and priority are summarized in the Implementation Table attached at the end of the DIP. The timing of the implementation of the actions is subject to funding, legislative action, the availability of data, staffing priorities and limitations, and the commitment of stakeholders to implementation of obligated actions. The availability of funding is a critical component of implementation as without funding many of the projects would not be able to be completed. The estimated time to implement each action is estimated based on the projection by the LCWPU and priority. The timeline for each action is an estimate of the year that the action will be initiated or implemented and does not necessarily reflect the year that the action will be completed. Some actions may be completed quickly whereas others may be implemented over the long-term. Several long-term actions would not likely begin implementation or possibly even consideration before 2017, and therefore a timeline for completion is only estimated. The timelines are shown on the Implementation Table.

### **Implementation 2014**

The recommended action listed for implementation in 2014 includes initiation of the LTMP by obtaining funding for the first year of monitoring to calibrate the CE-QUAL-W2 model. This action would start in 2014 or 2015, pending funding support.

### **Implementation 2015**

The recommended actions listed for implementation in 2015 include collection of 1 year of water quality data, using the data to calibrate the CE-QUAL-W2 model, and preparing a QAPP for the food web bioaccumulation model.

The initial findings of the first year of monitoring for the LTMP will guide the LCWPU towards re-prioritization and seeking funds for water quality monitoring and prioritizing actions based on initial results of the monitoring. Additional funding to revise or improve groundwater and surface water monitoring data to improve the water balance estimates may be considered to refine initial estimates of water exchanges within the Wapato Basin that would affect the CE-QUAL-W2 calculations and subsequent monitoring requirements. The expectation is that sensitivity analysis of the first year of data will focus the monitoring to a sufficient level that meets data quality objectives.

### **Long-term Actions for Implementation**

Recommended actions for implementation beyond 2015 include continuing an appropriate amount of surface water and groundwater monitoring that would support the initial findings of LTMP, and developing programmatic (continuous, annual) or long-term actions which are included in the Implementation Tables. These actions are those that will be implemented only after selected short-term actions are completed, or may be re-prioritized if watershed conditions or commitment to proposed actions change.

### **Review of Actions for Implementation**

This Implementation Plan is the initial forecast of the LCWPU to initiate formal watershed planning actions in WRIA 47. As such, the LCWPU recognizes the likelihood that watershed understanding will increase, and actions will rise and fall in priority each year and consequently anticipates periodically updating the Implementation Plan schedule. The LCWPU will annually review the Implementation Plan as follows:

1. Inspect those actions in the Implementation Table that have variable schedules and attempt to refine the timelines and/or reconsider the actions or identify an alternate project sponsor. New timelines/actions/implementing entities will be included in updates of the Implementation Plan as needed. These actions also include orphan recommendations (i.e., recommendations that currently have not been assigned to a project sponsor). Actions that are not accomplished in the estimated implementation year will be addressed the following year.
2. Annual review and update of the prioritization in the Implementation Table.
3. Annual review and update of funding sources and opportunities.
4. Update Implementation Table to include refinements of cost estimates, or implementation progress.

## **REFERENCES**

RH2 Engineering, Inc. 2009. WRIA 47 Phase 2 Water Quality Assessment. Prepared for Chelan County Natural Resources Department.

RH2 Engineering, Inc. January 2012. Lake Chelan Watershed Plan (WRIA 47). Prepared for WRIA 47 – Lake Chelan Watershed Planning Unit.

The Watershed Company. March, 2011. WRIA 47 Phase 3 Habitat Component.

**LAKE CHELAN  
WATERSHED PLAN  
(WRIA 47)**

*FINAL*  
**JUNE 2012**

Prepared for  
**WRIA 47 – LAKE CHELAN WATERSHED PLANNING UNIT**

Lead Agency CHELAN COUNTY NATURAL RESOURCES  
DEPARTMENT  
*Wenatchee, Washington*

Prepared by  
RH2 ENGINEERING, INC.  
*East Wenatchee, Washington*

Funded by  
Washington State Department of Ecology Grant # G0700224

## **Preamble to the Lake Chelan Watershed Plan**

Lake Chelan is unique.

Examples of Lake Chelan uniqueness include very high water clarity and quality, lake depth, active reservoir management, combined native and introduced species fisheries, and glacial contribution to runoff. While all waterbodies have their own distinct characteristics, Lake Chelan presents a special set of circumstances that may not lend itself as easily to scientific conclusions developed from studies conducted on other waterbodies about aquatic habitat needs, land use impacts and fisheries management issues. There is broad acknowledgement that Lake Chelan has been altered by the construction and management of the dam constructed on the Chelan River; extirpation of a native species; introduction of a variety of aquatic species; and substantial development of recreational, residential and commercial activities, particularly in the lower Wapato basin. Though these changes to Lake Chelan are well-documented, a broadly-accepted set of management actions for Lake Chelan based on Lake Chelan-specific research has not been developed to the extent desired by some. The Lake Chelan Watershed Plan (LCWP) attempts to address many of these issues.

A number of studies of aquatic habitat, water quantity, water quality, and fisheries conditions have been conducted in the watershed since the late 1970s to collect preliminary watershed information or to support specific data gathering objectives. Even with these studies, many gaps in understanding of specific conditions in the watershed still remain. Lake Chelan management agencies have considered the findings of water quality and habitat studies for other similar lakes (e.g., Lake Tahoe) to support the development of management programs for Lake Chelan, which, as stated previously, may not reflect as accurate conclusions as desired for Lake Chelan aquatic and terrestrial resources.

Because of the unique characteristics of Lake Chelan, during the preparation of the Phase 4 Detailed Implementation Plan, the Planning Unit will identify and develop specific study needs based on the recommendations in this watershed plan. These Lake Chelan specific studies will address unique conditions in Lake Chelan to promote the establishment of as sound management decisions as practicable. For example, the following questions regarding Lake Chelan management could be more readily understood through additional Lake Chelan-specific studies and policy consideration.

1. What are the effects, if any, of over-water and shoreline structures on aquatic habitat and aquatic species in Lake Chelan?
2. How should permitting for proposed new structures address these effects, if any?
3. What is the appropriate fisheries management plan for Lake Chelan given the various introductions and extirpations of aquatic species?

The following Lake Chelan Watershed Plan (WRIA 47) is intended to identify key findings and challenges facing watershed planning and recommend specific actions to address the key findings and challenges. The ultimate goal of the LCWP is to provide a locally based management document to assist in managing and protecting the natural resources of the Lake Chelan watershed. Based on Lake Chelan specific knowledge and understanding the Phase 4 Detailed Implementation Plan will provide the framework for management decisions and actions to be implemented.

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## **EXECUTIVE SUMMARY**

### **Introduction**

From 1991 to 2007, water quality planning activities were conducted by the Lake Chelan Water Quality Committee (LCWQC), which included Chelan County, the City of Chelan, the Lake Chelan Sewer District, the Lake Chelan Reclamation District, Chelan PUD and the U.S. Forest Service. The LCWQC was involved with several water and environmental quality studies and activities in the basin. This included the implementation of actions within the areas of sanitary sewage collection and treatment, on-site sewage disposal standards, stormwater facilities, boat pump-out stations, agricultural best-management practices, water quality monitoring and public educational programs.

In October 2007, the Lake Chelan Watershed Planning Unit (LCWPU) was formed, largely by members of the LCWQC, and has continued the objectives and activities of the LCWQC under the Watershed Planning Act, RCW 90.82.

Since October 2007, the LCWPU has conducted Phase 1 Organization Planning, Phase 2 Water Quantity and Quality Assessments, and a Habitat Assessment. The LCWPU has developed this Phase 3 Watershed Plan to compile the findings of the assessments and recommend actions that will meet the watershed planning objectives of the LCWPU. During Phase 4 Implementation, starting in 2012, the LCWPU will evaluate and prioritize the recommendations and proposed actions.

### **The LCWU established the following key objectives during Phase 1**

- Assess water supply, use and projected needs.
- Develop and implement a comprehensive, long-term monitoring program of key parameters that will ensure water quality sustainability throughout the Lake Chelan Watershed.
- Address water bodies with constituents on the State 303(d) list and other parameters of potential concern that threaten lake water quality.
- Inform and educate local communities and visiting populations about water quality protection.
- Develop a Water Quality Improvement Plan and Water Quality Management Plan to understand, restore and protect water resources

**The LCWU developed the following findings and challenges during Phase 2, and proposed recommended actions for the Lake Chelan (WRIA 47) Watershed Plan:**

**Water Quantity**

Findings and Challenges

- Most of the physically available water entering WRIA 47 is discharged through Lake Chelan and used for power generation.
- Water is available for appropriation subject to the terms of the 1992 Agreement between Chelan PUD and the Washington State Department of Ecology, and the 2006 renewal of the FERC license for the Lake Chelan Dam.
- Irrigation water use is very efficient and the incremental improvements in irrigation efficiency are unlikely to significantly increase water availability in the basin.
- Much of the domestic, commercial and industrial water use either returns as base flow seepage into Lake Chelan, or discharges to the Columbia River as treated wastewater; these beneficial uses are a minor component of water balance.
- Conversion of lands and beneficial uses of water in the Wapato, Manson and lower Lucerne sub-basins from irrigation to domestic use will affect groundwater recharge, base flow, and water quality in these sub-basins.
- Current water use and estimates of future water use in the Wapato, Manson and lower Lucerne sub-basins are based on limited documentation of actual beneficial uses and return flows.
- Predicting changes in water use requires additional data and analysis to quantify beneficial use and return flow estimates to support water quality modeling, water use planning, and watershed management.

Recommended Actions for Water Quantity

- Improve the documentation of beneficial water use, inchoate rights, pending applications for new water rights, existing municipal water supply, irrigation water use, and irrigation return flow to update water balance estimates and monitor the effects of changes in water use to improve estimates of future water availability in WRIA 47.
- Initiate surface water and groundwater monitoring in the Wapato, Manson and lower Lucerne sub-basins to provide data to support water quality and habitat monitoring and improvement plans in WRIA 47.
- Use improved water balance estimates to support implementation of water quality studies and water quality management.

- Promote joint comprehensive analysis and prioritization of future municipal/domestic use by large and small Group A systems, Group B systems, future irrigation use, and future commercial/industrial use.
- Evaluate regional growth patterns, regional demands, inchoate water rights and water system connections for future/expanded service areas.
- Evaluate potential future irrigation demands and transfers of water rights following conversion of agricultural land prior to transfer for other purposes.
- Obtain agreement from Ecology and the PUD regarding the amount of water available for appropriation under the 1992 Agreement (estimated at 20,000 acre-feet). Initiate cost-reimbursement processing of the pending new water right applications that may be covered by the 1992 agreement.
- Identify an adequate domestic water and fire-fighting supply as airport and planned developments proceed in the Howard Flats subbasin.

## **Water Quality**

### Findings and Challenges

- Water quality concerns within WRIA 47 include elevated concentrations of organochlorine pesticides, PCBs, and dioxins/furans in fish tissues, and elevated water quality constituents including phosphorous, pH, dissolved oxygen, and invasive exotic plants.
- A Total Maximum Daily Load (TMDL) for phosphorous in Lake Chelan was approved by Ecology and EPA in 1993.
- A TMDL for DDT/PCB in fish tissues in Lake Chelan was approved and completed in 2006.
- Monitoring fish tissue concentrations is the primary strategy to track progress of the implementation of the TMDL for DDT/PCB.
- Water quality monitoring data for WRIA 47 include few consistently measured parameters, which limits the ability to discern trends in water quality in WRIA 47.
- Developing and implementing a Long-Term Monitoring Plan (LTMP) for Lake Chelan would meet the effectiveness monitoring requirements and implementation objectives of the TMDLs.

### Recommended Actions for Water Quality

- Calibrate the QUAL-2K water quality model with the first year of data to initiate the LTMP
- Prepare a Quality Assurance Project Plan (QAPP) for the food web bioaccumulation model to support the characterization and monitoring objectives of the LTMP.

- Initiate the LTMP using the initial modeling results to advance the implementation of the TMDLs for phosphorous and DDT/PCB.
- Evaluate the feasibility and benefits of including benzene as part of the Long Term Monitoring Plan.
- Inform and educate agencies and the public regarding LTMP objectives and findings to support watershed protection in WRIA 47.
- Evaluate the feasibility and priority for extending sanitary sewer to rural areas along the North and South Shores and around the Manson Lakes.
- Evaluate the feasibility and benefits for establishing an On-site Wastewater Management District to improve rural septic system performance in removing both bacteria and nutrients.
- Evaluate the feasibility and benefit of managing irrigation drain return flows that discharge to surface water.
- Promote land use practices and regulations for stormwater and clearing/grading to reduce unmanaged stormwater and sediment discharge to surface water.

## **Habitat**

### Findings and Challenges

- Fish population impacts include habitat degradation and loss; land development, conversion, and management; agricultural practices; fish-passage barriers; dam operations; flooding; species introductions; interspecific breeding; competition for resources; disease; harvest; and hatchery and stocking operations.
- Historic and current land use practices, which disturb or modify natural habitat functions, have consequently altered water quality and/or quantity and availability and quality of habitat.

### Recommended Actions for Habitat

- Support the Lake Chelan Fishery Plan (LCFP) objectives to improve understanding of Lake Chelan fisheries and fisheries management, and address competing management approaches.
- Support the monitoring and understanding of habitat and species interactions and reproduction by coordinating LTMP activities with Lake Chelan Fishery Forum (LCFF) activities to implement the LCFP.
- Support habitat restoration efforts to improve limiting factors for both fish and wildlife.
- Support developing a detailed implementation plan that includes prioritized fish and wildlife actions.

## 1.0 INTRODUCTION

### Watershed Planning in Washington - RCW 90.082.010

*The legislature finds that the local development of watershed plans for managing water resources and for protecting existing water rights is vital to both state and local interests. The local development of these plans serves vital local interests by placing it in the hands of people: who have the greatest knowledge of both the resources and the aspirations of those who live and work in the watershed; and who have the greatest stake in the proper, long-term management of the resources. The development of such plans serves the state's vital interests by ensuring that the state's water resources are used wisely, by protecting existing water rights, by protecting instream flows for fish, and by providing for the economic well-being of the state's citizenry and communities. Therefore, the legislature believes it necessary for units of local government throughout the state to engage in the orderly development of these watershed plans.*

## 1.1 WRIA 47 WATERSHED PLANNING PROCESS

### 1.1.1 Four Phases of WRIA 47 Watershed Planning

The Watershed Planning Process, established by the Watershed Management Act in 1998 (RCW 90.82), includes the following four phases.

**Phase 1, Organization:** The initial phase, in which the initiating governments establish a Planning Unit and determine the scope of the planning was conducted by the Lake Chelan Watershed Planning Unit (LCWPU) from October 2007 to January 2008. Water quality planning activities were conducted by the Lake Chelan Water Quality Committee (LCWQC), which included Chelan County, City of Chelan, Lake Chelan Sewer District, Lake Chelan Reclamation District, Public Utility District #1 of Chelan County (Chelan PUD) and the U.S. Forest Service. The LCWQC operated from 1991 to 2007, and was involved with several water and environmental quality studies and activities in the basin. This included the implementation of actions within the areas of sanitary sewage collection and treatment, on-site sewage disposal standards, stormwater facilities, boat pump-out stations, agricultural best management practices, water quality monitoring and public educational programs. The LCWPU is largely formed by members of the LCWQC to continue the objectives and activities of the LCWQC.

The LCWPU concluded that certain sub-basins<sup>1</sup> would be included in the water quantity assessment but not in the watershed planning, as other agencies were adequately managing watershed conditions in the other sub-basins. Watershed conditions in the Stehekin and Railroad sub-basins are managed by the National Park Service.

**Phase 2, Watershed Assessment:** The technical analysis phase of watershed planning includes a required water quantity element and optional water quality, instream flow, habitat and water storage elements. The assessments compile and enhance local

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<sup>1</sup> The term "sub-basin" used in this report and in watershed planning is defined as a geographic portion of a management area, defined by the watershed planning unit, on the basis of hydrologic or hydrogeologic characteristics.

knowledge about water resource issues and concerns, and develop the tools necessary to support decision-making regarding management recommendations to address the concerns.

RH2 Engineering, Inc., (RH2) was retained to prepare the water quantity assessment (Appendix A) and AMEC/GeoMatrix (AMEC) was retained to prepare the water quality assessment (Appendix B). In June 2010, The Watershed Company (TWC) was retained to prepare a habitat component (Appendix C) for the watershed plan.

During the water quantity assessment work, several sub-basin meetings were held to evaluate the level of effort warranted to further assess the water quantity sub-basins during Phase 4. Based on these meetings, the LCWPU concluded that the First Creek, Twenty-Five Mile Creek, and Antoine Creek sub-basins would not be included for detailed consideration of potential projects, and that the remaining basins would receive priority for planning.

AMEC compiled and summarized water quality monitoring data from 1975 to date, meeting one of the Phase 2 Water Quality assessment objectives. AMEC concluded that the data are not suitable for water quality trend analysis, and the LCWPU determined that long-term monitoring of Lake Chelan water quality constituents was the top priority objective for water quality monitoring. AMEC prepared a long-term monitoring plan (LTMP), which will be implemented during Phase 4.

During Phase 1, the LCWPU elected not to conduct habitat assessment based on substantial work completed by Chelan PUD for Federal Energy Regulatory Commission (FERC) relicensing (particularly the Lake Chelan Fishery Plan (LCFP)) and by Chelan County Natural Resources Department (CCNRD) in the Lake Chelan Sub-basin Plan (Berg, 2004). The LCWPU subsequently concluded that addressing ecological needs in the lake would support water quality issues in watershed planning. Proposed mitigation activities and new shoreline rules have prompted active involvement by the local community to jointly address these issues with Lake Chelan watershed planning. Therefore, the LCWPU broadened the scope of the planning effort and included the optional habitat assessment during Phase 3.

**Phase 3, Watershed Plan Development:** The watershed plan summarizes prior findings and develops recommendations for actions by local, state and federal agencies, tribes, private property owners, private organizations and individual citizens, including a recommended list of strategies and projects that would further the purpose of the plan (See RCW 90.82.040(2)(ii)). The LCWPU has agreed on the key findings and challenges facing watershed planning and recommended specific actions to address the key findings and challenges.

**Phase 4, Implementation:** Within one year of the adoption of the watershed plan, the LCWPU must complete a detailed implementation plan (DIP), which is a condition of receiving grants for the second and all subsequent years of the phase four watershed planning grant (See RCW 90.82.043). The LCWPU prioritizes the sequence of implementing actions based on its respective value, ease of implementation, and availability of funding.

### **1.1.2 Funding for WRIA 47 Watershed Plan Implementation**

Assuming approval of a grant application for Phase 4 by the Washington State Department of Ecology, funding potentially available to WRIA 47 is shown in **Table 1**.

**Table 1 - Potential Phase 4 Implementation Funding**

<b>Potential Phase 4 Implementation Funding</b>	
<b>Year</b>	<b>Available Funding (10 percent local match required)</b>
1	\$100,000
2	\$100,000
3	\$100,000
4	\$50,000
5	\$50,000
<b>TOTAL</b>	<b>\$400,000</b>

Phase 4 implementation funding would be used to develop a detailed implementation plan, to support project management and continued activities of the LCWPU, and to serve as “seed money” for receiving additional funding under various grant and loan programs to implement the recommendations of the watershed plan. During the project selection process, most funding entities favorably view an approved watershed plan and the inclusion of a proposed project in the detailed implementation plan.

### **1.1.3 Organization of WRIA 47 Watershed Planning**

#### **Lead Agency**

Chelan County, the City of Chelan and the Lake Chelan Reclamation District initiated watershed planning in WRIA 47 and are recognized as “initiating governments” for watershed planning. These initiating governments established Chelan County as the “Lead Agency” for grant management, planning unit facilitation and consultant management purposes.

#### **LCWPU Membership and Procedures**

The following entities are members of the WRIA 47 LCWPU.

- Chelan County
- City of Chelan
- Lake Chelan Reclamation District
- Chelan County PUD #1
- Chelan-Douglas Health District
- Washington Department of Ecology (Ecology)
- Washington Department of Fish and Wildlife
- Washington Department of Health
- Washington Department of Natural Resources
- US Army Corps of Engineers
- US Forest Service
- Interested individuals

During Phase 1, the LCWPU established operating procedures to address how interested parties may become a member of the LCWPU, the loss of voting authority for members who do not actively participate in the process and the decision-making process. The LCWPU approved the planning unit charter in December 2007 (RH2/GeoMatrix, 2008).

The decision-making process includes the following definition of consensus for decision-making.

*"I can live with the decision and accept it, even though it may not be exactly what I want."*

In the event that full consensus is not reached, RCW 90.82.130(1) (a) states that:

*Upon completing its proposed watershed plan, the LCWPU may approve the proposal by consensus of all of the members of the LCWPU or by consensus among the members of the LCWPU appointed to represent units of government and a majority vote of the nongovernmental members of the LCWPU.*

## **1.2 OVERVIEW OF LAKE CHELAN WATERSHED (WRIA 47)**

### **General Characteristics**

The area occupied by the Lake Chelan Water Resource Inventory Area 47 (WRIA 47) comprises 1,044 square miles, of which 90 percent or 937 square miles includes Lake Chelan and its tributary sub-basins; the remaining 10 percent consists of sub-basins that drain to the Columbia River. One primary tributary, the Stehekin River, and one secondary tributary, Railroad Creek, discharge 85 percent of WRIA 47 runoff into Lake Chelan. The management area consists of ten sub-basins shown on **Figure 1**. Approximately 1.8 percent (19 square miles) of WRIA 47 lies within Okanogan County.

### **Topography and Vegetation**

WRIA 47 has physical and vegetation characteristics similar to other east-slope Cascade watersheds. The watershed includes glaciers and rugged mountains at the highest elevations, dense fir and open ponderosa pine forests, wide expanses of shrub-steppe, and narrow riparian zones in lower elevations. Elevations in WRIA 47 range from 700 feet above mean seal level (MSL) at the Columbia River to 9,511 feet MSL at Bonanza Peak. Landforms consist of the classic U-shaped glacially-carved valleys of Lake Chelan, the Stehekin River and smaller tributaries in the higher elevation sub-basins, which are surrounded by high ridges and steep cliffs. Lower elevation sub-basins are narrower incised valleys that are tributaries to Lake Chelan and the Columbia River, bounded by rolling hills near the lake's terminus at the City of Chelan, and gravel terraces along the Columbia River.

Lake Chelan and its immediate surroundings are the result of the complex interaction between two glacial masses. The lake was formed approximately 15,000 to 18,000 years ago during the Vashon/Wisconsin glacial period. During this time, the Chelan Glacier moved down the valley from the Cascade Crest, and the Okanogan-Columbia Valley lobe of the Cordilleran ice sheet extended upward from the south. The two glaciers approached each other and nearly met at Wapato Point and a constriction known as "The Narrows" (a shallow ledge 135 feet below the surface of the lake at its narrowest part). The lake consists of two basins: the Lucerne basin, which is deep and fjord-like



and extends north from The Narrows for approximately 40 miles to the Stehekin River; and the Wapato basin, which is relatively wide and shallow in comparison (maximum depth of 400 feet) and extends for approximately 15 miles south of The Narrows (Whetten, 1967) to the lake outlet at the head of the Chelan River.

### Geology

Bedrock comprises much of the exposed surficial geologic units on the steeper slopes above terraces and hills of the lower basin, and forms the slopes and ridges of the upper basin above 1,600 feet in WRIA 47. Glacial episodes deposited relatively broad layers of fine to coarse-grained sediment in the valley floors and partially on the valley sidewalls or in patches on ridges. Lakeshore, river and landslide deposits are found primarily along river and creek bottoms and at the base of slopes. The glacial and post-glacial deposits contain most of the available groundwater in WRIA 47, and nearly all developed and irrigated lands are underlain by unconsolidated geologic units. The unconsolidated deposits are found primarily as discontinuous layers of sediment in the Wapato Main Stem and Manson Lakes Sub-basins, as terrace and flood deposits in the Antoine Creek and Howard Flats Sub-basins, and locally as alluvial fill in the valley bottoms of other sub-basins.

### Hydrology

Precipitation that is not lost to evapotranspiration runs off steep slopes into stream channels, minor tributaries and primary tributaries of the Stehekin River and Railroad Creek, where they ultimately discharge out of Lake Chelan into the Chelan River and finally into the Columbia River. Smaller tributaries include 25-Mile, First, Fish, Prince, Gold, and Safety Harbor Creeks (**Figure 1**). Minor amounts (less than 5 percent of total WRIA 47 discharge) of stream flow discharges from sub-basins adjacent to the Columbia River. **Table 2** summarizes tributary stream flow data for the year 2000.

**Table 2 - Summary of Stream Flow Data in 2000**

Stream	Maximum Peak Flow (cfs)	Date	Base Flow (cfs)	Date (2000)
Stehekin River	6,010	May 22	1,130	Aug 1 – Sept 28
Railroad Creek	1,284	June 15	153	Aug 1 – Sept 28
Prince Creek	531	June 18	26.1	July 1 – Sept 28
Fish Creek	526	June 21	24.6	July 1 – Sept 28
25-mile Creek	145	May 23	8.5	July 1 – Sept 28
Safety Harbor Creek	141	June 8	5.3	July 1 – Sept 28
First Creek	97.8	April 14	7.6	May 15 – Sept 28
Grade Creek	35.8	April 22	2.6	July 1 – Sept 28
Gold Creek	11.1	April 20	0.7	June 1 – Sept 28
Mitchell Creek	6.5	April 31	1.8	May 15 – Sept 28

**Figure 2** illustrates stream flow data for the Stehekin and Chelan Rivers; average annual flows have not changed significantly over the period of gauging, from the early 1900s to date. The Stehekin River flow is typically 65 to 80 percent of Chelan River flow.

Primary and tributary streams to Lake Chelan experience peak runoff during the spring melt in May to July, and low flows during September through February (**Figure 3 and Figure 4**). Water in Lake Chelan is generally stored during the runoff period and released during the low flow season to generate hydroelectric power, resulting in a flattened hydrograph compared to natural flows (**Figure 5**).

Average annual inflow to Lake Chelan is estimated to be approximately 1.6 million acre-feet (af), equivalent to a constant flow of approximately 2,200 cubic feet per second (cfs). The Stehekin River accounts for 65 percent of the total inflow to the lake, Railroad Creek contributes 10 percent and approximately 50 other smaller tributaries contribute another 25 percent of the surface inflow (FERC, 2001). Precipitation that falls directly on the lake contributes 4.4 percent of the total inflow to the lake, or approximately 70,000 af per year.

### **Groundwater**

Groundwater in WRIA 47 is replenished from precipitation falling in the basin and infiltrating into porous surficial deposits. The broader and hilly terrain of the lower watershed sub-basins promotes groundwater recharge. In contrast, steep, thinly covered bedrock areas promote runoff and little recharge into bedrock fractures. Groundwater is recharged artificially via seepage from irrigation drains, via return flow infiltrating from irrigated lands, and via seepage from Wapato, Roses and Dry Lakes in the Manson Lakes Sub-basin. Groundwater elevations and yield to wells in these areas are expected to be artificially high relative to non-irrigation conditions.

### **Population**

The 2000 Washington State Census data determined a population of 11,706 within WRIA 47 (excluding the Okanogan County portion of the watershed). The Census forecasted a population of 13,104 for 2008 and 15,650 by 2025. The highest population density in WRIA 47 exists along the lake shoreline. Most residents work within the watershed and live within the Wapato Main Stem and Manson Lakes Sub-basins.

### **Land Use**

Most of the watershed is under federal management, primarily by the US Forest Service and National Park Service; approximately 87 percent of the Lake Chelan watershed is in federal, state, and local-government ownership. The remaining 13 percent is in private ownership. Hillsides above the lakeshore and lower elevation uplands are irrigated for orchard, vineyard and pasture. Lake Chelan is managed for multiple uses including power, recreation, irrigation, potable water supply, historic and cultural preservation, fisheries, wildlife and habitat.

### **Water Rights**

Ecology's water rights records indicate that more than 800 active certificated water rights are authorized in WRIA 47, consisting of 700 surface water rights and 100 groundwater rights. There are 133 surface water permits and 30 groundwater permits. The database identifies 530 surface water claims and 148 groundwater claims. Approximately 50,000 af of water rights and claims are filed with Ecology for water in

Lake Chelan sub-basins within WRIA 47, and more than 350,000 af of water rights and claims are filed for water in Columbia River sub-basins within WRIA 47.

In 1992, Chelan PUD and Ecology prepared an agreement in which the Chelan PUD water right Certificate 319 authorizes Chelan PUD to withdraw 4000 cfs from the Chelan River for hydroelectric power generation with an unspecified annual use. Permit 548 established a reservation of 33,000 af per year for above-dam diversion for irrigation and domestic use in the watershed. The agreement creates a 20,000 af reservation of new water right from unused portion of Certificate 319 for use only within Chelan WRIA 47. The potential future uses for the 20,000 af reservation have not been quantified or prioritized, but are likely subject to the first-in-time priority of pending water right applications.

### **Water Use**

Approximately 89 percent of households receive water from WRIA 47 surface water sources provided by 12 Group A Community systems, with 11 percent from groundwater (7 percent from exempt wells, 4 percent from 63 Group B systems). Approximately 2,500 af of water is used each year for residential consumption. Much of the wastewater from WRIA 47 is collected, treated, and discharged to the Columbia River.

Approximately 16,000 af of water is used for irrigation in the Wapato Main Stem sub-basin, and 5,000 af of water is used for irrigation in Columbia River sub-basins, primarily for orchard crops.

Approximately 350 af of water is used in the Wapato Main Stem sub-basin for commercial and industrial use.

### **Lake Chelan Project**

Lake Chelan is a regulated reservoir under FERC license that was initially authorized in 1926 and re-authorized on November 6, 2006. The Lake Chelan Hydroelectric Project FERC Project No. 637 consists of Lake Chelan, a 1,486-foot-deep, 55-mile-long natural glacial lake that was raised 21 feet by the construction of the 40-foot-high, 490-foot-long concrete gravity dam in 1926. Lake Chelan is a 32,560-acre reservoir at normal maximum water surface elevation of 1,100 feet MSL, with a gross storage capacity of 15.8 million af and a useable storage of 677,400 af.

Chelan PUD establishes target elevations to be achieved between May 1 and October 1, based on seasonal runoff and operational objectives including:

- maintaining minimum instream flows in the Chelan River;
- reducing high flows in the Chelan River; and
- providing usable lake levels for recreation (between 1,090 and 1,098).

The minimum flow varies depending on the time of year and whether it is a dry, normal, or wet water year.

Approximately 2,000 acres of project land lie within the Lake Chelan Project boundary. About 1,300 acres of the Project lands are inundated and project facilities occupy the other 700 acres. The Project lands are owned by the US Forest Service, National Park Service, several state agencies, Chelan PUD, and private property owners. Approximately 465.5 acres are inundated federal lands.

## **2.0 WRIA 47 WATERSHED PLANNING ACTIVITIES**

### **2.1 PHASE I WATERSHED PLANNING INITIATION**

During Phase 1, the LCWPU developed the following vision, mission, goals and objectives for watershed planning in WRIA 47.

#### **Vision**

Recognize, inform, educate, monitor, understand and protect the unique water resource that is Lake Chelan; the ecological processes and pathways essential to maintaining this high quality water body; and the ways in which we can live on this lakeshore, enjoy this unique treasure and protect it for generations to come.

#### **Mission**

To develop an understanding of water and related aquatic and land resources by building trust and positive working relationships among diverse interests in the watershed to achieve a sustainable balance of economic, social and environmental values.

#### **Goal**

To implement a management plan for water use and protection that sustains the environmental, educational, economic and recreational values associated with a healthy lakeside community and watershed.

#### **Objectives**

- Assess water supply, use and projected needs.
- Develop and implement a comprehensive, long-term monitoring program of key parameters that will ensure water quality sustainability throughout the Lake Chelan Watershed (WRIA 47).
- Address water bodies with constituents on the State 303(d) list and other parameters of potential concern that threaten lake water quality.
- Inform and educate local communities and visiting populations about water quality protection.
- Develop a Water Quality Improvement Plan and Water Quality Management Plan to understand, restore and protect water resources.

The initiating governments view watershed planning as a complement to other water resource management efforts in WRIA 47, including implementing regulatory actions as part of re-licensing the Chelan Dam and work done by the LCWQC.

Anticipating Phase 2 of watershed planning, the LCWPU elected to conduct the required water quantity assessment and the optional water quality assessment. The LCWPU elected not to review or modify instream flows established under FERC process. The LCWPU elected to conduct a summary habitat assessment incorporating

work completed by the USFS, WDFW, and Chelan PUD. Habitat recommendations are summarized in **Section 3**.

## **2.2 PHASE II WATER QUANTITY ASSESSMENT**

An assessment of water quantity is a required component of watershed planning under RCW Chapter 90.82. The water quantity assessment of a management area must include:

- An estimate of the amount of water present, taking into account seasonal variations;
- An estimate of the amount of water currently being used;
- An estimate of the amount of water allocated by rights to water including instream flow rules;
- An estimate of future water demands;
- An estimate of the amount of water available for further appropriation; and
- The identification of areas where groundwater is known to recharge and where it contributes to surface water bodies.

### **Methods**

Several detailed water balance studies have been prepared for the Lake Chelan basin since the 1970s, which were reviewed and updated as part of the Phase 2 Water Quantity Assessment (RH2, 2009). The updated water balance used existing information to estimate input (precipitation and imported water from outside the basin), water loss (evapotranspiration, recharge to groundwater and consumptive loss from beneficial uses). Although primary tributaries and lake level data are available to the 1920s, continuous stream flow data for minor streams in WRIA 47 are sporadic and limited in use for estimating sub-basin runoff. The difference between estimated input and output variables was attributed to runoff. The water balance was estimated for natural and developed conditions and average, dry/warm and wet/cool years.

Groundwater resources, including potential aquifers and volumes, water bearing regions, recharge areas and gaining/losing stream reaches were assessed by examining well logs, topographic and geologic information.

Water rights data obtained from Ecology, including water rights permits, certificates and claims were mapped in Geographic Information Systems (GIS) to display the distribution of sources and place of use.

The amount of water available for future appropriation was estimated by subtracting estimated runoff and available groundwater quantities from water allocated through existing water rights.

## Findings

The Water Quantity Assessment report (**Appendix A**) presented the following findings and recommendations that relate to water storage, as detailed below.

- The water balance estimates indicate that most of the physically available water (precipitation runoff, shallow groundwater recharge, imported water) entering WRIA 47 is discharged through the Lake Chelan reservoir and used for power generation.
- The lack of stream flow and groundwater data is responsible for large variation in water balance estimates for the sub-basins. Evaluation of the shift in water resource use in these sub-basins will require additional data and analysis to quantify.
- Irrigation water use is very efficient and the incremental improvements in irrigation efficiency are unlikely to significantly increase water availability in the basin.
- Commercial and industrial water use are minor components of the water balance; increased efficiency or reuse of commercial and industrial water are unlikely to significantly increase water availability in the basin.
- Much of the domestic water used in WRIA 47 either returns as groundwater storage and base flow seepage into Lake Chelan, or is exported from the basin to the Columbia River as treated wastewater; domestic consumption is a minor component of water balance.
- Converting the use of water from irrigation use to domestic use could substantially affect groundwater recharge and base flow in the sub-basins, since the consumptive loss of domestic water is low relative to total water present.
- Compilation of current use and estimates of future use are based on limited documentation of actual beneficial uses and return flows.

## Recommended Actions from Phase 2 Water Quality Assessment

- Improve the documentation of beneficial water use, inchoate rights, municipal water supply, commercial/industrial use, irrigation water use and irrigation return flow to update water balance estimates, monitor the effects of changes in water use, and improve estimates of future water availability.
- Initiate monitoring of surface water and groundwater bodies where changing land and water use would affect water quality and habitat conditions, and to support long-term monitoring plan (LTMP) objectives.
- Use improved water balance estimates to support implementation of water quality studies and water quality management.

## 2.3 PHASE II WATER QUALITY ASSESSMENT

### Methods

Phase 2 Water Quality activities summarized water quality data from previous assessments, including identifying all WRIA 47 water bodies with potentially impaired water quality, and identifying the parameters currently on the Clean Water Act 303(d) list. The information collected in all of the available water quality studies conducted in WRIA 47 since 1972 were reviewed to identify monitored parameters and to assess whether existing data sufficiently indicated detectable trends in water quality. The findings of the assessment and the compilation of information from the available water quality studies were summarized in two separate technical memos prepared in 2009: Assessment of Water Quality Issues within WRIA 47 (AMEC, 2009a); and Review and Summary of Existing Water Quality Studies within WRIA 47 (AMEC, 2009b). These two documents met the watershed planning objectives for a Phase 2 Water Quality Assessment (**Appendix B**).

### Findings

Water quality assessment of phosphorous in Lake Chelan was conducted between 1986 and 1989 with Ecology oversight, and a Total Maximum Daily Load (TMDL) for phosphorous in Lake Chelan was approved by Ecology and EPA in 1993. The Lake Chelan DDT/PCB TMDL to address the DDT and PCB contamination contained in the tissues of fish in the Lake Chelan Watershed was initiated in 2003 and completed in 2006. The TMDL identified potential actions designed to prevent DDT and PCB inputs to Lake Chelan and Roses Lake. Monitoring fish tissue concentrations will be the primary strategy to track progress of the TMDL implementation approach. TMDL targets will be achieved only when fish tissue targets are met. Ecology proposes to evaluate the need for fish tissue data collection and evaluation every five years to assess progress toward meeting TMDL targets.

Ecology provided the following recommendations following completion of the DDT and PCB in Fish TMDL (Ecology, 2005, 2006):

- The Washington State Department of Health should evaluate the need for fish consumption advisories for Lake Chelan and Roses Lake. If advisories are recommended, public notices should be posted at all public boat launches to the lakes. The public should be aware of potential problems from consuming fish in excess of recommended levels.
- DDT levels should be the primary focus for water quality managers in the Lake Chelan basin. PCB levels should be followed, but management options are more limited.
- Monitoring pollutant levels in lake trout tissue allows an evaluation of the worst-case scenario for total DDT and PCBs in fish tissue. Until total DDT and PCBs in fish tissue are within acceptable levels, tissue concentrations should continue to be monitored. Because lake sediments act as a large source pool for pollutants, evaluating tissue concentrations will be required far into the future.



- Natural attenuation should be considered the best management strategy for total DDT in Lake Chelan and Roses Lake sediments. Active removal of total-DDT-laden sediments from Lake Chelan is not an option, considering size and depth, disturbance to fish and invertebrate communities, and damage to habitat. Natural attenuation is also the least costly of management options.
- Pollutant input to the Wapato basin of Lake Chelan and to Roses Lake should be controlled to the extent possible, to help in recovery and to avoid exacerbating conditions. Investigations of sub-basins would be required to identify any specific sources for load reductions.
- Load reductions could occur just prior to discharge through developed wetland treatment, if and where feasible.
- An evaluation of total DDT concentrations in the water column from the Wapato basin should be conducted to better quantify spatial and temporal variations.
- An evaluation of the importance of total DDT loading from groundwater to the Wapato basin should be conducted.

Actions based on TMDL recommendations have included the following:

- Washington State Department of Health issued a fish consumption advisory for lake trout in Lake Chelan in 2004. Ecology has conducted periodic fish tissue sampling and evaluation.
- Management activities are being targeted primarily for DDT. However, PCB actions are being implemented, such as education, PCB transformer recycling, cleanup of old PCB sites, pesticide pickup days, etc.
- The LCWQC completed a Department of Ecology Centennial grant to continue monitoring sediment, soil, surface water, groundwater, and fish uptake mechanisms and to conduct education and outreach activities for the community, growers, schools, and media.
- The LCWQC and participating entities have worked with growers and irrigation districts to encourage and implement practices that utilize water efficiently, which will improve crops, reduce surface runoff and deep percolation and in turn reduce DDT transport to ground and surface waters.

Water quality concerns within WRIA 47 include elevated concentrations of organochlorine pesticides, PCBs, and dioxins/furans within fish tissues, and elevated water quality constituents including phosphorous, pH, dissolved oxygen, and invasive exotic plants. Water quality monitoring data for WRIA 47 were obtained to meet study-specific objectives and contain few consistently measured parameters; this limits the ability to evaluate long-term trends in water quality in WRIA 47. This lack of adequate monitoring data led to LCWPU recommendation to develop and implement a long-term monitoring plan (LTMP). The LCWPU recommended developing a water quality

model to evaluate water clarity/eutrophication, and a bioaccumulation food-web model to model toxics transfer between sediment, water, and the aquatic food chain.

#### Long-Term Monitoring Plan

The WRIA 47 Water Quality Subcommittee identified water quality trend analysis for Lake Chelan as the top priority planning objective and recommended development of a Long-Term Monitoring Plan (LTMP) for Lake Chelan. The LTMP goals included identifying data gaps, collecting data on a consistent basis to develop water quality trends, and providing a proactive or adaptable plan for WRIA 47. The LTMP objectives include the following:

- Develop a monitoring design supported by water quality models that can be used to evaluate trends in water quality parameters.
- Evaluate concerns about potential future changes in water clarity and lake eutrophication.
- Develop a monitoring approach for constituents that have completed TMDLs to allow a determination of the effectiveness of post-TMDL remedies (phosphorous, DDT analogs, PCBs).
- Develop a monitoring design for 303(d)-listed constituents in Lake Chelan that have not yet been addressed through the TMDL process (alpha-BHC, chlordane, dieldrin, dioxin/furans).
- Recommend data quality objectives and analytical methods to ensure greater consistency and comparability of data in the future.
- Develop a monitoring program that can be used to evaluate best management practices (BMPs) that may be implemented to address water quality concerns.

The proposed LTMP study area includes the southern 6 miles of the Lucerne Basin and all of the Wapato Basin, regions that have experienced the greatest development and where most of the water quality problems have been identified. The proposed study area includes four lake reaches within the Wapato Basin and six lake reaches in the lower Lucerne Basin, and the mouths of four tributaries to Lake Chelan.

AMEC prepared the LTMP (AMEC, 2009c) and associated Quality Assurance Project Plan (QAPP) for water quality modeling (AMEC, 2009d). The LTMP summarizes ideas and recommendations proposed by the WRIA 47 Water Quality Subcommittee members for the development of the LTMP and provides an initial framework for the plan that focuses on the calibration and application of two models 1) QUAL-W2, a water quality model to support evaluation of water quality conditions including water clarity, and eutrophication; and 2) the Lake Chelan food web bioaccumulation model. The QAPP for the QUAL-W2 model will guide the collection, management, and interpretation of data used in the model. Due to funding cuts, a QAPP for the food web model was put on hold, pending future funding.

Use and application of water quality and food web models as part of a monitoring program:

- Support the understanding of the sources of constituents of concern and the transfer among different environmental media;
- Support prediction of how constituents of concern will change based on different loading scenarios, application of best management practices, or natural attenuation; and
- Support the evaluation of the relative importance of different monitored parameters to allow adjustments to be made to the monitoring design.

#### QUAL-W2 model

One year of data is needed to calibrate the QUAL-W2 model, which would then be used to predict water quality changes, evaluate the effectiveness of BMPs, and support evaluation of monitoring needs and the effectiveness of the monitoring design for Lake Chelan.

Data needs for calibrating and applying the model require information for a water balance (inflows, surface water elevation, and outflows), inflow constituent concentrations, and longitudinal and vertical profiles specifying initial conditions for each cell (lake reach). Water quality parameters will be collected at defined monitoring stations over a sufficient period of time to characterize seasonal and episodic (e.g., storm events) water quality changes in Lake Chelan.

#### Bioaccumulation Food Web Model

The Lake Chelan food web model, would examine the distribution of DDT, DDE, and DDD within Lake Chelan sediment, water, and aquatic biota, and predict the accumulation of DDT in aquatic species from the water and diet. Monitoring data incorporated into the model would include water column concentrations of dissolved and particulate organic carbon, tissue concentrations of toxics in key prey species, and concentrations of toxics in sediment, water, and benthic biota. Data needs for applying the model also include information for a water balance (inflows, surface water and groundwater elevation, and outflows), inflow constituent concentrations, and longitudinal and vertical profiles.

The food web model would:

- Provide a mechanism for understanding of the sources of constituents of concern and the transfer among different environmental media;
- Provide a way to predict how constituents of concern will change based on different loading scenarios, application of best management practices, or natural attenuation;
- Provide a way to evaluate the relative importance of different monitored parameters to allow adjustments to be made to the monitoring design.

### **Recommended Actions from Phase 2 Water Quality Assessment**

- Initiate water quality modeling (QUAL-2K) and bioaccumulation food web modeling of toxic compounds in fish tissue to support the characterization and monitoring objectives of the LTMP.
- Calibrate the QUAL-2K water quality model with one year of data
- Prepare a Quality Assurance Project Plan (QAPP) for the Food Web model.
- Initiate the bioaccumulation Food Web Model.
- Implement the LTMP based on the findings of the models.

## **2.4 HABITAT ASSESSMENT**

The optional habitat component of Phase 3 watershed planning “must rely on existing laws, rules, or ordinances created for the purpose of protecting, restoring, or enhancing fish habitat, including the Shoreline Management Act, RCW Chapter 90.58, the Growth Management Act, RCW Chapter 36.70A, and the Forest Practices Act, RCW Chapter 76.09” (RCW 90.82.100). Strategies developed under this component of the plan were intended to address listed salmon and other fish species in WRIA 47.

### **Methods**

The habitat assessment addressed both aquatic habitat and fish species. While fishery management often involves habitat restoration and/or other habitat considerations, it may also include methods and processes distinct from habitat management. However, both habitat and non-habitat management components are vital to fish management in WRIA 47 and are the subjects of public interest and past restoration efforts.

Substantial work regarding aquatic habitat, watershed processes, and aquatic species composition and interactions has been previously conducted in WRIA 47. This work, including watershed assessments, planning documents, and management recommendations, is presented in the Phase 3 Habitat Component (TWC, 2011; see **Appendix C**). No new habitat studies were performed specifically for the habitat component. Phase 3 also draws upon previous studies and documents, including the Lake Chelan Fishery Plan (LCFP; Chelan PUD, 2007), the Lake Chelan Sub-basin Plan (Laura Berg Consulting, 2004), and WRIA 47 Phase 2 Water Quality and Water Quantity Assessments, to formulate goals, recommendations, and strategies.

### **Findings**

Factors impacting fish populations in the watershed include habitat degradation and loss; land development, conversion, and management; agricultural practices; fish-passage barriers; dam operations; flooding; species introductions; interspecific breeding; competition for resources; disease; harvest; and hatchery and stocking operations. Impacts and their effects on aquatic habitat in the watershed are described in **Table 3**.

**Table 3 - Major Impacts with Associated Ecological Functions in Lake Chelan WRIA 47**

<b>Impact Source</b>	<b>Impact Action(s)</b>	<b>Function(s) Affected</b>
Fire suppression	Loss of riparian vegetation, flashy stream flows, erosion and sedimentation	Water quality, hydrology, habitat
Land conversion	Loss of shrub-scrub, wetland, and riparian; pesticide and fertilizer use; irrigation; invasive species propagation	Water quality, habitat
Dam operations	Raised/fluctuating lake levels, entrainment, fish passage barriers	Hydrology, habitat, lake ecology
Docks and piers	Shading, structure in water	Habitat
Bulkheads and armoring	Loss of lakeshore vegetation, wetland loss, wave action alteration, erosion, alteration in recruitment of woody debris and sand/gravel	Hydrology, habitat
Non-fish-passable culverts	Fish passage barriers	Habitat, lake and tributary ecology
Other terrestrial development	Loss of native vegetation, ornamental species propagation, septic systems	Water quality, habitat
Agriculture and grazing	Loss of scrub-shrub, wetland, and riparian; pesticide and fertilizer use; sedimentation and erosion	Water quality, habitat
Fish introduction	Disruption of the food web, complex habitat interactions, introduction of disease.	Lake and tributary ecology

The fish community in Lake Chelan and its tributaries is an assemblage of native and non-native species. Main impacts and interactions among species are described in the Lower Lake Chelan In-Lieu Fee (ILF) Prospectus (TWC, 2010). Competitive pressures on native and popular non-native species are compounded by impacted habitat conditions summarized in **Table 3** above. The main impacts and interactions among species are summarized in **Table 4**.

**Table 4. Major fish species interactions, impacts and production in Lake Chelan WRIA 47**

Species	Impacts and Interactions	Function/Use	Reproduction/Support
Bull trout (native)	Decline due to over-harvest, interbreeding, disease, loss of spawning habitat; reintroduction hindered by competition from Kokanee and trout	Historic occurrence, threatened species	Not observed in Lake Chelan or tributaries since early 1950s
Chinook salmon (introduced)	Forage competition from mysids and lake trout, hatchery conditions, flooding, over-harvest, improved angling methods	Strongly supported recreational fishery until early 1990s, community desire to rebuild fishery	Reproduces naturally in low numbers, stocked, declining population
Kokanee (land-locked Sockeye salmon-introduced)	Forage competition from mysids, predation by Chinook salmon, flooding, interbreeding	Strongly supported recreational fishery	Reproduces naturally, expanding population in Stehekin River, stocked previously, 2007 spawners found sufficient to support population
Westslope cutthroat trout (native)	Gradient and velocity barriers, competition from non-natives, over-harvest, mining contaminants, logging impacts, hatchery operations, interbreeding	Strongly supported recreational fishery	Reproduces naturally in tributaries, stocked with hatchery fish, hybridizes with rainbow trout
Lake trout (introduced)	Compete with and prey on native and introduced fish, exceed DDT health standards in adipose	Popular trophy fish	Reproduce naturally in Lake Chelan, stocked previously
Rainbow trout (introduced)	Outcompete and hybridize with native westslope cutthroat trout	Strongly supported recreational fishery (triploids)	Stocked since early 1990s, hybridize with cutthroat trout, no reproductive fish stocked since 2005, triploids stocked
Smallmouth bass (introduced)	Danger of competition with or predation of native fish	Recreational fishery	Introduced illegally in 1990, reproducing in and presently limited to Wapato sub-basin

Species	Impacts and Interactions	Function/Use	Reproduction/Support
Eastern brook trout (introduced)	Compete with native fish; spread disease	Recreational fishery	Established in Stehekin River and Twenty-five Mile Creek from historic stocking
Burbot (native)	Competition for mysids, limited salmonid predation	Minor recreational fishery	Limited understanding of abundance and habitat

Species statuses and interactions were evaluated in a fish predator behavior and population dynamics study by Schoen and Beauchamp (2010) as part of LCFP implementation. Present and historic habitat issues and conditions in WRIA 47 are described in the Phase 3 Habitat Component (Appendix C). Anthropogenic impacts on each habitat type affect the aquatic habitat in WRIA 47 by disturbing or modifying natural habitat functions, which consequently alter water quality and/or quantity and availability and quality of habitat.

**Table 5** lists knowledge gaps and management limitations that pertain to the main predators and game fish in Lake Chelan. These gaps and limitations must be addressed before implementing species-based recommendations.

**Table 5 - Main knowledge gaps and management limitations  
for major species in Lake Chelan**

<b>Species</b>	<b>Knowledge Gaps</b>
<b>Westslope Cutthroat trout</b>	Small population makes it difficult to determine predation effects on recovery
	Data suggest species uses the lake in very small numbers (Chelan PUD 2001a, 2001b)
<b>Kokanee</b>	Desired population size not defined
	Recruitment and abundance in Lake Chelan unknown
<b>Chinook salmon</b>	Lacking extensive diet and growth rate information Lacking information on natural reproduction
<b>Bull trout</b>	Undetermined whether natural populations exist in the watershed
	Unknown whether existing habitat can support species
	Potential interactions with other species largely unknown
<b>Lake trout</b>	Lake trout reproductive rate knowledge gap makes predicting future predation impacts on kokanee difficult (Schoen and Beauchamps, 2010)
	No plan presently to control population growth
	Lake trout recruitment rate from natural reproduction unknown
<b>Burbot</b>	Limited understanding of abundance and habitat

### **Recommended Actions from Habitat Assessment**

Previous studies and the information contained in the Phase 3 Habitat Component (**Appendix C**) and in the LCFP highlight the issues and objectives regarding fish and aquatic habitat restoration and management in the Lake Chelan watershed. The LCFP presents the potentially conflicting objectives of restoring and managing Lake Chelan for native species while also supporting the management of recreational sport fisheries. The following recommendations are intended to fill knowledge gaps, work toward resolution of competing management objectives, and lead to effective restoration implementation in the watershed.

1. Evaluate and understand the role of fisheries and fishing activities in the local economy and consider broad-based efforts to address competing fisheries management issues.
2. Support existing and encourage new monitoring efforts, as outlined in the LCFP, to gain a better understanding of habitat utilization and interactions among the fish species present in Lake Chelan.



3. Utilize new and developing science to further understanding of predator-prey relationships and strategies, life-stage habitat use, and species reproduction in the lake and its tributaries.
4. Support the exploration and study of potential impacts of the management approaches offered in the LCFP.
5. Support habitat restoration efforts that improve identified limiting factors for both fish and wildlife.
6. Encourage participation in LCWPU activities and development of a detailed implementation plan to develop fish and wildlife priority actions for implementation of the watershed plan.

## **2.5. OTHER WRIA 47 PLANNING ACTIVITIES**

Other planning activities not conducted under WRIA 47 watershed Planning have similar water quality, water quantity, and habitat management objectives and activities that overlap with those of WRIA 47 watershed planning. These activities include the Chelan County Shoreline Master Program (SMP) update; Chelan County in-lieu fee program development; Chelan PUD FERC license activities under the Lake Chelan Settlement Agreement; and development of the Northwest Power and Conservation Council Lake Chelan Sub-basin Plan.

### **2.5.1 Shoreline Master Program Update**

Shoreline Master Programs (SMP) are a combination of rules and comprehensive planning that are developed by local governments to guide the development of stream and lake shorelines in accordance with the 1971 State Shoreline Management Act (RCW 90.58). The local SMP is essentially a shoreline-specific combined comprehensive plan, zoning ordinance, and development permit system. The Act emphasizes accommodation of appropriate uses that require a shoreline location, protection of shoreline environmental resources and protection of the public's right to access and use the shorelines (RCW 90.58.020).

Chelan County adopted the SMP in 1975 and is currently updating the SMP, which was submitted for public review draft form in August 2010. A Shoreline Restoration Plan will implement the updated SMP to address impaired ecological functions, provide environmental protection for shorelines, preserve and enhance public access, and encourage appropriate development that supports water-oriented uses.

### **2.5.2 FERC License and Implementation of Lake Chelan Comprehensive Plan**

FERC relicensing led to the Lake Chelan Comprehensive Plan prepared by Chelan PUD in 2003 to implement the Lake Chelan Settlement Agreement. Chelan PUD established several plans to manage erosion, fisheries, and wildlife habitat in the Lake Chelan Project area. Objectives of these plans overlap WRIA 47 water quality, quantity,

and habitat objectives. Chelan PUD has initiated and funded these planning activities with various levels of participation by federal, state, county and local agencies.

#### Erosion Control Plan

The National Park Service and the US Forest Service have implemented shoreline protection and restoration activities under the Erosion Control Plan. A large woody debris (LWD) program was initiated to support implementation of the erosion control and fishery plans. Future activities and management of the LWD program is under review and discussion by residents and government agencies.

#### Fishery Management Plan

WDFW has primary responsibility for fishery management in Lake Chelan. Fishery management plan objectives include restoring and enhancing habitat for native species, maintaining water quality and quantity, and coordinating plans and actions of other WRIA 47 stakeholders in developing fishery management measures. A significant monitoring objective included developing a food web model to support the development and management of the fishery management plan.

#### Wildlife Habitat Plan

The Wildlife Habitat Plan seeks to enhance wildlife habitat bordering Lake Chelan to restore, maintain, or improve ecological quality and diversity. Chelan PUD has funded and will continue to fund restoration projects along uplands, shorelines, and riparian zones.

### **2.5.3 Lower Lake Chelan In-Lieu Fee Mitigation Program**

Chelan County, in conjunction with federal, state, and local agencies and tribes, is developing an In-Lieu Fee (ILF) mitigation program to offer an alternative means of mitigating for unavoidable aquatic impacts when on-site, in-kind mitigation is not practicable. The ILF is described in the Lower Lake Chelan ILF Prospectus and Compensation Planning Framework (The Watershed Company, 2010). Chelan County submitted the ILF Prospectus to the Army Corps of Engineers and Ecology, and is meeting with other state and local agencies for review and approval. The program would pool fees from the shoreline permitting process into an ILF program account. The fees would be used to develop mitigation projects that would have much greater benefit to Lake Chelan shoreline conditions than piecemeal mitigation projects under the current LWD program. The ILF project would have long-term maintenance and monitoring support to ensure the ongoing effectiveness of mitigation projects.

### **2.5.4 Lake Chelan Sub-basin Plan**

The Lake Chelan Sub-basin Plan (Laura Berg Consulting, 2004, for NW Power and Conservation Council) established the goal to “restore conditions to a more natural state” by employing “ecosystem-based perspectives that consider multiple species, their life histories, and their inter-relationships.” The Sub-basin Plan includes a detailed inventory, and concludes with a number of habitat or biological objectives for key species and key habitats in the basin. Aquatic conservation strategies in the plan focus on fish populations and habitats. Funding sources for recommended actions are not specified.

### **3.0 SUMMARY OF RECOMMENDED ACTIONS**

Preliminary objectives for watershed planning in WRIA 47 were developed by the LCWPU during Phase 1 in 2008. WRIA 47 water quantity and quality conditions and challenges to meet the LCWPU objectives were identified during Phase 2 Watershed Planning, which included water quantity assessment and compilation of water quality conditions. Recommendations from the Phase 2 assessments were developed and carried forward into the Phase 3 watershed planning effort. A summary habitat assessment, compiled during Phase 3, identified watershed planning-related objectives and conditions to protect and enhance fish habitat in WRIA 47, and recommendations from habitat assessment activities are included in the Phase 3 watershed planning effort. The LCWPU reviewed and refined recommendations to meet the objectives developed in Phase 2 and 3, and the Phase 3 watershed planning recommendations are summarized in this section.

Specific watershed planning activities will be evaluated and prioritized as part of the Phase 4 detailed implementation plan following adoption of the watershed plan. Watershed planning objectives in WRIA 47 overlap objectives of other water, land and habitat management activities. The LCWPU members and stakeholders will improve the effectiveness of implementing watershed planning activities as they are coordinated with parallel activities in WRIA 47.

#### **3.1 Water Quantity Summary**

##### **Objectives**

- Improve estimates of beneficial uses to support water quality assessment and habitat enhancement and protection.

##### **Findings and Challenges:**

- Estimates of total water supply availability are imprecise based on assumptions of beneficial use and inchoate water rights.
- Water is available for appropriation subject to the terms of the 1992 Agreement between Chelan PUD and Ecology, and the 2006 renewal of the FERC license for Lake Chelan Dam.
- Irrigation use and return flow are not quantified and have the greatest effect on current and future water balance.
- Changes in land use and population in the Wapato, Manson and lower Lucerne sub-basins will affect local water use, water quality, and habitat conditions. Limited and sporadic water data are needed to predict and manage these changes.

##### **Recommended Actions for Water Quantity:**

- Improve the documentation of beneficial water use, inchoate rights, pending applications for new water rights, existing municipal water supply, irrigation

water use, and irrigation return flow to update water balance estimates and monitor the effects of changes in water use to improve estimates of future water availability in WRIA 47.

- Initiate surface water and groundwater monitoring in the Wapato, Manson and lower Lucerne sub-basins to provide data to support water quality and habitat monitoring and improvement plans in WRIA 47.
- Use improved water balance estimates to support implementation of water quality studies and water quality management.
- Promote joint comprehensive analysis and prioritization of future municipal/domestic use by large and small Group A systems, Group B systems, future irrigation use, and future commercial/industrial use.
- Evaluate regional growth patterns, regional demands, inchoate water rights and water system connections for future/expanded service areas.
- Evaluate potential future irrigation demands and transfers of water rights following conversion of agricultural land prior to transfer for other purposes.
- Obtain agreement from Ecology and the PUD regarding the amount of water available for appropriation under the 1992 Agreement (estimated at 20,000 acre-feet). Initiate cost-reimbursement processing of the pending new water right applications that may be covered by the 1992 Agreement.
- Identify an adequate domestic water and fire-fighting supply as airport and planned developments proceed in the Howard Flats subbasin.

### 3.2 Water Quality Summary

#### Objectives:

- Develop and implement a comprehensive, long-term monitoring program to monitor key parameters that will ensure water quality sustainability throughout WRIA 47.
- Address water bodies with constituents on the State 303(d) list and other parameters of potential concern that threaten lake water quality.
- Inform and educate local communities and visiting populations about water quality protection.
- Develop a Water Quality Improvement Plan and Water Quality Management Plan to understand, restore and protect water resources.

#### Findings and Challenges:

- Understanding the water quality in WRIA 47 to improve the implementation of TMDL and other water quality goals requires high quality data to develop useful baseline summary and discern water quality trends.
- Water quality data are sporadic and unsuitable for assessing conditions and management decisions.
- The food web model requires a QAPP.

Recommended Actions for Water Quality:

- Calibrate the QUAL-2K water quality model with the first year of data to initiate the LTMP
- Prepare a Quality Assurance Project Plan (QAPP) for the food web bioaccumulation model to support the characterization and monitoring objectives of the LTMP.
- Initiate the LTMP using the initial modeling results to advance the implementation of the TMDLs for phosphorous and DDT/PCB.
- Evaluate the feasibility and benefits of including benzene as part of the Long Term Monitoring Plan.
- Inform and educate agencies and the public regarding LTMP objectives and findings to support watershed protection in WRIA 47.
- Evaluate the feasibility and priority for extending sanitary sewer to rural areas along the North and South Shores and around the Manson Lakes.
- Evaluate the feasibility and benefits for establishing an On-site Wastewater Management District to improve rural septic system performance in removing both bacteria and nutrients.
- Evaluate the feasibility and benefit of managing irrigation drain return flows that discharge to surface water.
- Promote land use practices and regulations for stormwater and clearing/grading to reduce unmanaged stormwater and sediment discharge to surface water

### 3.3 Habitat Summary

Objectives:

- Address ecological needs in WRIA 47 concurrently with water quality and quantity issues to support watershed planning.

Findings and Challenges:

- Fish population impacts include habitat degradation and loss; land development, conversion, and management; agricultural practices; fish-passage barriers; dam operations; flooding; species introductions; interspecific breeding; competition for resources; disease; harvest; and hatchery and stocking operations.
- These historic and current land use practices, which disturb or modify natural habitat functions, consequently alter water quality and/or quantity and availability and quality of habitat.

Recommended Actions for Habitat:

- Support the Lake Chelan Fishery Plan (LCFP) objectives to improve understanding of Lake Chelan fisheries and fisheries management, and address competing management approaches.

- Support the monitoring and understanding of habitat and species interactions and reproduction by coordinating LTMP activities with Lake Chelan Fishery Forum (LCFF) activities to implement the LCFP.
- Support habitat restoration efforts to improve limiting factors for both fish and wildlife.
- Support developing a detailed implementation plan that includes prioritized fish and wildlife actions.

## 4.0 STATE ENVIRONMENTAL POLICY ACT (SEPA) GAP ANALYSIS

This Chapter of the WRIA 47 Watershed Plan provides documentation of programmatic State Environmental Policy Act (SEPA) compliance specific to the Water Resource Inventory Area 47 (WRIA 47) Watershed Plan for adoption of the Plan by Chelan County.

This section provides the following information:

- A description of the process used to evaluate consistency of the WRIA 47 Watershed Plan with the statewide Programmatic Environmental Impact Statement (EIS) for Watershed Planning;
- A summary of the assumptions and judgments used in determining SEPA compliance of WRIA 47 Watershed Plan actions; and,
- Documentation of compliance of each action recommended in the WRIA 47 Watershed Plan with requirements for programmatic, non-project SEPA review.

### 4.1 WRIA 47 Watershed Plan Approach for Programmatic SEPA Compliance

The following options were considered for SEPA compliance in WRIA 47:

- **Adoption of the statewide programmatic Watershed Planning EIS and Determination of Significance (DS).** This is an option if the statewide programmatic Watershed Planning EIS adequately addresses all probable adverse impacts. The County (as lead SEPA agency) will use all or part of an existing document (the statewide programmatic Watershed Planning EIS) to meet all or part of the proponent's responsibilities under SEPA to prepare an EIS or other environmental document. A Determination of Significance (DS) is a written decision by the lead SEPA agency that the proposal is likely to have a significant adverse environmental impact and therefore an EIS is required (WAC 197-11-310 and WAC 197-11-360).
- **Adoption, DS, and Addendum.** Same as DS option above, with the addition of an addendum which provides local decision makers with additional local

information on compliance with the statewide programmatic Watershed Planning EIS.

- **Adoption, DS, and Supplemental EIS.** If the statewide programmatic Watershed Planning EIS addresses some but not all of the probable significant adverse environmental impacts, a supplemental EIS is necessary.
- **Determination of Non-Significance (DNS).** A DNS could be issued if it is determined that there are no probable significant adverse impacts associated with the recommended actions contained in the WRIA 47 Watershed Plan. In the event that a DNS includes mitigation measures as a result of the process specified in WAC 197-11-350, a **Mitigated Determination of Non-Significance (MDNS)** could be issued.

The qualifications, assumptions, and consistencies analyzed to achieve programmatic SEPA compliance for the WRIA 47 Watershed Plan are included within this section of the Plan (Section 4.0). This section is considered as the addendum to the statewide programmatic Watershed Planning EIS. The purpose of this section is to document the logic used in the SEPA gap analysis and the compliance of each action in the Plan with programmatic SEPA.

*After reviewing the WRIA 47 Watershed Plan (Plan), Chelan County (as the lead SEPA agency) has determined they will adopt the statewide programmatic Watershed Planning EIS and issue a determination of significance (DS) to meet its responsibility to prepare a SEPA compliant review of the Plan. Adoption of the statewide programmatic Watershed Planning EIS is addressed with this section of the Plan. After adoption of the statewide programmatic Watershed Planning EIS, there is a seven (7) day waiting period before an action can be taken to approve the Plan (WAC 197-11-630).*

## 4.2 SEPA and Watershed Planning

The State Environmental Policy Act (SEPA) (Chapter 43.21C RCW) was enacted by the State legislature to ensure that State and local agencies consider likely environmental consequences of proposed actions during decision-making processes concerning such activities. These consequences are considered during the SEPA review process.

Under SEPA rules, non-project actions are defined as governmental actions involving decisions on policies, plans, and programs. Such actions can include the adoption or amendment of policies, programs, and plans, such as Watershed Plans under Chapter 90.82 RCW. Any non-project action must be reviewed under SEPA unless specifically exempted.

The Washington State Department of Ecology (Ecology) published a Final Environmental Impact Statement for Watershed Planning under Chapter 90.82 RCW in August 2003 (Ecology, 2003). A copy of this statewide programmatic Watershed Planning EIS is available for review at the Chelan County Natural Resource Department offices in Wenatchee, WA and on the internet at

<http://www.ecy.wa.gov/biblio/0306013.html>. Actions that could be included in local watershed plans are considered as SEPA “alternatives” in this statewide programmatic Watershed Planning EIS. Probable significant adverse environmental impacts that may be associated with these “alternatives” were also discussed in the statewide programmatic Watershed Planning EIS. If actions in a local watershed plan are consistent with the alternatives listed in the statewide programmatic Watershed Planning EIS, non-project programmatic SEPA requirements can be fulfilled by the statewide programmatic Watershed Planning EIS.

There are two SEPA compliance processes associated with actions in the WRIA 47 Watershed Plan:

- 1) Programmatic coverage of the County Watershed Plan approval process.

***Programmatic coverage of the WRIA 47 Watershed Plan is achieved through adoption of the statewide programmatic Watershed Planning EIS and the issuance of a Determination of Significance for the WRIA 47 Watershed Plan.***

- 2) Non-programmatic SEPA for specific actions. Some specific project or non-project actions recommended in the WRIA 47 Watershed Plan, such as the initiation of a specific construction or management activity, will go through a separate SEPA review of the individual action itself at the time the action is implemented. The SEPA review completed at the current programmatic, non-project level of the SEPA process is adequate for County approval. Where alternatives in the statewide programmatic Watershed Planning EIS provide coverage for these actions, some of the documentation needed for the project-level SEPA approval process may reference the statewide programmatic Watershed Planning EIS and this section. However, the extent of the project SEPA process needed for each action is dependent entirely upon the nature of the specific action and its potential adverse environmental impacts. In some cases, these individual actions are in their early planning stages and are not sufficiently developed to make a SEPA judgment at the time of plan adoption by the County.

***This non-programmatic SEPA review of specific actions is not a prerequisite for the SEPA compliance necessary to achieve County approval of the WRIA 47 Watershed Plan, but will generally be necessary for plan implementation.***

In summary, this section of the WRIA 47 Watershed Plan and adoption of the statewide programmatic Watershed Planning EIS fulfills the programmatic SEPA requirements necessary for County approval of the WRIA 47 Watershed Plan. SEPA compliance for individual (project and non-project) actions in the WRIA 47 Watershed Plan may also be granted during this approval process; however, some actions will be required to undergo specific project or non-project level review at the time that the individual action is implemented.

For federal actions, NEPA compliance is required when the action is implemented. However, this compliance is not a prerequisite for approval of the WRIA 47 Watershed



Plan by the County, nor is it necessary during the programmatic SEPA review. Additionally, the Watershed Planning Unit cannot obligate a federal agency to implement any actions, but can make recommendations to a federal agency.

## **4.3 SEPA Compliance for the WRIA 47 Watershed Plan**

### Plan Consistencies with the Statewide Programmatic Watershed Planning EIS

Recommended actions in the WRIA 47 Watershed Plan that are consistent with alternatives described in the statewide programmatic Watershed Planning EIS do not require supplemental information or additional consideration to achieve non-project programmatic SEPA compliance. A SEPA gap analysis was conducted where all alternatives in the statewide programmatic Watershed Planning EIS were reviewed and compared with recommended actions in the WRIA 47 Watershed Plan.

The alternatives from the statewide programmatic Watershed Planning EIS that were applied to the WRIA 47 Watershed Plan are listed below. Further descriptions of these alternatives and potential environmental impacts can be found in the statewide programmatic Watershed Planning EIS.

The following alternatives apply to one or more actions in the WRIA 47 Watershed Plan:

- WP 17 – Where adequate public water supplies are available, extend public water system service into areas served by exempt wells and require any new development to connect to such public water supplies.
- WP 28 – Request local governments or sewer utilities to construct and operate water reclamation and reuse facilities (e.g., reclamation plants and use areas) to reduce wastewater discharges to surface water bodies and improve water quality in receiving waters.
- WP 36 – Develop and implement a water quality public education program intended to prevent or reduce nonpoint pollution with focus on pollution sources associated with an urban setting, or with focus on pollution sources associated with a rural setting.
- WP 37 – Request local governments and Ecology to develop and operate water quality monitoring programs, including installation and maintenance of monitoring devices, to measure the extent of nonpoint pollution and/or measure the effectiveness of nonpoint pollution control measures.
- WP 40 – Request local governments to modify local regulations such as critical areas ordinances, stormwater regulations, and on-site sewage regulations to help reduce the potential for nonpoint pollution and/or to implement Total Maximum Daily Loads established for federal 303 (d) listed water bodies.
- WP 43 – Implement habitat improvement projects intended to “daylight” streams that are currently contained within enclosed channels.

- WP 45 – Request the Washington Department of Transportation, local governments, or other applicable agencies to remove or replace bridges, culverts, roadways, and other infrastructure as necessary to eliminate or reduce their impacts as fish passage obstructions and/or channel constrictions.
- WP 50 - Request local governments to develop regulations or programs to control sources of sediment that are not addressed through critical areas ordinances or other existing regulations and programs.

#### 4.4 Other SEPA Assumptions and Qualifications

During the SEPA gap analysis, a number of recommended actions in the WRIA 47 Watershed Plan were found that are not described explicitly by alternatives in the statewide programmatic Watershed Planning EIS. However, it was determined that all of the actions not explicitly covered by the statewide programmatic Watershed Planning EIS either do not have adverse environmental impacts or do not require additional SEPA coverage at the programmatic level based on the qualifications and assumptions listed below. Therefore an additional EIS is not required.

The following are the qualifications and assumptions that are not specifically discussed in the statewide programmatic Watershed Planning EIS that are relevant to the WRIA 47 Watershed Plan:

Recommended actions that do not have a foreseeable “adverse environmental impact” do not require a SEPA alternative, or a statement of SEPA compliance. The following types of actions are listed in the WRIA 47 Watershed Plan and are not expected to have an adverse environmental impact:

- Improve the documentation of beneficial water use, inchoate rights, municipal water supply, irrigation water use, and irrigation return flow to update water balance estimates and monitor the effects of changes in water use to improve estimates of future water availability in WRIA 47 (Noted in Table 6 below as **coordination/collaboration/monitoring**)
- Initiate surface water and groundwater monitoring in the Wapato, Manson and lower Lucerne sub-basins to provide data to support water quality and habitat monitoring and improvement plans in WRIA 47 (Noted in Table 6 as **monitoring**)
- Promote joint comprehensive analysis and prioritization of future municipal/domestic use by large and small Group A systems, Group B systems, future irrigation use, and future commercial/industrial use (Noted in Table 6 as **collaboration/coordination**)
- Evaluate regional growth patterns, regional demands, inchoate water rights and water system connections for future/expanded service areas (Noted in Table 6 as **collaboration/coordination**)
- Evaluate potential future irrigation demands and transfers of water rights following conversion of agricultural land prior to transfer for other purposes (Noted in Table 6 as **collaboration/coordination**)

- Prioritize and establish quantities for the current 20,000 af PUD water right reservation and any future PUD water right reservations when needed (Noted in Table 6 as **collaboration/coordination**)
- Identify an adequate domestic water and fire-fighting supply as airport and planned developments proceed in the Howard Flats subbasin (Noted in Table 6 as **collaboration/coordination**)
- Evaluate the feasibility and benefit of managing irrigation drain return flows that discharge to surface water (Noted in Table 6 as **study**)

## 4.5 WRIA 47 Watershed Plan SEPA Compliance Table

Each action in the WRIA 47 Watershed Plan was evaluated against the statewide programmatic Watershed Planning EIS alternative or other analysis criteria used to achieve non-project programmatic SEPA compliance (**Table 6**). The table includes a SEPA analysis of the recommended actions presented in **Section 3** of this plan. The table is included within the text so that Chelan County can use this section of the Plan as supporting information to adopt the statewide programmatic Watershed Planning EIS and issue a determination of significance (DS) to meet its responsibility to prepare a SEPA compliant review of the Plan.

In some cases, more than one Watershed Planning alternative or a combination of qualifications and assumptions and alternatives are consistent with one action. Where combinations of alternatives and/or qualifications or assumptions are used, evidence for SEPA compliance is more robust.

Table 6. Results of SEPA Gap Analysis for WRIA 47 Watershed Management Plan and the Watershed Planning EIS

Water Quantity Recommended Action	SEPA Analysis
<ul style="list-style-type: none"> <li>• Improve the documentation of beneficial water use, inchoate rights, municipal water supply, irrigation water use, and irrigation return flow to update water balance estimates and monitor the effects of changes in water use to improve estimates of future water availability in WRIA 47.</li> </ul>	Collaboration, Coordination, Monitoring
<ul style="list-style-type: none"> <li>• Initiate surface water and groundwater monitoring in the Wapato, Manson and lower Lucerne sub-basins to provide data to support water quality and habitat monitoring and improvement plans in WRIA 47.</li> </ul>	Monitoring
<ul style="list-style-type: none"> <li>• Use improved water balance estimates to support implementation of water quality studies and water quality management.</li> </ul>	WP 37
<ul style="list-style-type: none"> <li>• Promote joint comprehensive analysis and prioritization of future municipal/domestic use by large and small Group A systems, Group B systems, future irrigation use, and future commercial/industrial use.</li> </ul>	Collaboration, Coordination
<ul style="list-style-type: none"> <li>• Evaluate regional growth patterns, regional demands, inchoate water rights and water system connections for future/expanded service areas.</li> </ul>	Collaboration, Coordination

<ul style="list-style-type: none"> <li>Evaluate potential future irrigation demands and transfers of water rights following conversion of agricultural land prior to transfer for other purposes.</li> </ul>	Collaboration, Coordination
<ul style="list-style-type: none"> <li>Prioritize and establish quantities for the current 20,000 af PUD water right reservation and any future PUD water right reservations when needed.</li> </ul>	Collaboration, Coordination
<ul style="list-style-type: none"> <li>Identify an adequate domestic water and fire-fighting supply as airport and planned developments proceed in the Howard Flats subbasin.</li> </ul>	Collaboration, Coordination
<b>Water Quality Recommended Actions</b>	
<ul style="list-style-type: none"> <li>Calibrate the QUAL-2K water quality model with the first year of data to initiate the LTMP</li> </ul>	WP 37
<ul style="list-style-type: none"> <li>Prepare a Quality Assurance Project Plan (QAPP) for the food web bioaccumulation model to support the characterization and monitoring objectives of the LTMP.</li> </ul>	WP 37
<ul style="list-style-type: none"> <li>Initiate the LTMP using the initial modeling results to advance the implementation of the TMDLs for phosphorous and DDT/PCB.</li> </ul>	WP 37
<ul style="list-style-type: none"> <li>Evaluate the feasibility and benefits of including benzene as part of the Long Term Monitoring Plan.</li> </ul>	WP 37
<ul style="list-style-type: none"> <li>Inform and educate agencies and the public regarding LTMP objectives and findings to support watershed protection in WRIA 47.</li> </ul>	WP 36
<ul style="list-style-type: none"> <li>Evaluate the feasibility and priority for extending sanitary sewer to rural areas along the North and South Shores and around the Manson Lakes.</li> </ul>	WP 17
<ul style="list-style-type: none"> <li>Evaluate the feasibility and benefits for establishing an On-site Wastewater Management District to improve rural septic system performance in removing both bacteria and nutrients.</li> </ul>	WP 28
<ul style="list-style-type: none"> <li>Evaluate the feasibility and benefit of managing irrigation drain return flows that discharge to surface water.</li> </ul>	Study
<ul style="list-style-type: none"> <li>Promote land use practices and regulations for stormwater and clearing/grading to reduce unmanaged stormwater and sediment discharge to surface water</li> </ul>	WP 40, WP50
<b>Habitat Recommended Actions</b>	
<ul style="list-style-type: none"> <li>Support the Lake Chelan Fishery Plan (LCFP) objectives to improve understanding of Lake Chelan fisheries and fisheries management, and address competing management approaches.</li> </ul>	Collaboration, Coordination
<ul style="list-style-type: none"> <li>Support the monitoring and understanding of habitat and species interactions and reproduction by coordinating LTMP activities with Lake Chelan Fishery Forum (LCFF) activities to implement the LCFP.</li> </ul>	Collaboration, Coordination
<ul style="list-style-type: none"> <li>Support habitat restoration efforts to improve limiting factors for both fish and wildlife.</li> </ul>	WP 42, WP 43, WP 45
<ul style="list-style-type: none"> <li>Support developing a detailed implementation plan that includes prioritized fish and wildlife actions.</li> </ul>	Collaboration, Coordination

## Summary

This section of the WRIA 47 Watershed Management Plan provides documentation of compliance of the WRIA 47 Plan with the statewide programmatic SEPA requirements. This chapter is to be attached to the Determination of Significance filed for the Plan adoption action by Chelan County and provides local information

relevant to the WRIA 47 Plan that is not explicitly included in the statewide programmatic Watershed Planning EIS (Ecology, 2003).

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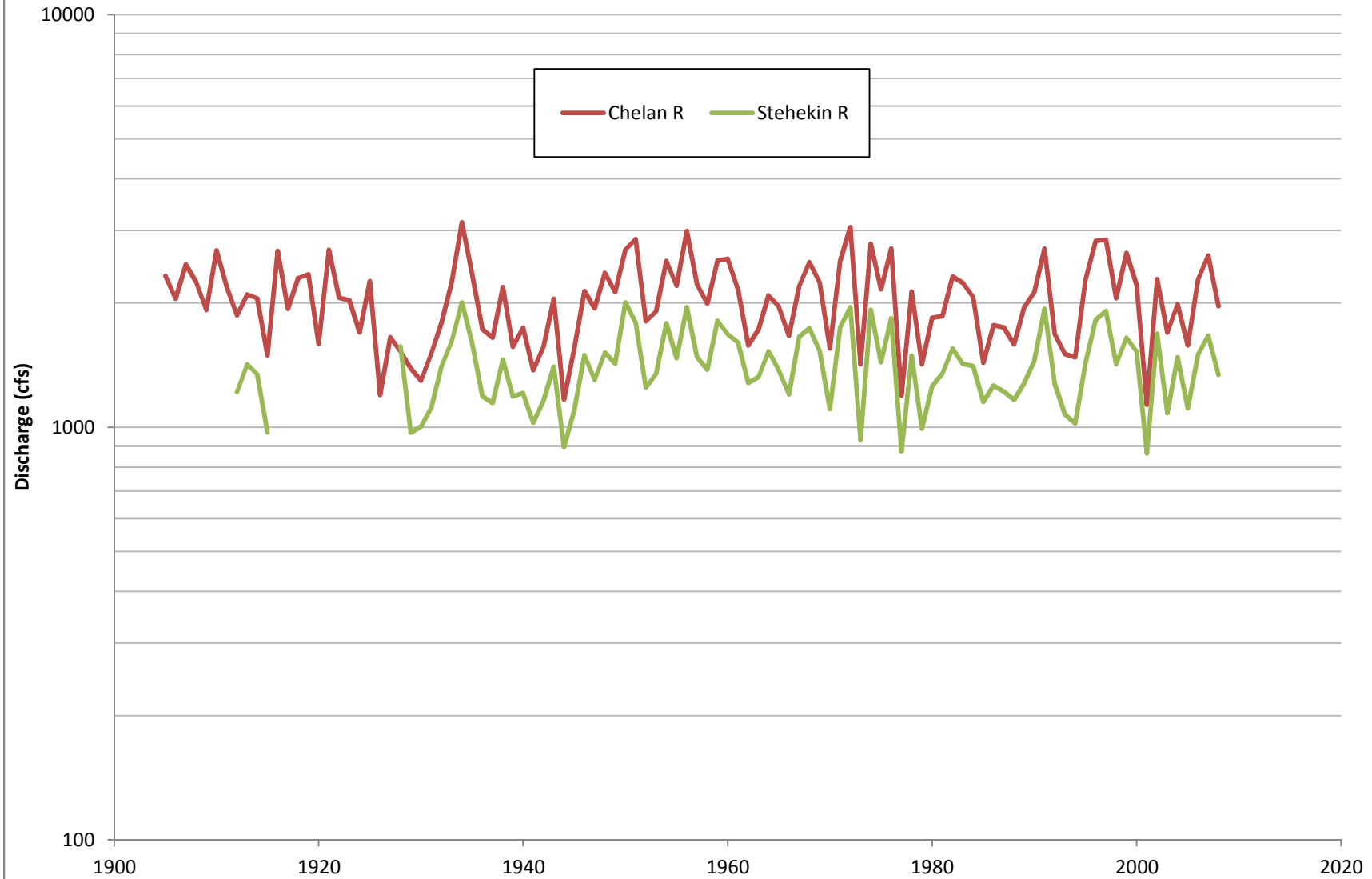
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# Subbasins WRIA 47 - Lake Chelan Watershed Planning Phase III Watershed Plan FIGURE 1





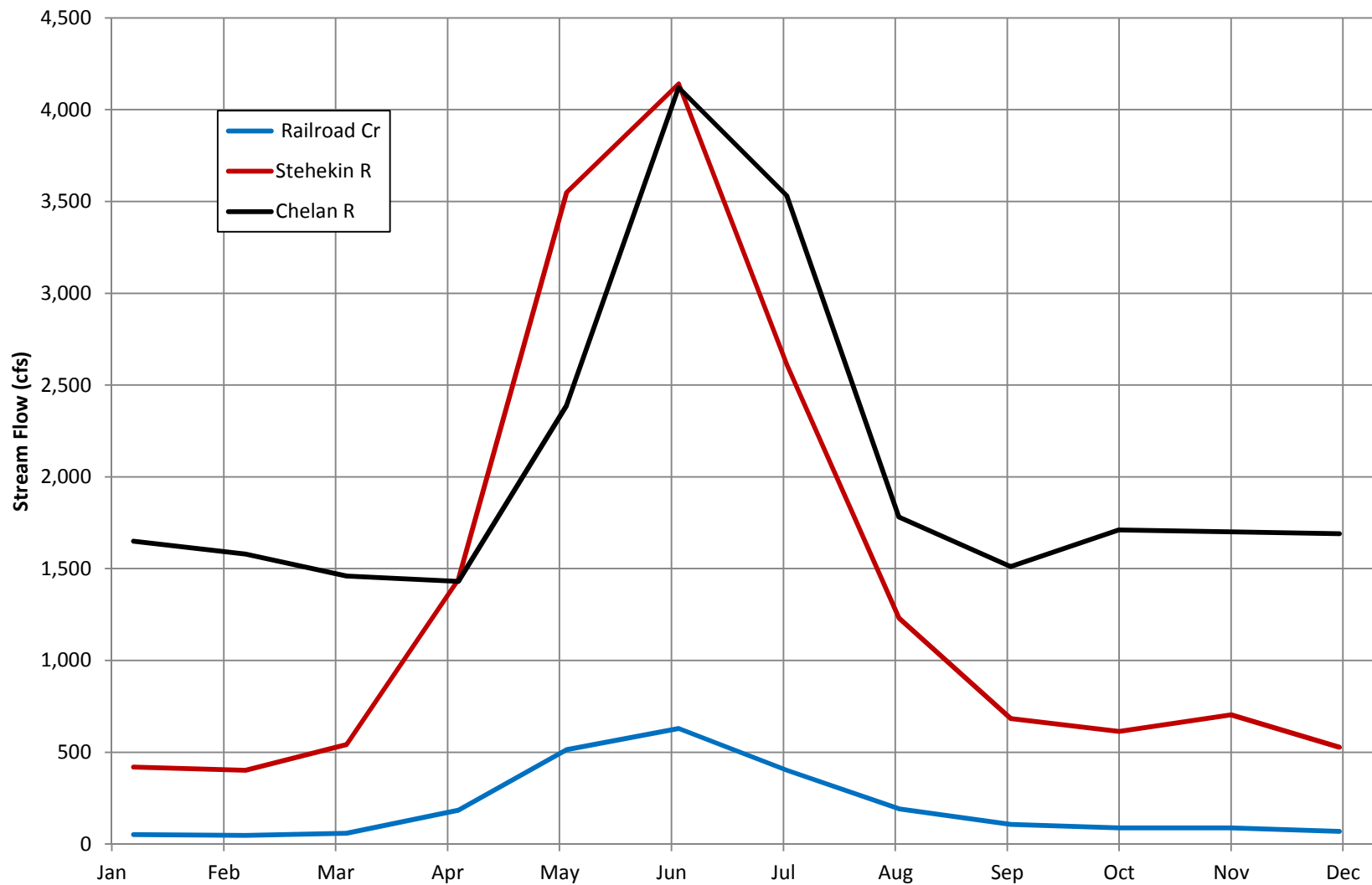
**Figure 2 - Stehekin River and Chelan River Flow**  
**Lake Chelan Watershed Plan - WRIA 47**



Source: USGS Gauge Data

RH2 Engineering, Inc.

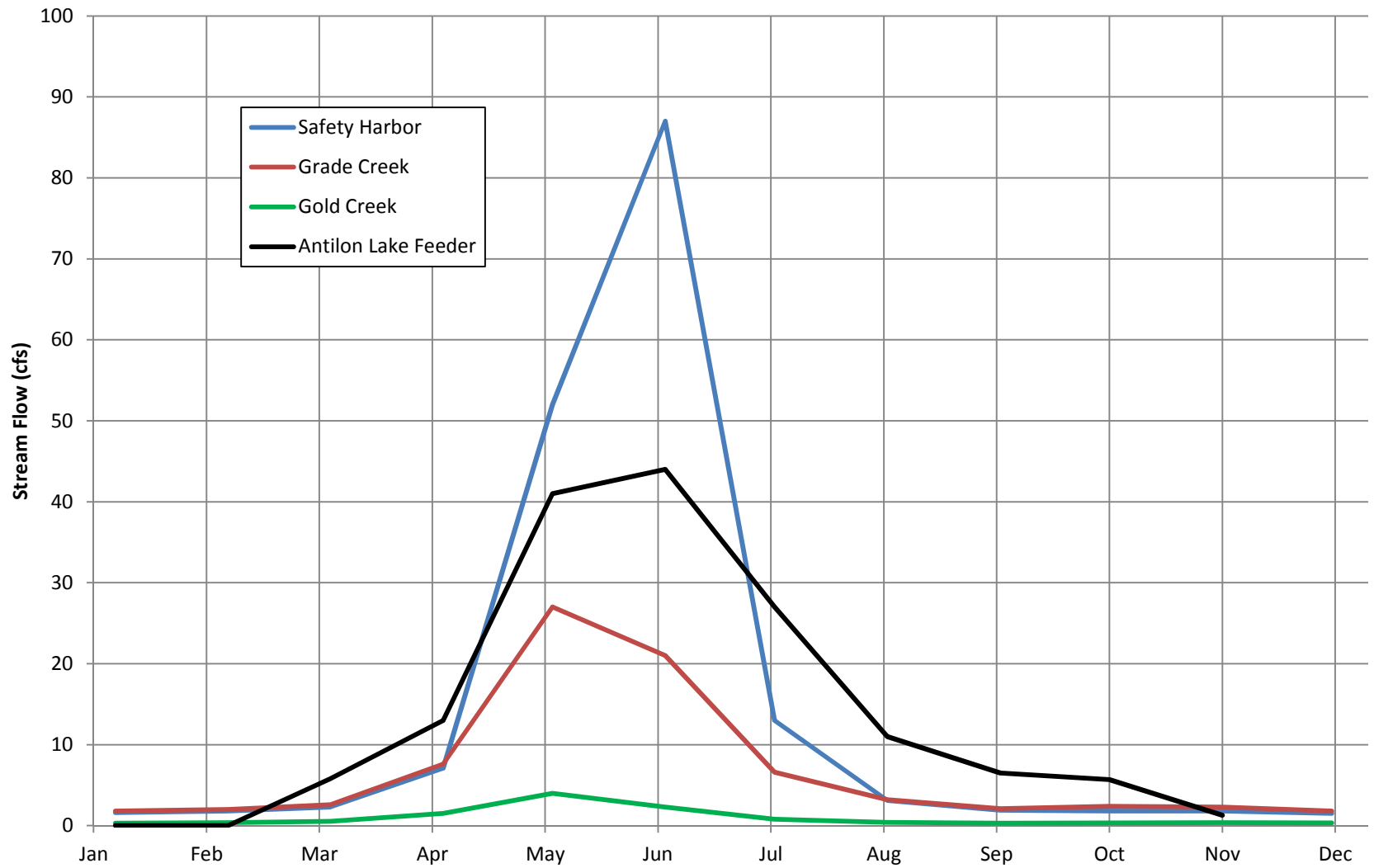
**Figure 3 - Average Monthly Flow - Primary Streams**  
**Lake Chelan Watershed Plan - WRIA 47**



Source: USGS Gauge Data

RH2 Engineering, Inc.

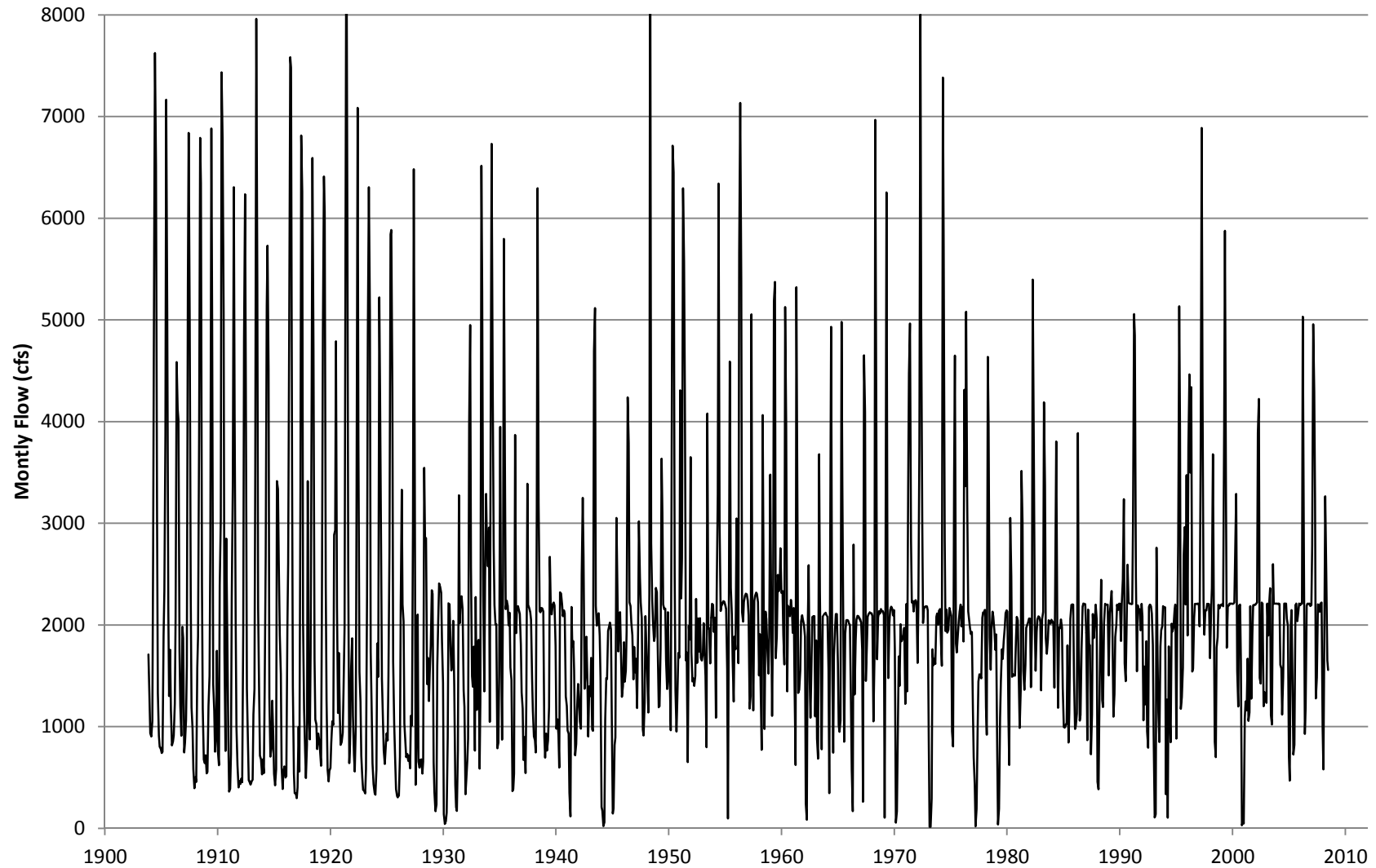
**Figure 4 - Average Monthly Flow - Tributary Streams  
Lake Chelan Watershed Plan - WRIA 47**



Source: USGS Guage Data

RH2 Engineering, Inc.

**Figure 5 - Monthly Flow from Lake Chelan**  
**Lake Chelan Watershed Plan - WRIA 47**



Source: USGS Gauge Data

RH2 Engineering, Inc.

**Appendix A**  
**Water Quantity Assessment Report**

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# **Section 1 – Introduction**

## **1.0 REGULATIONS AND APPLICATIONS**

In 1998, the Washington State Legislature adopted the Watershed Management Act (Act) codified as Chapter 90.82 RCW. Watershed plans are developed at the local level by residents of the area with guidance and involvement from the Washington State Department of Ecology (Ecology), rather than being developed and directed by Ecology with local resident support.

The Legislature stated the following regarding the purpose of the Act.

The purpose of this chapter is to develop a more thorough and cooperative method of determining what the current water resource situation is in each water resource inventory area of the state and to provide local citizens with the maximum possible input concerning their goals and objectives for water resources management and development (RCW 90.82.005).

## **1.1 PHASE 2 ASSESSMENT OBJECTIVES**

The Act requires that the planning unit conduct a water quantity assessment to examine water supply and use and develop strategies for future use. Perhaps the most significant goal of the watershed assessment is to provide the most thorough understanding possible of the current water resources situation in Water Resource Inventory Area (WRIA) 47, consistent with the Legislature's direction. A thorough and accurate understanding of the water resource situation provides a strong foundation for any future efforts related to water resource management, whether it is to guide additional studies or obtain funding for a needed water resources project.

The first phase of the watershed assessment summarizes the water resources of WRIA 47 and identifies significant gaps in the data. RH2 previously identified and compiled data gaps during Phase 1 (RH2, 2008), and described their significance on the quantity assessment. The water and biological resources of the watershed have received significant attention during the previous decades, and much of this assessment compiles and summarizes the findings of these studies. New data that became available since the last compilation studies consist of additional water level and flow data, well drilling logs and water use data.

During Phase I, the Planning Unit resolved to conduct Phase II technical assessments, including the mandatory water quantity assessment, which addresses water available for future demands, and a water quality assessment (a separate report). The initiating governments chose not to pursue in-stream flow and habitat elements because they considered these issues essentially completed during previous efforts.

RH2 Engineering, Inc. (RH2) was contracted by the Chelan County Natural Resources Department (CCNR) to conduct the Phase 2 Water Quality Assessment. A technical subcommittee consisting of Planning Committee members and interested citizens was created to work with RH2 to provide local information and review technical elements.



The following Act requirements pertain to these technical assessments (Chapter 90.82.070 RCW).

**Required Elements – Water Quantity Assessment**

Assess water supply and use in the management area and develop strategies for future use including:

- An estimate of the surface and ground water present, taking into account seasonal and other variations;
- An estimate of the water represented by claims in the water rights claims registry, water use permits, certificated rights, existing minimum instream flow rules, federally reserved rights, and any other rights to water;
- An estimate of the surface and ground water actually being used;
- An estimate of the water needed in the future for use;
- An identification of the location of areas where aquifers are known to recharge surface bodies of water and areas known to provide for the recharge of aquifers from the surface; and
- An estimate of the surface and ground water available for further appropriation.

Develop strategies for increasing water supplies, which may include water conservation, water reuse, the use of reclaimed water, voluntary water transfers, aquifer recharge and recovery, additional water allocations, or additional water storage and water storage enhancements.

## **1.2 WRIA 47 WATERSHED PLANNING IMPLEMENTATION**

The following summary was developed during Phase 1 planning.

The Planning Unit's vision is to recognize, inform, educate, monitor, understand and protect the unique water resource that is Lake Chelan; the ecological processes and pathways essential to maintaining this high quality water body; and the ways in which we can live on this lakeshore, enjoy this unique treasure and protect it for generations to come.

### **Mission**

To develop an understanding of water and related aquatic and land resources by building trust and positive working relationships among diverse interests in the watershed to achieve a sustainable balance of economic, social and environmental values.

### **Goal**

To implement a management plan for water use and protection that sustains the environmental, educational, economic and recreational values associated with a healthy lakeside community and watershed.

### **Objectives**

1. Assess water supply, use and projected needs.
2. Develop and implement a comprehensive, long-term monitoring program of key parameters that will ensure water quality sustainability throughout the Lake Chelan Watershed.
3. Address water bodies with constituents on the State 303(d) list and other parameters of potential concern that threaten lake water quality.

4. Inform and educate local communities and visiting populations about water quality protection.
5. Develop a Water Quality Improvement Plan and Water Quality Management Plan to understand, restore and protect water resources.

The initiating governments view watershed planning as a complement to other water resource management efforts in the Lake Chelan Basin, including the implementation of re-licensing the Chelan Dam and work done by the Lake Chelan Water Quality Advisory Committee. Additionally, the WRIA 47 sub-basins adjacent to the Columbia River Basin overlap the management area for the Columbia River Basin Water Resource Management Program, which extends 1 mile from the Columbia River shoreline. Watershed planning under the Act is intended to augment such efforts without duplicating them. In fact, the Act requires that the Planning Unit review historical data and previous planning activities to ensure that any products are incorporated into the watershed planning effort and that the watershed planning effort does not duplicate work already performed.

## Section 2 – WRIA 47

### Characteristics

The Water Resource Inventory Area (WRIA) 47 watershed has undergone several basin-wide reviews by various entities for various purposes since the mid-1960s. In the last decade, water quantity and quality studies were conducted to support the Federal Energy Regulatory Commission (FERC) relicensing effort. The relicensing process began in 1998, and the final license application was submitted to the FERC in June 2004. The Phase 2 Water Quantity Assessment relies upon the findings of these studies and incorporates recent water resource and water use data. The *Phase 1 Water Quantity Report* (RH2, 2008) included a literature review of water quantity studies in the watershed.

The area occupied by WRIA 47 (also referred in this report as the “watershed,” or “management area”) comprises 1,044 square miles, of which 90 percent or 937 square miles includes Lake Chelan and its tributary sub-basins; the remaining 10 percent consists of sub-basins that drain to the Columbia River. One primary tributary, the Stehekin River, and one secondary tributary, Railroad Creek, discharge 85 percent of WRIA 47 runoff into Lake Chelan. The management area consists of ten sub-basins shown on **Figure 2-1**. Characteristics of the sub-basins are summarized in Section 2.1. Approximately 1.8 percent of WRIA 47 lies within Okanogan County.

WRIA 47 has political and physical characteristics similar to other east-slope Cascade watersheds. Most of the watershed is under Federal management, primarily by the US Forest Service and National Park Service. The watershed includes glaciers and rugged mountains at the highest elevations, dense fir and open ponderosa pine forests, wide expanses of shrub-steppe, and narrow riparian zones in lower elevations. The largest communities have developed along the lake shoreline, and nearby hillsides are irrigated for orchard and pasture. WRIA 47 is distinct among other central Washington watersheds for its inclusion of Lake Chelan, a very large lake/reservoir that is managed for multiple uses including power, recreation, irrigation, potable supply, historic and cultural preservation, fisheries, wildlife and habitat. Lake levels and flows are strictly managed by the Chelan County PUD under FERC license to balance the water demands for each use.

Elevations in WRIA 47 range from 700 feet at the Columbia River to 9,511 feet at Bonanza Peak. Approximately 69 percent of WRIA 47 is above an elevation of 3,000 feet, and 47 percent of the basin lies above an elevation of 5,000 feet. Landforms consist of the classic U-shaped glacially-carved valleys of Lake Chelan, the Stehekin River and smaller tributaries in the higher elevation sub-basins, which are surrounded by high ridges and steep cliffs. Lower elevation sub-basins are narrower incised valleys that are tributaries to Lake Chelan and the Columbia River, bounded by rolling hills near the lake’s terminus at the City of Chelan, and gravel terraces along the Columbia River.

The 2000 Washington State Census data determined a population of 11,706 for WRIA 47 (excluding the Okanogan County portion of the watershed). The Census forecasted a population of 13,104 for 2008 and 15,650 by 2025. Most residents work within the watershed and live within the Wapato Main Stem and Manson Lakes Sub-basins.

Power generation, tree fruit agriculture and recreation are the predominant land uses in the basin, followed by year-round and seasonal residential use.

Lake Chelan and its immediate surroundings are the result of the complex interaction between two glacial masses. The lake was formed approximately 18,000 to 15,000 years ago during the Vashon/Wisconsin glacial period. During this time, the Chelan Glacier moved down the valley from the Cascade Crest, and the Okanogan-Columbia Valley lobe of the Cordilleran ice sheet extended upward from the south. The two glaciers approached each other and nearly met at Wapato Point and a constriction known as “The Narrows” (a shallow sill 135 feet below the surface of the lake at its narrowest part). The approach and recession of these two glaciers caused erosion in the mid and upper portion of the lake, and geologic moraine deposits at the lower end of the lake. Together, these erosional processes created Lake Chelan (Kendra and Singleton, 1987, and Hillman and Giorgi, 1999 in Viola and Foster 2000). The lake now consists of two basins: the Lucerne basin, which is deep and fjord-like and extends north from The Narrows for 38 miles; and the Wapato basin, which is relatively wide and shallow in comparison (maximum depth of 400 feet) and extends for 12 miles south of The Narrows (Hillman and Giorgi, 1999 in Viola and Foster, 2000).

Lake Chelan is a regulated reservoir under FERC license that was re-authorized on November 6, 2006. The reservoir project is described in the license as follows:

The Federal Power Commission (FPC) issued the original license for the Lake Chelan Project on May 8, 1926. On May 21, 1981, the Federal Energy Regulatory Commission (the successor to FPC) issued Chelan PUD a new license that was made retroactive to 1974; the license expired on March 31, 2004. Since that time, project operations have continued pursuant to an annual license.

The Lake Chelan Project consists of (a) Lake Chelan, a 1,486-foot deep, 55-mile-long natural glacial lake that was raised 21 feet by the construction of the dam to a normal maximum water surface elevation of 1,100 feet mean sea level (msl); (b) a 40-foot-high, 490-foot-long concrete gravity dam; (c) a reinforced-concrete side discharge intake structure that is integral with the dam; (d) a 14-foot-diameter, 2.2-mile-long power tunnel; (e) a 45-foot-diameter by 125-foot-high steel surge tank; (f) a 90-foot-long penstock that transitions from 14 feet in diameter to 12 feet in diameter before bifurcating to two 90-foot-long, 9-foot-diameter steel penstocks; (g) a powerhouse containing two vertical-shaft, Francis-type turbine generators with a rated capacity of 24,000 kilowatts (kW) each for a total rated capacity of 48,000 kW; and (h) a 1,700-foot-long excavated tailrace adjacent to the confluence of the Chelan River and the Columbia River that returns the project flows to the Columbia River. The average annual electric generation by the project was 380,871 megawatt-hours (MWh) for the 20-year period, 1980-1999.

The Lake Chelan Project, which can be operated locally or remotely from Chelan PUD’s Wenatchee Dispatch Center, operates at full or near full capacity almost year-round. Chelan PUD operates the project to maintain reservoir elevations between 1,100 and 1,079 feet msl, with the reservoir maintained above 1,098 feet for most of the summer recreation period. The reservoir is drawn down annually for power generation and storage of spring snowmelt beginning in early October, with the lowest lake levels being reached in April. The lake is refilled through May and June, to attain an elevation of 1,098 feet on or before June 30, where it is maintained

above 1,098 feet through September 30. Spills typically occur during May, June, and July, when inflows exceed the hydraulic capacity of the powerhouse units (2,300 cubic feet per second (cfs)) or when generation is curtailed. Water is spilled over the spillway into the 4.5-mile-long reach of the Chelan River that is bypassed by the project.

Under the new license, Chelan PUD has slightly greater flexibility in managing lake levels by establishing target elevations to be achieved between May 1 and October 1, rather than a fixed elevation by a certain date. Chelan PUD manages minimum lake elevations based on snow pack conditions, lake levels, predicted precipitation and runoff conditions, and operational objectives of maintaining minimum instream flows in the Chelan River, reducing high flows (greater than 6,000 cfs) in the Chelan River, providing usable lake levels for recreation (between 1,090 and 1,098), and ensuring the project can pass the probable maximum flood without dam failure, among other objectives. The previous license did not require a minimum flow release to the bypassed reach of the Chelan River. Chelan PUD provides a minimum flow for the entire bypassed reach, supplemented with pumping of additional water from the tailrace into the lower portion of the Chelan River (Reach 4) to improve spawning habitat for listed salmon and steelhead. The minimum flow varies depending on the time of year and whether it is a dry, normal, or wet water year.

Lake Chelan is a 32,560-acre reservoir at normal maximum water surface elevation of 1,100 feet msl, with a gross storage capacity of 15.8 million acre-feet (AF) and a useable storage of 677,400 AF between elevations 1,079 and 1,100. Approximately 2,000 acres of land lie within the Lake Chelan Project boundary which follows the 1,100-foot contour line from the upper end of Lake Chelan near Stehekin, Washington, to the City of Chelan then continues down both sides of the 4.5-mile-long bypassed reach of the Chelan River to the confluence of the Chelan and Columbia rivers. About 1,300 acres of the project lands are inundated and project facilities occupy the other 700 acres. The project lands are owned by the Forest Service, Park Service, several state agencies, Chelan PUD, and private property owners. Approximately 465.5 acres are inundated federal lands.

### **FERC License Background (Chelan PUD, 2008)**

The FERC Order on Offer of Settlement and Issuing New License (License) for the Lake Chelan Hydroelectric Project No. 637 (Project) was issued November 6, 2006 to the Public Utility District No. 1 of Chelan County (Chelan PUD). An Order on Rehearing for the Project was issued April 19, 2007.

On March 28, 2002 Chelan PUD entered into a Settlement Agreement (Agreement) and Lake Chelan Comprehensive Management Plan with the US Department of Agriculture Forest Service (USFS), National Park Service (NPS), National Marine Fisheries Service (NMFS), US Fish and Wildlife Service, (USFWS), Washington State Department of Fish and Wildlife (WDFW), Washington State Department of Ecology (Ecology), the Confederated Tribes of the Colville Reservation (CCT), American Whitewater and the City of Chelan. The Agreement was filed with the FERC on October 8, 2003 and was incorporated by the FERC as part of the License Order.

Chelan PUD and Ecology successfully defended the Project's water quality certification during a challenge before the State Pollution Control Hearing Board, and on April 21, 2004, Ecology amended and re-issued water quality certification for the Project.

The Chelan PUD issues an annual report summarizing the status of implementing the license measures and summarizing the work plan for the following year (Chelan PUD, 2008). Article 401(a) of the FERC License Order required that several plans be filed with the FERC on or before November 6, 2007 for approval prior to implementation. Each forum met during 2007 with the goal of completing the required resource plans for submittal to the FERC.

Following is a list of resource plans or reports submitted to the FERC and approved as of March 1, 2008.

- *Reservoir Drawdown Limitation and Safety Report* (filed January 8, 2007)
- *Traditional Cultural Properties Management Plan* (plan due November, 1 2008)
- *Threatened Endangered Species Protection Plan* (filed May 4, 2007, approved November 28, 2007)
- *Operations Compliance Monitoring Plan* (filed May 4, 2007, approved November 30, 2007)
- *Quality Assurance Project Plan* (filed May 4, 2007, approved November 30, 2007)
- *Annual Lake Level Report* (submitted November 6, 2007, accepted November 27, 2007)
- *Lake Chelan Fishery Plan* (filed November 6, 2007, approved December 4, 2007)
- *Erosion Control Plan* (Forest Service) and *Site Specific Plan* (filed November 6, 2007, approved January 4, 2008)
- *Annual Report of Activities* per Programmatic Agreement (filed December 4, 2007)

Below is a list of resource plans or reports with approval by the FERC pending as of March 1, 2008:

- *Stehekin Area Implementation Plan* (filed November 6, 2007)
- *Wildlife Habitat Plan* (filed November 6, 2007)
- *Recreation Resources Plan* (filed November 6, 2007)

## **2.0 SUB-BASINS**

Each of the ten sub-basins in WRIA 47 has distinct elevation, geology, weather, land use and vegetation characteristics. **Table 2-1** summarizes characteristics for each sub-basin. The following text summarizes the sub-basins from north to south.

### **Stehekin Sub-basin**

The Stehekin Sub-basin has the largest area and the highest elevation in WRIA 47 at Bonanza Peak at 9,511 feet. Much of the upper portion of this sub-basin consists of glaciated tributary valleys and surrounding steep ridges above and below timberline, as well as the deep and broad Stehekin River Valley. Upland areas are covered with subalpine forest and the Stehekin Valley includes a mixture of riparian and subalpine vegetation. Most of the Stehekin Sub-basin is managed by the USFS and NPS, except for small private in-holdings near the Town of Stehekin. The Stehekin Sub-basin terminates at the confluence with Lake Chelan.

### **Railroad Creek Sub-basin**

The second largest sub-basin is similar to the Stehekin Sub-basin but smaller in scale. The Railroad Creek Sub-basin is also under Federal land management, except for historic mining claims now patented for private use, and the villages of Holden and Lucerne.

### **First Creek and Twenty-five Mile Creek Sub-basins**

These lower elevation tributary sub-basins exhibit broad valleys and ridges unlike the topography of upper elevation sub-basins. Vegetation consists of a mixture of pine forest, deciduous riparian and shrub-steppe species. The highest elevations attain 6,000 feet but much of the sub-basin lies below 3,000 feet. Land use is wholly or partially managed by the USFS and Washington State, and much of the lower elevations of the First Creek Sub-basin are privately owned.

### **Lucerne Main Stem Sub-basin**

The Lucerne Main Stem Sub-basin consists of steep slopes above Lake Chelan and numerous small to minor tributaries. Higher elevations of the sub-basin exhibit alpine glacial headwalls that rise to elevations exceeding 8,000 feet and steep valleys that discharge to Lake Chelan. Further down lake towards Manson, the tributaries were truncated by the Chelan Glacier, resulting in relatively broad upland valleys connected to the lake by steep slopes and narrow stream channels. The Lucerne Main Stem is connected to the Wapato Main Stem at the lake narrows. Most of the Lucerne Main Stem Sub-basin is under USFS management, except for small private parcels along the shoreline. The sub-basin is covered by a range of vegetation from subalpine and mixed pine forest to shrub-steppe areas cut by riparian streams.

### **Wapato Main Stem Sub-basin**

The Wapato Main Stem Sub-basin is comprised of valleys and ridges that are broader than those present in the Lucerne Main Stem Sub-basin. The highest elevation attains 3,500 feet, and the terrain is more characterized by recent erosion of slopes and valleys rather than historic glacial activity. The lower elevations and broad, rolling topography promote extensive irrigation and residential use along and above the lake shoreline. Consequently, much of the basin is under private or municipal ownership. Irrigation has extensively modified the natural cover from shrub-steppe to orchard and pasture.

### **Manson Lakes Sub-basin**

The Manson Lakes Sub-basin has experienced the greatest amount of modification from natural shrub-steppe to irrigated orchard. The sub-basin contains several large lakes including Roses, Dry, Wapato and Antilon; the latter two were historically used to artificially store water for irrigation. The sub-basin consists primarily of rolling hills underlain by glacial geologic units and thick layers of soil that promote agriculture in the basin. Upper elevations rise to more than 5,500 feet in elevation and are covered with mixed pine-fir forests.

### **Columbia River Tributaries**

The Columbia River Sub-basins are directly connected to the Columbia River rather than to Lake Chelan. These sub-basins have limited water resources and domestic and irrigation supplies rely either on small groundwater wells or the Columbia River. The sub-basins are comprised of relatively steep slopes that lead to terraces above the river and are covered by shrub-steppe vegetation. Ephemeral streams flow occasionally during periods of spring melt and winter rains.

### **Howard Flats Sub-basin**

The Howard Flats Sub-basin is connected to the Columbia River. The broad terraces of the lower sub-basin support irrigation, and much of the water used in the sub-basin derives from the Columbia River. The upper sub-basin is comprised of shrub-steppe and pine forest at higher elevations of approximately 3,000 feet. Much of the lower elevation terrain is under private ownership, and upland areas are managed by Washington State or the US Bureau of Land Management for multiple uses.

### **Antoine Creek Sub-basin**

The Antoine Creek Sub-basin is similar in character to the Howard Flats although lacking the broad irrigated terraces. The headwaters of Antoine Creek rise to an elevation of 5,600 feet. Spring runoff from the headwaters may not reach the Columbia River due to diversion, infiltration or evapotranspiration. The Antoine Creek Sub-basin lies partially within Okanogan County, and the water rights of the basin were adjudicated in 1928. Land use is managed primarily for agriculture, livestock and forest products, either by private ownership in the lower elevations or under Federal management in the upper elevations.

**Table 2-1 Sub-Basin Characteristics**

<b>Sub-basin</b>	<b>Area (acres)</b>	<b>Minimum Elevation (feet)</b>	<b>Maximum Elevation (feet)</b>
<b>Stehekin</b>	218,576	1,100	9,511
<b>Lucerne Main Stem</b>	209,048	1,100	8,590
<b>Railroad Creek</b>	41,553	1,100	9,511
<b>Columbia River Tributaries</b>	35,726	710	3,800
<b>Manson Lakes</b>	24,974	1,100	5,850
<b>Lake Chelan</b>	33,344	1,079	1,100
<b>Wapato Main Stem</b>	30,548	1,100	3,600
<b>25-Mile Creek</b>	27,078	1,100	7,150
<b>Antoine Creek</b>	21,059 <sup>1</sup>	710	5,600
<b>Howard Flats</b>	11,807	710	3,400
<b>First Creek</b>	11,634	1,100	6,850
<b>Total</b>	<b>653,713</b>		

<sup>1</sup> Plus 3,290 acres in Okanogan County



## **2.1 LANDCOVER AND LAND USE**

Less than 4 percent of the land area in WRIA 47 is developed, primarily in and around the communities of Chelan and Manson in the Wapato Main Stem and Manson Lakes Sub-basins, and Chelan Falls at the confluence with the Columbia River. Smaller communities are developed near the tributaries and near their confluence with Lake Chelan, including Stehekin, Lucerne and Holden Village. Land cover in the Lucerne Main Stem Sub-basin ranges from shrub-steppe in the lower and middle elevations, whereas forest and bare rock outcrops cover much of the higher elevations in the Stehekin Sub-basin. Crop cover that is mostly comprised of orchards is extensive in the Manson Lakes and Wapato Main Stem Sub-basins (see Section 4). The Wapato Main Stem Sub-basin is dominated by shrub-steppe land cover with extensive orchards and relatively dense urban cover in the lower elevations within about 1 mile of the Columbia River. Shrub-steppe land cover in the First Creek and Twenty-five Mile Creek Sub-basins is found on slopes that are too steep to be used for agriculture. The Howard Flats and Antoine Sub-basins are comprised of flat terraces surrounded by steep slopes; most of the relatively flat areas in the sub-basins are covered by orchard.

Current zoning information from the Chelan County Planning Department indicates primary land uses in each sub-basin (**Figure 2-2**). About 80 percent of land use in the watershed is zoned Forest Land, 17 percent as Rural Residential/Resource (including agriculture) and 2 percent as Commercial Agriculture.

**Table 2-2 – Land Use in WRIA 47 (Acres)**

<b>Land Use</b>	<b>Forest/Public</b>	<b>Rural Res/ Resource</b>	<b>Agriculture</b>	<b>Urban</b>	<b>Industrial</b>	<b>Total</b>
Stehekin	203,754	14,821	-	-	-	218,576
Lucerne Main Stem	198,971	9,853	115	-	-	209,048
Railroad	41,553	-	-	-	-	41,553
Columbia River Tributaries	4,395	28,129	2,229	592	85	35,726
Manson Lakes	5,511	14,300	5,124	3	3	24,975
First Creek	10,847	780	-	-	-	11,634
Wapato Main Stem	1,804	21,207	2,351	5,040	8	30,548
25-mile Creek	26,157	666	-	-	-	27,077
Antoine Creek	1,313	9,946	106	-	-	12,339 <sup>1</sup>
Howard Flats	133	9,846	1,692	49	81	11,800
<b>Total</b>	<b>491,970</b>	<b>106,693</b>	<b>11,617</b>	<b>5,684</b>	<b>177</b>	<b>616,985</b>

<sup>1</sup>Within Chelan County

## **2.2 CLIMATE**

The climate of WRIA 47 is moist to semi-arid and characterized by mild to hot dry summers and mild to severe winters. The average summer maximum temperature for July in Chelan is 85°F, and the average winter minimum in Holden Village is 15°F (WRCC, 2009). Precipitation and temperature vary widely depending on the elevation and proximity to the Cascade Crest. Winds typically are funneled down the lake valley in a southeasterly and easterly direction towards the Columbia River Basin, where warm air masses are rising. This

pattern causes increased wind speeds in the evenings, especially on the north shore of Lake Chelan.

Average annual precipitation in the area ranges from a high of 150 inches near the crest of the Cascade Mountains to a low of 11 inches in the City of Chelan, near the Columbia River (Beck, 1991). Total annual precipitation at Stehekin, at the head of the lake, averages 34 inches, the majority of which falls as snow from November through March (FERC, 2001).

The climate in WRIA 47 ranges from semi-arid in the lower elevations to sub-alpine in the higher elevations. Prevailing westerly winds bring moisture across the Cascade Mountains, and higher elevations and west-facing slopes intercept most of the precipitation falling in the watershed. Most precipitation falls as snow above 3,000 feet during the months of October through April. Average winter and summer temperatures range from 22 to 53°F at Rainy Pass to 30 to 70°F at Chelan (**Table 2-3**), (Natural Resource Conservation Service [NRCS], 2006; Western Regional Climate Center, 2009). Temperature and precipitation are discussed in greater detail below.

Three climate recording stations lie within WRIA 47, and a number are positioned a few miles outside the watershed (**Figure 2-3; Table 2-3**). The Chelan (Lakeside) station, with a period of record from 1890 to date, lies at an elevation of 1,120 feet on the south shore of Lake Chelan and southwest of the City of Chelan. The Stehekin station, with a period of record from 1906 to date, lies at an elevation of 1,270 feet in the Stehekin River Valley, approximately 3 miles from the mouth of the Stehekin River. The Holden Village station, with periods of record from 1930 to 1957 and 1962 to 2008, lies at an elevation of 3,220 feet in Holden Village in the Railroad Creek valley, approximately 8 miles from the mouth of the Railroad Creek.

Three SNOTEL stations that lie within the Stehekin Sub-basin have collected snowfall and temperature data since approximately 1980. The Park Creek Ridge, Rainy Pass and Lyman Lake stations are at elevations of 4,600, 4,900 and 6,000 feet, respectively.

**Table 2-3 –Temperature Summary in WRIA 47**

Location	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
<b>Cooperative Stations</b>														
<b>Stehekin</b>	Max T (°F)	33.2	39.0	47.8	59.1	68.4	75.0	83.0	81.5	71.9	57.5	42.2	34.2	57.7
(1906 to 2008)	Min (°F)	22.8	25.0	29.2	35.4	42.2	48.4	53.0	52.3	44.9	36.7	30.1	25.3	37.1
Elev. 1,270 ft	Mean (°F)	28.0	32.0	38.5	47.2	55.3	61.7	68.0	67.0	58.4	47.1	36.2	29.8	47.4
	Ppt (in)	5.9	4.0	2.8	1.4	0.9	0.8	0.5	0.6	1.1	3.0	6.0	6.9	34.0
<b>Holden Village</b>	Max T (°F)	30.4	37.0	43.9	51.8	61.8	69.2	77.4	77.4	68.9	54.8	37.2	29.6	53.3
(1980 to 2008)	Min (°F)	<b>15.4</b>	17.8	22.6	27.9	34.0	40.3	44.0	44.0	37.7	30.5	23.4	15.5	29.4
Elev. 3,220 ft	Mean (°F)	22.9	27.4	33.3	39.9	48.0	54.8	60.7	60.7	53.3	42.6	30.3	22.5	41.3
	Ppt (in)	7.0	4.6	3.1	1.5	1.1	1.1	0.7	1.1	1.5	3.4	6.8	7.5	39.4
<b>Chelan</b>	Max T (°F)	32.8	40.6	51.1	61.1	70.3	77.6	<b>85.3</b>	85.0	75.1	61.2	44.3	34.0	59.9
(1890 to 2008)	Min (°F)	22.7	26.7	32.7	39.8	47.8	55.3	60.5	59.6	50.6	40.3	31.8	25.0	41.1
Elev. 1,120 ft	Mean (°F)	27.7	33.6	41.9	50.5	59.0	66.5	72.9	72.3	62.9	50.7	38.0	29.5	50.5
	Ppt (in)	1.5	1.1	0.9	0.7	0.8	0.7	0.3	0.4	0.4	0.7	1.6	1.9	10.9
<b>SNOTEL Stations</b>														
<b>Lyman Lake</b>	Max T (°F)	21.9	23.3	26.6	31.3	37.5	42.9	51.0	50.8	45.8	34.8	27.2	21.1	34.5
(1980 to 2008)	Ppt (in)	12.8	9.1	8.1	5.5	3.4	2.6	1.5	1.6	2.9	6.7	11.1	12.3	77.7
Elev. 5,980 ft														
<b>Park Cr Ridge</b>	Max T (°F)	24.1	26.7	30.0	35.3	42.6	48.7	57.0	57.9	51.9	40.7	34.8	23.0	39.4
(1979 to 2008)	Ppt (in)	11.7	8.2	6.7	3.6	2.1	1.7	1.0	1.1	2.3	5.3	11.8	11.6	66.9
Elev. 4,600 ft														
<b>Rainy Pass</b>	Max T (°F)	21.8	23.9	27.7	33.0	39.4	41.4	53.2	52.5	46.2	36.7	28.7	29.4	36.2
(1980 to 2008)	Ppt (in)	8.9	6.7	5.9	3.6	2.9	2.3	1.4	1.2	2.0	5.1	9.8	8.0	57.7
Elev. 4,890 ft														

**Figure 2-4** illustrates the monthly average temperatures at the Lyman Lake SNOTEL, Holden Village, Stehekin and Chelan stations.

## **2.3 PRECIPITATION**

Except for limited pumping from the Columbia River to adjacent sub-basins, precipitation provides all of the total water input to the WRIA 47 hydrologic system. Precipitation has been measured at several points in WRIA 47 since 1890. Precipitation patterns are dominated by winter snowfall at elevations above 3,000 feet for more than half of the watershed area, which melts and runs off April through June. Base flow occurs during July and August. Average monthly precipitation at the Lyman Lake SNTOL, Holden Village, Stehekin and Chelan station are shown in **Figure 2-5**.

Average annual precipitation measured in WRIA 47 ranges from 11 inches at Chelan to 77 inches at Lyman Lake SNOTEL (**Table 2-3**). These weather stations are located 50 miles apart and differ in elevation by over 4,800 feet (**Figure 2-3**). Point data represented by these two weather stations and spatial data from a digital elevation model were used in the Parameter-elevation Regression on Independent Slopes Model (PRISM; Oregon Climate Service [OCS], 2006) to produce a gridded estimate of average annual precipitation throughout the watershed (**Figure 2-3**). Area-weighted averages for annual precipitation during dry and wet years were derived from two representative water years, 1944 and 1996, respectively (WRCC, 2009). The gridded estimates and representative water year data were also used to estimate the total volume of precipitation into each sub-basin.

The average annual precipitation for WRIA 47 is approximately 45 inches. Annual dry-year precipitation is approximately 30 inches and annual wet-year precipitation is 51 inches. The annual volume of precipitation in WRIA 47 is approximately 2.4 million AF during an average year, 1.6 million AF during a dry year and 2.7 million AF during a wet year. **Table 2-4** summarizes precipitation data for the average of the period of record (1916 to 2008) and for representative dry (1944) and wet (2006) years.

**Table 2-4 – Average, Dry and Wet Year Precipitation**

Sub-basin	Average Annual Rainfall Normal Year (AFY)	Average Annual Rainfall Dry Year - 1944 (AFY)	Average Annual Rainfall Wet Year - 2006 (AFY)
Stehekin	1,246,100	772,067	1,360,143
Lucerne Main Stem	683,090	453,125	778,375
Railroad Creek	173,966	119,129	211,377
Columbia River Tributaries	51,093	38,433	56,695
Lake Chelan	69,427	48,599	76,370
Wapato Main Stem	40,390	31,698	46,808
25-mile Creek	77,227	54,843	85,194
Manson	45,075	29,523	42,071
Antoine	41,160	26,883	39,742
Howard Flats	16,982	12,364	19,010
First Creek	28,547	19,678	29,708
<b>Total</b>	<b>2,444,509</b>	<b>1,586,664</b>	<b>2,715,786</b>

The following assumptions were made in the precipitation estimates.

- Maximum and minimum values assigned to each precipitation band were taken from PRISM data and is represented by a single average value.
- Precipitation distribution is primarily controlled by elevation.

In addition this estimate does not consider:

- The influence of micro-climates within the basin; or
- Contributions from rime ice derived from fog and clouds that could contribute up to 3 to 4 inches per year at the highest elevations (USFS, 1969)

## **2.4 TEMPERATURE AND EVAPOTRANSPIRATION**

### **Temperature**

Air temperature generally cools with increased elevation at what is known as the wet lapse rate (2.7 °F per 1,000 feet of increased elevation). Average monthly and annual temperatures at selected weather station and SNOTEL sites are summarized in **Table 2-3**. The difference in average annual temperature between Lyman Lake and Chelan is 16.0 °F, which corresponds to a lapse rate of 3.3 °F per 1,000 feet.

### **Evapotranspiration**

Evapotranspiration (evaporation plus transpiration) accounts for processes that return water on or near the earth's surface back to the atmosphere as water vapor. For the purposes of this study, the term evapotranspiration refers to the return of water to the atmosphere from natural surfaces (i.e. soil, rock, and vegetative surfaces), as well as from transpiration from natural vegetation. Evaporation and transpiration resulting from the irrigation of crops is analyzed in the section on irrigation use. Some factors that control evapotranspiration are the type and density of vegetation, air temperature, wind, timing, duration and type of precipitation, and slope aspect.

If vegetation has unlimited access to soil water, and if the effects of advection and heat storage are ignored, then evapotranspiration will occur at a theoretical rate known as potential evapotranspiration (PET). Because soil moisture is often limited in warm and dry climates, actual evapotranspiration (AET) is typically lower than PET.

Free water evaporation is a term describing the amount of water evaporated from surface water bodies such as lakes, ponds and wetlands. Free water evaporation from major surface water features was estimated in addition to evapotranspiration.

Average annual PET was estimated using a heat-index method (Thornthwaite, 1948). Average temperature and precipitation from Lyman Lake, Stehekin, Holden Village and Chelan were used to estimate PET at these locations, and an empirical equation (Pike, 1964) relating average precipitation to PET was used to estimate AET. The estimated AET values were distributed among sub-basins to assign a value for AET to each sub-basin. The sum of actual evapotranspiration in each precipitation band was used to calculate average values of AET for WRIA 47.

Free water evaporation was estimated using evaporation pan data collected at the Wenatchee Experimental Station (elevation ~875 feet) from 1957 to 1997 (OCS, 2006). Evaporation pan data, from recordings taken during the months of April through October, indicate annual pan evaporation is 40.88 inches. This value was multiplied by a pan coefficient of 0.70 to adjust for excess loss caused by heating of the pan and to incorporate differences in elevation between the Wenatchee Experimental Station and higher elevations in WRIA 47 (there are no pan data available within WRIA 47). The annual free water evaporation from surface water in WRIA 47 is 28.6 inches.

**Table 2-5** summarizes the estimates of AET for climate stations within WRIA 47. The average-year evapotranspiration (average annual evapotranspiration) for WRIA 47 ranged from 7.1 inches (Lyman Lake) to 18.6 inches (Holden Village).

AET is limited by available moisture. As precipitation increases, AET approaches PET. The warmer and drier lower elevation sub-basins have a much lower ratio of AET to PET than the upper sub-basins (**Table 2-5**). Increasing seasonal moisture will cause a greater rise in AET for lower-elevation sub-basins than higher-elevation sub-basins. However, the higher elevation sub-basins that experience the most precipitation and cover more of the watershed likely control the total evapotranspiration for the watershed. More than half of WRIA 47 lies above 3,000 feet elevation, and it is probable that the upper basin average AET values are relatively insensitive to changes in precipitation that lie within the typical range of precipitation in these regions of the WRIA 47.

Annual free water evaporation is estimated to be 28.6 inches. This value, applied to the approximately 33,300 acres of Lake Chelan and the 1,000 acres of lakes, ponds and reservoirs in WRIA 47 corresponds to a volume of 80,000 and 2,400 AF of evaporation per year, respectively.

**Table 2-5 – Annual Evapotranspiration for Average, Warm, and Cool Years**

Station	Elevation (feet)	PET <sup>1</sup> (in/yr)			AET <sup>2</sup> (in/yr)		
		Average	Wet/Cold	Warm/Dry	Average	Wet/Cold	Warm/Dry
Chelan	1,120	27.3	25.5	30.4	10.1	13.6	4.0
Stehekin	1,270	22.3	19.9	27.0	18.6	18.7	16.6
Holden Village	3,220	15.3	15.0	18.1	14.3	14.4	14.4
Lyman Lake SNOTEL	5,980	7.2	7.2	7.2	7.1	7.2	7.1

<sup>1</sup>PET = the amount of water lost to evapotranspiration in an average year given unlimited moisture availability.  
<sup>2</sup>AET = the amount of water actually lost to evapotranspiration, limited by moisture availability.

Estimates for evapotranspiration in WRIA 47 are consistent with other published estimates for similar basins in central Washington. Average annual AET values for other areas of central Washington were estimated by the US Geological Survey (USGS; Bauer and Vaccaro, 1990) at approximately 12 inches in upper Naneum Creek (similar to the upper elevations of WRIA 47 above 3,000 feet) and approximately 9 inches in the southern half of Douglas County (similar to the middle elevations of WRIA 47).

The following assumptions were made in estimating evapotranspiration.

- A regional distribution of precipitation, temperature and evapotranspiration values using available data from weather and SNOTEL stations.
- Influence of wind and micro-climates within the basin were insignificant.

## **2.5 HYDROLOGY**

Precipitation that is not lost to evapotranspiration runs off steep slopes into stream channels and minor tributaries of the Stehekin River and Railroad Creek, and into minor tributaries of

Lake Chelan, where they ultimately discharge out of Lake Chelan into Chelan River and finally the Columbia River. The Stehekin River and Railroad Creek are the primary tributaries that discharge into Lake Chelan, which discharges into the Columbia River via the Chelan River. Smaller tributaries include 25-Mile and First Creeks, and Fish, Prince, Gold, and Safety Harbor Creeks (**Figure 2-1**). Minor amounts (less than 5 percent of total WRIA 47 discharge) of stream flow discharges from sub-basins adjacent to the Columbia River.

#### **Data Sources**

The USGS maintains two stream gauges in WRIA 47 and historically maintained four other gauges. No long-term stream gauge data are available for Twenty-five Mile, Antoine or First Creeks. **Table 2-6** summarizes the significant data for long-term gauges.

The Phase 1 (RH2, 2008) water quantity study summarized the period of record and location of all available flow data in WRIA 47 and is attached in **Appendix A**.

**Table 2-6 – Long-Term Stream Gauge Data**

<b>Gauge</b>	<b>USGS Station</b>	<b>Drainage Area (mi<sup>2</sup>)</b>	<b>Period of Record</b>	<b>Mean Annual Streamflow (cfs)</b>	<b>Minimum Annual Streamflow (cfs)</b>	<b>Maximum Annual Streamflow (cfs)</b>
Chelan River at Chelan	12452500	924	1903-date	2,055	1170	3140
Stehekin River at Stehekin	12451000	321	1910-1925; 1926-date	1,400	871	2010
Railroad Creek at Lucerne	12451500	64.8	1911-1913; 1927-1957	200	128	297
Safety Harbor Creek near Manson	12451600	7.85	1961-1969	14	7.1	22
Grade Creek near Manson	12451620	8.45	1961-1969	5.6	3.7	8.3
Gold Creek near Manson	12451650	6.3	1961-1969	0.55	0.55	0.45
Antilon Lake Feeder	12451700	-	1958-1969	-	-	-

**Figures 2-6 and 2-7** illustrate monthly stream flow for these streams for the period of record (USGS, 2008).

Other watershed flow data were measured infrequently. The Ecology (1989) study included a basin-wide monitoring effort, albeit during a relatively dry year, that was used to create a water balance. Data from this study indicated that the Stehekin River and Railroad Creek contributed 75 percent of inflow to Lake Chelan, and other upper basin tributaries contributed 20 percent of inflow.

A study measured large and smaller streams during April to October of 2000 (Anchor, 2000). These data (**Table 2-7**) show that flows in the smaller tributaries ranged by more than an order of magnitude between minimum and maximum flows during one year. In contrast, the annual flow in Stehekin River and Railroad Creek range within 50 percent of the average over the period of record, shown in **Figure 2-8**.

**Table 2-7 – Summary of Stream Flow Data in 2000**

Stream	Maximum Peak Flow (cfs)	Date	Base Flow (cfs)	Date (2000)
Stehekin River	6,010	May 22	1,130	Aug 1 – Sept 28
Railroad Creek	1,284	June 15	153	Aug 1 – Sept 28
Prince Creek	531	June 18	26.1	July 1 – Sept 28
Fish Creek	526	June 21	24.6	July 1 – Sept 28
25-mile Creek	145	May 23	8.5	July 1 – Sept 28
Safety Harbor Creek	141	June 8	5.3	July 1 – Sept 28
First Creek	97.8	April 14	7.6	May 15 – Sept 28
Grade Creek	35.8	April 22	2.6	July 1 – Sept 28
Gold Creek	11.1	April 20	0.7	June 1 – Sept 28
Mitchell Creek	6.5	April 31	1.8	May 15 – Sept 28

### **Lake Chelan Discharge**

Nearly the entire outflow from Lake Chelan is diverted through a penstock for hydroelectric power production at the Chelan Falls Power Plant, owned by Chelan PUD. The relatively small dam at the outlet was constructed in 1927, causing the lake to rise by approximately 21 feet. Although Lake Chelan is operated as a storage reservoir for power production, the lake level is generally maintained at full pool during the peak recreational season (June through September). The water level of Lake Chelan can then drop up to 21 feet during the winter before the spring runoff begins. In general, discharge from the lake is held at a constant 2,000 cubic feet per second (cfs). However, during spring runoff the average flow rises to approximately 4,000 cfs, and during dry years the flow can drop to below 200 cfs during late winter. The rate of outflow can also drop during late summer in order to maintain the lake level at a constant elevation for recreational usage. Water that does not go through the power plant flows through a spillway and down the relatively short Chelan River to the Columbia River. Discharge from the power plant flows directly to the Columbia River through a tailrace canal.

Flows recorded at the Chelan River gauging station include the combined discharge from the hydroelectric power plant, the Chelan Dam spillway and irrigation withdrawals from the power plant penstocks. Since nearly all water flows through the power plant, very little or no stream flow in the Chelan River channel exists except during periods of spill. The available data represents discharge from Lake Chelan and not flow in the Chelan River. **Figure 2-9** illustrates the monthly flow from Lake Chelan since the early 1900s. The data illustrate the effect of dam operation since 1927, where constant flows are held during the summer, fewer peaks occur during the spring flood than before dam operation and more frequent low flows occur.

Based on data trends for the Stehekin and Chelan Rivers shown in **Figure 2-8**, average annual flows in Lake Chelan have not changed significantly over the period of gauging, from the early 1900s to date. The graph indicates that, as a percentage of stream flow, the Stehekin River was 65 to 80 percent of Chelan River flow. Low flow years exhibit the highest ratio of Stehekin to Chelan River flows, which suggests that water stored as snow and ice in the Stehekin Sub-basin contributes a higher percentage of total flow during dry years, and that evapotranspiration losses from lower tributaries further reduce stream flow during dry years (see Granshaw, 2002).



Tributary streams to Lake Chelan experience peak runoff during the spring melt in May to July, and low flows during September through February. Water in Lake Chelan is generally stored during the runoff period and released during the low flow season to generate hydroelectric power, resulting in a flattened hydrograph compared to natural flows (**Figures 2-6, 2-7 and 2-8**).

Average annual inflow to Lake Chelan is estimated to be approximately 1.6 million AF, equivalent to a constant flow of approximately 2,200 cfs. The Stehekin River accounts for 65 percent of the total inflow to the lake, Railroad Creek contributes 10 percent and approximately 50 other smaller tributaries contribute another 25 percent of the surface inflow (FERC, 2001). Precipitation that falls directly on the lake contributes 4.4 percent of the total inflow to the lake, or approximately 70,000 AF per year.

**Figures 2-10 and 2-11** show water year data for Stehekin River and Lake Chelan discharge representing dry (2001), wet (1972) and average (1984) flows during the previous 30 years of the period of record. The data show that during average years, flow from Lake Chelan is kept near 2,000 cfs. During wet years, surplus water is discharged during the spring and summer runoff season, and during a dry year, Lake Chelan flow is curtailed to replenish storage and manage lake levels.

The smaller perennial streams are often dry in late summer and fall, or even early summer (Antoine Creek). The smaller creeks are susceptible to periodic flooding from springtime rain on snow runoff events and during rare high intensity summer thunderstorms (USFS, 2000).

### **Reservoirs**

There are two reservoirs in WRIA 47 with volumes of 10 AF or greater (smaller private ponds with volumes less than 10 AF were not described in this assessment). Wapato Lake (2,000 AF) and Antilon Lake (1,920 AF) were constructed in natural, in-channel basins enlarged to enhance irrigation storage. Water levels in these reservoirs comprise a total area of approximately 338 acres, with storage of approximately 3,920 AF, including active and inactive reservoirs (Ecology Dam Safety Office, 2006).

### **Summary**

Most of the land in WRIA 47 that contributes runoff to the watershed is under Federal management and land use planning by the USFS and NPS. These manage land use practices that potentially affect the surface water flows into WRIA 47. No significant changes in land use or water use are anticipated in this intensively managed basin that could affect the watershed hydrology. The USGS and Chelan PUD will continue to monitor surface water flows, and the Chelan PUD will continue to use hydrologic data to forecast spring runoff to support the management of lake levels and Chelan River flows under the FERC license. Surface water characteristics of WRIA 47 have remained consistent since dam operation began in 1927.

## **2.6 GEOLOGY AND GROUNDWATER**

Recent hydrogeologic studies of WRIA 47, with emphasis on the Wapato Sub-basin, compiled and contributed new geologic information in three reports: Harper-Owes (1989); Ecology (1995); and Geomatrix (2006). These reports, drillers logs compiled by Ecology and geologic mapping by Tabor et al. (1987) provide the background for the following summary

of hydrogeologic and groundwater characteristics of WRIA 47. **Figures 2-12 and 2-13** present geologic maps of WRIA 47 and the Wapato Main Stem and Manson Lakes Sub-basins, respectively, using data compiled from the Washington State Department of Natural Resources (WDNR).

### **Geologic Characteristics**

#### *Geologic Units*

Three distinct geologic groups occur in WRIA 47 that record the complex geologic history of extensive regional geologic processes that formed the bedrock foundation of the watershed and the relatively recent glacial and post-glacial processes that modified and deposited unconsolidated sediment upon the bedrock. Bedrock comprises much of the exposed surficial geologic units in the watershed on the steeper slopes above terraces and hills of the lower basin, and forming the slopes and ridges of the upper basin above 1,600 feet. Glacial episodes deposited relatively broad layers of fine to coarse-grained sediment in the valley floors and partially on the valley sidewalls or in patches on ridges. Lakeshore, river and landslide deposits are found primarily along river and creek bottoms and at the base of slopes. The glacial and post-glacial deposits contain most of the available groundwater in WRIA 47, and nearly all developed and irrigated lands are underlain by unconsolidated units. The unconsolidated deposits are found primarily as discontinuous layers of sediment in the Wapato Main Stem and Manson Lakes Sub-basins, as terrace and flood deposits in the Antoine Creek and Howard Flats Sub-basins, and locally as alluvial fill in the valley bottoms of other sub-basins.

The following broadly summarizes the general geologic conditions in WRIA 47. The sources described above provide detailed descriptions and delineations of individual geologic formations.

#### Bedrock

The oldest geologic units exposed at the surface of WRIA 47 consist primarily of Late Cretaceous age igneous tonalities and metamorphic migmatites and gneiss of the Chelan Complex (Hopson and Mattinson; 1971; Tabor et al, 1987). These erosion-resistant units are composed of common rock-forming minerals in dense, crystalline form, which are weathered into tan and gray fractured outcrops that are white to dark gray and less fractured in the subsurface. Bedrock units outcrop on the surface generally above elevations of 1,600 feet.

#### Glacial Deposits

Glacial processes eroded the U-shaped valley of Lake Chelan and its primary tributaries. The advance and retreat of glacial ice coincided with the deposit of fine to coarse-grained sediment ahead of or beneath glacial ice. Outflow channels from the ice front discharged coarse-grained outwash channels in broad valleys; the outwash deposits are interbedded with finer-grained sediment resulting in compositionally variable and stratified sand, gravel and silt. Some of these former glacial outwash channels were subsequently abandoned as ice melted, resulting in terraces of sand and gravel along slopes above the axis of the Lake Chelan and Columbia River Valleys. Coarse-grained deposits are typically found at elevations between 1,300 and 1,500 feet.

Formation of ice dams across outflow channels and at the terminus of Lake Chelan resulted in temporary lakes that were subsequently filled with silt. If over-ridden by glaciers, these silt layers are hard and dense, whereas lake deposits accumulated ahead of glacial ice are typically

platy and soft. Silt deposits are typically found directly overlying bedrock in lower elevations of the basin, generally below elevations of 1,400 feet along the Lake Chelan shoreline in the Wapato Main Stem Sub-basin (Ecology, 1989).

Glacial ice plucked and carried rock debris in a layer of plastic sediment beneath the ice that was subsequently pulverized into silt-sized particles. The sediment was over-ridden, pulverized, and compressed by the ice into dense, glacial till; sediment that was pushed aside or carried on top of the ice became loose glacial moraine or ice-contact deposits. Both till and moraine sediment is comprised of widely-variable grain sizes ranging from silt to boulders. Till deposits are typically less than 10 feet thick, and found below elevations of 1,500 feet in the Wapato Main Stem and Manson Lakes Sub-basins. Till is also present in the upper elevations of the watershed and deposited by more recent alpine glacial activity.

Glacial deposits outcrop typically below elevations of 1,600 feet and consist of relatively thick layers that filled larger depressions of eroded bedrock or thin layers overlying bedrock ridges.

Turbulent events continued to substantially modify the terrain of WRIA 47 preceding and during Quaternary Age glaciations (approximately 12,000 to 18,000 years ago). Catastrophic release of water behind ice dams in northern Washington and Montana flooded the Columbia Basin, scoured channels down to basalt bedrock and deposited extensive layers of coarse to fine-grained sediment along the scoured channels. These glacial flood units primarily occur in the sub-basins adjacent to the Columbia River and within 1 mile of the Columbia River in WRIA 47, and consist of tens to several hundred feet thick layers of sand, silt and gravel.

#### Post-Glacial Deposits

Final glacial retreat allowed river, shoreline and mass-wasting processes to rework the glacial deposits and further erode bedrock. These processes resulted in deposits of sand and gravel alluvium along river and creek bottoms, broad terraces above lake shorelines and fans of landslide debris, a jumbled mixture of bedrock blocks in a matrix of sand, silt and clay at the base of steep slopes. Thin and discontinuous layers of coarse to fine-grained alluvium lie along and beneath all stream channels in WRIA 47. The alluvial deposits are typically less than 100 feet thick and vary widely in composition from thin silt lenses to thick gravel layers. Steep slopes remain susceptible to release of small to large landslides that discharge onto flat benches or stream channels.

### **Hydrogeologic Characteristics**

#### *Bedrock Units*

Bedrock units contain little primary porosity within rock fractures that store small quantities of groundwater. Locally, wider fractures and voids may create additional groundwater storage volume. Fracture orientation or density, however, is generally an inconsistent indicator of groundwater availability or flow and prediction of groundwater occurrence in bedrock is inconsistent. Experienced local drillers favor groundwater exploration on ridges and knobs, where greater fracture density and groundwater storage are generally encountered.

Depth to groundwater in bedrock units varies widely, from tens to several hundreds of feet. Groundwater levels in bedrock wells completed deeper than 150 feet typically rise to within 50 to 100 feet of ground surface, indicating confined conditions that pressurize the

groundwater within fractures. Groundwater levels in bedrock wells tend to remain constant through the year, indicating their slow rates and widespread sources of recharge. Groundwater in the bedrock is replenished by slow percolation of rainwater through fractures at the surface or indirectly via recharge through overlying unconsolidated units. The degree of hydraulic continuity between bedrock and surface water varies widely along the Lake Chelan shoreline, where water levels may or may not coincide even within wells that are less than 100 feet from the shoreline.

#### *Surficial Aquifer*

The surficial aquifer comprises the groundwater-saturated portions of coarse-grained glacial outwash units and post-glacial alluvium and terrace deposits that consist of dense to loose sand and gravel layers in thicknesses of tens to 300 feet. The aquifer comprises the greatest volume and source of groundwater available for withdrawal. The surficial aquifer is discontinuously distributed in the Wapato Main Stem and Manson Lakes Sub-basins, underlies the valley floors in creeks and coulees, and forms the base of the Howard Flats and Antoine Creek sub-basins. Thick sequences that include overlying glacial flood deposits may attain 300 feet below Howard Flats.

The limited extent and thickness of the surficial aquifer also localizes the availability of groundwater in WRIA 47. However, high permeability zones of the surficial aquifer in certain areas may promote high rates of precipitation and irrigation recharge which becomes available for local sources of groundwater withdrawal.

Groundwater levels in the surficial aquifer vary from near surface to more than 100 feet according to patterns of recharge and the distribution and thickness of lower permeability lacustrine and till layers or bedrock that impede groundwater flow into and within the surficial aquifer.

Fine-grained units consisting of till and lacustrine deposits are interbedded with, overlie and form lateral boundaries with the surficial aquifer. These layers are not sources of groundwater to WRIA 47, but rather impede flow between units and act as barriers to recharge in the surficial aquifer.

#### *Glacial Flood Units*

The glacial flood units are found in the sub-basins adjacent to the Columbia River and the Howard Flats and Antoine Creek Sub-basins. Groundwater occurs extensively in the glacial flood units generally at depths less than 100 feet and within moderate to high permeability coarse sand and gravel layers interbedded with very low permeability silt units. The silt layers isolate and impede groundwater flow, whereas high permeability layers yield significant flow to wells in the range of tens to hundreds or even thousands of gallons per minute (gpm). The glacial flood units are in significant hydraulic continuity with the Columbia River within several thousand feet of the river. The flood deposits are recharged by precipitation, lateral discharge from adjacent units (and the Columbia River), and percolation of return flow from irrigation water and domestic wastewater. The flood units exhibit the highest permeability of any units in the watershed; consequently, these units provide the most significant source of groundwater in WRIA 47 and are tapped for domestic, irrigation and municipal withdrawals, including the Chelan Falls Water System and Chelan PUD wells for the Chelan Falls Hatchery.

### **Hydrologic Cycle of WRIA 47**

Groundwater in WRIA 47 is replenished from precipitation falling in the basin and infiltrating into porous surficial deposits. The broader and hilly terrain of the lower watershed sub-basins promotes groundwater recharge. In contrast, steep, thinly covered bedrock areas promote runoff and little recharge into bedrock fractures. Groundwater is recharged artificially via seepage from irrigation drains, via return flow infiltrating from irrigated lands, and via seepage from Wapato, Roses and Dry Lakes in the Manson Lakes Sub-basin. Groundwater elevations and yield to wells in these areas are expected to be artificially high relative to non-irrigation conditions.

Precipitation and irrigation return flow that enters the subsurface below the root zone migrates with groundwater along flow paths of greatest permeability and gradient. The underlying bedrock topography and its mantle of low permeability glacial deposits control groundwater flow paths in the lower elevation sub-basins. Valley bottoms in the upper elevation sub-basins are comprised of alluvium and glacial deposits that contain groundwater in continuity with streams. Groundwater flow is constrained to these narrow alluvial aquifers by underlying bedrock. Streams in the lower elevation sub-basins have incised unconsolidated units and may exchange groundwater with underlying aquifers. The streams in the upper elevations of the sub-basins are likely losing streams, where surface water tends to seep out of the streams into underlying aquifers, promoting groundwater recharge. In the lower basins, the streams are likely gaining, where groundwater from adjacent aquifers seeps into the stream, promoting base flow. Seepage into streams is likely greater near areas of irrigation water storage, conveyance and application where irrigation return flow that infiltrated to the surficial aquifer discharges into streams.

### **Groundwater Elevations and Flow**

Widely variable conditions affect groundwater elevations, and include seasonal and long-term precipitation trends, topography, subsurface layering and geologic unit composition. The limited groundwater elevation data from existing wells somewhat reduce the accurate determination of the elevation, flow directions or velocity of groundwater within the watershed. Groundwater withdrawals will locally affect groundwater levels, but not enough to alter local groundwater flow directions. Ecology (1989) provided generalized groundwater flow maps that illustrate the generalized pathways of groundwater through the surficial aquifer. These maps are reproduced in **Appendix B**.

### **Hydraulic Boundary between WRIA 47 and Columbia River**

Within approximately 1/2-mile of the Columbia River, the groundwater flow directions and hydraulic gradient of the hydrogeologic units are potentially controlled by the river stage. This effect increases with proximity to the river. The Chelan Falls area experiences the greatest river influence, where portions of the permeable flood deposits are in hydraulic continuity with the river. The river also has some influence on groundwater elevations along the shoreline at the Howard Flats and Antoine Creek Sub-basins. Therefore, the degree of hydraulic continuity between the river and geologic units and the hydraulic boundary of WRIA 47, is indefinite. This boundary is a significant characteristic of the watershed and could be determined by accurate mapping of groundwater elevations in existing wells. Boundary delineation would support water balance estimates, determining the potential availability of groundwater in the watershed and identifying hydraulic continuity between groundwater and the river to identify areas of sustainable yield, and would be required for establishing impacts of groundwater withdrawal on instream flow.

### **The Physical Availability of Groundwater in WRIA 47**

**Figures 2-12 and 2-13** show the distribution of domestic, municipal and irrigation wells recorded by Ecology for WRIA 47. The map illustrates areas of the highest density of groundwater withdrawal, which generally indicates the availability of groundwater in the watershed. Groundwater withdrawal primarily occurs at exempt wells to supply single residence domestic use. Public supply wells (Chelan Falls Water System, Chelan PUD) and some private irrigation wells derive groundwater from flood deposits in hydraulic continuity with the Columbia River.

Groundwater in bedrock generally occurs in isolated, discontinuous, open fractures that yield small quantities of water to single residence domestic wells. Although groundwater is widespread in bedrock, the amount of available groundwater at any one location is unpredictable, and potentially in quantities that cannot continuously sustain withdrawals.

The groundwater development potential of the bedrock unit is limited to wells that yield less than 10 gpm and more typically 2 to 4 gpm.

Yield to domestic wells in the surficial aquifer range from 10 to 100 gpm, but because of their limited size, are not considered significant sources of groundwater for uses other than single residence domestic supply, small irrigation projects and a few smaller public (Group B) systems.

Groundwater sources within flood deposits and in hydraulic continuity with the Columbia River may potentially yield 1,000 gpm or more to wells.

**Table 2-8** summarizes the groundwater development potential from different hydrogeologic units in WRIA 47.

**Table 2-8 – Groundwater Development Potential in WRIA 47**

Hydrogeologic Unit	Sub-basins	Well Yield
Flood Units	Howard Flats, Antoine, Columbia River	100 to 1,000+ gpm
Surficial Aquifer	Wapato Main Stem, Manson Lakes, Antoine and Howard Flats at > 0.5 mile from Columbia River; valley bottoms in upper elevation sub-basins	10 to 100 gpm
Bedrock	Upper elevation sub-basins	2 to 10 gpm

### **Groundwater Recharge**

Groundwater recharge is precipitation that infiltrates below the root zone in soil and is not lost to evapotranspiration or as runoff to surface water. Some of the recharge migrates in shallow soil aquifers and rapidly discharges to surface water where groundwater tables intersect a low-lying land surface (for example, at springs along steep slopes within stream channels or below cliffs), and a minor portion will be withdrawn by supply wells. However, much of the infiltrated precipitation enters the surficial or bedrock aquifers, migrates down gradient through adjacent geologic units, and ultimately discharges into Lake Chelan or the Columbia River.

Surface water in steep gradient streams will recharge the surficial aquifer where it abuts the mountain or hillside slope. This mountain front recharge is a significant source of groundwater recharge for the surficial aquifer and valley bottom aquifers, particularly in the lower elevation sub-basins that experience high evapotranspiration rates such as in the gulches of Manson Lakes and the sub-basins adjacent to the Columbia River. The recharge

from winter storms and spring runoff discharges back into the lower reaches of streams as summer and fall base flow.

Irrigated lands receive additional recharge at rates of 10 to 40 percent of the application rate (Geomatrix, 2006). Consequently, groundwater levels are typically higher and groundwater is more readily available for withdrawal in irrigated areas, in particular, the Manson Lakes Sub-basin. Some of the groundwater discharges back into the nearby lakes or drains.

Recharge is largely controlled by the capacity of earth material (soil type and underlying geologic structures) to absorb and facilitate the downward migration of water. For example, fine-grained soils derived from till and other fine-grained glacial deposits usually have low permeability and slower recharge rates.

Several studies have estimated groundwater recharge and discharge from the surficial aquifer in the Wapato Main Stem and Manson Lakes Sub-basins using theoretical methods to calculate groundwater flow, measurements of base flow, and estimates of irrigation return flow. These estimates range from 160 to 160,000 acre-feet per year (AFY) and are likely closer to 10,000 AFY (Ecology, 1989; Ecology, 2005; Geomatrix, 2006).

Recharge has been simulated in various parts of eastern Washington by Bauer and Vaccaro (1990) using the USGS Deep Percolation Model (DPM). They estimated recharge in the Columbia Basin and Waterville Plateau to be about 1 inch per year, or approximately 10 percent of the annual rainfall in these areas. Because climate and geology in the lower elevations of WRIA 47 are similar to the Columbia Basin, this value was chosen to represent the lower recharge limit in WRIA 47. A simple average of the upper and lower recharge limits was used to establish a value for average annual recharge.

Recharge in WRIA 47 is controlled by the permeability of soil and underlying geologic units. Recharge is limited in areas of bedrock that can receive water directly from precipitation or overlying soil and thin geologic units. Recharge is greatest where porous and permeable coarse-grained glacial deposits and alluvial deposits occur at the surface, primarily in the Wapato Main Stem and Manson Lakes Sub-basins (**Figure 2-13**). Annual recharge in the basin likely ranges from 1 to 24 inches, or 33 percent of average annual precipitation, based on the differences between precipitation and evapotranspiration and the permeability. Variations in recharge during dry and wet years were not examined due to the extreme range already present in annual average estimates.

### **Summary**

The geologic characteristics of WRIA 47 control the rate of runoff from higher elevation sub-basins underlain by bedrock and the rate of groundwater recharge in lower elevation sub-basins underlain by unconsolidated glacial and post-glacial deposits. The amount of groundwater recharge returning to Lake Chelan is highly variable, but appears to be a minor component of the overall lake water balance. However, extensive water use in the lower elevation sub-basins alters the natural hydrologic cycle in these sub-basins, so that surface water applied for irrigation artificially recharges groundwater which in turn affects base flow in drains and creeks. Agricultural practices and domestic land use may introduce man-made chemicals into groundwater that may convey these chemicals along groundwater flow paths to surface water. Future changes in land use could affect the location, type and rates of recharge that will affect both water quantity and quality in the lower elevation sub-basins. Watershed planning should focus on the areas where potential recharge are greatest, that is, in areas underlain by coarse-grained glacial and post-glacial deposits.

## Section 3 – Existing Water Rights and Claims

### **3.0 BACKGROUND**

In order to understand the implications of the following discussion about water rights and claims in WRIA 47, it is important to understand the basics of both water rights and claims. The following is an excerpt from the Department of Ecology (Ecology) website (underlines added by author).

The waters of Washington State collectively belong to the public and cannot be owned by any one individual or group. Instead, individuals or groups may be granted rights to use them. A water right is a legal authorization to use a predefined quantity of public water for a designated purpose. This purpose must qualify as a beneficial use. Beneficial use involves the application of a reasonable quantity of water to a non-wasteful use, such as irrigation, domestic water supply, or power generation, to name a few.

State law requires certain users of public waters to receive approval from the state prior to using water - in the form of a water right permit or certificate. Any use of surface water (lakes, ponds, rivers, streams, or springs) which began after the state water code was enacted in 1917 requires a water-right permit or certificate.

Likewise, withdrawals of underground (ground) water from 1945 onward, when the state groundwater code was enacted, require a water right permit or certificate – unless the use is specifically exempt from state permitting requirements. While “exempt” groundwater uses are excused from needing a state permit, they still are considered to be water rights.

In the 1960's, the Washington State legislature realized the need to document water rights established prior to 1917 for surface water and prior to 1945 for groundwater. These water rights are vested rights. A vested right is a water right established through beneficial use of water. A water right claim is a statement of beneficial use of water that began prior to 1917 for surface water and prior to 1945 for groundwater. In 1967, the Claims Registration Act was enacted to record the amount and location of these vested water rights.

The Claims Registration Act set a specific time window for water users to file their water right claims with the state. Users of exempt ground-water withdrawals were also encouraged to file claims so that they could establish priority dates for their rights. Some users were not required to file a claim, including:

- Individuals served water through a company, district, public or municipal corporation (the water supplier should have filed claims for its users);
- Persons with a valid Water Right Permit or recorded Certificate;
- Individuals with a water right determined by Court Decree and recorded through issuance of a Certificate of Water Right by Ecology or one of its predecessor agencies;
- Non-consumptive water uses, like boating, swimming, or other recreational and aesthetic uses, with no physical diversion or artificial impoundment of water; or
- Owners of livestock that drink directly from a surface-water source.



The initial statewide opening of the Claims Registry ended June 30, 1974. The legislature has subsequently re-opened the Claims Registry three times. The most recent opening occurred from September 1997 to June 1998. Statewide, there are roughly 169,000 water-right claims on record.

Claims will remain valid until water rights adjudication occurs, whereby the validity of the claims must be proven before a court of law. Adjudication can be initiated by several means, but normally will not occur unless there are significant problems with water availability in an area. During adjudication, claimants are required to prove that water has been in constant beneficial use prior to 1917 for surface water and prior to 1945 for groundwater. Five or more consecutive years of non-use may invalidate a claim.

### **3.1 SURFACE AND GROUNDWATER RIGHTS AND CLAIMS IN WRIA 47**

**Table 3-1** summarizes surface water and groundwater rights and claims in the Twenty-five Mile Creek, Antoine Creek, First Creek, Howard Flats, Manson Lakes and Wapato Main Stem Sub-basins. **Table 3-1** presents the total rights and claims for the entire WRIA 47 area. These summaries were derived from Ecology's water rights data base.

Ecology's Geographic Water-right Information System (GWIS) database is the source of information for the tables, figures and summary presented here. The GWIS is a graphic component of the Water Right Tracking System (WRTS). The GWIS allows users to separate water use by location.

Ecology separates the water rights holders contained within the GWIS into two categories: Claim Place of Use (CPOU) and Place of Use (POU).

The CPOU water rights records are for water uses that are claimed to have been exercised before the water permitting system (1917 for surface water and 1945 for groundwater). These claimed rights have not been validated by the State and require judicial processing through what is known as a general adjudication of water right to either validate or invalidate the claimed rights. The result of a general adjudication is the issuance of adjudicated certificates of water right for those rights that are validated. Quantities posted on claims are frequently inaccurate or exaggerated, and therefore unreliable sources of information supporting water use in the watershed. For example, some claim quantities apparently exceed the entire flow of the Chelan River, likely due to a transcription error indicating a quantity in units of cfs rather than the intended quantity in gpm, quantities in gpm, rather than the intended gallons per day.

The POU water rights records relate to those water uses that were initiated after the water permitting system had been established. These records include water right applications, permits and certificates. An application for a water right, although in the POU records, does not constitute a "water right" because it does not authorize the use of water. It is merely a request that the State authorize the use of water for an identified purpose. A permit grants permission to put water to a beneficial use subject to the terms and conditions of that permit. Once the water is put to beneficial use, the water right is said to be "perfected" and a water right certificate is granted. At this point, the water is attached to the land and remains within the land unless specifically severed as part of a transaction.

Ecology's GIS database for water right places of use identifies 1,131 water rights records (including claims) in the WRIA 47 study area. The 1,131 total records consist of 919 surface

water rights and 212 groundwater rights, as well as 442 water right claims consisting of 329 surface water claims and 113 groundwater claims.

In addition, Ecology records indicate three pending water rights applications for new appropriations of water and five pending change applications for existing rights. There are a total of 120 permits (water rights that have not yet been fully perfected and issued a water right certificate), 47 adjudicated certificates of water right (the result of previous water right adjudications in a superior court), 483 water right certificates, 7 change certificates (where specific details of an existing water right have been changed), 22 change Reports of Exam (where changes to an existing right have been approved but have not yet been fully perfected and a change certificate has not yet been issued) and two temporary permits for use of water.

Neither instantaneous (gallons per minute or cubic feet per second) nor annual quantities (AFY) of water are allowed to be increased through the water right change process, and in some cases, they may be reduced in situations where the full quantities of water have not been historically put to use. Changes can be made to permits, certificates, adjudicated certificates or claims. These changes are most commonly a change in type of use, location of the point of diversion or withdrawal, number of points of diversion or withdrawal, and/or place of use.

**Table 3-1 WRIA 47 GWIS Water Rights/Claims Summary**

		<b>CFS</b>	<b>GPM</b>	<b>Annual Quantity (total) AFY</b>	<b>Acres irrigated</b>	<b># of Rights/ Claims</b>	<b>Surface</b>	<b>Ground</b>
<b>25-mile Creek</b>								
	CPOU <sup>1</sup>	NA	NA	42	5	17	17	0
	POU <sup>1</sup>	10.1	45	356	354	39	37	2
	<b>sum</b>	<b>10.1</b>	<b>45</b>	<b>398</b>	<b>359</b>	<b>56</b>	<b>54</b>	<b>2</b>
<b>Antoine Creek</b>								
	CPOU	NA	NA	67	20	3	3	0
	POU	5.8	1,963	1,779	651	47	27	20
	<b>sum</b>	<b>5.8</b>	<b>1,963</b>	<b>1,846</b>	<b>671</b>	<b>50</b>	<b>30</b>	<b>20</b>
<b>First Creek</b>								
	CPOU	NA	NA	1,514	670	15	12	3
	POU	5.2	0.0	117	22	5	5	0
	<b>sum</b>	<b>5.2</b>	<b>0.0</b>	<b>1,631</b>	<b>692</b>	<b>20</b>	<b>17</b>	<b>3</b>
<b>Howard Flats</b>								
	CPOU	NA	NA	782	203	21	9	12
	POU	1.0	13,140	6,457	1,573	36	12 <sup>4</sup>	24 <sup>3</sup>
	<b>sum</b>	<b>1.0</b>	<b>13,140</b>	<b>7,239</b>	<b>1,776</b>	<b>57</b>	<b>21</b>	<b>36</b>
<b>Manson Lakes</b>								
	CPOU	NA	NA	2,591	806	71	33	38
	POU	57.5	1,149	12,215 <sup>5</sup>	3,457	61	43	18
	<b>Sum</b>	<b>57.5</b>	<b>1,149</b>	<b>14,806</b>	<b>4,263</b>	<b>132</b>	<b>76</b>	<b>56</b>

**Table 3-1 WRIA 47 GWIS Water Rights/Claims Summary (continued)**

	<b>CFS</b>	<b>GPM</b>	<b>Annual Quantity (total) AFY</b>	<b>Acres irrigated</b>	<b># of Rights/Claims</b>	<b>Surface</b>	<b>Ground</b>
<b>Wapato Main Stem</b>							
CPOU	NA	NA	6,609	1,774	315	255	60
POU	156 4,209 <sup>2</sup>	1,000	24,732 <sup>5</sup> 640,000 <sup>2</sup>	5,338	480	448 <sup>4</sup>	32 <sup>4</sup>
<b>sum</b>	<b>365</b>	<b>1,000</b>	<b>31,341</b>	<b>7,112</b>	<b>795</b>	<b>703</b>	<b>92</b>
<b>Direct Drainage to Columbia River</b>							
CPOU	1	10,896	2,658	477	24	13	11
POU	431	57,515	345,611	1,853	74	41	33
<b>Sum</b>	<b>432</b>	<b>68,411</b>	<b>348,269</b>	<b>2,330</b>	<b>98</b>	<b>54</b>	<b>44</b>
<b>Lucerne Main Stem</b>							
CPOU	8,493	96	4,699	245	148	138	10
POU	4	35	443	138	73	71	2
<b>Sum</b>	<b>8,497</b>	<b>131</b>	<b>5,142</b>	<b>383</b>	<b>221</b>	<b>209</b>	<b>12</b>
<b>Railroad Creek</b>							
CPOU	-	-	-	-	-	-	-
POU	16	-	59	5.0	6	6	0
<b>Sum</b>	<b>16</b>	<b>-</b>	<b>59</b>	<b>5.0</b>	<b>6</b>	<b>6</b>	<b>0</b>
<b>Stehekin</b>							
CPOU	111	242	926	163	33	21	12
POU	29	33	243	85	23	20	3
<b>Sum</b>	<b>140</b>	<b>275</b>	<b>1,169</b>	<b>248</b>	<b>56</b>	<b>41</b>	<b>15</b>
<b>TOTAL</b>	<b>9,530</b>	<b>86,114</b>	<b>411,900</b>	<b>12,502</b>	<b>1,011</b>	<b>763</b>	<b>248</b>

<sup>1</sup> CPOU refers to Claim place of use. POU refers to water right permit or certificate place of use.

<sup>2</sup> 4,000 cfs and 640,000AF non-consumptive reservoir/hydroelectric use.

<sup>3</sup> Most points of withdrawal lie within an aquifer in hydraulic continuity with Columbia River.

<sup>4</sup> Several points of withdrawal lie within an aquifer/surface water in hydraulic continuity with Columbia River.

<sup>5</sup> Lake Chelan Reclamation District rights derive from Lake Chelan and applied to both Manson Lakes and Wapato Main Stem Sub-basins.

NA – Data are not sufficiently accurate to quantify

Note: Uses include domestic general, domestic multiple, domestic single, domestic municipal, irrigation, fire protection, power, stock watering and wildlife propagation and are included on individual water rights and claims in various combinations.

The preceding table is a summary of the Department of Ecology Water Rights Tracking System, which includes detailed water rights records. The table lists all of the recorded water rights and claims in WRIA 47 by sub-basin and shows the type of point of withdrawal (headworks gravity flow, surface water pump [surface water], wells [groundwater]), and the Township, Range, and Section associated with the point of withdrawal for each of the water rights and claims.

**Figure 3-1** shows surface water rights and claims in the Antoine Creek Sub-basin.

**Figure 3-2** shows surface water rights and claims in the Direct Drainage to Columbia River.

**Figure 3-3** shows surface and groundwater rights and claims in the First Creek Sub-basin.

**Figure 3-4** shows surface and groundwater rights and claims in the Howard Flats Sub-basin.

**Figure 3-5** shows surface and groundwater rights and claims in the Lucerne Main Stem Sub-basin.

**Figure 3-6** shows surface and groundwater rights and claims in the Manson Lakes Sub-basin.

**Figure 3-7** shows surface and groundwater rights and claims in the Railroad Creek Sub-basin.

**Figure 3-8** shows surface and groundwater rights and claims in the Stehekin Sub-basin.

**Figure 3-9** shows surface and groundwater rights and claims in the Twenty-five Mile Creek Sub-basin.

**Figure 3-10** shows surface and groundwater rights and claims in the Wapato Main Stem Sub-basin.

### **Current Water Use**

Also, note that there are numerous areas where water right places of use and water right claim places of use appear to overlap. This is consistent with the findings described below under the discussion of ground and surface water claims.

#### 3.1.1 Water Right Claim in WRIA 47

There is a total of 442 water right claims in WRIA 47. Of this total, 329 are for surface water uses and 113 are for groundwater uses.

#### 3.1.2 Groundwater Claims in WRIA 47

Groundwater uses that began prior to 1945 and for which claims have been submitted may be valid.

Of the 113 groundwater claims, 79 include domestic use as the first use listed and 43 of these claims are solely for domestic use. There are a total of 16 for the sole purpose of irrigation, but many of the claims list irrigation as one of the uses. Most of the claims that include domestic use are likely for residences with a relatively small irrigation component, and essentially wells allowed by the “exempt well” statute, which allows use of a well up to 5,000 gallons per day and up to half an acre of non-commercial lawn and garden irrigation without obtaining a water right from the state. (See the discussion of exempt wells below.)

The water balance has attempted to estimate the number of residences that are relying on individual wells for their water supply and has assumed a daily water use of two values. One was captured by taking the average per capita consumption evident in the City of Chelan from 2004-2007, 215 gallons/person. The other value, 350 gallons per day per residence is the value proposed by DOH ODW *Water System Design Manual*. Any additional assignment of water use to the existing claims would likely result in double-counting of most of these uses.

#### 3.1.3 Surface Water Claims in WRIA 47

Of the 329 surface water claims, approximately 296 include a domestic component, 18 are for irrigation only and 13 are for stock water only. Most of the claims list more than one use, so an exact accounting of the numbers in each purpose is difficult.

If the Planning Unit desires additional details on the land and water use associated with water right claims in WRIA 47, they may wish to consider including a recommendation in the watershed plan for further work to refine these numbers. However, it should be noted that such a detailed analysis is time consuming, would provide detail on what appears to be a relatively minor water use, and would still be uncertain given that adjudication of water rights is the only way to achieve certainty with respect to water right claims. It may be appropriate to address this piecemeal by sub-basin in order of priority.

*A general note about the analysis of water right claims.*

The data on a water right claim was provided by the claimant. In many cases, that person was not well acquainted with water resources management or water law and, as a result, much of the information on the claims is not accurate. This is especially true where the claimed instantaneous and annual quantities of water are listed. For example, the total number of acres claimed for irrigation in WRIA 47 is 3,478 acres. The total volume of claimed water is 111,605 acre-feet, or 32.1 AF of water per acre. Actual water use is more likely to be 2 to 4 acre-feet of water per acre. Therefore, the claims in the claims register may or may not represent a valid vested water right. However, if they do, the quantities of water listed on the claim are often inaccurate and should not be relied upon for any work related to the water balance for a given area.

#### 3.1.4 Water Rights Adjudications

A general adjudication is a legal process conducted through a superior court to determine the extent and validity of all the existing water rights within a particular water system. A general adjudication can determine rights to surface water, groundwater or both. It does not create new water rights, it only confirms existing rights.

Adjudications provide the only legal means for certainty, clarity and surety for water rights holders, Ecology and others interested in water rights. When the court confirms a water right, that right becomes enforceable against other water users and can be protected from impairment by illegal users or new water rights applications. Adjudicated rights favor senior water rights holders during times of limited water availability. The adjudication process provides Ecology with information necessary for decision-making regarding the impact of granting new rights and proposed changes to existing rights.

The 1917 surface water code established the system of appropriative rights in Washington State, i.e. the system of water rights permits and certificates. However, before 1917, the State also recognized riparian rights. Riparian rights attach only to land bordering a stream or water body. Owners of more distant land could not obtain riparian rights for their land.

There is no priority of right between riparian owners. All riparian owners have equal rights with competing interests to be resolved by the Courts. As demand increased, the riparian doctrine was divided into (a) the natural flow theory and (b) the reasonable use theory.

Under the natural flow theory, the riparian owner could divert water for domestic purposes that included family, livestock, and gardening, and otherwise had the right to have the water in the stream or lake kept at its "natural flow" level. Under the reasonable use theory, the use of the stream is limited to what is reasonable, having due regard for the rights of others on the water source. (Pharris, 2002)

A subsequent Washington State Supreme Court decision ruled that riparian rights, not beneficially used by 1932 were invalid. (See Department of Ecology v. Abbott, 103 Wash.2d 686, 694 P.2d 1071 (1985)).

Ecology records indicate that four adjudications have been completed in portions of WRIA 47. These areas are: Antoine Creek; Joe Creek; Safety Harbor Creek; and Johnson Creek. These adjudications examined and validated existing surface water rights, including active pre-1917 vested and riparian rights, and active post-1917 State-issued permits or certificates. Except for riparian rights, any post-1917 use of surface water should have applied for a water right permit from the State. Since 1932, all uses of surface water should have applied for a water right permit from the State. Similarly, all groundwater uses initiated after 1944 (except those with a so-called exempt well) should also have applied for a water right permit from the State. If an application was approved, a permit would have been issued and, once the use was perfected, a certificate would have been issued. If the application was denied, no water use should have occurred.

If a vested right or a riparian right was found to exist in the adjudication, an adjudicated certificate of water right would have been issued. Any surface water rights issued by the State subsequent to 1917 and found to be still valid would also have been issued an adjudicated certificate of water right. Similarly, any groundwater rights issued by the State subsequent to 1944 and found to be still valid would also have been issued an adjudicated certificate of water right. Therefore, any water right claims for a right, other than a riparian right, that claim a date of first use after 1917 for surface water or after 1944 for groundwater are likely invalid because they were filed for a use that began after the water codes were enacted and should have already had a water right associated with them.

In some cases, people misunderstood the water right claims process and filed claims for uses for which they already had a water right. In such cases, the right is still valid (assuming water is still being used, etc.) and the claim is redundant. For these and other reasons, including transcription errors, the surface water claims are not being specifically factored into the water balance analysis for WRIA 47.

### **3.2 EXEMPT WELLS AND WELL LOGS IN WRIA 47**

There are four types of groundwater uses exempt from state water right permitting requirements.

- Providing water for livestock (no volume or acreage restriction).
- Watering a non-commercial lawn or garden 1/2-acre in size or less (no volume limit).
- Providing water for a single home or groups of homes (limited to 5,000 gallons per day).
- Providing water for industrial purposes, including irrigation (limited to 5,000 gallons per day with no acre limit).

These uses are exempt from permitting and establish a water right by putting water to a beneficial use. The priority date for such rights is the date the water was first put to use. In the event of an adjudication of groundwater, any uses that meet the exemption criteria above and for which use can be documented with pumping and drilling records, receipts, etc., would be granted an adjudicated groundwater right for the quantity of water actually put to beneficial use, not to exceed the 5,000 gallon per day limit where it applies. (See RCW 90.44.050). Note that, during adjudication, claimants are required to prove that water has been in constant beneficial use prior to 1917 for surface water and prior to 1945 for groundwater. Five or more consecutive years of non-use may invalidate a claim.

As noted in the discussion of groundwater claims, most of the claims include domestic as one of the stated water uses. It is very likely that a large number of the claims were filed on wells that are exempt from permitting. Claims for groundwater from wells drilled before 1945, which are

still active, may be valid. However, the practical reality is that a claim for domestic use is inconsequential because such wells are considered a legal source of water upon the date of first use and are only exempt from the permitting process. The only difference would be that pre-1945 wells, with valid claims, would be found to have an earlier date of priority, which is significant only when periods of water shortage lead to regulation based on seniority (first-in-time, first-in-right). While interruptible rights are regulated fairly often, the regulation of domestic water rights has rarely, if ever, occurred.

Submittal of well logs before 1971 was voluntary. In 1992, well drillers were required to submit notices of intent to construct a water well (also called “start cards”) and Ecology’s monitoring increased. As a result, the database is quite complete for wells drilled since 1992, incomplete for the period from 1971 to 1992, and scattered for pre-1971. Ecology estimates that the well log database includes about 70 percent of the wells drilled prior to 1991.

Review of well logs reported for WRIA 47 to Ecology was part of the technical assessment work. Well logs submitted by well drillers contain limited to extensive information, including location (often to the nearest  $\frac{1}{4}$ ,  $\frac{1}{4}$  section), boring and casing diameter, well depth, well construction and testing details (casing type, screen type, pump elevation, yield, drawdown, etc.), and geologic materials encountered at different depths. Ecology’s database contains approximately 2,600 well logs for WRIA 47, but many of these are monitoring or resource protection wells and are not used for obtaining water supplies. This study estimates that there are approximately 959 exempt wells in WRIA 47. Water use from these wells was estimated as part of the water budget and is discussed in Section 4 in this Assessment.

## **Section 4 – Estimated Current Water Use**

### **4.0 DRINKING WATER SOURCES AND DOMESTIC WATER USE**

The Washington State Department of Health (DOH) defines Group A public water systems as those regularly serving 15 or more residential connections, or 25 or more people for 60 days during the year. Group B public water systems supply 2 to 14 connections having fewer than 25 people. These water systems are subject to state and local ordinances governing water quality and system operations. The DOH is the primary agency for water system regulation and the Washington State Department of Ecology (Ecology) is the primary agency for water rights regulation. Exempt wells are generally not subject to regulation by DOH or Ecology.

#### **Method**

The number of connections and the population served by Group A and Group B public water systems in Water Resource Inventory Area 47 (WRIA 47) were estimated from information obtained through the DOH website, City of Chelan, Lake Chelan Reclamation District and Chelan County PUD No. 1. The total number of residences in the watershed in 2008 was estimated to be 13,211 from current population as provided by the City of Chelan and the DOH Division of Environmental Health Office of Drinking Water (ODW) website. Washington State Office of Financial Management (OFM) census data was also used to verify the value derived from the DOH data. Two OFM census tracts are completely contained within WRIA 47, while two others cover only a small portion of WRIA 47. The tracts completely within WRIA 47 are 9603 and 9604. These cover the majority of the Wapato basin, which contains the majority of the populated area. Census tract 9601 covers the majority of the Lucerne basin as well as Entiat WRIA 46. Census tract 9710 follows the Okanogan County line, covering the upland area of the Antoine Creek sub-watershed. The OFM data shows that the 2008 population for the two tracts contained within WRIA 47 was 10,623. Approximately 3,000 more people reside outside of these tracts based on the data from the other census tracts.

Total water use was calculated based on the total number of connections provided by the agencies listed above, the Group A Communities listed in the DOH ODW water system database (minus inactive and multiple sources serving the same system), plus domestic use supplied by exempt wells.

The majority of residences in WRIA 47 are served by Group A Community water systems. The City of Chelan serves 7,407 while the Lake Chelan Reclamation District (LCRD) serves 3,220. The next largest purveyor, Chelan Falls Water District, serves 380 residents; this purveyor uses a groundwater source that is in direct hydraulic continuity with the Columbia River.

The following sources were used to calculate the volume and quantity of residential water consumption.

- Group A communities with metered values, including the City of Chelan, the LCRD and Chelan Ridge.



- Group A Community use based on per capita consumption rates, including the following purveyors.

<b>Group A Communities</b>	<b>Population</b>
Chelan Falls Water District	380
Apple Acres Village	212
Chelan Co PUD - Chelan Ridge	90
Sunnybank Water System	89
Lakeview Utilities	79
Holden Village	64
Chelan Park Ranches Water Assn	52
Little Butte Water System	48
Snow Creek Water System	41
Azwell Orchards	28

Two consumption rates were used: 1) 215 gallons per day based on the per capita consumption rate in the City of Chelan from 2004 to 2007; 2) 350 gallons per day per residence following the DOH ODW *Water System Design Manual*. (The reader should make note of the fact when following the calculations that the first number, 215 gallons is per person, while the 350 gallons is per residence.)

Based on the data available, the population served was either multiplied by the per capita rate or converted to number of residences (assuming a occupancy rate of 2.624 people per residence based on OFM census data) The calculations based on residences or households were multiplied by the 350 gallons per residence value promulgated by the DOH *Surface Water Design Manual*. These consumption rates were then multiplied by 365 days to estimate average annual use.

Local data indicating the amount of water consumed for indoor uses were not available. However, the *Water System Design Manual* indicates that Washington State average domestic water use rarely drops below 200 gallons per day (gpd) regardless of rainfall. Therefore, an indoor consumptive rate of 200 gpd was used for this estimate. Average outdoor use is estimated to be the difference between the total consumption rate and the indoor consumptive rate, or 150 gpd.

## **Results**

Values were calculated to show whether a source of domestic water was groundwater or surface water. Approximately 11 percent of households receive water from WRIA 47 groundwater sources, with 89 percent from surface water (**Table 4-1**). Next, estimates were shown for the number of connections and populations served by Group A and B water systems and exempt wells in **Table 4-2**. Group A water systems supply 89 percent, exempt wells supply 7 percent and Group B water systems supply 4 percent of water used in WRIA 47. The distribution of potable water systems is shown on **Figure 4-1**.

**Table 4-1 – Domestic Water Sources in WRIA 47<sup>1</sup>**

	Population <sup>2</sup>	Percent of Total Residences
Groundwater <sup>3</sup>	1,501	11%
Surface Water	11,710	89%
<b>Total</b>	<b>13,211</b>	<b>100%</b>

<sup>1</sup>The Antoine Creek sub-watershed is not included in analysis.

<sup>2</sup>Based on DOH, ODW Community Group A populations served and an assessment of exempt wells.

<sup>3</sup>Not including Chelan Falls Water District

**Table 4-2 – Domestic Water Use in WRIA 47**

	Population Served	Total Use Metered Values (AFY)	Total Use Consumption (AFY)		Indoor (AFY)	Outdoor (AFY)
<b>Group A</b>			215 <i>gal/person</i>	350 <i>gal/residence</i>		
City of Chelan	7,407	1,400	-	-	626	774
Lake Chelan Reclamation District	3,220	805	-	-	272	533
Chelan Ridge	90	27	-	-	8	20
Remaining Community Systems	993		237	147	84	153
<b>Group B and Group A Non-community systems</b>	542		129	53	30	99
<b>Exempt Wells</b>	959		229	142	81	148
Total population served	<b>13,211</b>					
Total based on metered values		2,232				
Total based on DOH population				341		
Total based on per capita consumption			594			
<b>Total volume from residential consumption</b>			<b>2,826</b>	<b>2,573</b>	<b>1,101</b>	<b>1,725</b>

Approximately 90 percent of wastewater is treated at the City of Chelan Wastewater Treatment Plant (CCWTP); in addition, approximately 60 percent of the LCRD domestic water service area is also piped to the CCWTP. The outflow for this plant is the Columbia River, thus almost all Group A indoor domestic water use, and hence the vast majority of indoor domestic water consumption, is exported out of the watershed. In contrast, the water applied as irrigation re-enters the watershed as groundwater infiltration if it passes the root zone of the plants and is not lost through evapotranspiration.

### Potential Sources of Error

The number of residences depending on exempt wells for supply (959 residences) was estimated by searching and screening the number of exempt wells listed in Ecology's well logs. This number represents those wells that supply domestic-use water and were within a specific diameter (6 to 8 inches) known to provide domestic water supply. Wells were excluded if they were classified as "Resource Protection" or "Abandoned". RH2 assumed wells with a diameter smaller than 6 inches were associated with a "Resource Protection" well and those well with a diameter larger than 8 inches would be associated with a water right and thus included in either the Office of Drinking Water or the Water Rights Application Tracking System GIS database, called the Geographic Water Information System (GWIS).

The 959 well borings reported in Ecology's database and not attached to a certified or permitted right is significantly lower than the number of residences potentially relying upon exempt well water sources. Several possible reasons for this difference include the following.

- Ecology did not require exempt well reporting before 1971 and did not enforce well reporting until 1992. Ecology estimates that 30 percent of wells drilled before 1992 were not reported.
- Up to six residences can be served by a single exempt well.
- Some households receive domestic water from springs.
- A few residences may haul water for supply.
- The estimated number of households may not reflect actual conditions.

Another potential source of error in the domestic use calculation includes those potential supply wells that derive a portion of groundwater withdrawal from recharge through aquifers in hydraulic continuity with the Columbia River. This potential undocumented importation of water into the watershed is likely restricted to wells completed within flood deposits or alluvial aquifers within 1/2-mile of the river.

Also, domestic indoor use associated with household consumption may not reflect actual use as household size and/or seasonal occupation may vary. This may be especially prevalent within Group B and Group A non-community systems. Many of these households may be either occupied seasonally or be a system associated with non-residential use (e.g. a mobile home park).

#### **4.1 INDUSTRIAL AND COMMERCIAL WATER USE**

Major industrial and commercial water users were identified by examining water rights. Industrial and commercial water users and water use are summarized in **Table 4-3**. The City of Chelan meters their users, at the time of this report metered consumption for the years 2004 through 2007 was an average of 504 AFY. This value encompasses all consumption not included in the residential tally: institutional, commercial and municipal uses. Given the difficulty in estimating the amount of water returned via infiltration and the relatively small component of the water balance, all commercial and municipal water use was assumed to be a loss to the WRIA 47 water balance.

**Table 4-3 – Commercial and Industrial Use Water Rights Volumes**

	<b>Instantaneous Quantity (gpm)</b>	<b>Acre-feet per Year (AFY)</b>
<b>Chelan River Irrigation District (Wapato Main Stem)</b>	799.2	273
<b>Jack Sibert (Howard Flats)</b>	40	65
<b>S. A. Lepley (Wapato Main Stem)</b>	103.3	54
<b>Chelan Concrete Co. Inc. (Wapato Main Stem)</b>	50	20
<b>Lakeshore Orchards (Wapato Main Stem)</b>	40.4	14.4

## **4.2 IRRIGATION WATER USE**

### **Method**

Several irrigation districts were contacted to inquire about crop types and distributions, but none could provide an accurate account, presumably due lack of centralized information and annual changes in crop cover. The most definitive basin-wide assessment of crop distribution is a 1988 report which states 11,500 acres covered by orchards and 7,500 acres in non-orchard agriculture, the majority being dry land wheat. In addition, a GIS analysis of crop cover was preformed, using a land cover file published by the USDA/NRCS, National Cartography and Geospatial Center titled, USDA-NAS Cropland Data Layer. The data shows land cover for the United States and was created from imagery processed from 1997 to 2006. Each cell in the raster data file represents a 30-meter by 30-meter square. The value calculated using this analysis was found to be grossly low compared to the approximate values of the 1988 survey and more recent values and thus discarded.

### **Results**

GIS analysis shows the approximate *location* of the land cover committed to agriculture, (but, again, due to the limits of data accuracy actual acreage was not used). The land classes described in the USDA/NASS data are alfalfa, apples, winter wheat and other crops. The great majority of agriculture was shown to occur in the LCRD boundary, falling within the Manson Lakes and Wapato Main Stem sub-basins. The LCRD was contacted and found to have 6,472.6 acres under irrigation. They recorded an average water consumption of 16,009 AFY since 1987. This translates to 29.68 inches over the 6,472.6 irrigable acres. Further, a LCRD staff contacted via email noted that crop cover has changed dramatically over the last 5 to 8 years: apples and cherries are expanding. In addition, wine grapes are becoming more prevalent in the district. The LCRD staff also noted that more recently, due to the current economic recession, many farmers are laying their land fallow and some irrigation water rights are being used for domestic supply. Water use for the LCRD and other smaller irrigation districts within this area are summarized in **Table 4-4**.

**Table 4-4 – Irrigation District Consumption**

	<b>Instantaneous Quantity (cfs)</b>	<b>Total Use (AFY)</b>
<b>Lake Chelan Reclamation District</b>	116.7	16,009
<b>Chelan Falls Irrigation District</b>	5.0	1,700
<b>Chelan River Irrigation District</b>	6.7	2,000
<b>Isenhardt Irrigation District</b>	4.0	1,250

Of the amount of water that is applied to a crop, approximately 5 percent to 15 percent is lost to evaporation (spray evaporative loss, canopy loss, or wind drift), while up to an additional 15 to 30 percent of agricultural water can be lost due to application inefficiencies, either as surface runoff or deep percolation. This surface runoff and water which percolates beyond the root zone of the plants stays within the watershed due to the local geology (discussed above) though potentially lost to that sub-basin. The volume of irrigation water taken up by plants and exported out of the system is approximately 55 percent, up to 100 percent in highly efficient operations.

**Potential Sources of Error**

Several assumptions that could affect the values presented above. The reader should consider that the data regarding irrigation methods for each irrigation district was an average but this discounts increasing irrigation efficiency, selection of crops by farmers, changing weather patterns, farmers' reaction to market demand or water reallocation.

## **Section 5 – Water Balance**

Water balance accounts for inputs, outputs and returns to the hydrologic system. By definition, once all components have been quantified, the water balance should be zero. However, in practice, it is impossible to measure and account for all components of the water balance, as even in well-instrumented basins with numerous, long-term data sources. Therefore, water balance estimates are intended to identify the relative importance of each water balance component. Although a water balance may account for average water inputs, outputs and returns during a particular year, it does not consider the cumulative effects of previous years. The climatic and water use conditions of the past several years will affect the outcome of a water balance for any given year.

Typical water balance approaches examine input and output components to the hydrologic system by primarily analyzing precipitation (input) and stream flow data (output). Precipitation and stream flow are the significant components of a water balance, and long-term monitoring data for these components are available for WRIA 47.

**Figure 5-1** schematically illustrates the components and relationships of a water balance.

### **5.0 PREVIOUS ESTIMATES**

The water balance of Lake Chelan has been estimated several times since 1975, and results are generally comparable. The estimates relied upon flow data for major and minor tributaries, estimates or measurements of water use, and assumptions of water loss from evapotranspiration and groundwater recharge and water gain from irrigation return flow, imported water and groundwater discharge.

The initial water budget for Lake Chelan used stream flow data and water use estimates (Ecology 1975). **Table 5-1** summarizes the initial water balance.

**Table 5-1 – WRIA 47 Water Balance (1975) excluding Columbia River Sub-basins**

Source	Average Flow (AFY)	Use	Quantity (AF/year)	Percent Consumed
Precipitation	+ 2,706,000	Hydroelectricity	1,415,500	0
Evapotranspiration	- 1,490,000	Irrigation	16,600	60 to 90
Runoff	- 1,216,000	Municipal	1,500	10 to 30
		Industrial	650	Unknown
		Domestic	350	10 to 30
		Stock	100	100

A 1981 study of the Lake Chelan water budget used surface water flow data and estimates of evaporation and irrigation withdrawal to calculate the potential quantity of groundwater discharge to Lake Chelan. **Table 5-2** summarizes the budget below.

**Table 5-2 – Water Budget of Lake Chelan for 1976-1980 (in AF per year)**

Net Inflow to Lake	Surface Water	Groundwater	Precipitation	Evaporation	Irrigation Withdrawal	Irrigation Return
1,589,470	910,676	199,737	517,247	71,929	(75,325)	(34,795)
100%	70%	33%	4.5%	-4.7%	-2.2%	1.3%

A detailed yearly water budget for Lake Chelan was prepared for the Lake Chelan Water Quality Assessment Project (Ecology, 1989; **Table 5-3**). The water budget was based on stream flow and precipitation data that was collected between December 1986 and November 1987, and then adjusted to reflect long-term conditions. The study included estimates of evaporation and rates of runoff. Note that this study concluded that groundwater input is a “relatively minor” component of inflow to Lake Chelan, in contrast to the conclusions of the 1981 estimate. The study also concluded that water withdrawn from the lake for irrigation was estimated at 1 to 2 percent of the total water balance, and of this, 10 to 40 percent is estimated to return as drain flow and groundwater recharge.

**Table 5-3 – Low Flow Period Water Budget of Lake Chelan for 1987 (in AF/year)**

Net Outflow from Lake	Surface Water	Precipitation	Evaporation	Irrigation Withdrawal
(1,490,000)	1,570,000	69,427	-66,534	-15,900

In 1995, Ecology (**Table 5-4**) prepared an initial watershed assessment using the data from the 1989 estimate and revised irrigation and domestic use according to irrigation and census records.

**Table 5-4 – Revised Water Balance Estimate for Lake Chelan (Ecology, 1995)**

Component	Annual Quantity		
	Average Volume (acre-feet)	Average Flow	Percent of Total
<b>Inflows</b>			
Stehekin River	1,023,321	1,415	65.2
Railroad Creek	147,532	204	9.4
Upper Basin Tributaries	316,759	438	20.2
Lower Basin Tributaries	9,329	12.9	0.6
Stormwater Runoff	3,254	4.5	0.2
Agricultural Drains	651	0.9	0.0
Direct Precipitation	69,427	96	4.4
<b>Total Inflow</b>	<b>1,570,056</b>	<b>2,171</b>	<b>100.0</b>
<b>Outflow</b>			
Chelan River	1,487,612	2,057	94.7
Irrigation Withdrawal	15,910 to 34,560	22 to 47.7	1.0 to 2.2
Evaporation	66,534	92	4.2
<b>Total Outflow</b>	<b>1,570,056</b>	<b>2,171</b>	<b>100.0</b>

### **Water Balance of WRIA 47 Sub-basins**

The water balance was calculated for each WRIA 47 sub-basin using precipitation and evapotranspiration rates based on climate station data. The estimates were developed for average, dry/warm and wet/cool years (**Tables 5-5, 5-6 and 5-7**). The water balance for dry/warm and wet/cool years examines the potential range of water availability during extreme climate conditions in the watershed. A dry/warm year represents climatic conditions at the lowest annual precipitation and highest annual average temperatures. A wet/cool year represents highest annual average precipitation and lowest annual average temperatures during the period of record. Estimated withdrawals and subsequent return flow for beneficial uses within the sub-basin, and estimated groundwater recharge were included to illustrate the difference in natural and artificial exchanges of water compared to the primary components of precipitation and evapotranspiration.

Potential runoff was determined from the difference between precipitation and evapotranspiration (Precipitation – actual evapotranspiration) and compared to stream gauge data. Potential runoff and stream flow were within 10 percent, indicating that groundwater recharge is likely within 1 to 10 percent of total precipitation, which would be expected for areas underlain predominantly by bedrock, as in the upper elevation sub-basins and the arid climate of the lower elevation sub-basins. The water balance estimates indicate that regardless of the type of year (normal, wet, dry) the relative proportions of water flow into WRIA 47 are consistent.



**Table 5-5 – Summary of Precipitation and Evapotranspiration – Average Year (1916 to 2008 period of record)**

Sub-basin	Total Area (ac)	Precip. (AF)	Percent of Lake Chelan Sub-basins	Precip. (in)	AET <sup>1</sup> (in)	Precip - AET (in)	Precip - AET (AF)	Percent of Lake Chelan Sub-basins	Percent of WRIA 47	River Flow at Gauge (AF)	Groundwater Recharge Rate <sup>2</sup>	Groundwater Recharge from Precip (AF)
Stehekin	218,576	1,246,100	53	68.4	12.8	55.6	1,012,951	60	58.1	1,085,276	1	12,461
Lucerne Main Stem	209,048	683,090	29	39.2	12.8	26.4	460,106	27	26.4		1	6,831
Railroad Creek	41,553	173,966	7	50.2	12.8	37.4	129,642	8	7.4	153,488	1	1,740
Columbia River Tributaries.	35,726	51,093	-	17.2	10.2	7.0	20,726	-	1.2		10	5,109
Lake Chelan	33,344	69,427	3	25.0	28.6	-3.6	(10,043)	-1	-0.6		0	-
Wapato Main Stem	30,548	40,390	2	15.9	10.2	5.7	14,424	1	0.8		10	4,039
25-mile Creek	27,078	77,227	3	34.2	12.1	22.1	49,923	3	2.9		1	772
Manson Lakes	24,974	45,075	2	21.7	10.2	11.5	23,847	1	1.4		10	4,507
Antoine	21,059	41,160	-	23.5	12.0	11.5	20,102	-	1.2		10	4,116
Howard Flats	11,807	16,982	-	17.3	12.0	5.3	5,175	-	0.3		10	1,698
First Creek	11,634	28,547	1	29.4	12.0	17.4	16,914	1	1.0		1	197
<b>Total</b>	<b>653,713</b>	<b>2,444,509</b>		<b>44.9</b>			<b>1,743,767</b>		<b>100</b>			
Lake Chelan only	596,756	2,363,822	97				1,697,764			1,886,744		30,350
Columbia River only	56,957	80,688	3				46,003					

<sup>1</sup> AET values based on average AET measured at separate climate stations.

<sup>2</sup> Estimated based on permeability of predominant geologic units.

**Table 5-6 – Summary of Precipitation and Evapotranspiration – Warm/Dry Year (1944)**

Sub-basin	Total Area (ac)	Precip. (AF)	Percent of Lake Chelan Sub-basins	Precip. (in)	AE T <sup>1</sup> (in)	Precip - AET (in)	Precip - AET (AF)	Percent of Lake Chelan Sub-basins	Percent of WRIA 47	River Flow at Gauge (AF)	Groundwater Recharge Rate <sup>2</sup>	Groundwater Recharge from Precip (AF)
Stehekin	218,576	772,067	51	42.4	11.9	30.5	555,312	62	58.3	647,980	1	7,721
Lucerne Main Stem	209,048	453,125	30	26.0	14.4	11.6	202,268	23	21.2		1	4,531
Railroad Creek	41,553	119,129	8	34.4	14.4	20.0	69,264	8	7.3	92,672	1	1,191
Columbia River Tributaries	35,726	38,433	-	12.9	4.0	8.9	26,524	-	2.8		10	3,843
Lake Chelan	33,344	48,599	3	25.0	28.6	-3.6	(10,003)	-1	-1.1		0	-
Wapato Main Stem	30,548	31,698	2	12.5	4.0	8.5	21,515	2	2.3		10	3,170
25-Mile Creek	27,078	54,843	4	24.3	14.4	9.9	22,350	2	2.3		1	548
Manson Lakes	24,974	29,523	2	14.2	4.0	10.2	21,198	2	2.2		10	2,952
Antoine	21,059	26,883	-	15.3	4.0	11.3	19,864	-	2.1		10	2,688
Howard Flats	11,807	12,364	-	12.6	4.0	8.6	8,428	-	0.9		10	1,236
First Creek	11,634	19,678	1	20.3	4.0	16.3	15,800	2	1.7		1	297
<b>Total</b>	<b>653,713</b>	<b>1,586,664</b>		<b>29.1</b>			<b>952,521</b>		<b>100.0</b>			
Lake Chelan only	596,756	1,528,662	96				897,705			844,980		20,311
Columbia River only	56,957	58,002	4				54,816					

<sup>1</sup> AET values based on average AET measured at separate climate stations.

<sup>2</sup> Estimated based on permeability of predominant geologic units.

**Table 5-7 – Summary of Precipitation and Evapotranspiration – Wet/Cool Year (2006)**

Sub-basin	Total Area (ac)	Precip. (AF)	Percent of Lake Chelan Sub-basins	Precip. (in)	AE T <sup>1</sup> (in)	Preci P - AET (in)	Precip - AET (AF)	Percent of Lake Chelan Sub-basins	Percent of WRIA 47	River Flow at Gauge (AF)	Ground-water Recharge Rate <sup>2</sup>	Groundwater Recharge from Precip (AF)
Stehekin	218,576	1,360,143	52	74.7	12.8	61.9	1,126,995	59	58.0	1,413,972	1	13,601
Lucerne Main Stem	209,048	778,375	30	44.7	14.4	30.3	527,517	28	27.1		1	7,784
Railroad Creek	41,553	211,377	8	61.0	14.4	46.6	161,513	8	8.3	217,200 <sup>3</sup>	1	2,114
Columbia River Tributaries	35,726	56,695	-	19.0	13.6	5.4	16,206	-	0.8		10	5,670
Lake Chelan	33,344	76,370	3	25.0	13.6	11.4	31,677	2	1.6		0	-
Wapato Main Stem	30,548	46,808	2	18.4	28.6	-10.2	(25,997)	-1	-1.3		10	4,681
25-Mile Creek	27,078	85,194	3	37.8	13.6	24.2	54,506	3	2.8		1	852
Manson Lakes	24,974	42,071	2	20.2	13.6	6.6	13,767	1	0.7		10	4,207
Antoine	21,059	39,742	-	22.6	13.6	9.0	15,876	-	0.8		10	3,974
Howard Flats	11,807	19,010	-	19.3	13.6	5.7	5,629	-	0.3		10	1,901
First Creek	11,634	29,708	1	30.6	14.4	16.2	15,747	1	0.8		1	-
<b>Total</b>	<b>653,713</b>	<b>2,715,786</b>		<b>49.9</b>			<b>1,943,436</b>		<b>100.0</b>			
Lake Chelan only	596,756	2,630,046	97				1,905,725			1,487,820		33,536
Columbia River only	56,957	85,740	3				37,711					

<sup>1</sup> AET values based on average AET measured at separate climate stations.

<sup>2</sup> Estimated based on permeability of predominant geologic units.

<sup>3</sup> 1957 data

Natural flow and beneficial uses (water rights) are summarized in **Table 5-8**. This summary shows the significant components in the water balance for WRIA 47; however, it excludes the non-consumptive diversion for hydropower. The source of most diversion for irrigation and municipal/domestic supply derives from Lake Chelan. Most of the water is applied to the Manson Lakes and Wapato Main Stem Sub-basins. Irrigation return recharges groundwater within these basins and is either withdrawn for use or discharges into Lake Chelan. Treated municipal wastewater is routed out of the watershed to discharge into the Columbia River, and smaller domestic wastewater is discharged to ground and ultimately returns to Lake Chelan.

**Table 5-8 – Comparison of Natural Flows to Water Rights**

<b>Sub-basin</b>	<b>Total Area (ac)</b>	<b>Precip. (AF)</b>	<b>Precip - AET (AF)</b>	<b>River Flow at Gauge (AF)</b>	<b>Surface Water Rights (AF)</b>	<b>Groundwater Rights (AF)</b>
Stehekin	218,576	1,246,100	1,012,951	1,013,600	-	-
Lucerne Main Stem	209,048	683,090	460,106		445	-
Railroad Creek	41,553	173,966	129,642	144,800	-	-
Columbia R Tributaries	35,726	51,093	20,726		CR <sup>1</sup>	CR
Lake Chelan	33,344	69,427	(10,043)		-	-
Wapato Main Stem	30,548	40,390	14,424		30,907	434
25-mile Creek	27,078	77,227	49,923		398	-
Manson Lakes	24,974	45,075	23,847		14,217	589
Antoine	21,059	41,160	20,102		1,846	CR
Howard Flats	11,807	16,982	5,175		CR	CR
First Creek	11,634	28,547	16,914		1,631	-
<b>Total</b>	<b>655,347</b>	<b>2,473,057</b>	<b>1,743,767</b>		<b>49,444</b>	<b>1,023</b>
Lake Chelan only	596,755	2,363,822	1,697,764	1,487,820	47,598	1,023
Columbia River only	56,958	80,687	46,003		CR	-

<sup>1</sup>CR – derived primarily from surface water outside Lake Chelan sub-basins or groundwater in continuity with Columbia River.

The irrigation and municipal diversions place a small demand on the runoff component (precipitation minus evapotranspiration) of the water balance for all sub-basins. The source of water for beneficial use derives from the collective storage in Lake Chelan. Approximately 85 percent of the lake water derives from runoff from the Stehekin and Railroad Creek Sub-basins, which is able to support the withdrawals in the lower sub-basins where runoff rates are only a few percent of the total water balance. These lower sub-basins benefit from irrigation return flow that substantially augments the natural groundwater recharge from infiltration of precipitation, which increases groundwater availability and base flow in these sub-basins.

## **Section 6 – Summary and Recommendations**

This section summarizes key findings of the water quantity assessment, identifies needed data that would improve understanding of the quantity and availability of water, and recommends actions for data collection and analysis that would improve water management in the watershed.

### **6.0 KEY FINDINGS**

#### **6.0.1 Water Balance**

During normal water years, WRIA 47 receives more than 2 million acre-feet (AF) of precipitation, loses approximately one-third of that to evapotranspiration and discharges more than 1 million AF of runoff through the Chelan River. Approximately 90 percent of precipitation and evapotranspiration occurs on federal lands, and essentially all of the surface water discharged from WRIA 47 is regulated through a Federal Energy Regulatory Commission (FERC) license. The greatest non-hydropower beneficial uses of water in WRIA 47, irrigation and domestic use, occur in the Wapato Mainstem and Manson Sub-basins, and water stored in the Lake Chelan Basin supports these demands. Annual irrigation water and domestic water rights for these sub-basins represent less than 5 percent of the more than 1 million AF of runoff from the watershed. These percentages within the WRIA 47 water balance create the appearance of abundant water availability for new diversion and uses. However, water right law prevents unrestricted development of new sources that could impair senior rights. Future water demands that would be most readily developed from Lake Chelan storage may occur, but only within the conditions of the FERC license and associated water right.

#### **6.0.2 Land Use**

Much of the land use, and therefore water use, in the watershed is federally-managed. The United States Forest Service (USFS) and National Park Service (NPS) land use policies affect the largest area of the watershed and potentially have the greatest man-made influence on surface water flow in the watershed. Therefore, watershed planning must align with federal land use planning. Irrigable land area in the watershed is constrained by land ownership, topography, soil and geologic conditions, and the distance from irrigable land to the lake shore or an irrigation system conveyance. Approximately 50 percent of irrigable land in the Manson Lakes Sub-basin is irrigated or could be irrigated if water was available. As irrigated land converts to less water intensive and/or high value crops or domestic use, water use and return flows within sub-basins will respond to these changes.

#### **6.0.3 Water Rights and Water Use**

The largest water use, hydropower, is managed by FERC license to Public Utility District No. 1 of Chelan County (Chelan PUD). The FERC license governs the lake level and the timing and rate of dam release, which affects access to water. Therefore, watershed planning that involves surface water must align with FERC license requirements.

As irrigation water use changes with crop and land conversion, irrigation return flow will affect groundwater recharge and local base flow. Current water law and policy will constrain the conversion of water rights from seasonal irrigation to year-round domestic use.

Groundwater withdrawals are a minor component of the watershed water budget, and are primarily for domestic use. The demand for new groundwater supplies will be constrained by the limited availability of water in the surficial aquifer in areas not already appropriated for groundwater withdrawal.

## **6.1 ADDITIONAL DATA NEEDED TO IMPROVE UNDERSTANDING OF THE QUANTITY AND AVAILABILITY OF WATER**

Surface water flow data are sufficient to manage Lake Chelan levels and flow. However, irrigation water use has proven difficult to quantify due to the lack of reliable long-term metering data. Changes in crop patterns and water demands are not well documented, but are needed to support forecasting future demands for irrigation supply.

Available smaller tributary flow data are sporadic and not currently useful for analyzing trends or estimating availability. However, the available runoff data indicates that these tributaries contribute a relatively insignificant quantity to the water budget. Tributary monitoring in smaller sub-basins would support evaluation of surface water availability for beneficial use within the sub-basin.

Groundwater use in WRIA 47 from sources not in hydraulic continuity with the Columbia River is primarily from wells that support limited withdrawals for domestic use. Groundwater elevation data are sporadic and currently not useful to evaluate trends of groundwater availability, demand or influence on stream flow. Compilation and mapping of groundwater data would identify areas that could rely on local groundwater sources or areas that would require importing surface water to meet future growth. Since much of the groundwater recharge into the surficial aquifer derives from irrigation and septic return flow, groundwater level monitoring could support the evaluation of the effects of land and water use changes on surficial aquifer recharge and base flow.

Groundwater use from exempt wells within the watershed is not well documented. The Department of Ecology (Ecology) records for well installation are incomplete for dates before 1992 when drillers were not required to file a notice of intent. The quantities of groundwater withdrawn for consumptive use and returned as recharge are variable depending on land and water use, occupancy and soil types. The future availability of water may be constrained if the net effect of withdrawals exceeds recharge. A more detailed survey of groundwater use from exempt wells would support forecasting of future groundwater availability and potential regulation of groundwater withdrawal from exempt wells.

## **6.2 ACTIONS, DATA COLLECTION AND ANALYSES TO IMPROVE WATER MANAGEMENT**

### **6.2.1 Improve Data Collection for Water Use**

Large retail water purveyors currently meter water use and report these data to the Washington State Department of Health. Irrigation districts meter water use, but these data are not readily available for watershed planning purposes. Other irrigation water use records

for private water rights are dispersed among dozens of ownerships and will be very difficult to collect and compile. If watershed planning goals include tracking irrigation supply, demand and return flows, irrigation districts and private water right holders could participate in a water use network to provide a demand and forecasting tool for future growth and management of drought periods.

Changes in crop cover and irrigation practices may have a large impact on the sub-basin. Documenting the annual crop type in association with water use would also support watershed planning to evaluate the potential or actual effects of water use on surface flow in streams and groundwater levels.

#### 6.2.2 Climate Change

The majority of water supply in WRIA 47 originates as precipitation in the upper sub-basins. Climate change may impact snow pack via a change in overall quantity of snow fall, change in snow level (exponential reduction in surface area due to typical cone shape of mountains), timing of winter storms and ensuing spring melt, and/or frequency of storms.

Current data collection includes an Ecology stream gauge at the Stehekin River mouth, one WRCC COOP Station on the Stehekin River (3 NW), and two SNOTEL sites (Park Creek Ridge and Rainy Pass). These data sources will continue to support the evaluation of long-term trends of water availability in the largest tributaries. This information becomes more important during dry years as the contribution from the Stehekin Basin to the entire watershed increases.

Watershed planning efforts should consider how to interpret available stream gauge data to reflect the potential availability of water in smaller sub-basins or install and monitor local stream gauges should water demands increase in smaller sub-basins.

### **6.3 FUTURE WATER NEEDS/METHODS TO RESERVE WATER FOR HIGH PRIORITY PURPOSES AND PLACES OF USE**

#### 6.3.1 Population Change

Annual population growth trends in the Wapato and Manson Lakes Sub-basins (1.7 percent) and in less populous smaller sub-basins (1.3 percent) suggest a 30 percent growth from 2008 to 2025. Water to meet this population growth will come from municipal supplies derived from Lake Chelan storage and private domestic wells. Municipal purveyors (City of Chelan and Lake Chelan Reclamation District, for example) will perfect more of their inchoate rights to meet the future demand, and private well owners will rely on permit exempt rights. The largest municipal purveyors have inchoate rights or current water right applications to meet demand into 2050. Beyond this period, new sources of supply would likely be derived from Lake Chelan storage.

New large scale planned communities outside municipal purveyor service areas will convert irrigated lands to domestic use. These lands may come with irrigation rights that may be transferred to domestic use, which may not require additional appropriation of water for the new development. However, if these developments occur within an irrigation district service area, the water will remain with the district for irrigation purposes. Other non-irrigation purposes of the development must obtain a new source of water, likely from Lake Chelan storage. The irrigation rights for the irrigated lands within the development that are converted to impervious or fallow features will be relinquished to the district for use on

other lands within the district's boundary. Developments outside existing irrigated lands will likely need to obtain all their water supplies from Lake Chelan storage.

#### 6.3.2 Irrigation Demand

Irrigation water supply is limited by the economics of pumping and piping water to un-irrigated lands. The demand for high-value crops such as cherries and grapes will likely drive new demand for irrigation water. Water for portions of this future demand will be met from the existing water rights of the irrigation districts. As some irrigation rights are relinquished back to the irrigation district, other lands will be waiting to accept the available rights. The net result is no additional gain or loss in supply. Areas outside of the irrigation district could sustain commercial agriculture, but it is not currently economical to develop. Where it is economical to develop additional agricultural land, an estimated application rate of 30 inches per acre for Lake Chelan Reclamation District irrigated lands may be used for forecasting demand. An additional 2,000 acres of irrigable lands (approximately one-third the current amount irrigated in the Lake Chelan Reclamation District service area) is estimated outside of the irrigation district boundary and would require 5,000 AF of irrigation supply. The source would derive from Lake Chelan storage or the Columbia River if in the Columbia River sub-basins.

#### 6.3.3 Commercial/Industrial Demand

The combined annual quantity of commercial and industrial water rights is 360 AF per year in Lake Chelan Sub-basins and 65 AF per year in the Howard Flats Sub-basin (**Table 4.3**). Future supply for commercial and industrial use will develop with new industrial and commercial growth. No new facilities in the watershed are forecasted, and growth could be expected at the same pace as residential growth. Watershed planning should identify the type and timing of potential new industrial and commercial operations and determine their potential water supply requirements.



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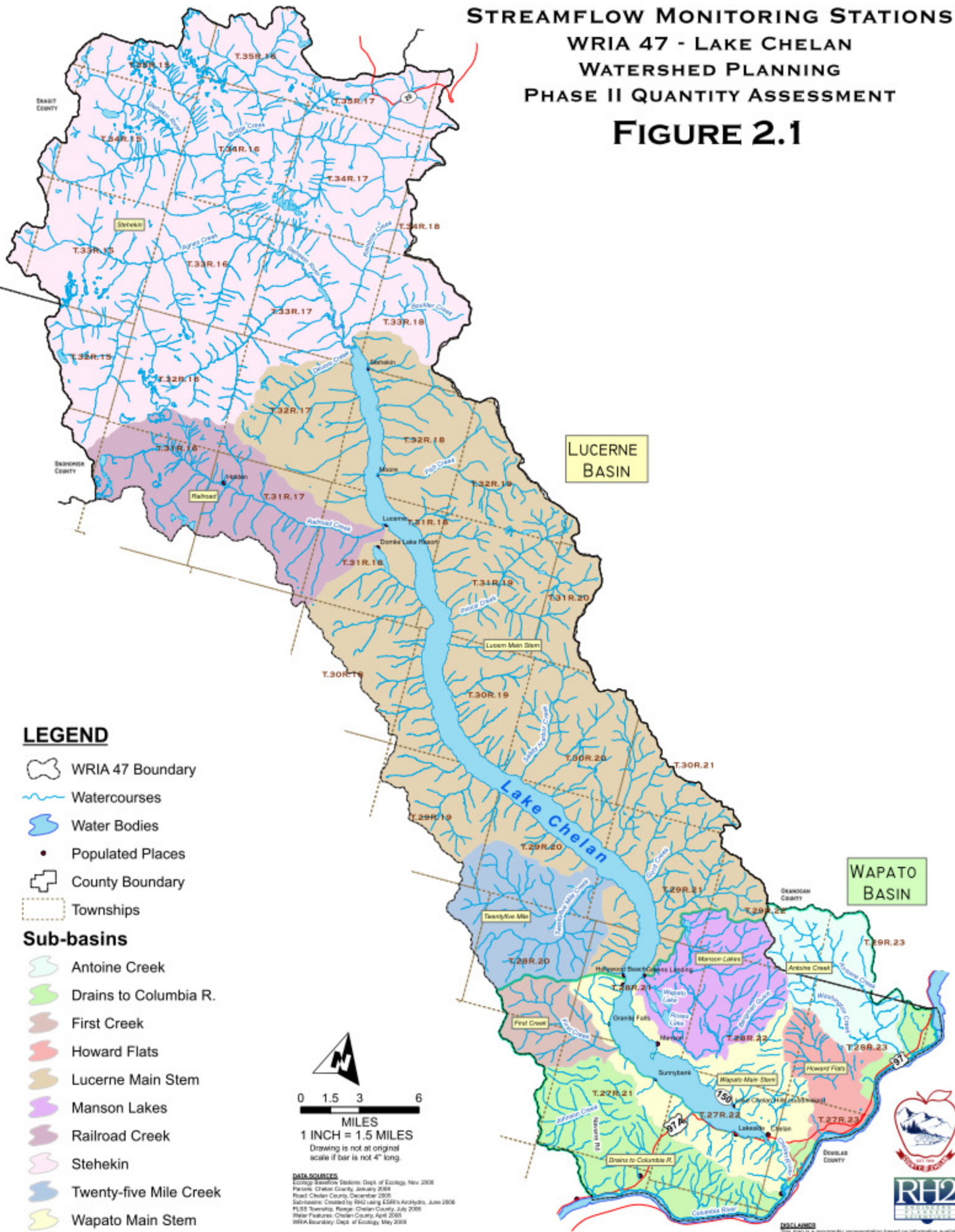
# STREAMFLOW MONITORING STATIONS

## WRIA 47 - LAKE CHELAN

### WATERSHED PLANNING

### PHASE II QUANTITY ASSESSMENT

## FIGURE 2.1





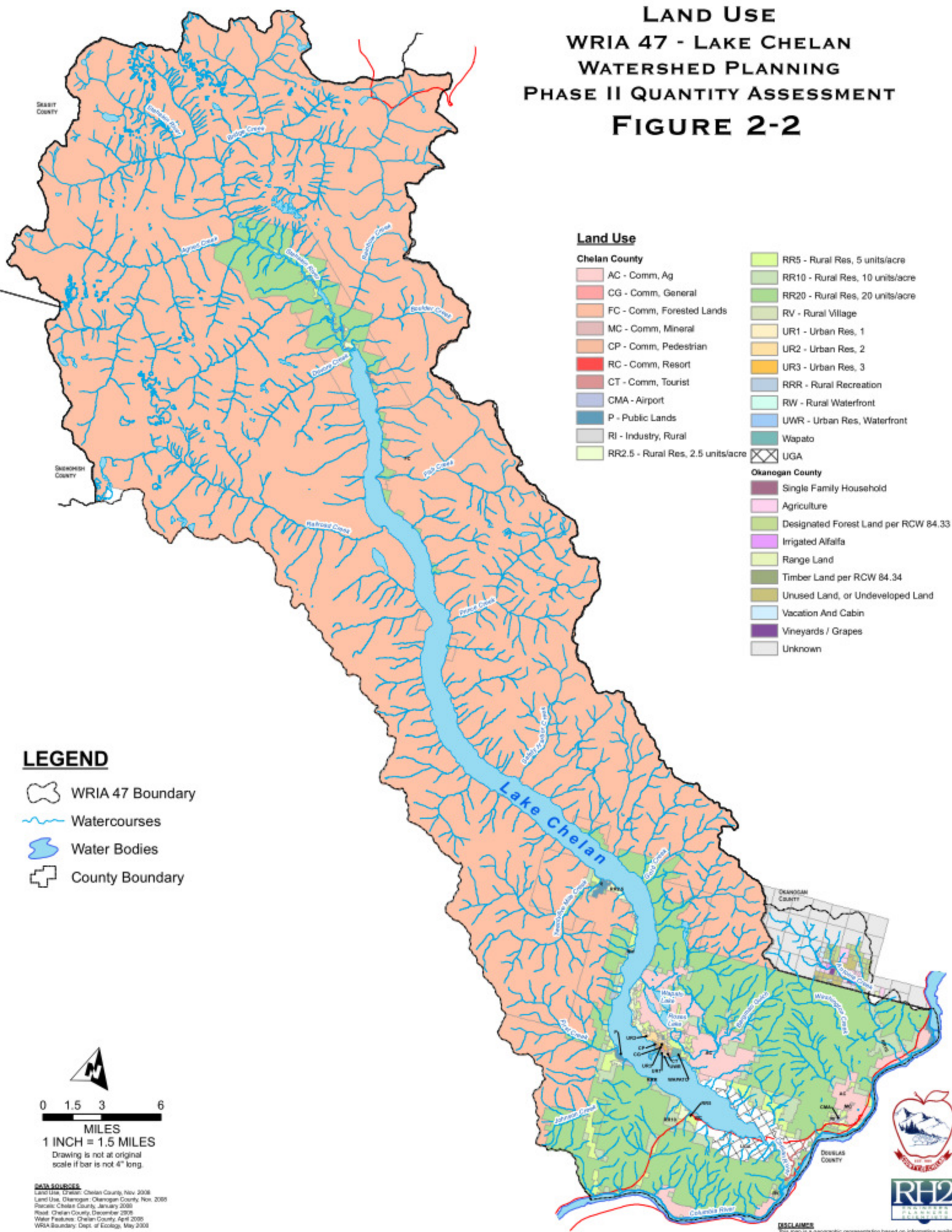
# LAND USE

## WRIA 47 - LAKE CHELAN

### WATERSHED PLANNING

### PHASE II QUANTITY ASSESSMENT

## FIGURE 2-2





# PRECIPITATION DISTRIBUTION, 30 YEAR AVERAGE (1961-1990) WRIA 47 - LAKE CHELAN WATERSHED PLANNING PHASE II QUANTITY ASSESSMENT FIGURE 2-3

## Average Annual Precipitation

9"	39"	69"	99"
11"	41"	71"	101"
13"	43"	73"	103"
15"	45"	75"	105"
17"	47"	77"	107"
19"	49"	79"	109"
21"	51"	81"	111"
23"	53"	83"	113"
25"	55"	85"	115"
27"	57"	87"	117"
29"	59"	89"	119"
31"	61"	91"	125"
33"	63"	93"	135"
35"	65"	95"	145"
37"	67"	97"	

## Environmental Monitoring Stations

- SNOTEL Stations
- WRCC COOP Stations

## LEGEND

- WRIA 47 Boundary
- Sub-watersheds
- Watercourses
- Water Bodies
- County Boundary

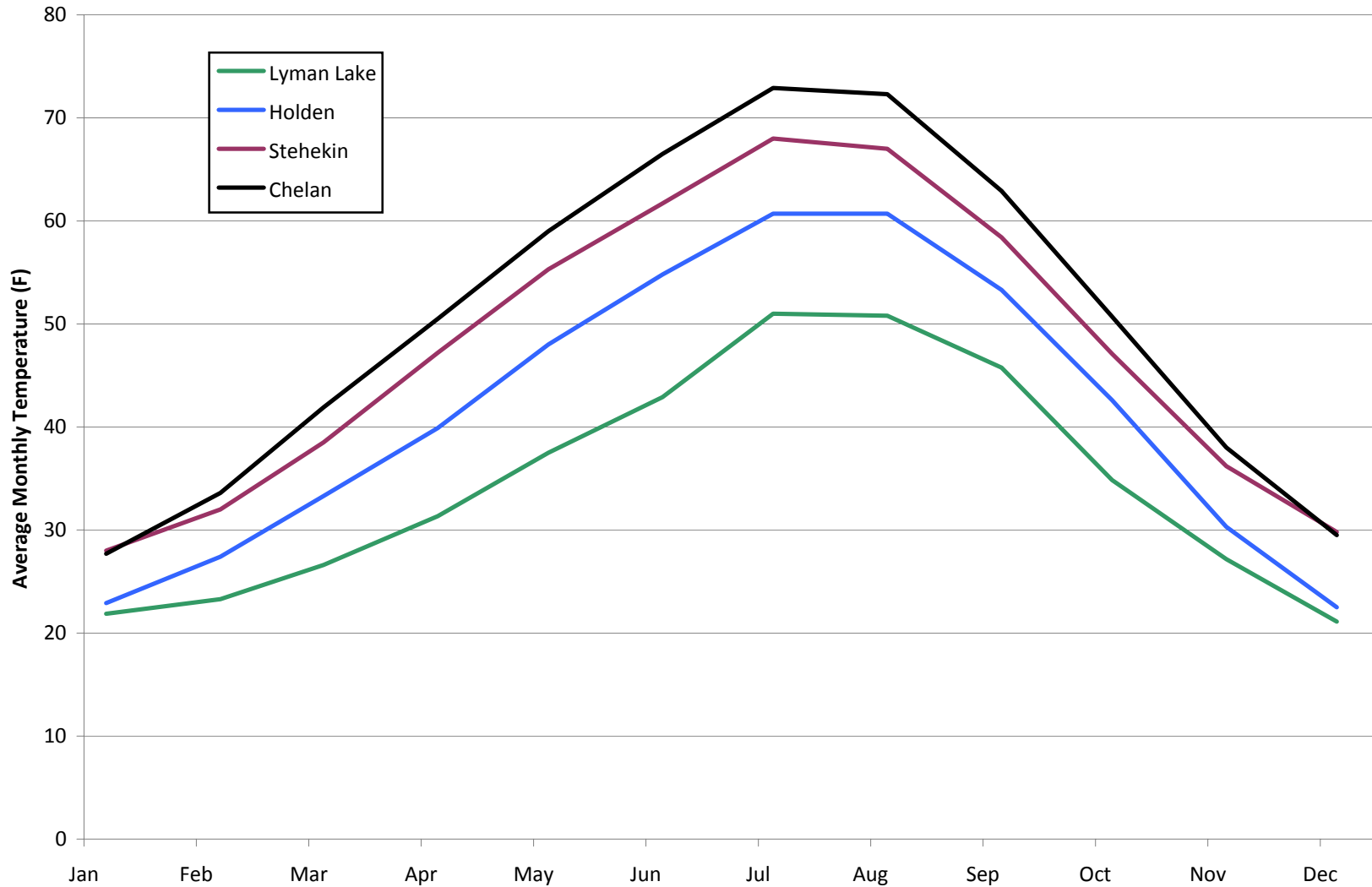


**DATA SOURCES**  
Environmental Monitoring Systems Dept. of Ecology, April 2006  
Precipitation: Oregon Climate Service, Jan. 2004  
Road: Chelan County, December 2005  
SNOTEL: National Weather Service, downloaded June 2009  
Water Features: Chelan County, April 2009  
WRCC COOP Stations: Oregon Regional Climate Center, downloaded June 2009  
WRIA Boundary: Dept. of Ecology, May 2002

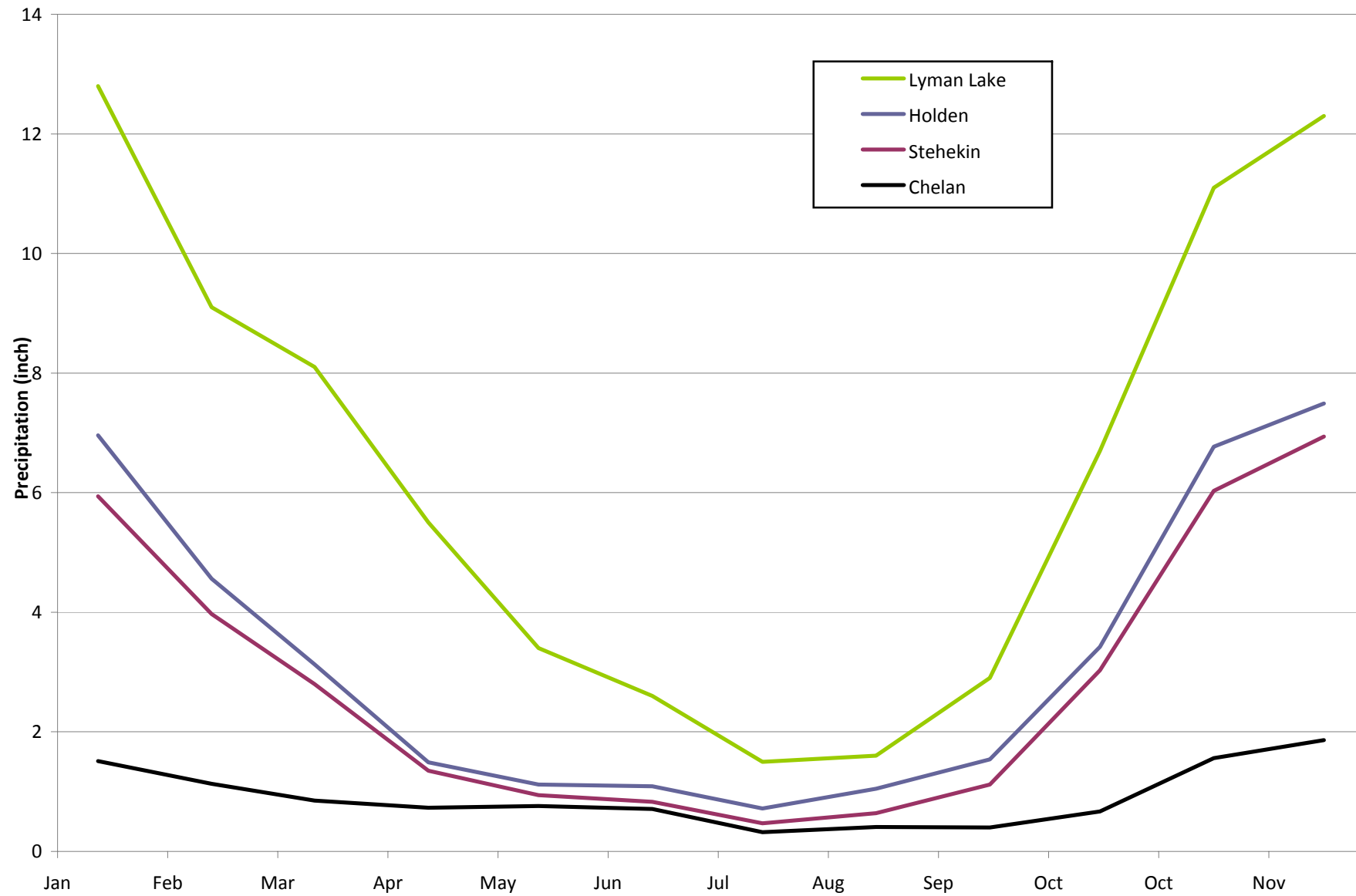


This map is a geographic representation based on information available. It does not represent a warranty. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.

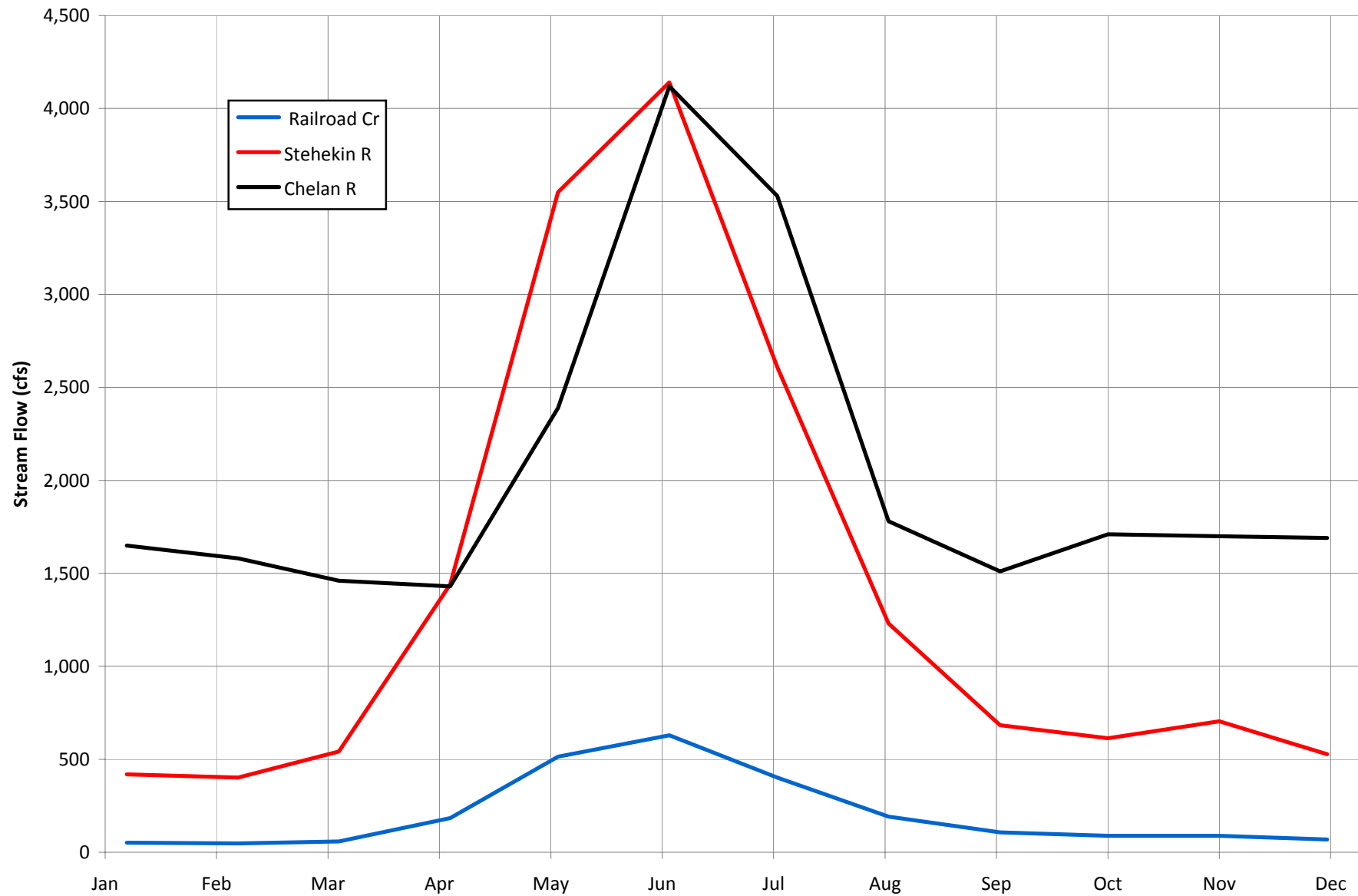
**Figure 2-4 - Average Monthly Temperature  
WRIA 47**



**Figure 2-5 - Average Monthly Precipitation  
WRIA 47**

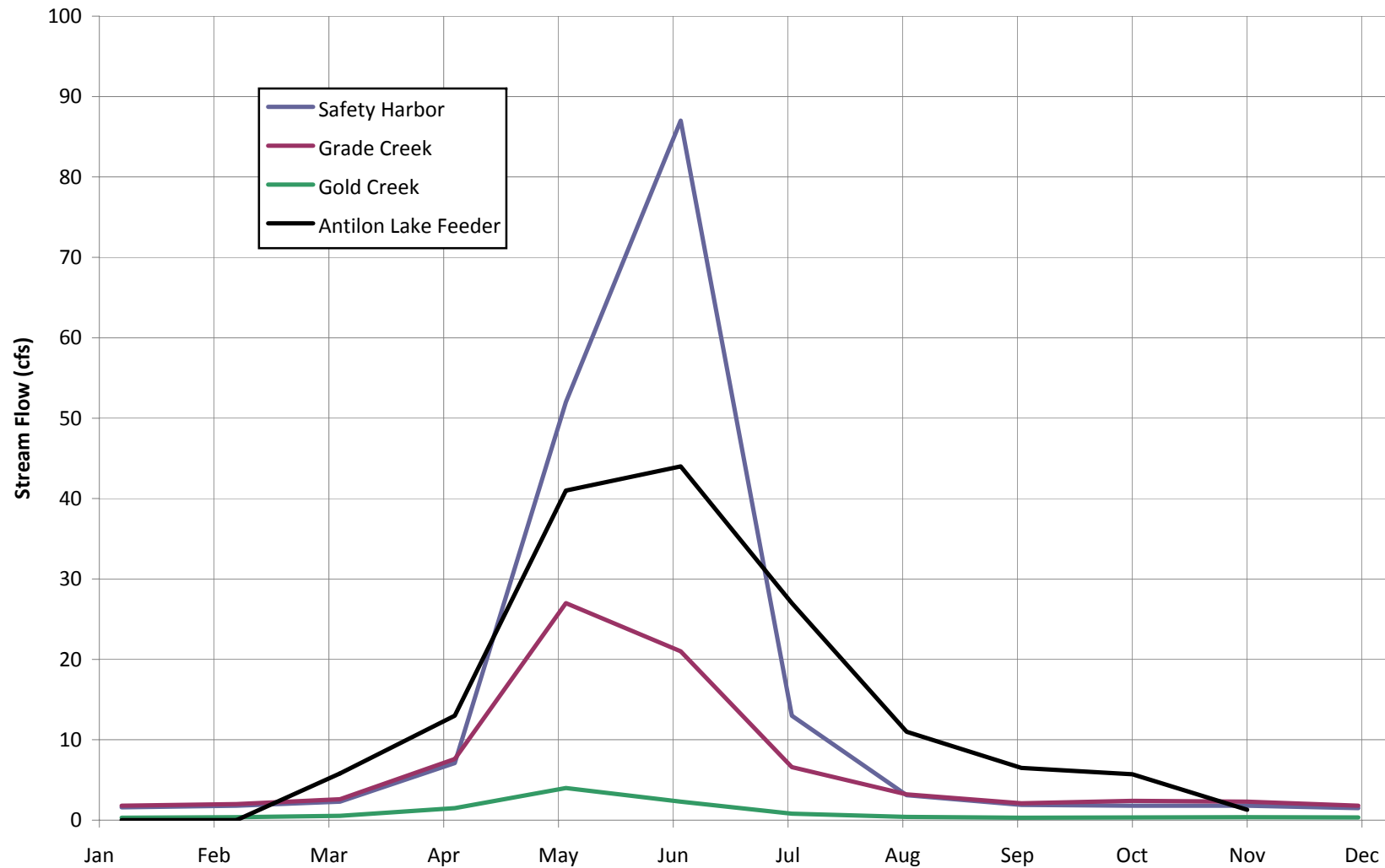


**Figure 2-6 - Average Monthly Flow - Major Streams  
WRIA 47**

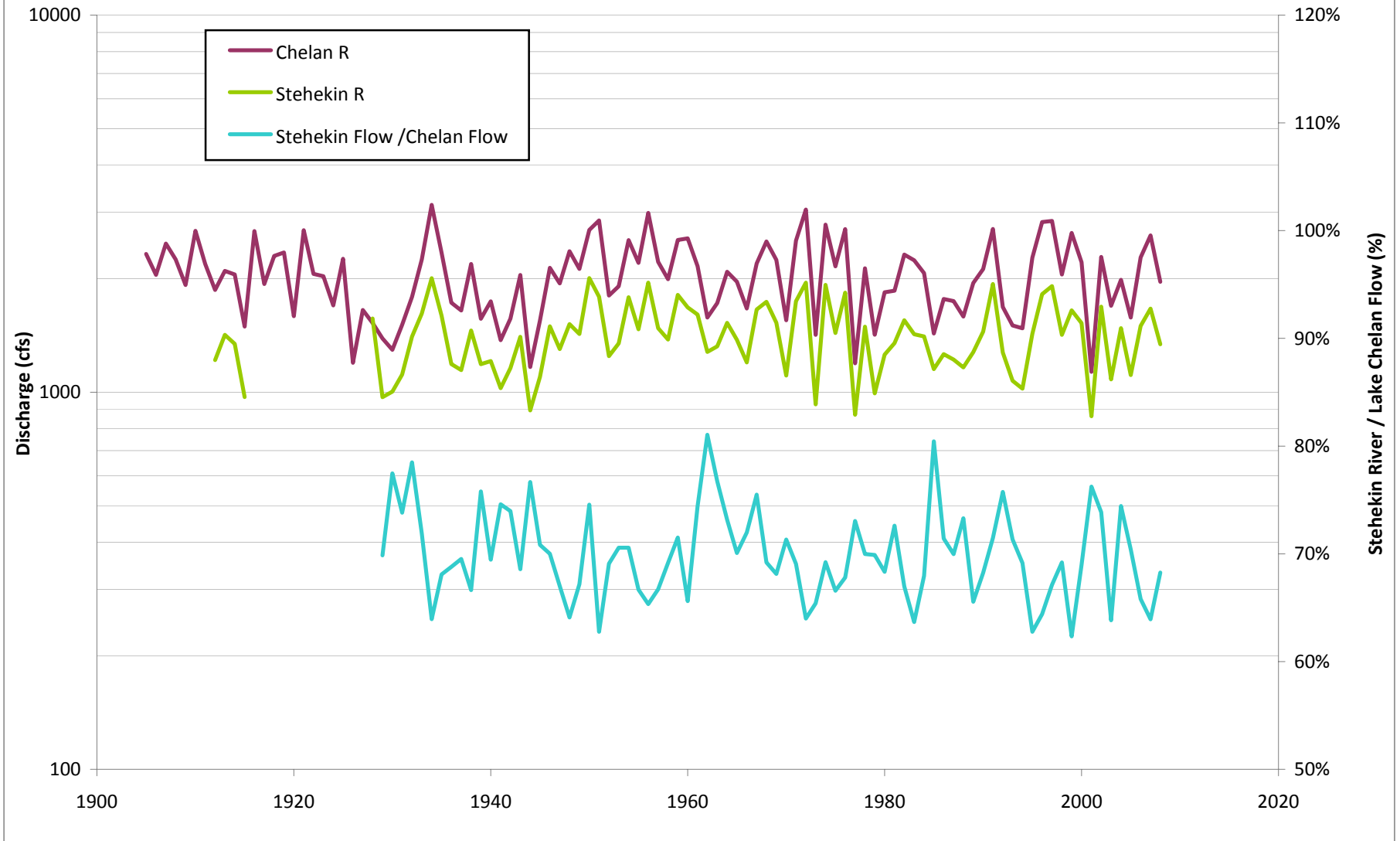




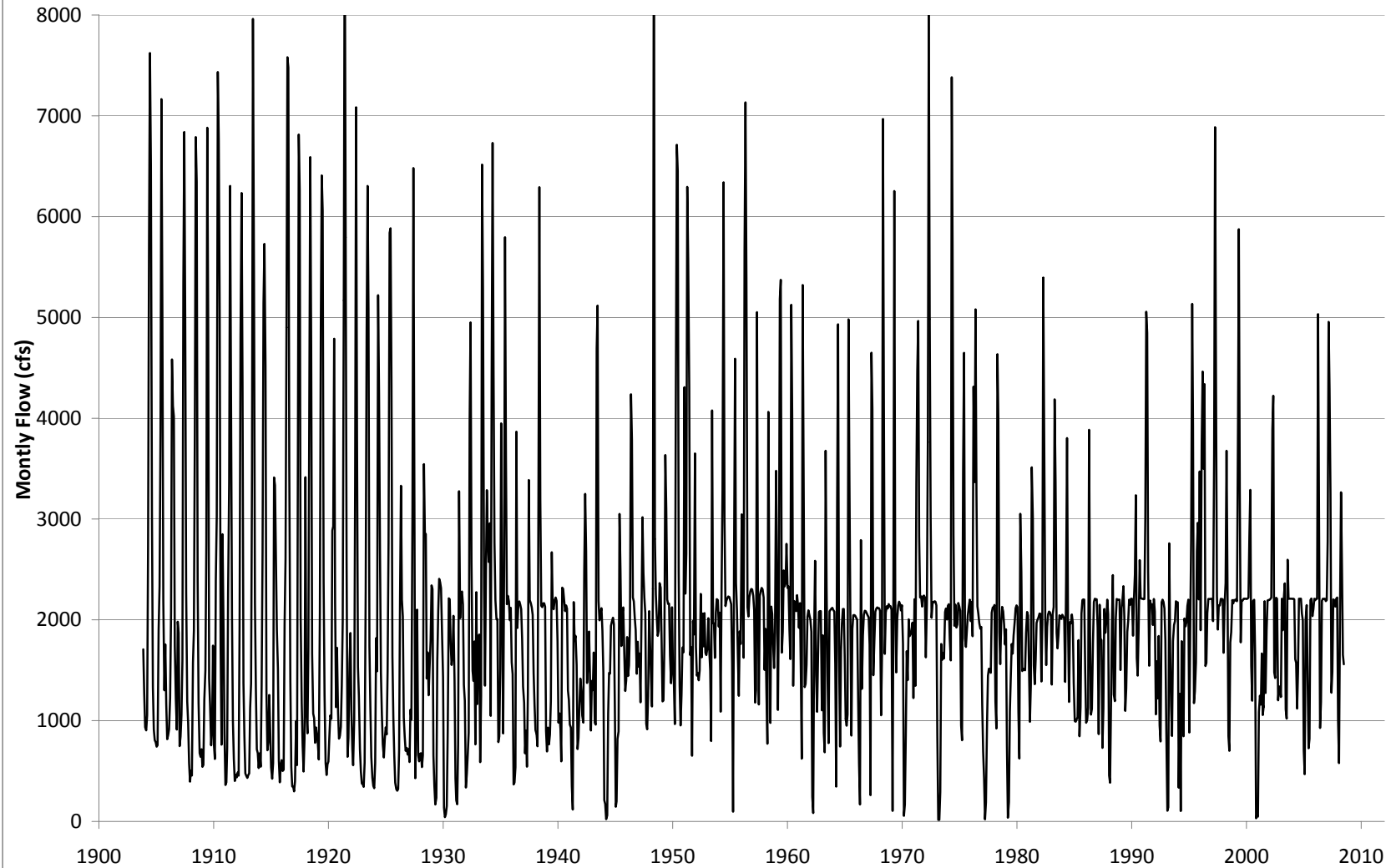
**Figure 2-7 - Average Monthly Flow - Minor Streams  
WRIA 47**



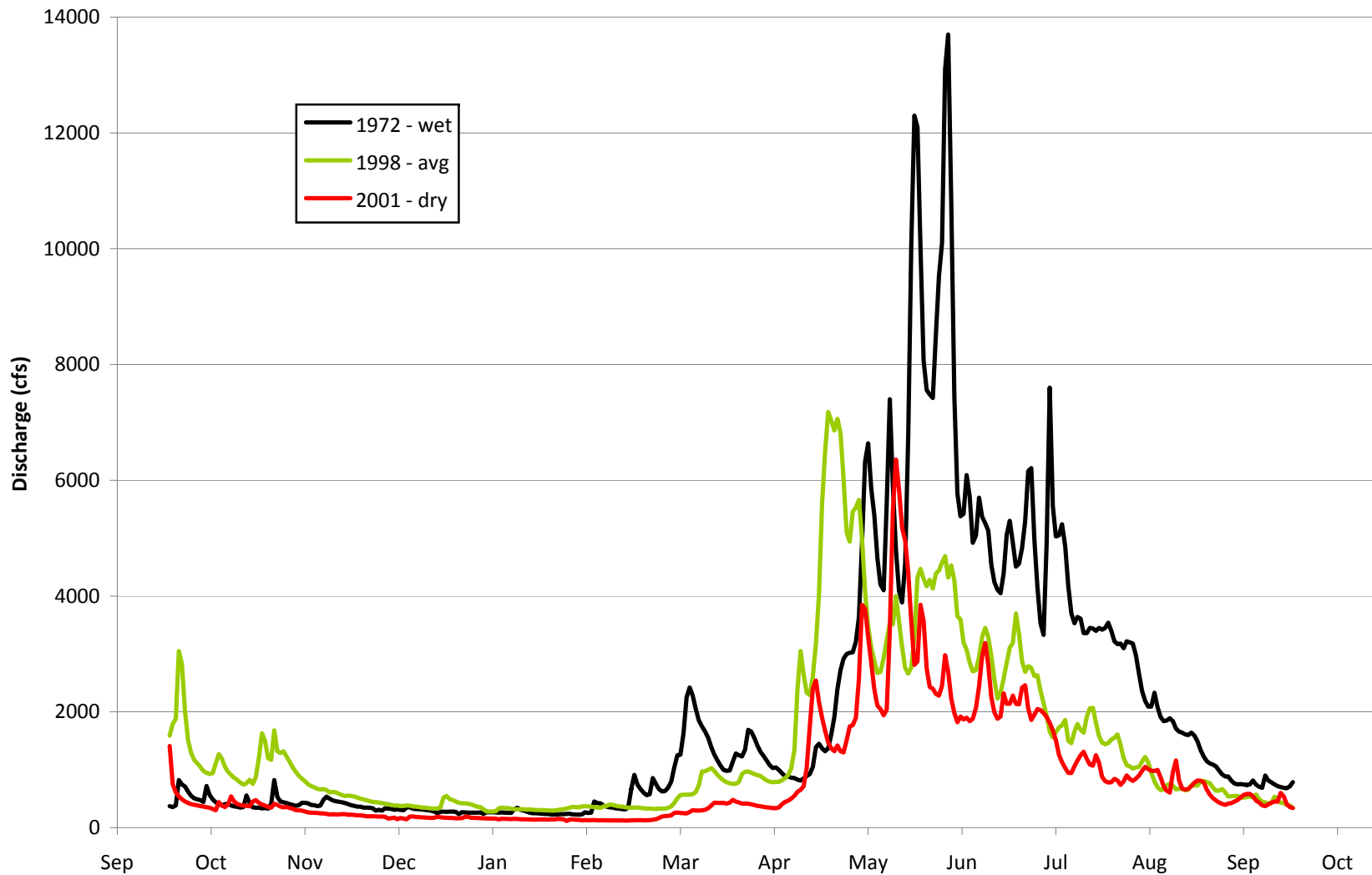
**Figure 2-8 - Stehekin and Chelan River Flow**  
**WRIA 47**



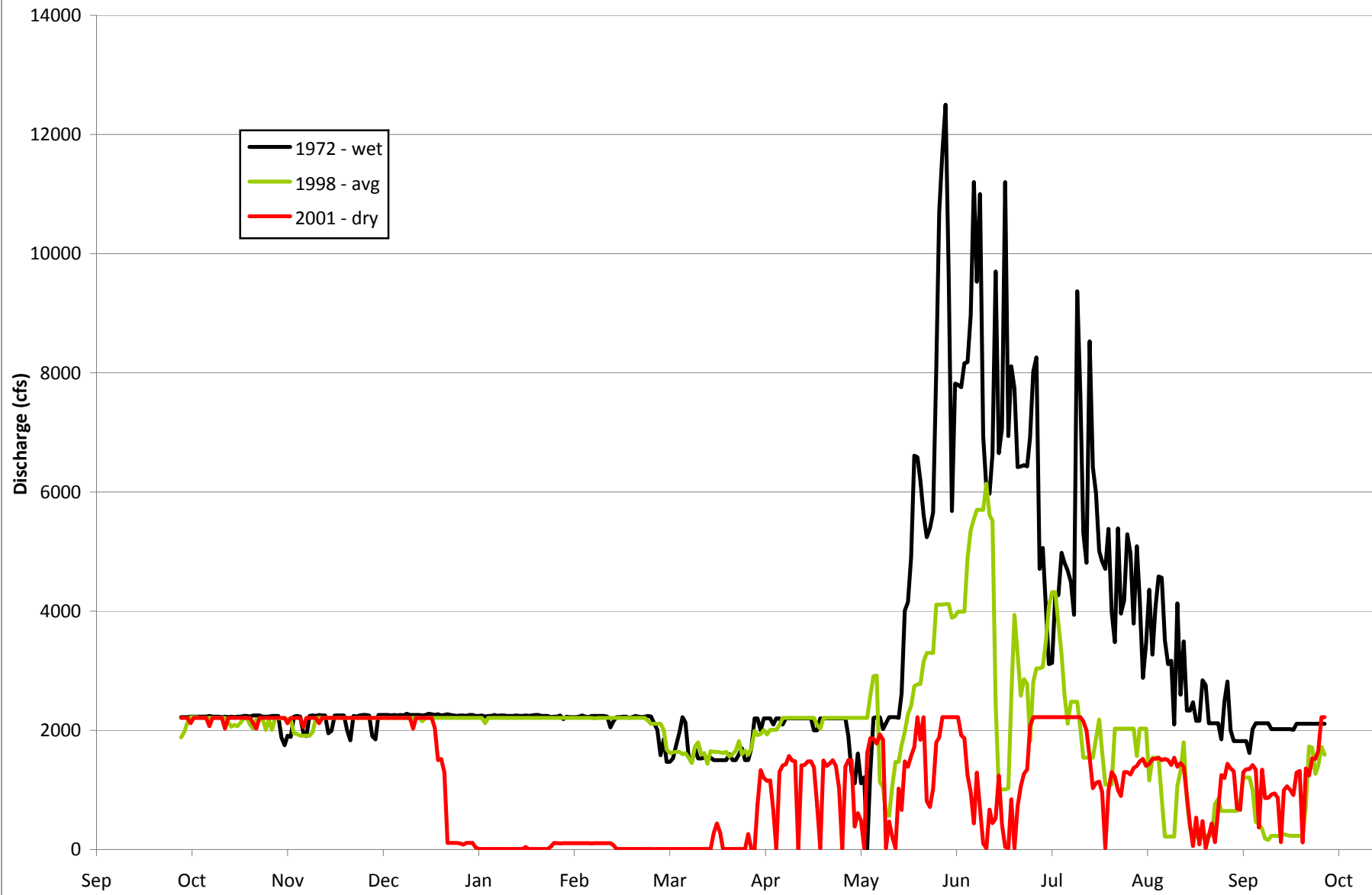
**Figure 2-9 - Monthly Flow from Lake Chelan**  
**WRIA 47**

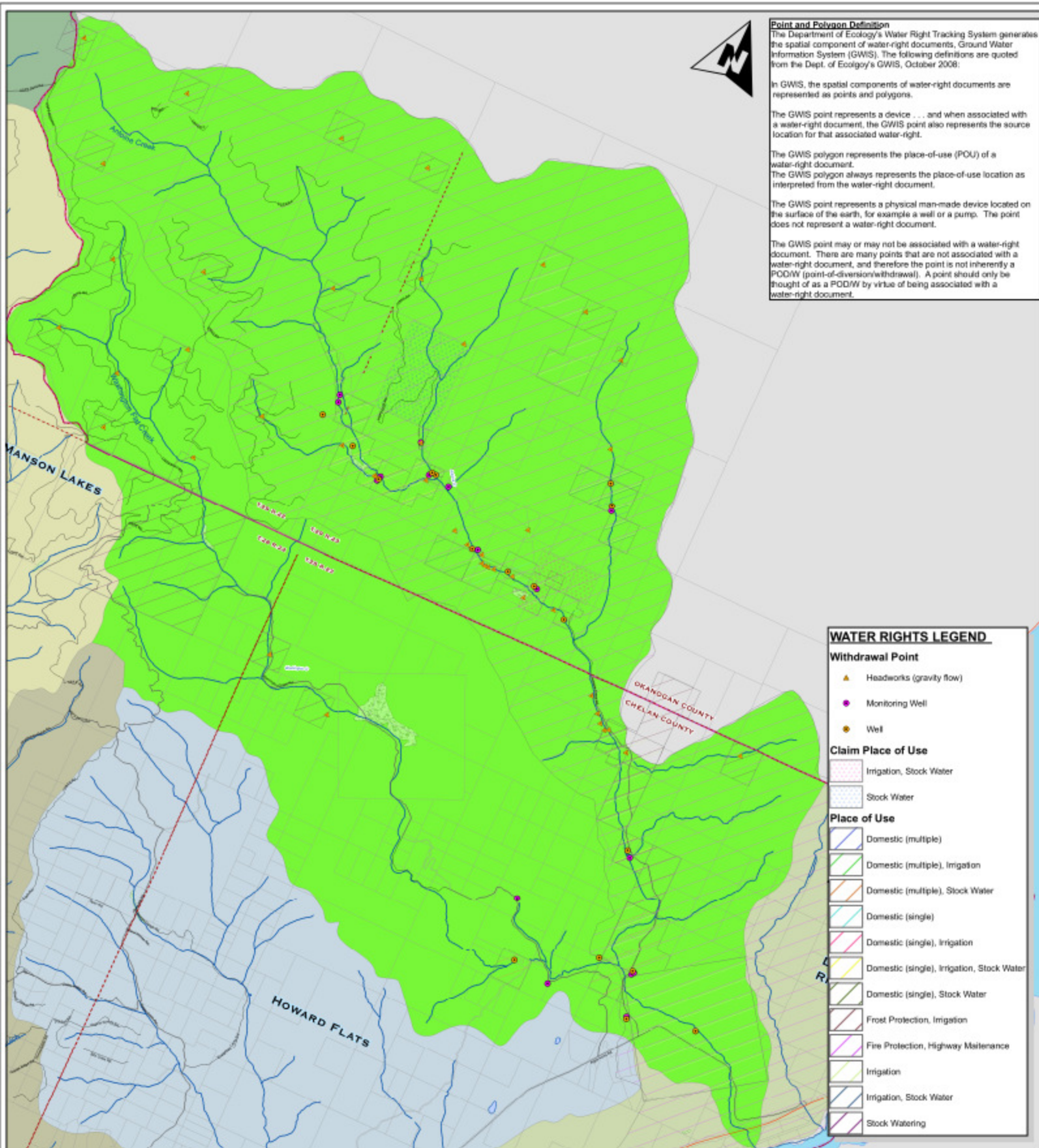


**Figure 2-10 - Average, Dry, Wet Years - Stehekin River  
WRIA 47**



**Figure 2-11 - Average, Dry, Wet Years - Chelan River  
WRIA 47**





## FIGURE 3-1. ANTOINE CREEK SUB-BASIN

PLACE OF USE: POINT OF WITHDRAWALS &  
 WATER-RIGHT BOUNDARY POLYGONS  
 WRIA 47 - LAKE CHELAN  
 WATERSHED PLANNING  
 PHASE II QUANTITY ASSESSMENT



0 0.25 0.5  
 Miles

1 INCH = 0.25 MILES

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Location: c:\Data\GIS\WRM\GIS\MapData\Antoine\_Creek\_POU\_POD\_WRI47.mxd Modified by: dhr on 10/10/08



**Point and Polygon Definition**  
The Department of Ecology's Water Right Tracking System generates the spatial component of water-right documents, the Ground Water Information System (GWIS). The following definitions are quoted from the Dept. of Ecology's GWIS, October 2008:

In GWIS, the spatial components of water-right documents are represented as points and polygons.

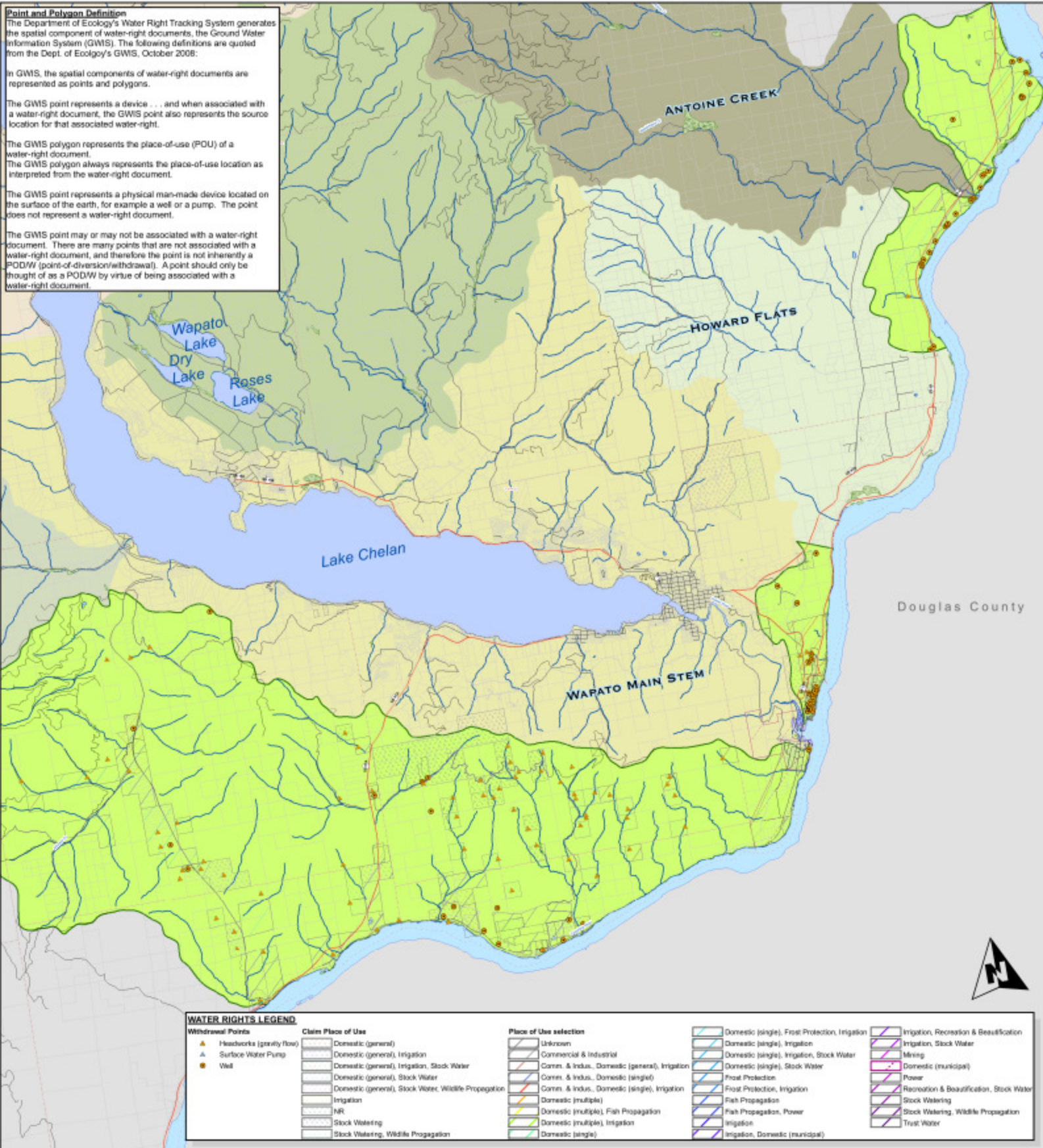
The GWIS point represents a device . . . and when associated with a water-right document, the GWIS point also represents the source location for that associated water-right.

The GWIS polygon represents the place-of-use (POU) of a water-right document.

The GWIS polygon always represents the place-of-use location as interpreted from the water-right document.

The GWIS point represents a physical man-made device located on the surface of the earth, for example a well or a pump. The point does not represent a water-right document.

The GWIS point may or may not be associated with a water-right document. There are many points that are not associated with a water-right document, and therefore the point is not inherently a POD/W (point-of-diversion/withdrawal). A point should only be thought of as a POD/W by virtue of being associated with a water-right document.



**FIGURE 3-2. DIRECT DRAINAGE TO COLUMBIA RIVER  
POINT OF WITHDRAWALS AND WATER-RIGHT  
DOCUMENTS LISTED PURPOSE  
WRIA 47 - LAKE CHELAN  
WATERSHED PLANNING  
PHASE II QUANTITY ASSESSMENT**

**LEGEND**

- Parcels
- Township, Range
- Roads
- Highways
- Water Courses
- Wetlands
- Waterbodies



0 0.25 0.5  
1 INCH = 0.5 MILES



# WATER RIGHTS LEGEND

## Withdrawal Point

Headworks (gravity flow)

Well

## Claim Place of Use

Comm. & Indust., Domestic (multiple), Stock Water

Domestic (general)

Domestic (general), Irrigation

Domestic (general), Irrigation, Stock Water

Domestic (general), Stock Water

Domestic (general), Stock Water, Wildlife Propagation

Irrigation

Irrigation, Stock Water

NR

Other

Stock Water

Wildlife Propagation

Place of Use

Domestic (multiple)

Domestic (multiple), Irrigation

Domestic (single)

Irrigation

Irrigation, Domestic (municipal)



## Point and Polygon Definition

The Department of Ecology's Water Right Tracking System generates the spatial component of water-right documents, the Ground Water Information System (GWIS). The following definitions are quoted from the Dept. of Ecology's GWIS, October 2005:

In GWIS, the spatial components of water-right documents are represented as points and polygons.

The GWIS point represents a device . . . and when associated with a water-right document, the GWIS point also represents the source location for that associated water-right.

The GWIS polygon represents the place-of-use (POU) of a water-right document.

The GWIS polygon always represents the place-of-use location as interpreted from the water-right document.

The GWIS point represents a physical man-made device located on the surface of the earth, for example a well or a pump. The point does not represent a water-right document.

The GWIS point may or may not be associated with a water-right document. There are many points that are not associated with a water-right document, and therefore the point is not inherently a PODW (point-of-diversion/withdrawal). A point should only be thought of as a PODW by virtue of being associated with a water-right document.

# FIGURE 3-3. FIRST CREEK SUB-BASIN

PLACE OF USE: POINT OF WITHDRAWALS &  
WATER-RIGHT BOUNDARY POLYGONS

WRIA 47 - LAKE CHELAN

WATERSHED PLANNING

PHASE II QUANTITY ASSESSMENT

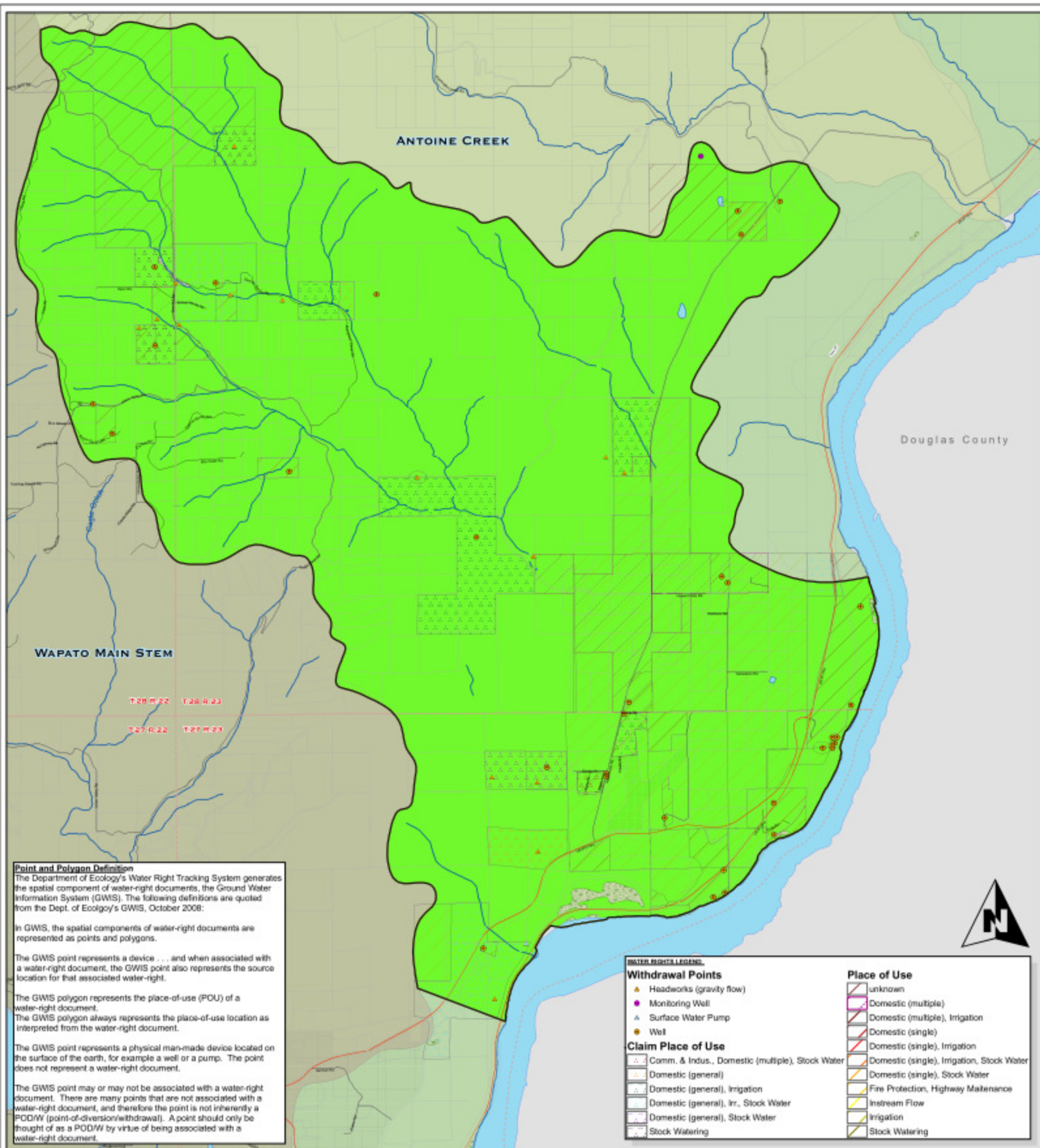
## LEGEND

- Parcels
- Township, Range
- Roads
- Highways
- Water Courses
- Waterbodies
- Wetlands



0 0.2 0.4  
Miles  
1 INCH = 1,056 Feet  
1 INCH = 0.2 MILES





**FIGURE 3-4. HOWARD FLATS SUB-BASIN**  
**PLACE OF USE: POINT OF WITHDRAWALS &**  
**WATER-RIGHT BOUNDARY POLYGONS**  
**WRIA 47 - LAKE CHELAN**  
**WATERSHED PLANNING**  
**PHASE II QUANTITY ASSESSMENT**





## FIGURE 3-5. LUCERNE MAIN STEM SUB-BASIN

POINT OF WITHDRAWALS AND WATER-RIGHT  
DOCUMENTS LISTED PURPOSE

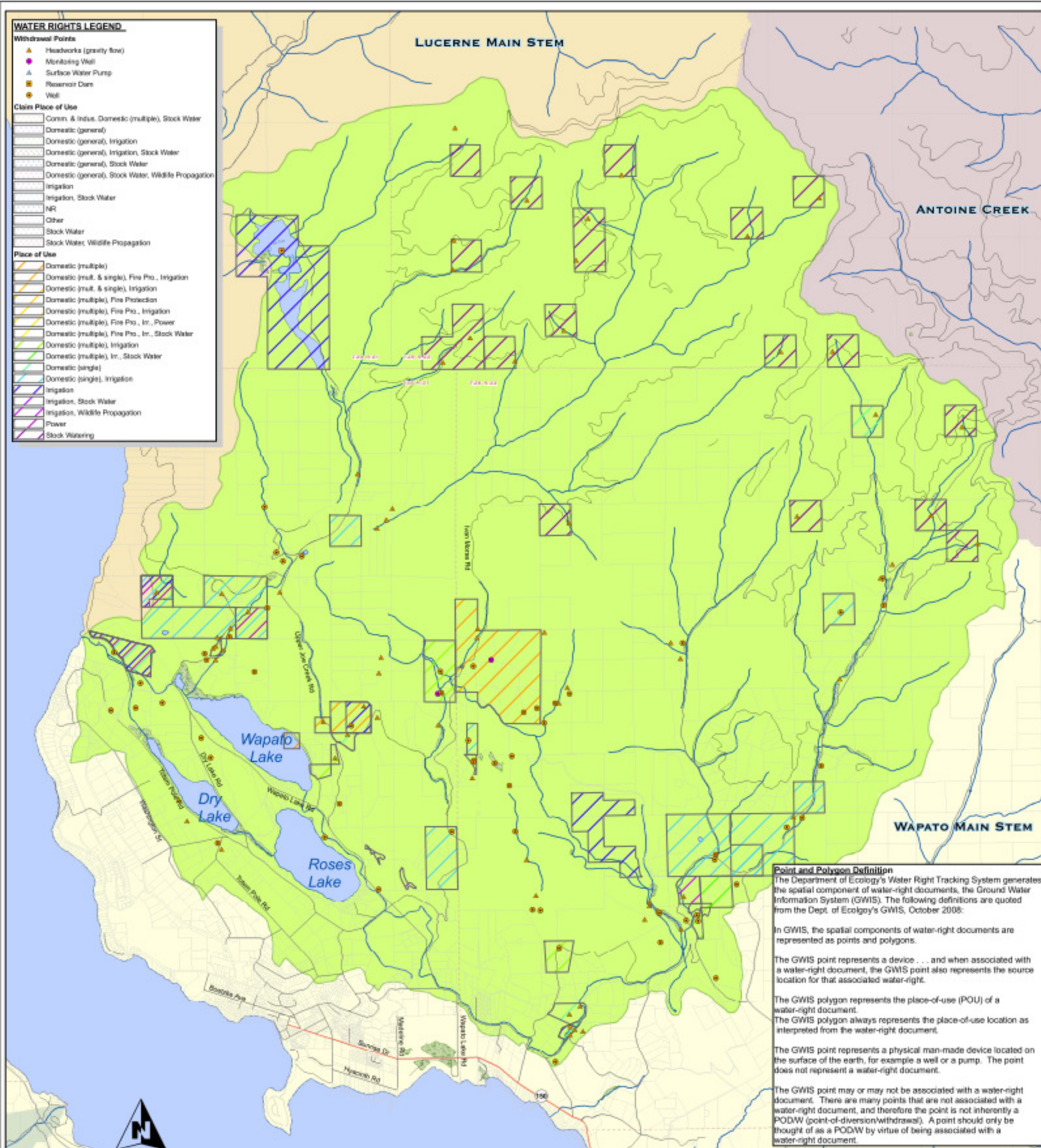
WRIA 47 - LAKE CHELAN WATERSHED PLANNING  
PHASE II QUANTITY ASSESSMENT



0 1 2 Miles  
1 INCH = 1 MILES



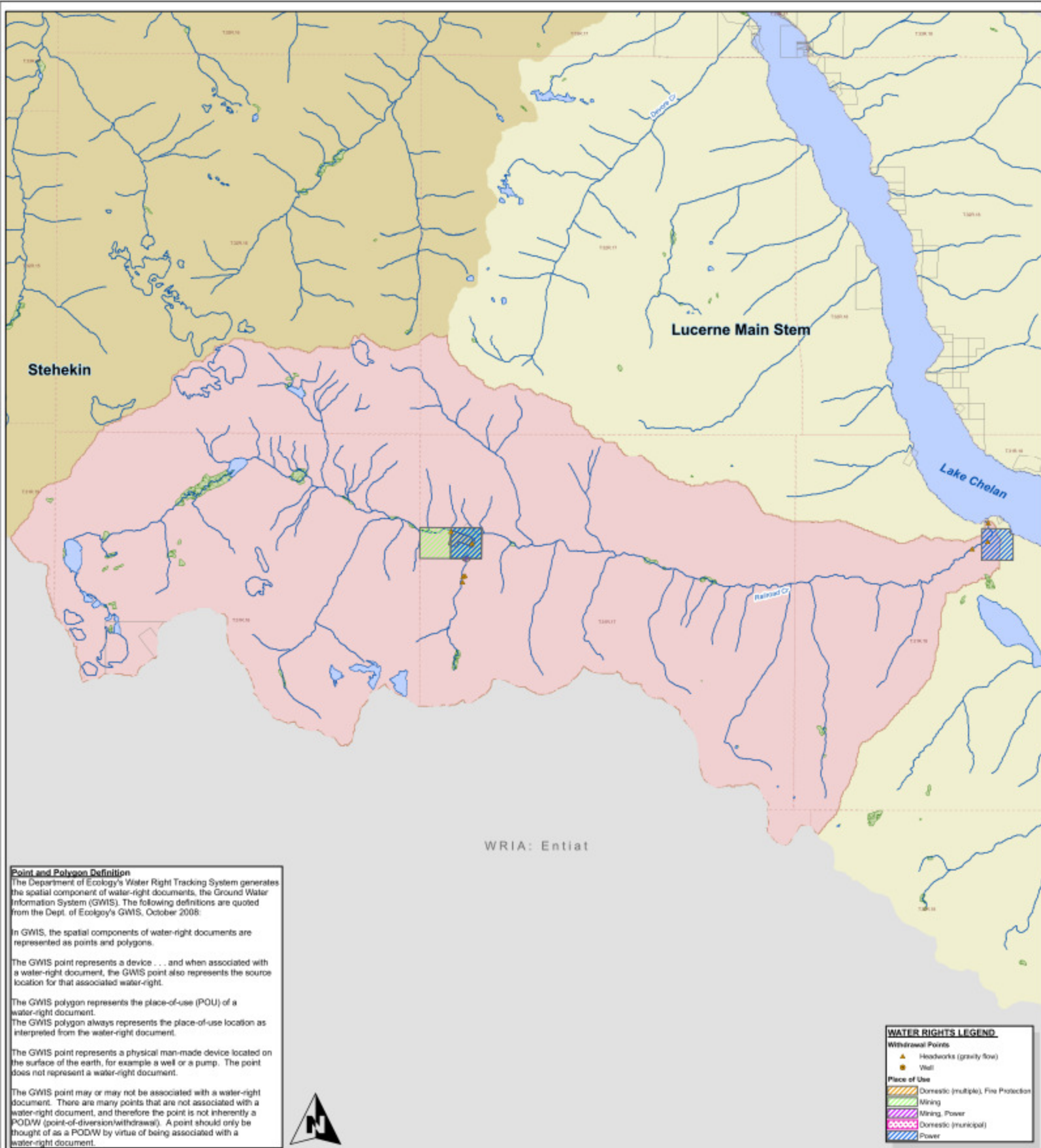




**FIGURE 3-6. MANSON LAKES SUB-BASIN**  
**POINT OF WITHDRAWALS AND WATER-RIGHT**  
**DOCUMENTS LISTED PURPOSE**  
**WRIA 47 - LAKE CHELAN**  
**WATERSHED PLANNING**  
**PHASE II QUANTITY ASSESSMENT**







## FIGURE 3-7. RAILROAD CREEK SUB-BASIN

POINT OF WITHDRAWALS AND WATER-RIGHT  
DOCUMENTS LISTED PURPOSE

WRIA 47 - LAKE CHELAN WATERSHED PLANNING  
PHASE II QUANTITY ASSESSMENT



0 0.5 1  
Miles

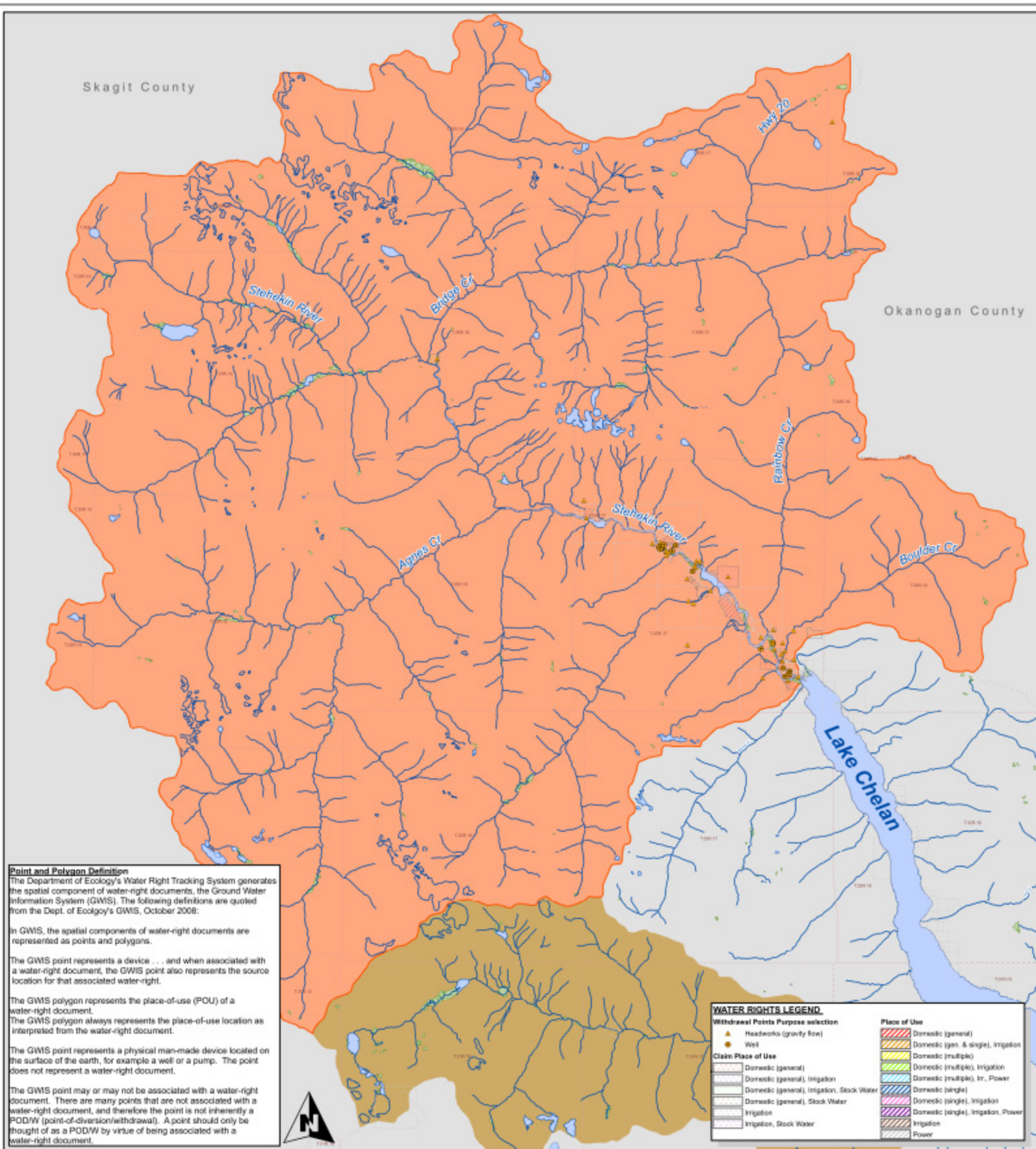
1 INCH = 0.5 MILES

This map is a general representation of the information provided. It is not intended to be used for legal purposes. The map is not a warranty of accuracy. The map is not a representation of the actual situation. The map is not a representation of the actual situation.

### LEGEND

- Parcels
- Township, Range
- Roads
- Highway
- Water Courses
- Wetlands
- Waterbodies





**FIGURE 3-8. STEHEKIN SUB-BASIN**  
**POINT OF WITHDRAWALS AND WATER-RIGHT**  
**DOCUMENTS LISTED PURPOSE**  
**WRIA 47 - LAKE CHELAN WATERSHED PLANNING**  
**PHASE II QUANTITY ASSESSMENT**



0 0.75 1.5  
 Miles

1 INCH = 0.75 MILES

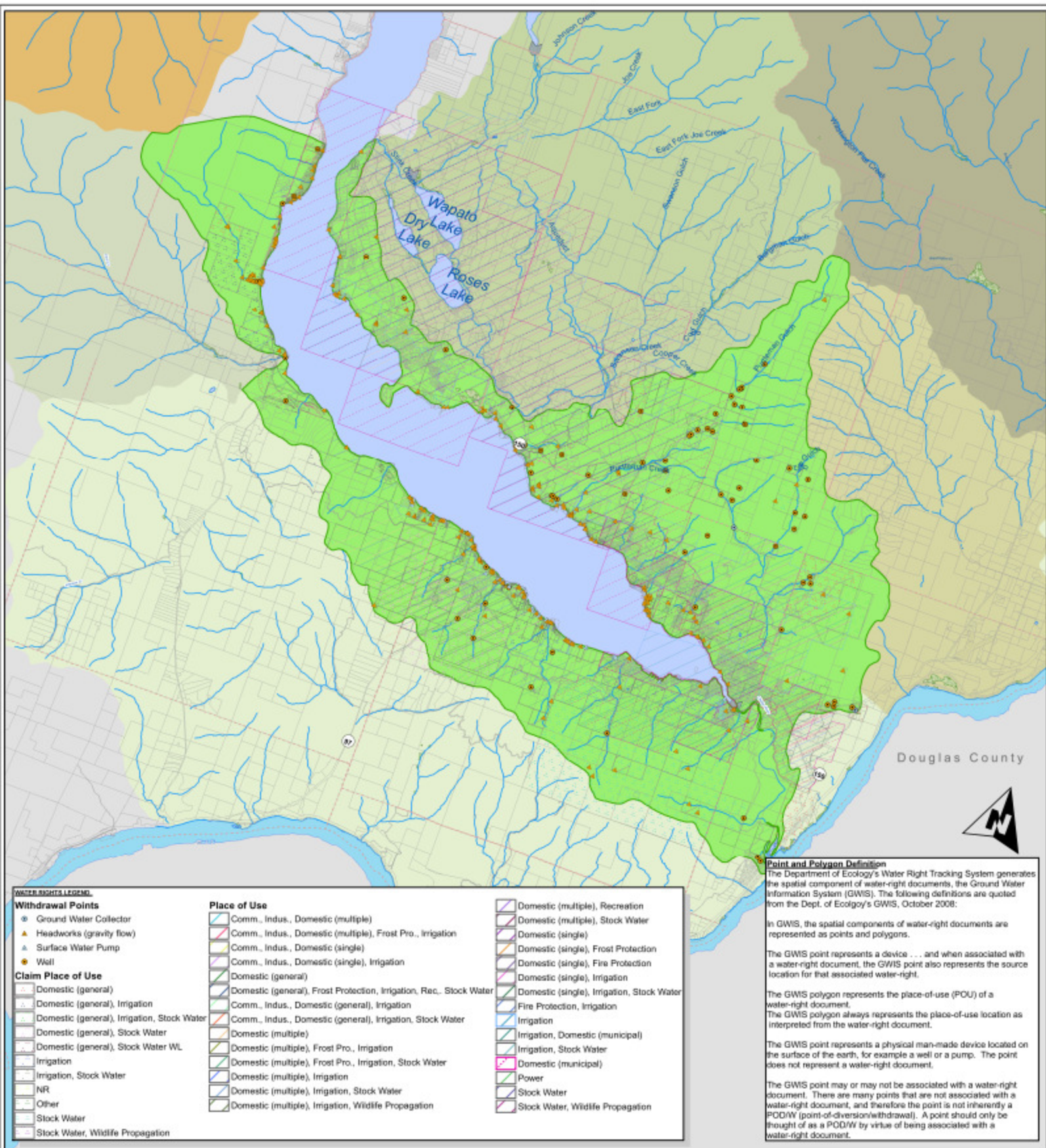
This map is a graphic representation of information available from the Washington Department of Ecology. It is not intended to be used for legal purposes. No warranty is made by the Department of Ecology for the accuracy or completeness of the information shown on this map.











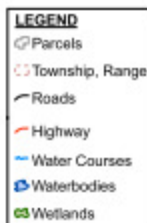
## FIGURE 3-10. WAPATO MAIN STEM SUB-BASIN

POINT OF WITHDRAWALS AND LISTED PURPOSE  
WITH WATER-RIGHTS DOCUMENT  
WRIA 47 - LAKE CHELAN  
WATERSHED PLANNING  
PHASE II QUANTITY ASSESSMENT

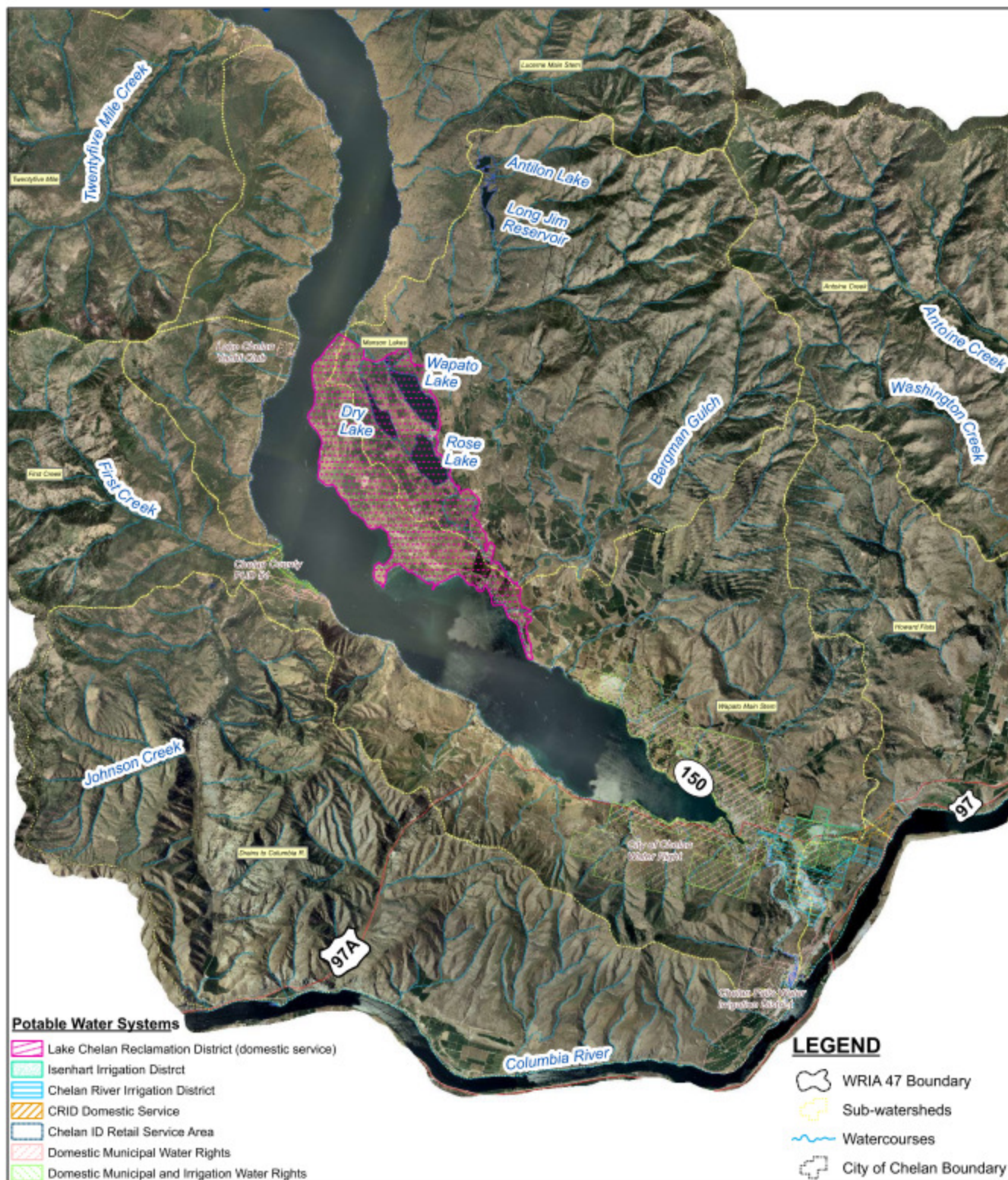


0 0.5 1  
Miles

1 INCH = 0.5 MILES







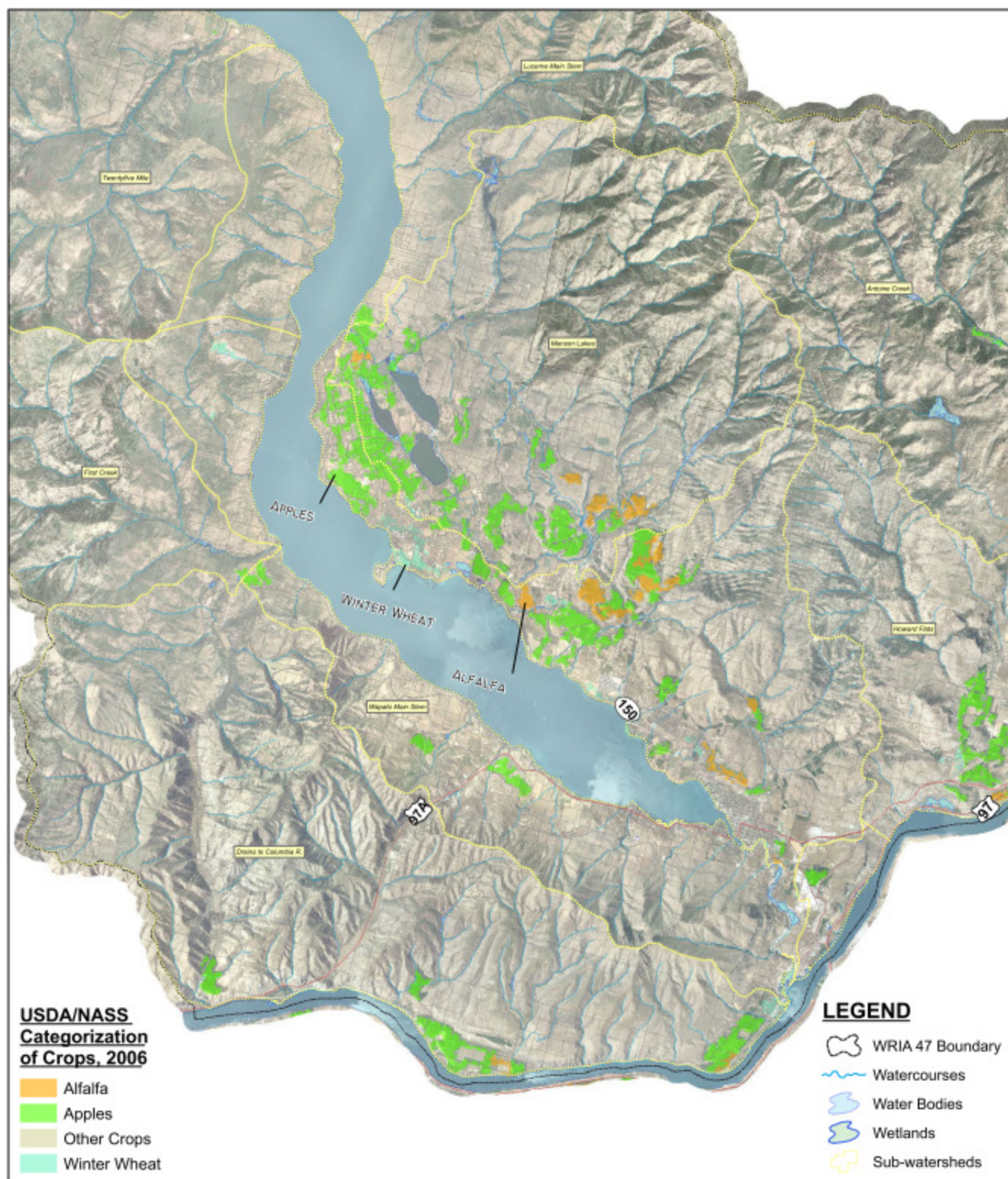
**FIGURE 4-1. POTABLE WATER SYSTEMS  
WRIA 47 - LAKE CHELAN  
WATERSHED PLANNING  
PHASE II QUANTITY ASSESSMENT**

**DATA SOURCES**  
 2008 Imagery: USDA, NAIP, Updated by G. H. 2008  
 Highways: Dept. of Transportation, 2005, Feb. 2008  
 USGS: Lake Chelan Reclamation District, Feb. 2008  
 Potable Water Systems: Dept. of Ecology  
 Water Resources Program, 2008  
 Road: Chelan County, December 2008  
 Water Features: Chelan County April 2008  
 WRIA Boundary: Dept. of Ecology May 2008



**DISCLAIMER**  
 This map is a geographic representation based on information available. It does not represent a warranty. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.





**FIGURE 4-2. CROP COVER  
WRIA 47 - LAKE CHELAN  
WATERSHED PLANNING  
PHASE II QUANTITY ASSESSMENT**

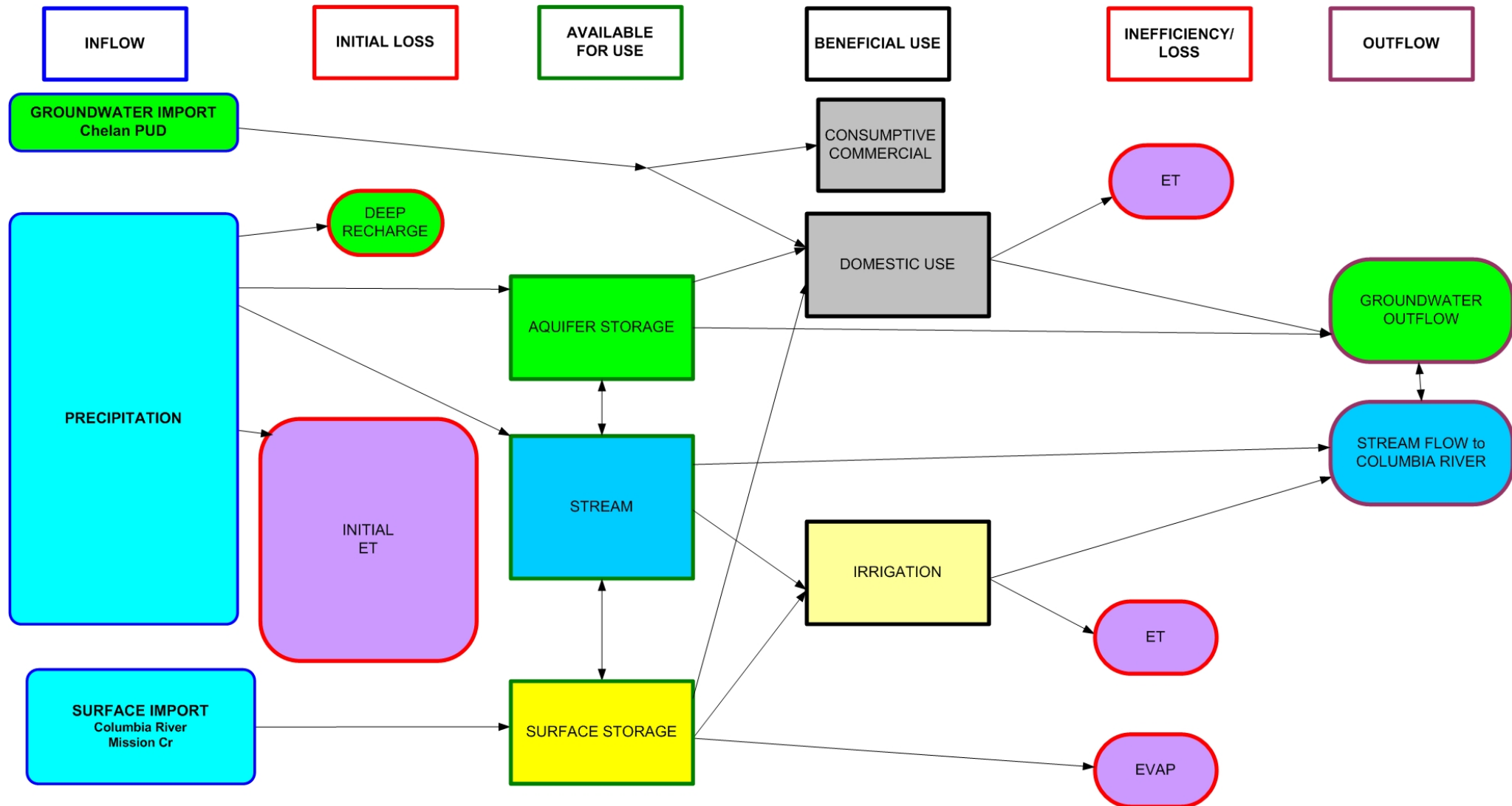
0 0.5 1 2  
MILES  
1 INCH = 0.5 MILES  
Drawing is not at original  
scale if bar is not 4" long.

**DATA SOURCES**  
USDA/NASS, National Agricultural Statistics Service  
(NASS), Research and Development Division, March 2007  
Road: Chelan County, December 2005  
State Wetlands: Chelan County April 2008  
Wetlands: US Fish and Wildlife Service's National  
Wetlands Inventory, Oct. 1988  
WRIA Boundary: Dept. of Ecology, May 2000



**DISCLAIMER**  
This map is a geographic representation based on information available.  
It does not represent current data. No warranty is made concerning the  
accuracy, currency, or completeness of data depicted on this map.

**FIGURE 5-1**  
**WATER BALANCE SCHEMATIC**



**Appendix B**  
**Water Quality Assessment Documents**



**Long-Term Monitoring Plan for Lake Chelan**

WRIA 47 Phase II Watershed Planning  
Chelan County, Washington

*Submitted to:*

**Chelan County Natural Resource Department,  
Wenatchee, WA**

*Submitted by:*

**AMEC Geomatrix, Inc.,  
Lynnwood, WA**

June 2009

Project 13462.002

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Table 2	General Guidelines for Sampling Boundary Conditions
Table 3	General Guidelines for In-Pool Water Quality Sampling
Table 4	Monitoring Recommendations for the Lake Chelan Food Web Model

## FIGURE

Figure 1	Conceptual Diagram Showing Organisms Included in the Lake Chelan Contaminant Food Web Model
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## APPENDICES

Appendix A	Assessment of Water Quality Issues within WRIA 47
Appendix B	Review and Summary of Existing Water Quality Studies within WRIA 47



## ACRONYMS AND ABBREVIATIONS

BOD	biological oxygen demand
BMP	best management practice
CBOD	carbonaceous biological oxygen demand
DO	dissolved oxygen
DOC	dissolved organic carbon
DOM	dissolved organic matter
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
LTMP	long-term monitoring plan
NTR	National Toxic Rule
PCB	polychlorinated biphenyl
POC	particulate organic carbon
POM	particulate organic matter
RCW	Revised Code of Washington
SPMD	semipermeable membrane device
TOC	total organic carbon
TMDL	total maximum daily load
TSS	total suspended solids
WRIA	Water Resource Inventory Area

## **LONG-TERM MONITORING PLAN FOR LAKE CHELAN**

### **WRIA 47 Phase II Watershed Planning**

### **Chelan County, Washington**

#### **EXECUTIVE SUMMARY**

On May 14, 2008, the Water Resource Inventory Area (WRIA) 47 Water Quality Subcommittee met to discuss future objectives for assessing water quality in Lake Chelan. The Subcommittee approved a recommendation to develop and implement a long-term monitoring plan (LTMP) for the lake. This document summarizes the recommendations and ideas proposed by Subcommittee members for the development of a LTMP and provides an initial framework for the plan that focuses on the calibration and application of two models (CE-QUAL-W2 and the Lake Chelan food web model). These models will allow the evaluation of water quality dealing with water clarity, eutrophication, and toxics accumulation in fish tissue.

# **LONG-TERM MONITORING PLAN FOR LAKE CHELAN**

## **WRIA 47 Phase II Watershed Planning**

### **Chelan County, Washington**

#### **1.0 INTRODUCTION**

The Lake Chelan Watershed Planning Unit was created in 2007 to conduct comprehensive watershed planning under Washington State's Watershed Planning Act (Chapter 90.82 RCW). Phase I of the watershed planning process (organization) was completed in January of 2008 (RH2 and Geomatrix, 2008). These activities included identifying all WRIA 47 waterbodies with potentially impaired water quality and identification of the parameters currently on the Clean Water Act 303(d) list (Appendix A). In addition, information collected in all water quality studies conducted in Water Resource Inventory Area (WRIA) 47 since 1972 were reviewed to identify data gaps and to assess whether existing data was sufficient to be able to detect trends in water quality (Appendix B).

Existing water quality concerns within WRIA 47 include elevated fish tissue concentrations of organochlorine pesticides (alpha-BHC, chlordane, DDT, DDE, DDD, and dieldrin), polychlorinated biphenyls (PCBs), and dioxins/furans. In addition, some waterbodies have water quality concerns as a result of elevated total phosphorus concentrations, pH, dissolved oxygen, and the presence of invasive exotic plants. A review of the existing information shows that while a large list of conventional water quality parameters and toxics have been measured in WRIA 47 waterbodies over the last 35 years, there are relatively few parameters that have been consistently measured by the studies. The lack of consistent methods, monitoring stations, and varying frequency of sampling events makes it difficult to assess trends in water quality within WRIA 47.

In May 2008, the WRIA 47 Water Quality Subcommittee (Subcommittee) met to discuss future objectives for assessing water quality in WRIA 47. Water quality issues with the WRIA fall into the three categories listed below:

- Identified impaired water quality and no total maximum daily load (TMDL) has been completed (Lake Chelan for alpha-BHC, chlordane, dieldrin, and dioxin).
- Identified impaired water quality. A TMDL has been completed and a Detailed Implementation Plan is being implemented to address water quality concerns (Lake Chelan for DDT, DDE, DDD, total PCB, total phosphorus; Chelan River for DDT, DDE, DDD, and Roses Lake for DDE).



- Available data suggests that not all beneficial uses for the waterbody may be supported; however, the data is insufficient to list the waterbody as having impaired water quality (Anton, Dry, Roses, and Wapato lakes for total phosphorus; Chelan River for temperature; First Creek for dissolved oxygen; and Wapato Lake for dieldrin).

Of the waterbodies with known water quality concerns, Lake Chelan was the only one that is considered to have impaired water quality and a TMDL has not yet been completed.

Recognizing the importance and unique nature of Lake Chelan, the Subcommittee decided that watershed planning efforts within WRIA 47 should focus on better identifying water quality trends within the lake. The Subcommittee approved a recommendation to develop and implement a long-term monitoring plan (LTMP) for the Lake Chelan. This document summarizes the recommendations and ideas proposed by Subcommittee members for the development of a LTMP and provides an initial framework for the plan. Details regarding sampling locations, analytical methods, and sampling protocols will be provided in a subsequent Quality Assurance Project Plan.

## **2.0 MONITORING PLAN GOALS AND OBJECTIVES**

There is general agreement that the goals of a LTMP should be to address data gaps, identify water quality trends, and provide a proactive monitoring plan for Lake Chelan. The general objectives identified for the LTMP by Subcommittee members are:

- Develop a monitoring design supported by water quality models that can be used to evaluate trends in water quality parameters;
- Evaluate concerns about potential future changes in water clarity and lake eutrophication;
- Develop a monitoring approach for constituents that have completed TMDLs to allow a determination of the effectiveness of post-TMDL remedies (phosphorus, DDT analogs, PCBs);
- Develop a monitoring design for 303(d)-listed constituents in Lake Chelan that have not yet been addressed by completing a TMDL (alpha-BHC, chlordane, dieldrin, dioxins/furans);
- Recommend data quality objectives and analytical methods to ensure greater consistency and comparability of data in the future; and
- Develop a monitoring program that can be used to evaluate best management practices (BMPs) that may be implemented to address water quality concerns.

### 3.0 WATER QUALITY MODELS

Two models are recommended to evaluate water quality issues within Lake Chelan. CE-QUAL-W2 is well suited to evaluate water clarity/eutrophication issues. The Lake Chelan food web model, which is currently under development, models toxics transfer between sediment, water, and the aquatic food chain. These models are described below.

#### 3.1 CE-QUAL-W2

CE-QUAL-W2 is a two dimensional (longitudinal/vertical) water quality and hydrodynamic model supported by the U.S. Army Corps of Engineers Waterway Experiments Station. The model has been under continuous development and enhancement since 1975. The latest upgrade occurred in January 2008 with the release of Version 3.5 (Cole and Wells, 2008). The model has been widely applied to simulate water quality in lakes and reservoirs. CE-QUAL-W2 allows any combination of constituents to be included or excluded from a simulation. Version 3.5 includes the following water quality state variables in addition to temperature:

- Any number of generic constituents defined along with a decay rate and/or settling velocity and/or Arrhenius temperature rate multiplier to define a conservative tracer, hydraulic residence time, coliform bacteria, or contaminants;
- Any number of phytoplankton, periphyton, macrophyte, and zooplankton groups;
- Nutrients (ammonium, nitrate-nitrite, bioavailable phosphorus);
- Inorganic and organic carbon (labile and refractory and dissolved and particulate species);
- Alkalinity, dissolved oxygen, pH; and
- Organic sediment contributions to nutrients and dissolved oxygen.

CE-QUAL-W2 models basic eutrophication processes such as temperature-nutrient-algae-dissolved oxygen-organic matter and sediment relationships. Application of this model to Lake Chelan would provide a comprehensive framework for understanding relationships among water quality parameters and provide a tool to predict how water quality would be impacted by future changes in nutrient loads or implementation of BMPs.

Application of the model requires that the lake be divided into segments which are arranged in a series along the longitudinal axis of the lake. Three input files (bathymetry file, control file, and meteorological file) must be created for each model application. Data needs for applying the model require information for a water balance (inflows, surface water elevation, and



outflows), inflow constituent concentrations, and longitudinal and vertical profiles specifying initial conditions for each cell.

### **3.2 LAKE CHELAN FOOD WEB MODEL**

Lake Chelan has been listed under Section 303(d) of the Clean Water Act for non-attainment of the U.S. Environmental Protection Agency's (EPA's) National Toxic Rule (NTR) criteria for DDE (a degradation product of the insecticide DDT) and PCBs in edible fish tissue. The Washington State Department of Ecology (Ecology) completed a TMDL for DDE and PCBs in 2005. Fish samples collected in the Wapato Basin of Lake Chelan during 2003 showed that fillets from burbot, kokanee, and LAKE trout had total DDT concentrations that exceeded the NTR human health criteria for DDT in fish tissue (32 µg/kg). Fillets for kokanee and lake trout also exceeded the NTR human health criteria for total PCBs in fish tissue (5.3 µg/kg).

Lake Chelan has also been listed for non-attainment of the NTR human health criteria for chlordane, dieldrin, and dioxin/furans in fish tissue based on the analysis of lake trout samples collected near the mouth of Stick Creek during October 2000. TMDLs have not been conducted for these chemicals.

In 2006, the Lake Chelan Water Quality Committee initiated efforts to develop a Lake Chelan food web model (Figure 1). The objective for the initial development of the model was to predict tissue concentrations of DDT and its breakdown products DDE and DDD in the three fish species (burbot, kokanee, and lake trout) that exceed NTR criteria. The modified version of the 1993 Gobas food web bioaccumulation model (Gobas, 1993) was selected to examine the distribution of DDT, DDE, and DDD within Lake Chelan sediments, water, and aquatic biota (Arnot and Gobas, 2004; Gobas and Arnot, 2005). This model has gained general scientific acceptance for predicting chemical residues in aquatic food webs and has been used in a substantial number of scientific and regulatory applications (Burkhard, 1998; Gobas and Arnot, 2005; Gobas et al., 1991; Kelly and Gobas, 2003; Walker and Gobas, 1999). A description of the model theory is provided by Arnot and Gobas (2004). The model can be used to examine the partitioning of sediment DDT to pore water and the overlying water column and to examine the accumulation of DDT in aquatic species from the water and diet. The model simulates two chemical uptake processes: intake via respiratory surfaces and dietary uptake. Four chemical elimination processes are also simulated: elimination via the respiratory surfaces, excretion, chemical metabolism, and growth.

The initial parameterization of the model was completed in March 2006 (Geomatrix, 2006). The final model calibration for DDT analogs, which was originally scheduled for completion prior to June 30, 2009, was discontinued due to funding cuts. This model could be applied to

include the other toxics compounds for which TMDLs have not yet been completed (chlordane, dieldrin, and dioxin/furans).

Additional monitoring data that are recommended to reduce model uncertainties include:

- Water column concentrations of dissolved organic carbon (DOC) and particulate organic carbon (POC);
- Tissue concentrations of toxics in key prey species (three-spine stickleback, peamouth chub, mysids); and
- Synoptic data set for toxics concentration in sediment, pore water, and benthic biota.

Once the model is calibrated, it can be used to address important management questions. Some examples include:

- Predict the fraction of tissue contaminants that are derived from water, sediment, and diet.
- How will sediment deposition trends affect tissue concentrations? Total DDT concentration in Wapato Basin sediments increase with depth. Over the depth range of 7 to 0 cm, total DDT concentrations decrease approximately 110  $\mu\text{g/kg}$  with each 1 cm of deposition (i.e., more recent sediments have lower DDT concentrations). Using an estimate of the sediment deposition rate, the model can predict how fish tissue concentrations will change based on future changes in sediment concentrations.
- How will changes in contaminant loads from tributaries and irrigation drains affect fish tissue concentrations?
- The model predicts tissue concentrations increase with fish size. What sizes of burbot, kokanee, or lake trout are predicted to have tissue concentrations below the National Toxics Rule?
- Given predicted changes in fish tissue concentration over time, what monitoring interval should occur to be able to detect statistically significant changes?

#### **4.0 MONITORING PARAMETERS AND FREQUENCY OF SAMPLING**

Monitoring programs that are designed around the calibration of models typically have an intensive first phase that is designed to collect sufficient data to calibrate the model. This is followed by less frequent sampling as the model allows a greater understanding of the system and better prediction of the sampling intervals that are necessary to capture measurable changes in parameters. A discussion of the parameters and frequency of sampling is provided for each of the models discussed above.

#### 4.1 CE-QUAL-W2

This model categorizes constituents into four levels, depending on whether they affect phytoplankton/nutrient/dissolved oxygen dynamics and whether they are transported longitudinally or vertically within the lake (Table 1). In order to evaluate water clarity/eutrophication issues in Lake Chelan, Level II and Level IV constituents will need to be monitored. Given the low productivity and steep nearshore bathymetry of most of the lake, Level III constituents are likely not necessary for an understanding of lake eutrophication trends.

Calibration of the model requires monitoring data for the boundary conditions. Boundary conditions frame the grid area that is simulated by the model. Surface boundary conditions and hydraulic parameters are required for model application boundary conditions for inflows; outflows are optional.

Surface boundary conditions include the following:

- **Surface heat exchange** – calculated from latitude, longitude, air temperature, dew point temperature, wind speed and direction, and cloud cover;
- **Solar radiation absorption** – solar radiation is determined from latitude, longitude, and date. Distribution of solar radiation in the water column is controlled by the fraction of radiation absorbed in the surface layer (user specified) and the attenuation rate due to water, inorganic, and organic suspended solids (if modeled);
- **Wind stress** – this boundary condition is determined from wind speed and direction; and
- **Gas exchange** – wind speed is also used for computing gas exchange at the water surface if dissolved oxygen and/or total inorganic carbon are simulated.

Hydraulic boundary conditions include the following:

- **Dispersion/diffusion coefficients** – the model allows selection of default values for horizontal dispersion coefficients for momentum and temperature. The model is relatively insensitive to variation in these values. Vertical diffusion coefficients for momentum and temperature vary in time and space and are computed by the model.
- **Bottom friction** – user can enter different values for the Chezy coefficient or Manning's N for bottom friction for each model cell.

Inflow boundary conditions include the following:

- **Upstream inflows (optional)** – Model provides an option to distribute inflows evenly throughout the inflow segment (farthest up-lake segment – likely would be



located in the lower Lucerne Basin) or distribute flows according to density. If this option is used, then a separate file is needed for inflow, temperature, and all constituents that are being modeled (Table 2);

- **Tributary inflows (optional)** – If this option is selected, then the same data requirements as upstream inflow are required for each tributary. If the model was setup to examine the lower Lucerne and Wapato basins, potential tributaries to include would be Twenty-Five Mile Creek, Stink Creek, First Creek, Knapp Coulee Creek, and Purttman Creek.
- **Distributed tributary inflows (optional)** – these flows represent non-point source inflows that are distributed throughout a segment weighted by the segment surface area. It is unlikely that initial inflows would be specified. However, through the calibration process inflows could be specified to obtain a better fit to collected data. Nutrient input via septic systems or groundwater influx of contaminants could be modeled using this boundary parameter.

Outflow boundary conditions include the following:

- **Downstream outflows (optional)** – for Lake Chelan this would be the water leaving the lake at Chelan Dam. The model allows specification of the depth interval over which water outflow occurs.
- **Lateral withdrawals (optional)** – this option could be used if water loss for human consumption and/or irrigation has a significant impact on the water balance (unlikely).
- **Evaporation (optional)** – this is calculated from air and dew point temperature and wind speed.

As noted above, several of the boundary condition parameters are provided by the model as default values, or are calculated from meteorological data that can be obtained from local or regional reporting stations. The minimum requirement for each boundary cell (upstream inflow or tributary) would be to monitor temperature, total organic carbon, soluble reactive and total phosphorus, nitrate+nitrite, and ammonium (Table 2). Table 2 also shows additional parameters that would substantially improve the predictive capability of the model. Cole and Wells (2008) recommend a weekly sampling frequency that includes capturing storm events. This frequency, while desirable, would not be necessary for an initial calibration of the model. Monthly sampling is recommended for collecting data to calibrate the portion of the lake being modeled (Table 3).

Monitoring data is also needed for each model segment established to simulate water quality conditions in the lake. Each segment would span the width of the lake and a specified longitudinal distance upstream. Typically these segments are setup to capture only one tributary inflow, if that option is being simulated. The minimum amount of monitoring data

would collect data from several depths at one location in the middle of the cell. Multiple sites could be sampled if lateral variability is suspected (if this is determined, the model can be setup to evaluate branch segments). Table 3 shows the minimum number of parameters required to simulate the eutrophication features of the model. Additional parameters that would substantially enhance the predictive capability of the model are also shown in Table 3. All of the parameters shown except phytoplankton biomass and type and biological oxygen demand are recommended for initial model calibration.

#### **4.2 LAKE CHELAN FOOD WEB MODEL**

Section 3.2 identified additional data that would assist in the initial calibration of the food web model. Once the model is calibrated, it is recommended that the parameters shown in Table 4 be monitored at a frequency of once every 3 to 5 years. Fish tissue and mid-lake sediment samples were last collected in Lake Chelan in 2003. The collection and evaluation of data with the Lake Chelan food web model would provide the effectiveness monitoring required for the DDT and PCB TMDL and perhaps meet the requirements for completing a TMDL for chlordane, dieldrin, and dioxins/furans.

#### **5.0 NEXT STEPS**

The next steps in completing a long-term monitoring plan for Lake Chelan will include the following:

- Watershed Planning Committee approval of the application of the models recommended in this report (or alternative models);
- Watershed Planning Committee approval of the constituents to be monitored and the sampling frequency and design;
- Completion of a Quality Assurance Plan for the monitoring program; and
- Implementation of the plan once funding is secured.

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**TABLES**

**TABLE 1**  
**CONSTITUENT LEVEL CATEGORIES IN CE-QUAL-W2**  
 WRIA 47 Phase II Watershed Planning  
 Chelan County, Washington

Level	Group Characterization	Constituent
I	No interaction with phytoplankton/nutrient/ DO dynamics	Total dissolved solids
		General constituents
		Inorganic suspended solids
II	Affect phytoplankton/nutrient/DO dynamics	Dissolved inorganic Phosphorus
		Ammonium
		Nitrate-Nitrite
		Dissolved silica
		Particulate biogenic silica
		Total iron
		Labile and refractory DOM
		Labile and refractory POM
		CBOD
		DO
		zooplankton
		phytoplankton
III	Constituents that interact with Level II constituents but are not transported	Periphyton
		Organic sediments
		Macrophytes
IV	Necessary for computing pH and carbonate species; Model state variables	Total inorganic carbon
		Alkalinity

#### Abbreviations

BOD: biological oxygen demand  
 CBOD: carbonaceous biological oxygen demand  
 DO: dissolved oxygen  
 DOM: dissolved organic matter  
 POM: particulate organic matter

**TABLE 2**  
**GENERAL GUIDELINES FOR SAMPLING BOUNDARY CONDITIONS**  
 WRIA 47 Phase II Watershed Planning  
 Chelan County, Washington

Minimum Parameters	Additional Parameters	Sampling Frequency
Inflow and Outflow Temperature	Conductivity, DO, pH Total Dissolved Solids <sup>1</sup>	Daily or continuous
TOC	DOC, POC, BOD <sup>2</sup>	Weekly, with storm sampling
Soluble Reactive Phosphorus Total Phosphorus	Total Dissolved Phosphorus Total Inorganic Phosphorus Dissolved Inorganic Phosphorus	Weekly, with storm sampling
Nitrate + Nitrite Ammonium	Total Kjeldahl Nitrogen Dissolved Kjeldahl Nitrogen	Weekly, with storm sampling
	TSS <sup>3</sup>	Weekly, with storm sampling
	Chlorophyll a Dissolved silica <sup>4</sup> Alkalinity	Weekly, with storm sampling

#### Notes

1. Enough samples to correlate to conductivity (important for density effects).
2. Used to characterize decay rates of organic matter.
3. Suspended solids affect phosphorus partitioning, light penetration, and density.
4. May be limiting for diatom growth.

#### Abbreviations

BOD: biological oxygen demand  
 DO: dissolved oxygen  
 DOC: dissolved organic carbon  
 POC: particulate organic carbon  
 TOC: total organic carbon  
 TSS: total suspended solids

**TABLE 3**  
**GENERAL GUIDELINES FOR IN-POOL WATER QUALITY SAMPLING**  
 WRIA 47 Phase II Watershed Planning  
 Chelan County, Washington

Minimum Parameters	Additional Parameters	Sampling Frequency
Temperature <sup>1</sup> , DO <sup>1</sup> , pH <sup>1</sup> Conductivity <sup>1</sup>	Total Dissolved Solids <sup>2</sup>	Monthly
Chlorophyll <i>a</i> <sup>3</sup>	Phytoplankton biomass and type (e.g., diatoms, green, blue-green)	Monthly
TOC <sup>3</sup>	DOC, POC, BOD	Monthly
Soluble Reactive Phosphorus <sup>3</sup> Total Phosphorus <sup>3</sup>	Total Dissolved Phosphorus Total Inorganic Phosphorus Dissolved Inorganic Phosphorus	Monthly
Nitrate + Nitrite <sup>3</sup> Ammonium <sup>3</sup>	Total Kjeldahl Nitrogen Dissolved Kjeldahl Nitrogen	Monthly
	Secchi depth/light transmission	Monthly
	Total inorganic carbon Alkalinity TSS	Monthly

**Notes**

1. Preferably biweekly; samples should be taken at 1-meter intervals.
2. Enough samples to correlate with conductivity.
3. Minimum number of samples includes one each in epilimnion, metalimnion, and hypolimnion; preferred sampling would be at 3-meter intervals.

**Abbreviations**

BOD: biological oxygen demand  
 DO: dissolved oxygen  
 DOC: dissolved organic carbon  
 POC: particulate organic carbon  
 TOC: total organic carbon  
 TSS: total suspended solids

**TABLE 4**  
**MONITORING RECOMMENDATIONS FOR THE LAKE CHELAN FOOD WEB MODEL**  
 WRIA 47 Phase II Watershed Planning  
 Chelan County, Washington

Parameter	Sample Description	Sampling Frequency
TMDL fish species <sup>1</sup>	Composite fillets without skin	3 to 5 years
Key prey species <sup>2</sup>	Composite whole-body	3 to 5 years
TMDL constituents in sediment <sup>3</sup>	Several samples along mid-lake transect	3 to 5 years
Freely dissolved TMDL constituents <sup>3</sup>	SPMD deployments for approximately 30 days	3 to 5 years

Notes

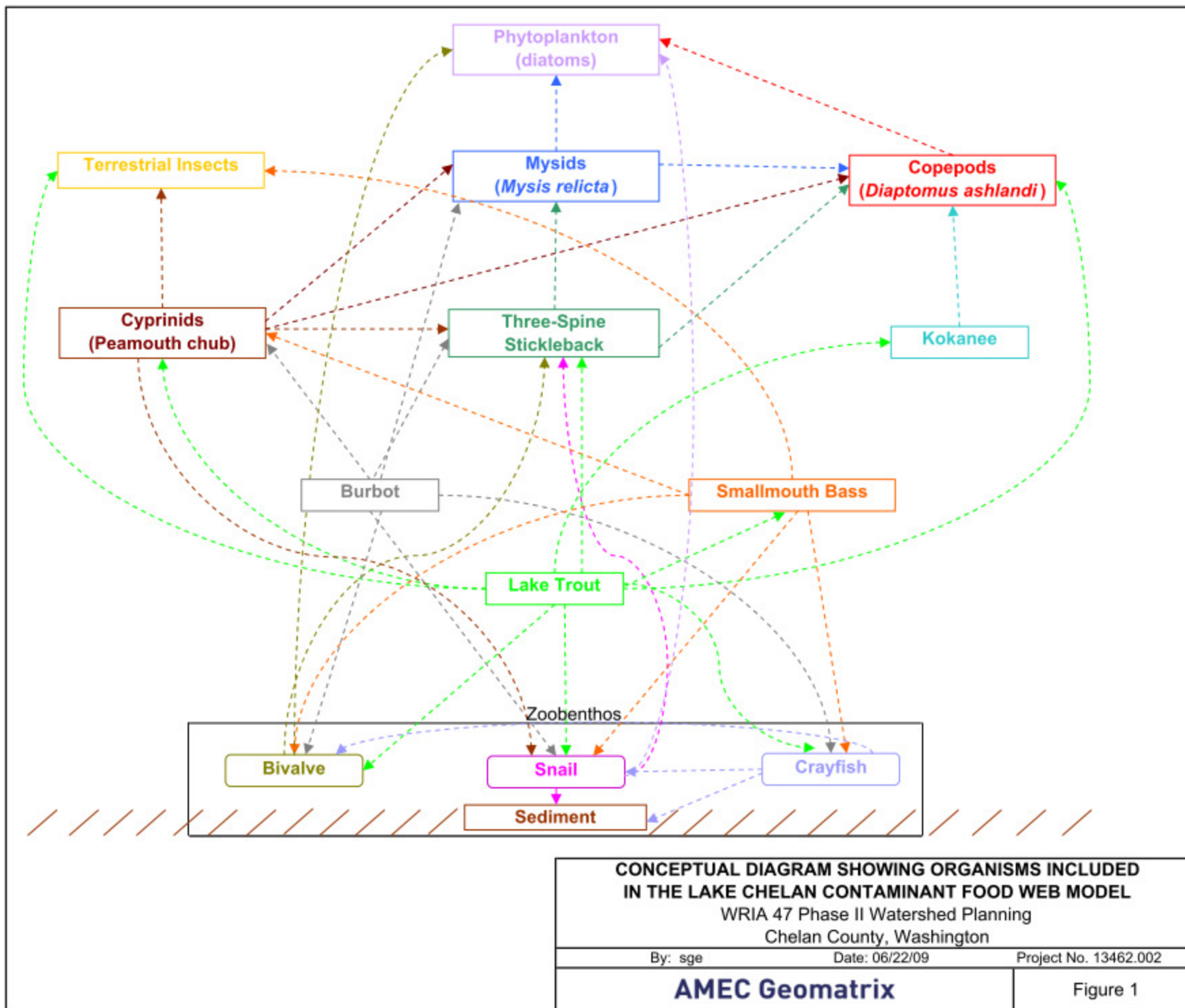
1. Burbot, kokanee, lake trout.
2. Mysids, three-spine stickleback.
3. Chlordane, dieldrin, dioxins/furans, DDT analogs, polychlorinated biphenyls (PCBs).

Abbreviations

SPMD: semipermeable membrane device  
 TMDL: total maximum daily load

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**FIGURES**



Assessment of Water Quality Issues Within WRIA 47



## Memo

To: Paul Cross, RH2 Engineering, Inc. Project: 13462.002.0  
From: Steve Ellis, Ph.D. cc. Mike Kaputa, Chelan County  
Tel: (425) 921-4000 Natural Resource Department  
Fax: (425) 921-4040  
Date: December 21, 2009

**Subject:** Assessment of Water Quality Issues Within WRIA 47,  
WRIA Phase II Watershed Planning

This memorandum describes the five reporting categories for classifying the water quality status of waters within Washington State, identifies the parameters and waterbodies within Water Resource Inventory Area (WRIA) 47 listed in these categories, and discusses the requirements for developing a pollution control plan that would allow water quality issues to be addressed through the Category 4B process. This information is intended to assist the initiating governments (Chelan County, City of Chelan, and the Lake Chelan Reclamation District) to make decisions regarding the actions that may occur during Phase II water quality planning within WRIA 47.

### Water Quality Categories

The U.S. Environmental Protection Agency (EPA) advocates the use of a five-part categorization format for classifying water quality for state reporting requirements under Sections 303(d), 305(b), and 314 of the Clean Water Act (EPA, 2005). State reporting requirements under these regulations are summarized below (EPA, 2005):

- **Section 303(d)** – By April 1 of all even-numbered years, a list of impaired and threatened<sup>1</sup> waters still requiring total maximum daily loads (TMDLs); identification of the impairing pollutant(s); and priority ranking of these waters, including waters targeted for TMDL development within the next 2 years.
- **Section 305(b)** – By April 1 of all even-numbered years, a description of the water quality of all waters of the state.
- **Section 314** – In each Section 305(b) submittal an assessment of status and trends of significant publicly owned lakes including extent of point source and nonpoint source impacts due to toxics, conventional pollutants, and acidification.

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<sup>1</sup> EPA recommends that states consider as threatened those waters that are currently attaining water quality standards, but which are expected to not meet standards by the next listing cycle (2 years).

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The Washington State Department of Ecology (Ecology) uses the following five category system for classifying water quality within the state.

- **Category 1** – All designated uses are supported, no use is threatened. Parameters listed under this category for a waterbody are those that have been analyzed and found to meet applicable water quality standards.
- **Category 2** – Available data and/or information indicate that not all beneficial uses are fully supported. Ecology designates waters under Category 2 as “waters of concern.” Examples of situations for this listing include: (1) not enough violations of water quality standards have been documented to categorize it as impaired according to Ecology’s listing policy (Ecology, 2006a); (2) data showing water quality violations may not have been collected using proper scientific methods<sup>2</sup>; or (3) a waterbody might have pollution levels that are not quite high enough to violate water quality standards (Ecology, 2004a).
- **Category 3** – Insufficient data and/or information are available to make beneficial use support designation. Ecology does not list waterbodies that have not been tested, but if they do not appear in one of the other categories, they are assumed to be under Category 3 (Ecology, 2004a).
- **Category 4** – Available data and/or information indicate that at least one designated use is not being supported or is threatened, but a TMDL is not needed. Three subcategories are used to indicate why a TMDL is not required (Ecology, 2004a):
  - **Category 4A** – A TMDL has been completed and approved by EPA. The actions described in the TMDL to come into compliance with water quality standards are being implemented.
  - **Category 4B** – A TMDL is not required because an approved pollution control plan is in place. Pollution control plans have many of the same features as TMDLs and there must be some legal or financial guarantee that they will be implemented.
  - **Category 4C** – The waterbody is impaired by a non-pollutant that cannot be addressed through a TMDL. Examples of non-pollutants include low water flow, stream channelization, dams, and invasive exotic species.
- **Category 5** – Available credible data<sup>2</sup> indicate that at least one designated use is not being supported or is threatened, and a TMDL is required.

Waterbodies that have Category 5 parameters that are not meeting water quality standards comprise what is called the 303(d) list. New listings are initiated by Ecology’s “call for data”; the most recent 60-day period for data submission closed on November 7, 2006. The submitted

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<sup>2</sup> The Water Quality Data Act codified in RCW 90.48.570 through 90.48.590 requires that Ecology shall use credible data for determining whether any surface water of the state is supporting its designated use or other classification. Data are considered credible only when appropriate quality assurance and quality control procedures were followed and documented in collecting and analyzing water quality samples.

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data is assessed in accordance with Ecology Policy 1-11 (Ecology, 2006a, 2006b). The most recent draft 303(d) list was published for public review and comment during February 5 – March 21, 2008 and April 16 – 30, 2008. Following the review of public comments, Ecology submitted an integrated report<sup>3</sup> that included the candidate 303(d) list for EPA approval on June 23, 2008. The 2008 water quality assessment and updated 303(d) list was approved by EPA on January 29, 2009.

Ecology Policy 1-11 (Ecology, 2006a) describes the minimum amount of data that is required for a Category 5 listing and over what historical period the data are considered representative of current conditions. The Policy indicates that data submitted by the public which are less than 5-years old and meet the requirements outlined in the policy will be consolidated and assessed with other data of the same waterbody segment and parameter. Data older than 5 years will only be considered by Ecology on a case-specific basis. This 5-year requirement differs from the Category 5 assessment methodology described in Section 6 of the Policy, which states that *“newly submitted data will be added to previously assessed data that are less than 10-years old.”*

The Category 5 determination requirements vary for different water quality parameters. For toxic pollutants, a waterbody segment will be placed in Category 5 due to a toxic pollutant in the water column when two or more samples within a 3-year period exceed the applicable criteria. The segment will also be placed in Category 5 if either the mean of three single-fish samples for a given pollutant or one composite sample made up of at least five fish exceeds the applicable criteria (Ecology, 2006a).

### **Water Quality Listings within WRIA 47**

Table 1 lists the waterbodies and parameters listed under Categories 2 through 5 in WRIA 47 based on the latest approved 303(d) list which was approved by EPA on January 29, 2009.

Several waterbodies have Category 5 listings based on measurements of contaminant concentrations in fish tissue or water:

- In Lake Chelan the listed constituents are organochlorine pesticides (chlordane, dieldrin, alpha-BHC) and dioxins.
- In the Columbia River the listed constituents are organochlorine pesticides (4,4'-DDD, 4,4'-DDE), total PCB, and temperature.

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<sup>3</sup> EPA (2005) recommends that States submit an integrated report that satisfies the reporting requirements of sections 303(d), 305(b), and 314.

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- Category 5 listings for the Manson Lakes area east of the Lake Chelan Wapato/lower Lucerne basins include dissolved oxygen (Joe Creek, Stink Creek, Wapato Lake outflow), and total phosphorus (Dry Lake and Roses Lake).
- Category 5 listings for creeks discharging to the upper Lucerne Basin in Lake Chelan include lead (Copper Creek, Holden Creek, and Railroad Creek) and copper, mercury, and silver (Railroad Creek).

Approved TMDLs completed for total phosphorus in 1993, and DDT compounds and PCBs in 2006 have resulted in these contaminants being classified as Category 4A in the 2008 303(d) list. TMDL effectiveness monitoring for total phosphorus in Lake Chelan was conducted in 2007 (Sargeant, 2007). The water quality improvement plan for DDT compounds and PCBs in Lake Chelan and the Chelan River was submitted for EPA approval on August 5, 2008.

Several waterbodies (Lake Chelan, Chelan River, Columbia River, Dry First Creek, Mitchell Creek, and Wapato Lake) have parameters listed under Category 2 (waters of concern). The listing basis for these parameters is based on limited data collected five or more years ago; therefore, monitoring is needed to confirm the Category 2 listings for these waterbodies.

The state reporting requirements for the Integrated report<sup>3</sup> that is submitted to EPA requires that Ecology submit a schedule and prioritization for the establishment of TMDLs for waters with a Category 5 listing. Ecology's TMDL prioritization and scheduling process is a 5-year process consisting of the following steps:

- Year 1: Scoping;
- Years 2 and 3: Data collection and analysis;
- Year 4: Development of a plan of action; and
- Year 5: Implementation.

The 2008 water quality assessment approved by EPA indicates that the TMDL process for Category 5 waters in WRIA 47 will occur from 2011 to 2116 (Ecology, 2009).

### **Category 4B Requirements**

EPA guidance recognizes that alternative pollution control requirements may substitute for the need to complete a TMDL (EPA, 2005). Segments within waterbodies are not required to be included on the Section 303(d) list if: *“technology-based effluent limitations required by the [Clean Water] Act, more stringent effluent limitations required by state, local, or Federal authority, or other pollution control requirements (e.g., best management practices) required by*

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*local, state, Federal authority are stringent enough to implement applicable water quality standards within a reasonable period of time."*

Ecology (2004b) provides the following criteria that must be met for a Category 5 constituent to be proposed for listing under Category 4:

- Have enforceable pollution controls or actions stringent enough to attain the water quality standard of standards;
- Be problem-specific and waterbody-specific;
- Have reasonable time limits established for correcting the specific problem, including for interim targets when appropriate;
- Have a monitoring component;
- Have adaptive management built into the plan to allow for course corrections if necessary;
- Be feasible, with enforceable legal or financial guarantees that implementation will occur; and
- Be actively and successfully implemented and show progress on water quality improvements in accordance with the plan.

Ecology (2004b) indicates that the timeframe for correcting the impairment will be considered reasonable if it is as fast as practical given full cooperation of all parties involved and if it is similar to the timeframe that would be developed under a TMDL. Monitoring must be scheduled to verify that the water quality standards or interim targets are attained as expected. Modeling may be required to show that attainment of water quality standards is likely. Documentation must be provided to clearly explain and support how the pollution control plan meets the criteria for each specific pollutant and waterbody.

Ecology (2004b) provides five examples of successful pollution control plans that justified listings under Category 4B. The example most relevant to watershed planning efforts in WRIA 47 is the Category 4B listing for temperature in WRIA 46. The approved Entiat WRIA 46 Management Plan developed as part of watershed planning efforts in this watershed was reviewed by Ecology and was determined to meet the criteria for listing under Category 4B.

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**APPENDIX TABLE**



**TABLE 1**  
**WATER QUALITY LISTINGS WITHIN WRIA 47**  
Chelan County, Washington

Category	Waterbody	Parameter	Medium	Listing Basis
5 <sup>1</sup>	Lake Chelan	Chlordane	Tissue	EPA National Lake Fish Tissue Study shows an excursion beyond the National Toxics Rule criterion in lake trout composite samples collected on 10/09/2000 at one location (off Stink Creek).
		Dieldrin	Tissue	EPA National Lake Fish Tissue Study shows an excursion beyond the National Toxics Rule criterion in lake trout composite samples collected on 10/09/2000 at one location (off Stink Creek).
		Dioxin	Tissue	EPA National Lake Fish Tissue Study shows an excursion beyond the National Toxics Rule criterion in lake trout composite samples collected on 10/09/2000 at one location (off Stink Creek).
		Alpha-BHC	Tissue	Hopkins et al. (1985) show excursions beyond the National Toxic Rule criterion in composite samples of edible tissue from bridgelip sucker and northern squawfish; samples were collected in 1984.
5 <sup>1</sup>	Columbia River	Temperature	Water	Washington Department of Fish and Wildlife data (submitted September 1995) show numerous excursions beyond the criterion at the inflow to Wells Hatchery.
		4,4'-DDD	Tissue	Fillet samples of northern pikeminnow and mountain whitefish collected from Lake Entiat in 2004 exceeded the National Toxics Rule criterion.
		4,4'-DDE	Tissue	Fillet samples of northern pikeminnow, peamouth, and mountain whitefish collected from Lake Entiat in 2004 exceeded the National Toxics Rule criterion.
		Total PCB	Tissue	Fillet samples of northern pikeminnow, peamouth, and mountain whitefish collected from Lake Entiat in 2004 exceeded the National Toxics Rule criterion.
5 <sup>1</sup>	Copper Creek	Lead	Water	Samples collected on 5/23/97 and 7/11/97 exceeded chronic water quality criterion.
5 <sup>1</sup>	Dry Lake	Total Phosphorus	Water	In 2002, the summer epilimnetic mean concentration of total phosphorus exceeded the action value for this ecoregion (35 µg/L).
5 <sup>1</sup>	Holden Creek	Lead	Water	Samples collected on 5/19/97, 7/10/97, 9/15/97, and 10/4/97 exceeded chronic water quality criterion.
5 <sup>1</sup>	Joe Creek	Dissolved Oxygen	Water	In 2003, 4 of 11 samples (36.4%) showed an excursion of the criterion.



**TABLE 1**  
**WATER QUALITY LISTINGS WITHIN WRIA 47**  
Chelan County, Washington

Category	Waterbody	Parameter	Medium	Listing Basis
5 <sup>1</sup>	Railroad Creek	Copper	Water	Samples collected during April - June 1997, May 1998, May 2001, and June 2002 exceeded chronic water quality criterion.
		Lead	Water	Samples collected during May - July and September 1997 exceeded chronic water quality criterion.
		Mercury	Water	Samples collected on 5/19/97, 5/22/97, and 7/10/97 exceeded chronic water quality criterion.
		Silver	Water	Two samples collected on 5/20/97 exceeded chronic water quality criterion.
5 <sup>1</sup>	Roses Lake	Total Phosphorus	Water	In 2002 the summer epilimnetic mean concentration of total phosphorus samples exceeded the action value for this ecoregion (35 µg/L). Data from 2005 shows a value below the action value (34.5 µg/L).
5 <sup>1</sup>	Stink Creek	Dissolved Oxygen	Water	In 2002, 2003, and 2004 greater than 10 percent of the samples collected exceeded the water quality criterion.
5 <sup>1</sup>	Wapato Lake	Dissolved Oxygen	Water	In 2003, 5 of 11 samples collected from the Wapato Lake outflow exceeded the water quality criterion.
4A <sup>2</sup>	Lake Chelan	4,4'-DDD	Tissue	Composite samples of burbot, kokanee, and lake trout and individual samples of rainbow trout and lake trout exceeded the National Toxics Criterion.
		4,4'-DDE	Tissue	Composite samples of burbot, kokanee, and lake trout and individual samples of rainbow trout and lake trout exceeded the National Toxics Criterion.
		4,4'-DDT	Tissue	Composite samples of burbot, kokanee, and lake trout and individual samples of rainbow trout and lake trout exceeded the National Toxics Criterion.
		Total PCB	Tissue	TMDL approved Sept. 11, 2006.
		Total phosphorus	Water	TMDL approved Jan. 26, 1993.
4A <sup>2</sup>	Roses Lake	4,4'-DDE	Tissue	Fillet samples of largemouth bass collected in 2003 exceeded the National Toxics Rule criterion.
4C <sup>3</sup>	Lake Chelan	Invasive exotic species		Eurasian water-milfoil.
4C <sup>3</sup>	Domke Lake	Invasive exotic species		Eurasian water-milfoil.

**TABLE 1**  
**WATER QUALITY LISTINGS WITHIN WRIA 47**  
Chelan County, Washington

Category	Waterbody	Parameter	Medium	Listing Basis
4C <sup>3</sup>	Roses Lake	Invasive exotic species		Eurasian water-milfoil.
4C <sup>3</sup>	Wapato Lake	Invasive exotic species		Eurasian water-milfoil.
2 <sup>4</sup>	Lake Chelan	pH	Water	Hallock (2001) Dept. of Ecology Ambient Monitoring Station 47A070 (Chelan R @ Chelan) shows 1 excursion beyond the criterion out of 12 samples collected between 1993 - 2001.
		Temperature	Water	Anchor Environmental, 2000, shows the 7-day mean of maximum daily values was exceeded throughout July and August 2002.
2 <sup>4</sup>	Chelan River	Temperature	Water	Anchor Environmental, 2000, shows the 7-day mean of maximum daily values was exceeded throughout July and August 2002.
2 <sup>4</sup>	Columbia River	Temperature	Water	Hallock (2001) Dept. of Ecology Ambient Monitoring Station 47B070 (Columbia R @ Chelan Station) shows 1 excursion beyond the criterion out of 9 samples collected between 1993 - 2001.
		Dioxin	Tissue	Fillet samples of mountain whitefish collected in 2004 exceeded the National Toxics Rule criterion.
2 <sup>4</sup>	First Creek	Dissolved oxygen	Water	Patmont et al. (1989), two excursions beyond the criterion, at the mouth, between 12/86 and 11/87.
2 <sup>4</sup>	Joe Creek	pH	Water	In 2003, 1 of 11 samples (9.1%) showed an excursion of the criterion (1 high ph excursion).
2 <sup>4</sup>	Mitchell Creek	pH	Water	Patmont et al. (1989), two excursions beyond the criterion out of 13 samples (15%), at the mouth, on 7/28/87 and 6/16/87.
2 <sup>4</sup>	Wapato Lake	Dieldrin	Tissue	Johnson (1997) shows one estimated excursion beyond the criterion in a composite of 8 rainbow trout fillets collected in 1996.

**Note(s)**

1. Data exists showing water quality standards have been violated and there is no TMDL or pollution control plan. TMDL is required.
2. An approved TMDL exists and is being implemented.
3. Impaired by a non-pollutant that cannot be addressed through a TMDL.
4. Waters of concern. Some evidence of a water quality problem, but not enough to require production of a TMDL at this time.

Review and Summary of Existing Water Quality Studies Within WRIA 47

**Memo**

To: Paul Cross, RH2 Engineering, Inc.    Project: 13462.002.0  
From: Steve Ellis, Ph.D.    cc. Mike Kaputa, Chelan County  
Tel: (425) 921-4000    Natural Resource Department  
Fax: (425) 921-4040  
Date: December 21, 2009

**Subject:** Review and Summary of Existing Water Quality Studies Within WRIA 47,  
WRIA Phase II Watershed Planning

This memorandum provides an overview and summary of water quality studies that have been conducted within Water Resource Inventory Area (WRIA) 47. In addition, information is presented to evaluate our ability to detect trends using the historical data. This information is intended to assist the initiating governments (Chelan County, City of Chelan, and the Lake Chelan Reclamation District) that are leading the Phase II watershed planning efforts in WRIA 47 to make decisions regarding the need for water quality planning and the development of a long-term monitoring program within the watershed.

**Existing Data**

Publicly available reports, memoranda, and databases that present water quality data or discuss water quality conditions within WRIA 47 over the last 40 years were reviewed. An annotated bibliography of the sources of information identified is provided in Attachment A. Attachment A also identifies briefing memoranda and quality assurance project plans (QAPPs) that contain compilations of historical data.

Table 1 identifies the water quality parameters that have been analyzed within WRIA 47 by 16 studies conducted from 1972 to 2007. The table shows that while a large list of conventional water quality parameters and toxics have been measured, there are relatively few parameters that have been consistently measured by the various studies. Common parameters that were monitored in at least half of the studies, in order of decreasing frequency, include temperature, conductivity, pH, nitrate+nitrite, total phosphorus, total suspended solids (TSS), dissolved oxygen (DO), and turbidity.

Bacteria were commonly analyzed in studies conducted prior to 1995, but have not been analyzed in more recent studies. Analysis of metals was conducted as part of a comprehensive water quality study of Lake Chelan conducted during 1986-1987. However, with the exception of monitoring studies conducted in the vicinity of Holden Mine, no recent data have been collected. A comprehensive examination of a large suite of organic compounds has only occurred at one site within WRIA 47. Stink Creek water samples were analyzed for 161

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pesticide and pesticide degradation products as part of a statewide pesticide monitoring program. Table 1 lists the 33 pesticides detected within Washington State.

Water quality sampling within WRIA 47 has occurred mainly within the Wapato Basin of Lake Chelan, Manson Lakes, and in the vicinity of Holden Mine. The sampling locations for surface water data contained in the Washington State Department of Ecology's (Ecology) EIM database for WRIA 47 and studies conducted by AMEC Geomatrix, Inc., is shown on Figure 1.

Water quality is often interpreted more broadly than just the analysis of water and can include information on sediment quality and contaminant concentrations in biota. A list of studies that have information on these other types of data in WRIA 47 is included in Attachment B.

### **Water Quality Trends**

Temporal trends in water quality are ideally determined through the implementation of a statistically-based monitoring program which collects data at designated stations using consistent methods and analytical techniques. Most of the studies that have collected data within WRIA 47 (see Table 1 and Figure 1) were conducted to meet study-specific objectives (see Attachment A) that did not include evaluation of long-term trends in water quality.

Monitoring efforts that were designed by Ecology to evaluate trends include the following:

- Total Maximum Daily Load (TMDL) effectiveness monitoring for phosphate; and
- Ecology water quality monitoring at Station A7A070 near the Lake Chelan outlet.

Phosphorus was identified as the limiting nutrient for aquatic plant growth in Lake Chelan during a comprehensive lake-wide study sponsored by Ecology in 1986-1987 (Patmont et al., 1989). Ecology completed a TMDL for total phosphorus (TP) in 1991 that established a management goal of maintaining the ultra-oligotrophic condition of the Lake Chelan (Pelletier, 1991). This goal was to be met by ensuring that TP loads for various land uses to the lake do not result in a mean epilimnetic (i.e., the upper portion of the water column) TP concentration exceeding 4.5 µg/L.

In 1995 and 1996, the mean epilimnetic TP concentration was measured in the Wapato Basin of Lake Chelan (Congdon, 1996; Sargeant, 1997). In 1995, the mean TP concentration was 2.2 µg/L; in 1996, the mean TP concentration was 2.6 µg/L. Both of these values are statistically less than the TP concentration measured in 1987 (3.5 µg/L). The 1996 TP concentration is also statistically greater than the 1995 TP concentration. All three studies (1987, 1995, and 1996) used different analytical laboratories, different analytical methods, and different sampling personnel. Since we are unable to assess how these study differences may affect the comparability of the data sets, attributing the changes to a "trend" has a large amount

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of uncertainty. However, the three studies do provide confirmation that TP concentrations in the Wapato Basin are below the TP management goal of 4.5 µg/L.

In 2007, Ecology collected samples to calculate the mean epilimnetic TP concentration in the Wapato Basin (Sargeant, 2007). Sampling stations and collection methods were identical to Ecology's 1996 study. The QAPP did not identify the analytical method that would be used to analyze TP; however, it recommended that methods that could reach lower detection limits than were achieved in 1996 be considered (Sargeant, 2007). The data collected in 2007 has not yet been published, and it is unknown whether any quality assurance procedures were implemented to address any changes in analytical methods. However, the 2007 data, along with the historical data, should help assess TP concentration trends in the Wapato Basin.

Another data set that can be used to assess TP trends in Lake Chelan is monitoring data collected by Ecology at Station 47A070, located near the lake outlet close to Chelan Dam. Water grab samples collected monthly or bi-monthly have been analyzed for TP from 1971 to 1994. The data for each month of the year over this time period is shown on Figures 2 to 7. No statistically significant change in TP concentration occurred at this monitoring location over the 23-year period. However, it should be noted that the high detection limit (10 µg/L) and large number of non-detects in this data set make trends difficult to assess.

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**References:**

- Congdon, G., 1996, Epilimnetic Water Quality in the Wapato Basin of Lake Chelan Summer 1995: Prepared for Lake Chelan Water Quality Committee, Wenatchee, Washington.
- Patmont, C.R., Pelletier, G.J., Welch, E.B., and Ebbesmeyer, C.C., 1989, Lake Chelan Water Quality Assessment: Prepared by Harper Owes, Inc., for Washington State Department of Ecology, Olympia.
- Pelletier, G., 1991, Lake Chelan TMDL for Total P: Washington State Department of Ecology, Publication No. 91-e50, Olympia.
- Sargeant, D., 1997, Water Quality in the Wapato Basin of Lake Chelan, Summer 1996: Washington State Department of Ecology, Publication No. 97-323, Olympia.
- Sargeant, D., 2007, Quality Assurance Project Plan – Lake Chelan Wapato Basin Total Phosphorous TMDL Effectiveness Monitoring, 2007: Washington State Department of Ecology, Publication No. 07-03-109, Olympia.

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**APPENDIX TABLE**



TABLE 1

WATER QUALITY PARAMETERS ANALYZED WITHIN WRIA 47

Chelan County, Washington

Data Collection Period		1969-1980	1972	1982	1983	1986	1986-1987	1990	1991	1994	1994	1995	1996	1996	1999	2002-2003	2003	2006
SOURCE <sup>1</sup>		1	2	3	4	5	6	7	8	9	10	24	12	13	14	15	17	22
Water Quality Parameter	Units																	
Conventionals																		
Alkalinity	mg CaCO3/L	●					●							●		●		
Ammonia	µg N/L	●			●	●	●		●	●								
Bicarbonate	µg/L						●											
Biological Oxygen Demand	mg/L		●															
Chemical Oxygen Demand	mg/L	●	●		●													
Chloride	mg/L						●											
Chlorophyll a	µg/L	●					●					●	●		●	●		
Cyanide	mg/L													●				
Dissolved Oxygen	mg/L			●			●	●	●	●		●	●		●	●		
Dissolved Oxygen Saturation	%						●						●					
Fluorine	µg/L						●											
Light Extinction Coefficient	1/meter						●											
Nitrogen - Nitrite+Nitrate N	µg N/L	●		●	●	●	●		●	●	●	●	●	●	●	●		
Nitrogen - Total N	µg N/L	●			●		●			●					●			
Nitrogen - Total Persulfate N	ng/L											●	●					
Nitrogen - Total Soluble N	µg N/L						●											
pH		●	●	●	●		●	●	●	●	●	●	●	●	●	●		
Phaeophytin	µg/L						●					●	●					
Phosphorus - Orthophosphate	mg/L				●				●							●		
Phosphorus - Soluble Reactive P	µg P/L						●			●								
Phosphorus -Total P	µg P/L	●		●	●	●	●		●	●		●	●	●	●	●		
Phosphorus - Total Soluble P	µg P/L						●											
Secchi Disk Depth	meters			●			●	●				●	●					
Specific Conductance	µmho/cm	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
Sulfate	mg/L													●				
Temperature	°C		●	●	●		●	●	●	●	●	●	●	●	●	●	●	●
Total Chlorine Residual	mg/L				●													

TABLE 1

**WATER QUALITY PARAMETERS ANALYZED WITHIN WRIA 47**  
Chelan County, Washington

Data Collection Period		1969-1980	1972	1982	1983	1986	1986-1987	1990	1991	1994	1994	1995	1996	1996	1999	2002-2003	2003	2006
SOURCE <sup>1</sup>		1	2	3	4	5	6	7	8	9	10	24	12	13	14	15	17	22
Water Quality Parameter	Units																	
<b>Conventionals (continued)</b>																		
Total Dissolved Gas	%														●			
Total Hardness	mg/L													●				
Total Nonvolatile Suspended Solids	mg/L		●															
Total Organic Carbon	mg/L										●						●	
Total Solids	mg/L		●															
Total Settleable Solids	mg/L		●															
Total Suspended Solids	mg/L		●		●		●		●	●	●			●	●	●	●	
Total Nonvolatile Suspended Solids	mg/L		●															
Transparency															●			
Turbidity	NTU		●		●		●		●	●				●		●	●	
<b>Bacteria</b>																		
Fecal Streptococci	#/100 mL						●											
Fecal Coliform	#/100 mL		●		●	●	●		●	●		●						
Total Coliform	#/100 mL			●			●											
<b>Metals</b>																		
Aluminum	µg/L						●							●				
Arsenic	µg/L						●							●				
Cadmium	µg/L													●				
Calcium	µg/L						●											
Copper	µg/L													●				
Iron	mg/L						●							●				
Lead	µg/L													●				
Managanese	µg/L													●				
Mercury	µg/L													●				
Nickel	µg/L													●				
Silver	µg/L													●				
Zinc	µg/L													●				

TABLE 1

**WATER QUALITY PARAMETERS ANALYZED WITHIN WRIA 47**  
Chelan County, Washington

Data Collection Period		1969-1980	1972	1982	1983	1986	1986-1987	1990	1991	1994	1994	1995	1996	1996	1999	2002-2003	2003	2006
SOURCE <sup>1</sup>		1	2	3	4	5	6	7	8	9	10	24	12	13	14	15	17	22
Water Quality Parameter	Units																	
Herbicides																		
2,4-D	µg/L										○							
Atrazine	µg/L										○							
Bromacil	µg/L										○							
Bromoxynil	µg/L										●							
Dacthal	µg/L										○							
Dichlorobenil	µg/L										●							
Dichlofop-methyl	µg/L										○							
MCPA	µg/L										○							
MCPP	µg/L										○							
Norflurzaon	µg/L										●							
Norflurazon Desmethyl	µg/L										●							
Simazine	µg/L										●							
Trillate	µg/L										○							
Insecticides																		
Carbaryl	µg/L										○							
Chlorpyrifos	µg/L										●							
4,4'DDD	ng/L															●	●	●
4,4'DDE	ng/L										○					●	●	●
4,4'DDT	ng/L										●					●	●	●
Total DDT	ng/L										●					●	●	●
Diazinon	µg/L										●							
Diuron	µg/L																	
Hexazinone	µg/L																	
3-hydroxycarbofuran	µg/L										●							
Malathion	µg/L										○							
Ozinphos-methyl (Guthion)	µg/L										●							
Terbacil	µg/L																	

**TABLE 1**

**WATER QUALITY PARAMETERS ANALYZED WITHIN WRIA 47**  
Chelan County, Washington

Data Collection Period		1969-1980																
		1972	1982	1983	1986	1986-1987	1990	1991	1994	1994	1995	1996	1996	1999	2002-2003	2003	2006	
SOURCE <sup>1</sup>		1	2	3	4	5	6	7	8	9	10	24	12	13	14	15	17	22
Water Quality Parameter		Units																
Other Organics																		
Bromodichloromethane	µg/L						●											
Chlorodibromomethane	µg/L						●											
Pentachlorophenol	µg/L										●							
PCB Aroclors	µg/L																●	
PCB Congeners	µg/L																	
Tribromomethane	µg/L						●											
Trichloromethane	µg/L						●											

Note(s)

- See Attachment A for Source references.
- Analyzed Parameter  
○ Analyzed parameter but not detected

## APPENDIX FIGURES

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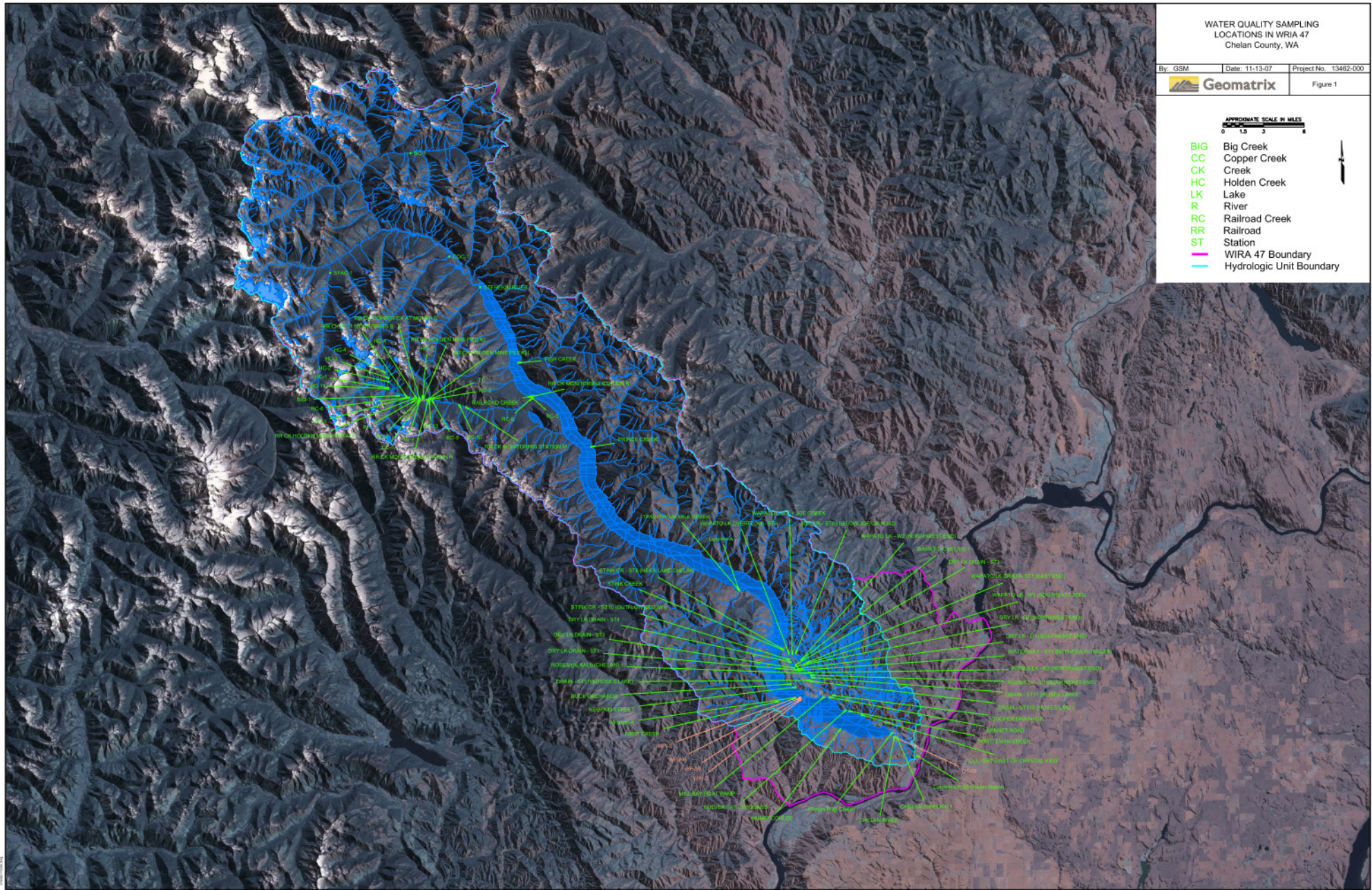
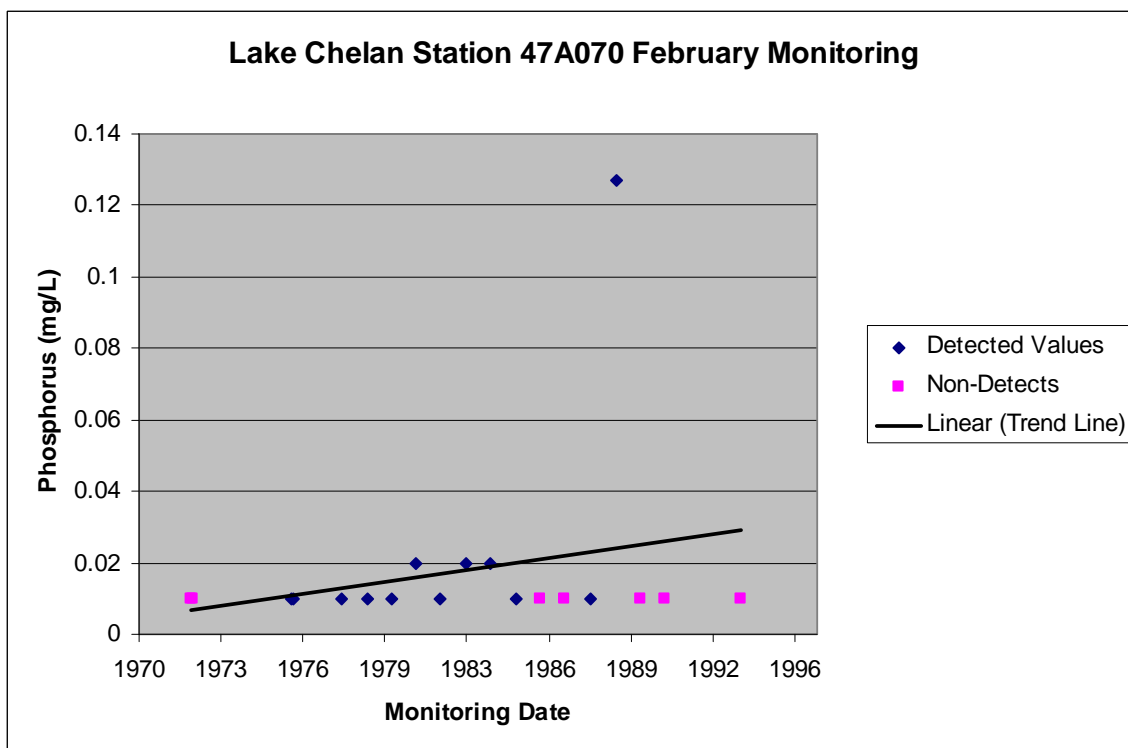
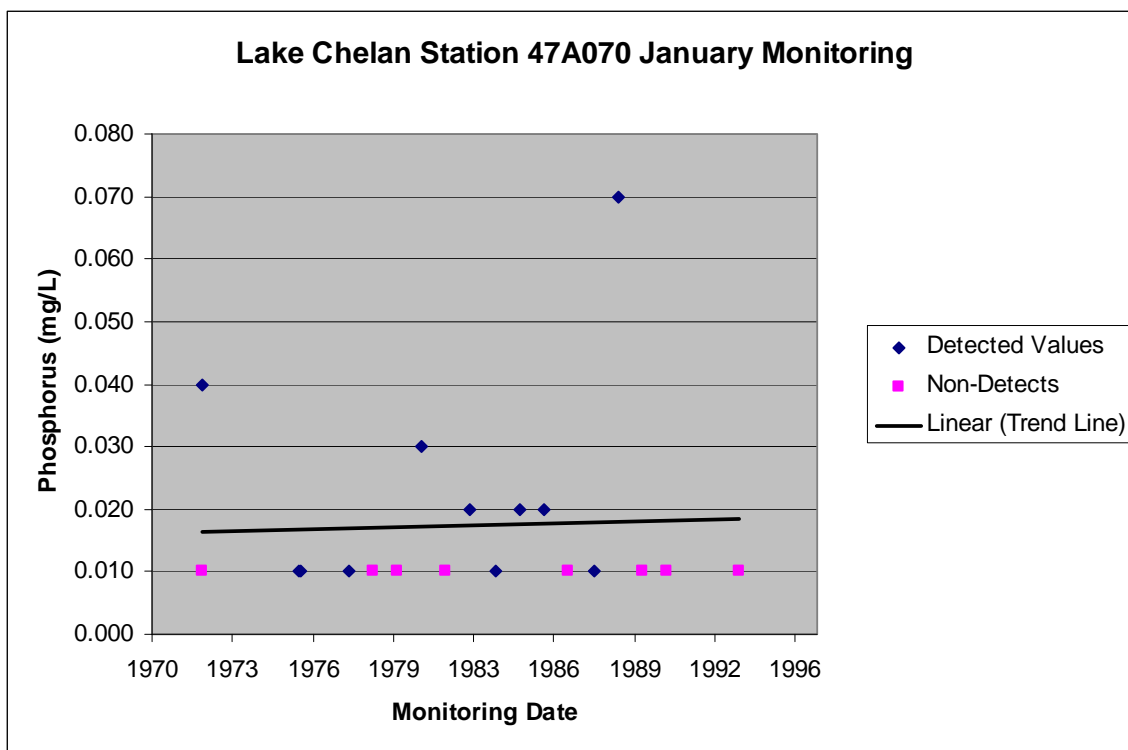


Image Courtesy of NASA Jet Propulsion Laboratory





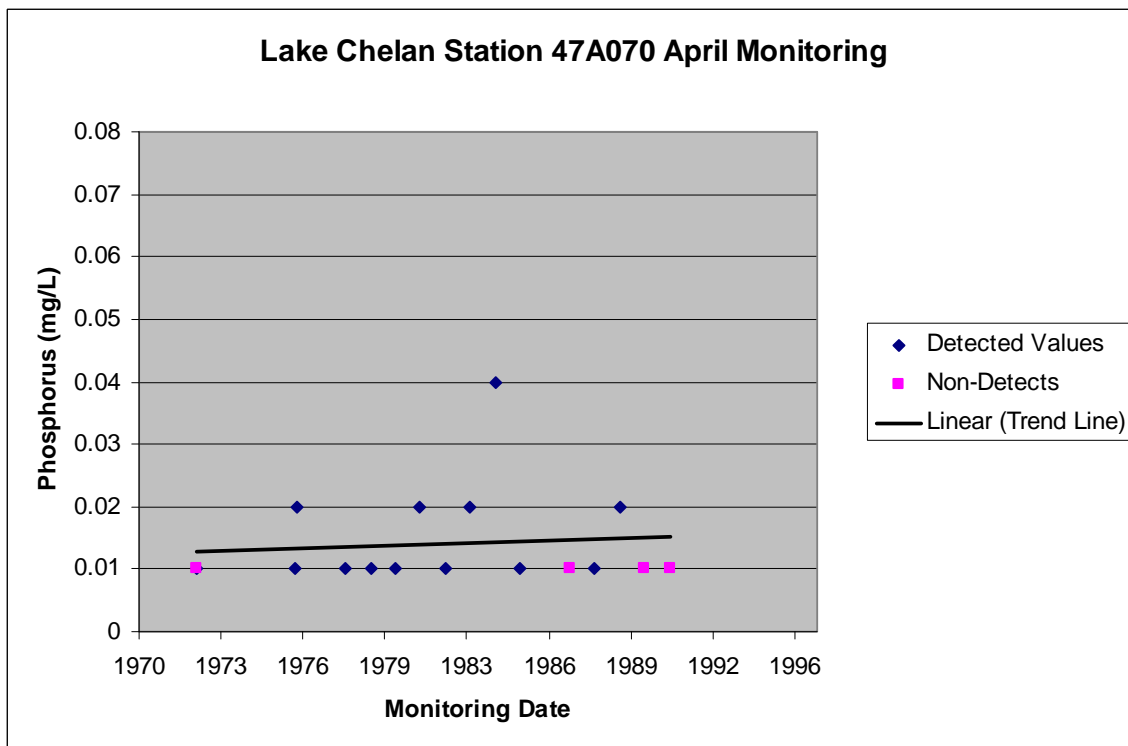
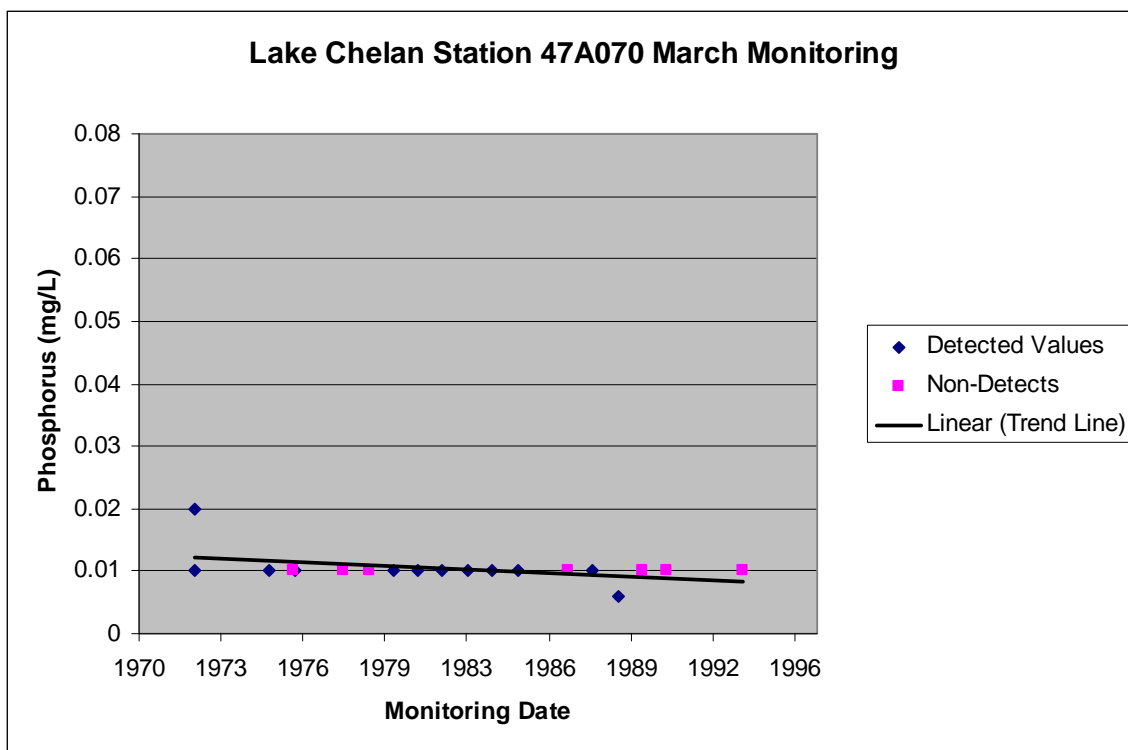
PHOSPHORUS MONITORING  
 WRIA 47 Phase II Watershed Planning  
 Chelan County, Washington

Abbreviation(s)  
 mg/L = milligrams per liter

By: sge	Date: 12/21/09	Project No. 13462.002
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**AMEC Geomatrix**

**Figure 2**



PHOSPHOROUS MONITORING  
WRIA 47 Phase II Watershed Planning  
Chelan County, Washington

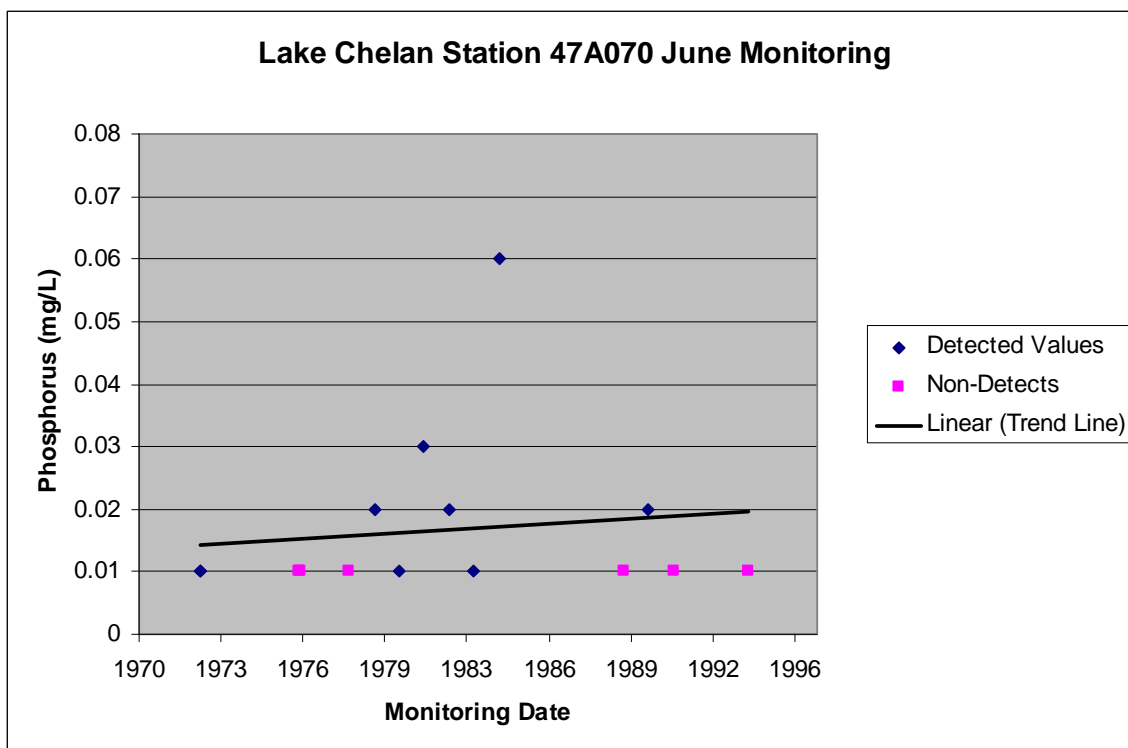
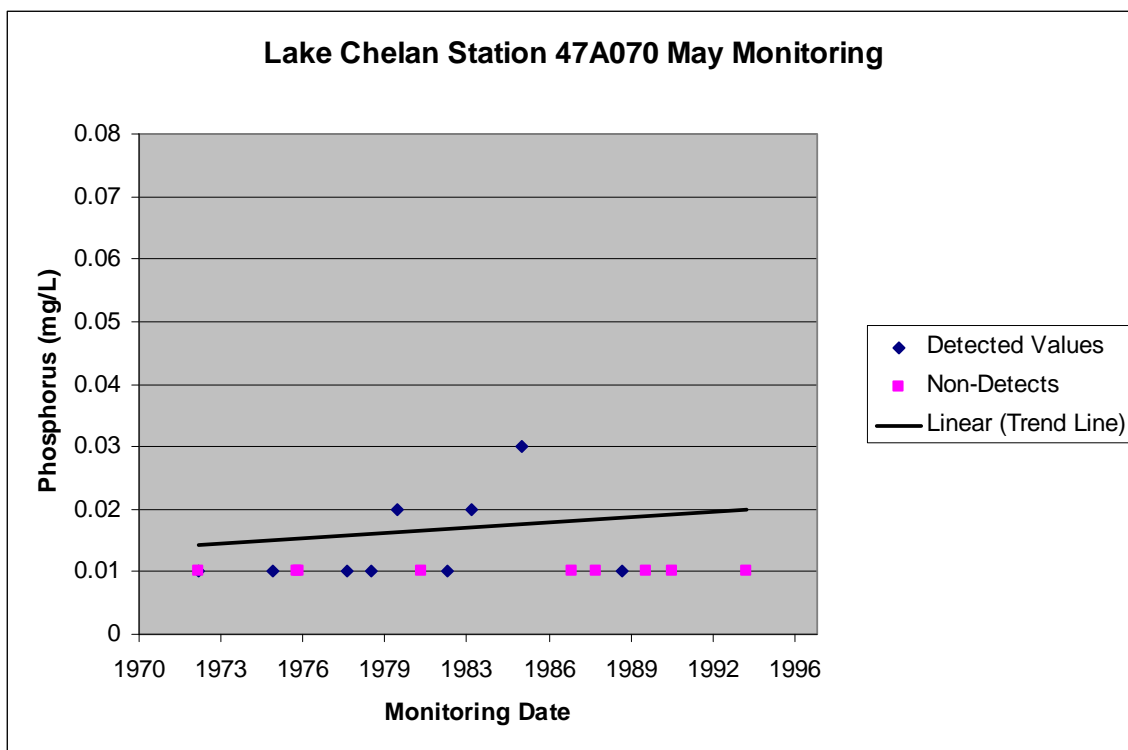
Abbreviation(s)  
mg/L = milligrams per liter

By: sge Date: 12/21/09 Project No. 13462.002

**AMEC Geomatrix**

**Figure 3**





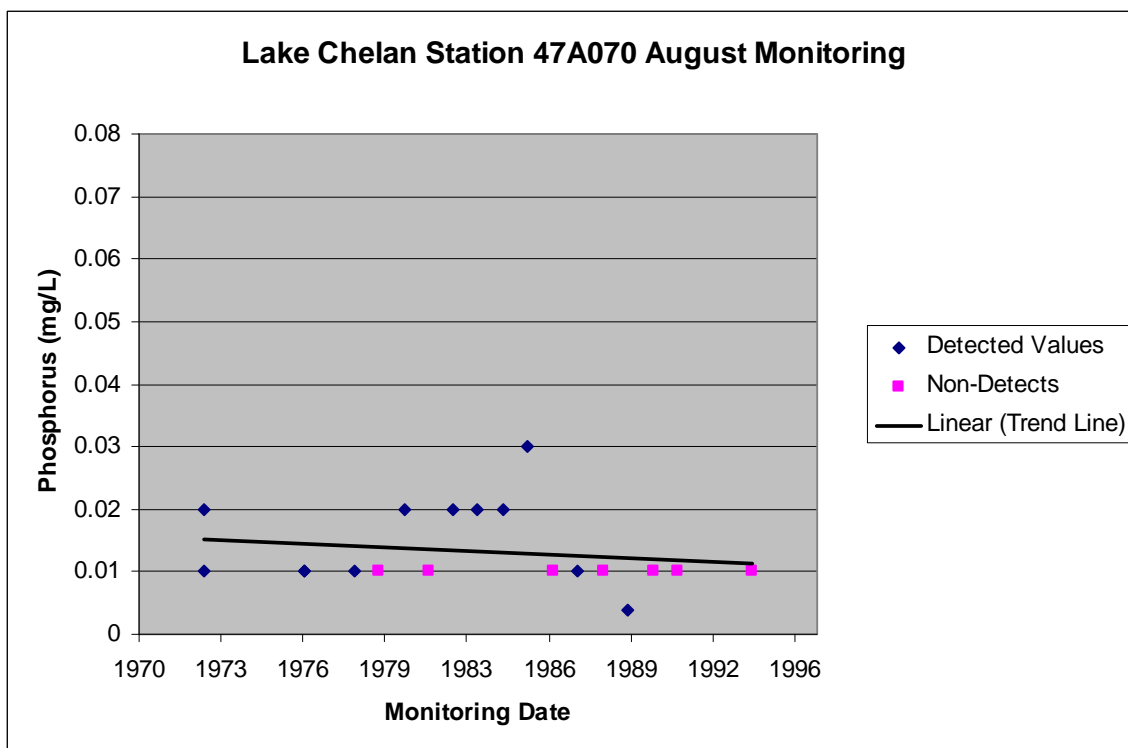
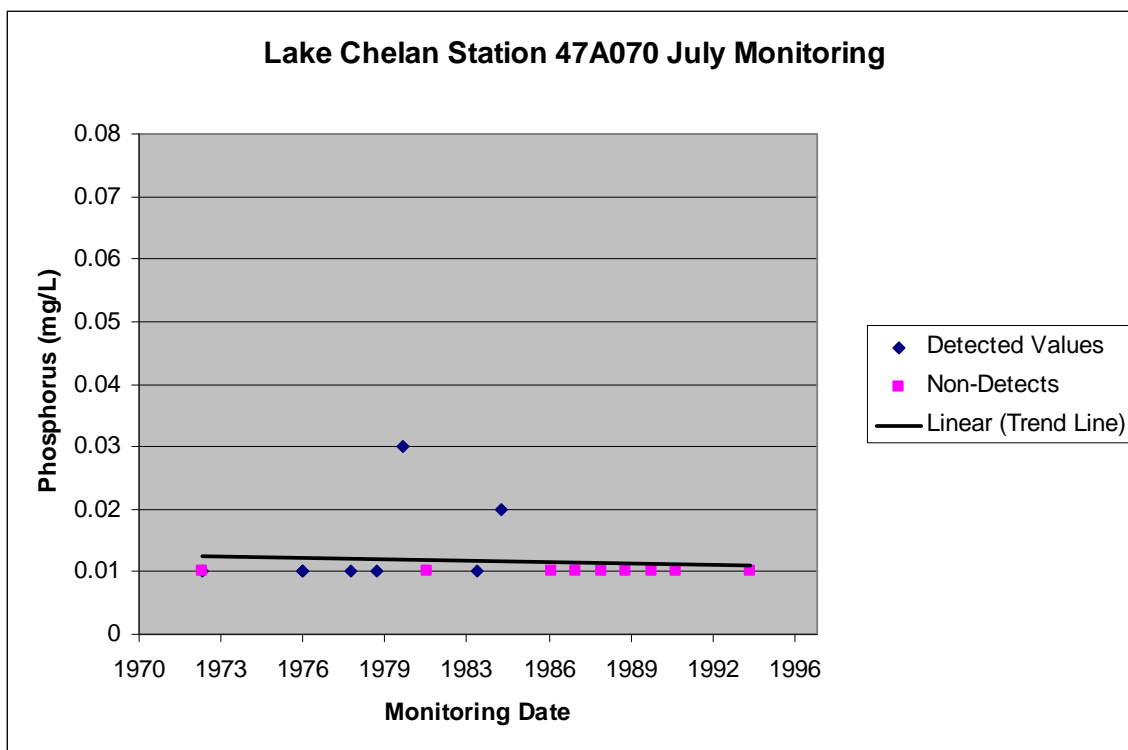
PHOSPHORUS MONITORING  
WRIA 47 Phase II Watershed Planning  
Chelan County, Washington

Abbreviation(s)  
mg/L = milligrams per liter

By: sge	Date: 12/21/09	Project No. 13462.002
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**AMEC Geomatrix**

**Figure 4**



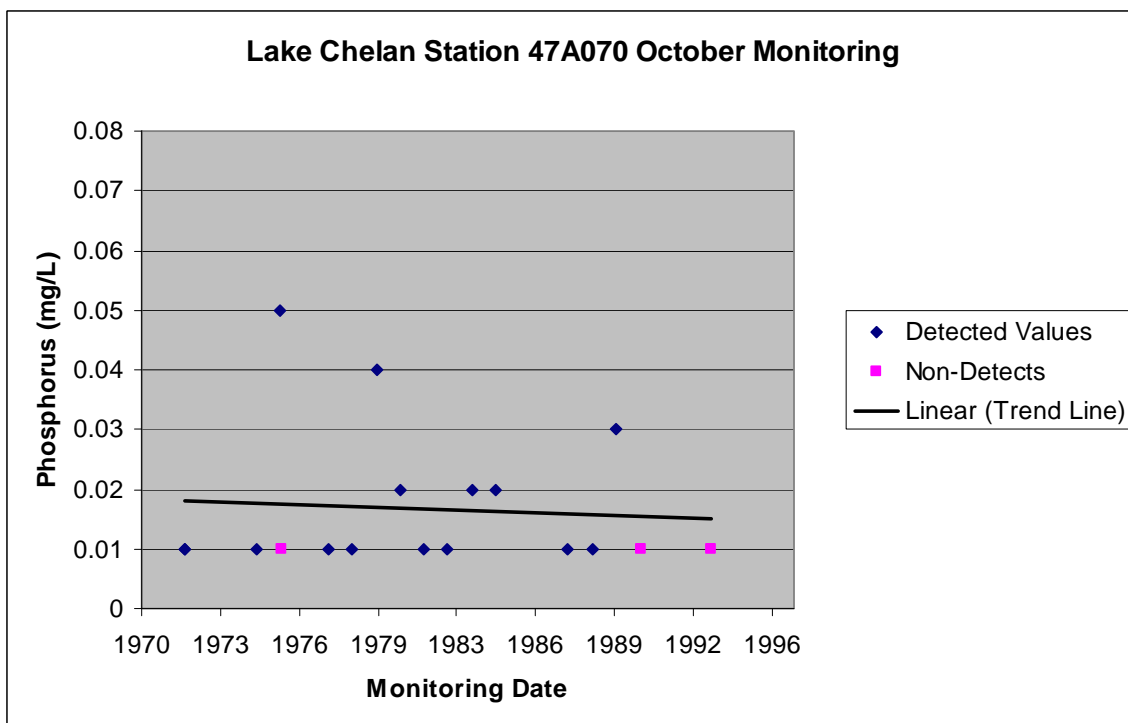
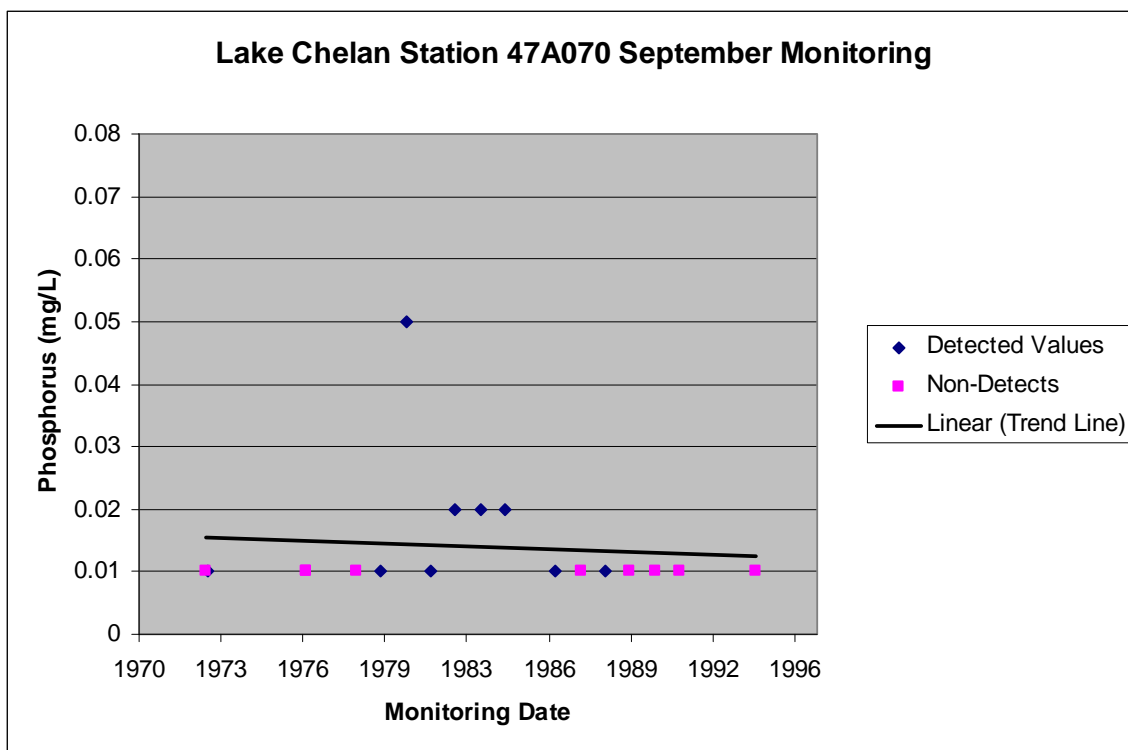
PHOSPHORUS MONITORING  
WRIA 47 Phase II Watershed Planning  
Chelan County, Washington

Abbreviation(s)  
mg/L = milligrams per liter

By: sge Date: 12/21/09 Project No. 13462.002

**AMEC Geomatrix**

**Figure 5**



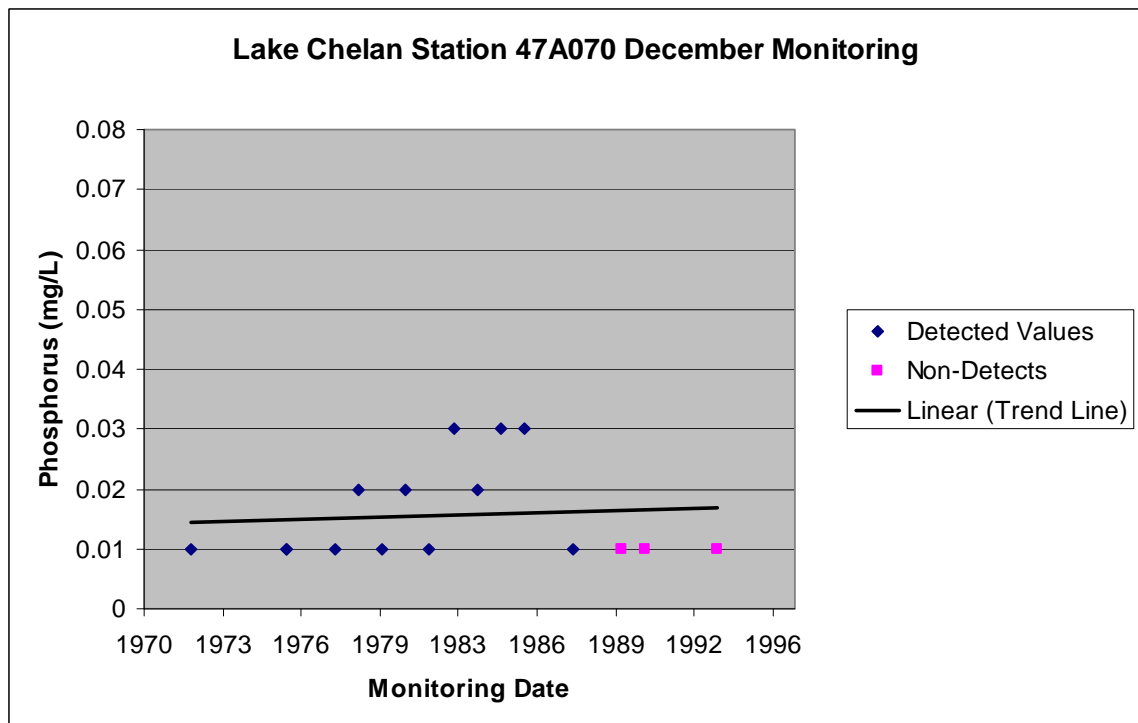
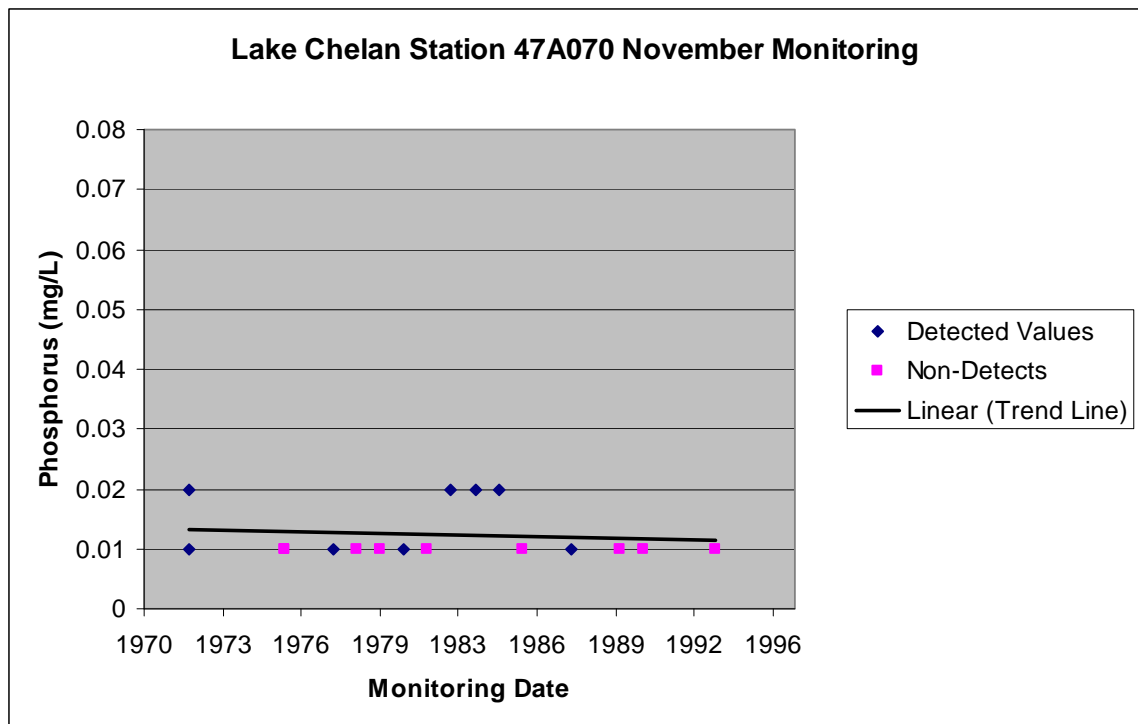
PHOSPHORUS MONITORING  
WRIA 47 Phase II Watershed Planning  
Chelan County, Washington

Abbreviation(s)  
mg/L = milligrams per liter

By: sge	Date: 12/21/09	Project No. 13462.002
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**AMEC Geomatrix**

**Figure 6**



PHOSPHORUS MONITORING  
WRIA 47 Phase II Watershed Planning  
Chelan County, Washington

Abbreviation(s)  
mg/L = milligrams per liter

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**AMEC Geomatrix**

**Figure 7**

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**ATTACHMENT A**

WRIA Water Quality Studies Annotated Bibliography

**Attachment A**  
**WRIA 47 WATER QUALITY STUDIES ANNOTATED BIBLIOGRAPHY**

1. R.W. Beck and Associates. 1982a. Lake Chelan "208" Water Quality Study. Washington State Department of Ecology, Publication No. 82-e12, Olympia.

This memorandum provides a modified scope of work for a Lake Chelan "208" Water Quality Study. It includes a water balance for Lake Chelan for the years 1976-1980 and nitrogen and phosphorus loads for orchard irrigation returns, Chelan City golf course, Chelan City Park, forest surface runoff, groundwater, precipitation, and dry deposition. The memorandum provides the range of concentrations reported in historical data for water quality parameters (pH, specific conductance, alkalinity, chemical oxygen demand [COD], nitrate+nitrite, ammonia, Kjeldahl nitrogen, total phosphorus, and chlorophyll *a*) in the Wapato Basin, Lucerne Basin, and irrigation drains. The memorandum also summarizes the result of phytoplankton and zooplankton taxonomy analyses conducted for samples collected during August 1969.

2. Devitt, R. 1972. Chelan STP Memo to Tom Hagerty. Washington State Department of Ecology, Publication No. 72-e24, Olympia.

On July 26, 1972, a standard efficiency survey was conducted on Chelan sewage treatment plant (STP) located on the Chelan River downstream of the Chelan Dam. Composite samples were taken on the influent, primary clarifier effluent, and final effluent. Influent samples were analyzed for temperature conductivity, settleable solids, 5-day biological oxygen demand (BOD), COD, total solids, total nonvolatile solids, total suspended solids (TSS), pH, and turbidity.

3. R.W. Beck and Associates. 1982b. Lake Chelan "208" Water Quality Study. Washington State Department of Ecology, Publication No. 82-e04, Olympia.

The results of a 1-day (February 24, 1982) monitoring survey of 12 locations in Lake Chelan is presented in this memorandum. The locations sampled are identified in R.W. Beck and Associates (1982a). The water quality parameters analyzed include nitrate+nitrite, total phosphorus, total coliform bacteria, dissolved oxygen (DO), temperature, pH, conductivity, and secchi depth.

4. Porath, H., and Hodgson, J. 1984. Chelan Sewage Treatment Plant (STP) Class II Inspection (July 26-27, 1983) and, Receiving Water Survey (July 27, 1983 and October 26, 1983). Washington State Department of Ecology, Publication No. 84-e09, Olympia.

This memorandum presents the results of a Class II inspection at the Chelan STP along with a limited receiving water quality survey at six stations located downstream of the Chelan Dam in the Chelan River. The receiving water study in the Chelan River consisted of a one-time sampling of six stations on July 27, 1983, and a one-time sampling of a series of nine stations on October 26, 1983. Receiving water samples were analyzed for DO, temperature, total chlorine residual, pH, turbidity, conductivity, TSS, COD, ammonia, nitrate, nitrite, orthophosphate, total phosphorus, and fecal coliform bacteria.

5. Kendra, W., and Singleton, L. 1986. Shoreline Survey and Source Inventory of Wapato Basin, Lake Chelan. Washington State Department of Ecology, Publication No. 86-e29, Olympia.

A shoreline survey of Wapato Basin, Lake Chelan, was conducted April 15-16, 1986. Of the 20 sources sampled, 12 were thought to include irrigation return flows, 3 were likely urban runoff, and 2 were streams draining relatively undeveloped watersheds. A map and description of the sampling sites is provided in this memorandum report. The parameters measured were discharge, specific conductance, nitrate+nitrite, ammonia, total phosphorus, and fecal coliform bacteria. Loads to Lake Chelan were calculated and presented in the report.

6. Patmont, C.R., Pelletier, G.J., Welch, E.B., Banton, D., and Ebbesmeyer, C.C. 1989. Lake Chelan Water Quality Assessment, Final Report. Prepared by Harper-Owes, Seattle, Washington, for Washington State Department of Ecology, Olympia.

The three primary objectives of this investigation were:

- Provide a baseline study of the lake;
- Evaluate the suitability of on-site wastewater disposal systems (septic tanks and drain fields) within the developing Lower Chelan Basin; and
- Estimate principal sources and potential impacts of bacteria and chemicals of concern to Lake Chelan.

Investigators obtained more than 100,000 data observations between November 1986 and November 1987. These observations resulted from the following activities:

- Data compilation and mapping of the near-surface geology and hydrogeology;
- Installation of 23 groundwater monitoring wells;
- Quarterly water quality sampling and analysis of groundwater wells and existing domestic wells;
- Monitoring of hydrologic, chemical, and bacteriological inputs to Lake Chelan from a range of sources through 13 surveys;
- Nearly continuous monitoring of circulation processes;
- Intensive investigations of lake productivity and nearshore algal accumulation, in addition to a bacteriological assessment from three studies; and
- Lake sediment and fish tissue samples (14 each) collected for chemical analysis.

7. Rector, J., and Hallock, D. 1993. Lake Water Quality Assessment Report, 1990. Washington State Department of Ecology, Publication No. 92-124, Olympia.

This report presents results from the volunteer monitoring program in 48 Washington State lakes, including Lake Chelan. Volunteers monitored Lake Chelan at the center of the lake between Twenty-Five Mile Creek and Dutch Harbor. Temperature, pH, water color, and secchi disk data were collected on June 14, July 11, August 20, and September 6, 1990. A depth profile from the surface to a depth of 50 meters is presented in the report for August 20, 1990. In addition to the above parameters, DO and conductivity were measured for the depth profile.

8. Hopkins, B. 1993. Freshwater Ambient Monitoring Report for Water-Year 1991. Washington State Department of Ecology, Publication No. 93-75, Olympia.

From October 1, 1990, to September 30, 1991 (Water-Year 1991), the Washington State Department of Ecology (Ecology) Ambient Monitoring Section measured conventional water quality parameters monthly at 81 stations in Washington State. One station (Chelan River @ Chelan) was located within WRIA 47. The parameters measured were ammonia, DO, nitrate+nitrite, pH, orthophosphate, total phosphorus, conductivity, temperature, TSS, turbidity, and fecal coliform bacteria.



9. Hallock, D., and Ehinger, W. 1995. River and Stream Ambient Monitoring Report for Wateryear 1994. Washington State Department of Ecology, Publication No. 95-349, Olympia.

As part of Ecology's ambient monitoring program monthly water quality data was collected during 1994 at one location within WRIA 47. This location (Station No. 47A070) is described as Chelan River @ Chelan. It is located on the north side of the Woodin Avenue Bridge that crosses Lake Chelan. The water quality parameters monitored included conductivity, DO, pH, temperature, TSS, turbidity, fecal coliform bacteria, soluble reactive phosphorus, total phosphorus, ammonia, nitrate+nitrite, and total nitrogen.

10. Davis, D. 1996. Washington State Pesticide Monitoring Program: 1994 Surface Water Sampling Report. Washington State Department of Ecology, Publication No. 96-305, Olympia.

This report includes water quality data collected during April, June, and October 1994 at one location (Stink Creek) in WRIA 47. Water samples were analyzed for 161 pesticides and pesticide breakdown products, total organic carbon (TOC), TSS, nitrate+nitrite, conductivity, temperature, pH, and flow. Eleven pesticides were detected in Stink Creek during 1994.

11. Ehinger, W., Cusimano, R., Davis, D., Garrigues, R., and Golding, S. 1995. Watershed Briefing Paper for the Wenatchee Basin Water Resource Inventory Area. Washington State Department of Ecology, Publication No. 95-348, Olympia.

This briefing paper includes a discussion of water quality issues within Lake Chelan, First Creek, Mitchell Creek, Railroad Creek, and the Stehekin River in WRIA 47. No data are provided in the report.

12. Sargent, D. 1997. Water Quality in the Wapato Basin of Lake Chelan, Summer 1996. Washington State Department of Ecology, Report No. 97-323, Olympia.

Project Objectives:

- Determine the mean epilimnetic total phosphorus (TP) concentration in the Wapato Basin for comparison to previous data and the TMDL criterion of 4.5 µg/L TP.
- Gather information on other key water quality parameters in the Wapato Basin that might indicate degradation of water quality.

Water samples were taken from four stations in the Wapato Basin at the same locations as the 1995 sampling. A hand-held Global Positioning System (GPS) device was used to help locate the sampling stations. At Stations 2, 3, and 4 samples were obtained from three depths, 0.3, 10, and 20 m, and at Station 1 samples were obtained at 0.3 m only. The lake was sampled during seven surveys on the following dates: May 16, June 4, June 20, July 18, August 15, September 9, and October 3, 1996. Samples were analyzed for total phosphorus, total persulfate nitrogen, nitrate+nitrite, chlorophyll *a*, and phaeophytin *a*. Sample duplicates were collected in accordance with the Quality Assurance Project Plan (QAPP). Field measurements for temperature, conductivity, pH, and DO were taken to a depth of 50 m where possible. Secchi disk readings were obtained at each station.

13. Johnson, A., White, J., and Huntamer, D. 1997. Effects of Holden Mine on the Water, Sediments, and Benthic Invertebrates of Railroad Creek, Lake Chelan. Washington State Department of Ecology, Environmental Investigations and Laboratory Services Program, Publication No. 97-330, Olympia.

An initial survey was conducted on June 12 to inspect the Holden Mine site, locate monitoring stations, obtain initial water quality data, and perform qualitative sampling of benthic invertebrates. Water samples were collected at the downstream end of the mine portal discharge (P-5), mouth of Copper Creek (CC-1), and the three Railroad Creek monitoring stations (RC-1 near the wilderness boundary, RC-2 below the tailings piles, and RC-3 at Lucerne). RC-2 has historically been located on the left bank directly opposite the downstream end of tailings pile #3. To allow more thorough mixing of the leachate, Ecology samples were collected approximately 100 yards farther downstream. A sample of the leachate was taken from the east side of tailings pile #3. All water samples were simple grabs; the creek samples coming from the center channel.

Samples were analyzed for a range of conventional water quality parameters, cyanide, and metals. Metals analyzed included those in the Forest Service monitoring program (zinc, copper, iron, and lead); other metals shown to be elevated in U.S. Geological

Survey samples of Holden Mine discharges (iron, aluminum, manganese, cadmium, and nickel); and arsenic, mercury and silver.

14. Anchor Environmental, LLC. 2000. 1999 Water Quality Monitoring Report, Final: Lake Chelan Hydroelectric Project, FERC Project No. 637. Prepared for Public Utility District No. 1 of Chelan County, Wenatchee, Washington.

Water quality monitoring was conducted during 1999 at eight stations in WRIA 47: five in Lake Chelan, one at the lake outlet, one in the lower bypass reach, and one in the tailrace. Of the five stations in Lake Chelan, four were in the Wapato Basin and one was in the Lucerne Basin. Sampling stations occupied in the Wapato Basin were located at the same coordinates sampled in 1987 (Patmont et al., 1989), 1995 (Congdon, 1996), and 1996 (Sargeant, 1997). The 1999 Lucerne Basin station was positioned sufficiently uplake of the Wapato Basin to minimize the potential for mixing between these two basins; this station location is representative of water quality conditions in the Lucerne Basin.

The lake outlet station was located at the Riverwalk Park boat ramp on Lake Chelan, approximately 500 feet uplake from the dam. The lower bypass reach station was located just below the gorge section of the reach. In this way, water quality was characterized just before entering the bypass reach and again immediately after traveling through the turbulence and plunging of the gorge section. Data collected from these stations provide a characterization of maximum water quality changes within the bypass reach. The tailrace station (T1) was located approximately 200 feet downstream of the powerhouse to characterize water quality conditions of water passing through the power generating system of the project.

At the five stations in Lake Chelan, water quality was measured at the surface (0.3 m), and at 10 m, 20 m, 70 m, and 100 m, where possible. To characterize water quality at each depth, the following parameters were measured: temperature, DO, pH, conductivity, TP, total nitrogen, and nitrate+nitrite. At each station, total dissolved gas and water transparency were measured at the surface and chlorophyll *a* was measured at the surface, and at 10 m and 20 m. At the bypass reach and tailrace stations, surface measurements (0.3 m) of temperature, DO, pH, conductivity, total dissolved gas, and TSS were recorded.

Sampling was conducted eight times between the start of May and the end of September 1999. Due to weather constraints, the Lucerne Basin station was only sampled during five of the eight sampling events. Due to the absence of water in the

bypass reach, the lower bypass reach station (B2) was only sampled during June through August; the bypass reach was not sampled during the May or September sampling events.

15. Burgoon, P., and Cross, P. 2004. Manson Lakes Water Quality Assessment: Lake Trophic Status and DDT and Phosphorus Load Evaluation. Prepared for Washington State Department of Ecology, Olympia.

This project summarizes results from a two-year program that monitored DDT and phosphorus loads into the Manson Lakes (Roses, Dry, and Wapato lakes). Net storage of DDT and phosphorus in the lakes was determined as well as the loads exported from Manson Lakes into Lake Chelan. Lake water samples were collected monthly at two stations in each lake from March to December in 2002 and from February to May in 2003. Stations were located along a center line on the long axis of each lake. Lake samples were analyzed for total phosphorus, orthophosphate, chlorophyll a, turbidity, and alkalinity. Agricultural drains were sampled for the above parameters, DO, temperature, pH, nitrate, TSS, and total DDT.

16. Coots, R., and Era-Miller, B. 2003. Quality Assurance Project Plan: Total Maximum Daily Load Study for DDT and PCBs in Lake Chelan. Washington State Department of Ecology, Publication No. 03-03-105, Olympia.

This document is the QAPP for sampling to support the Lake Chelan DDT and PCBs in fish TMDL. Existing data (prior to 2003) on PCB and DDT compounds in fish, sediments, and water are provided in the QAPP. This TMDL technical study will determine what DDT and PCB loading to Lake Chelan and Roses Lake will result in edible fish tissue meeting EPA human health criteria for 4,4'-DDE, PCB-1254, and PCB-1260. Sampling will occur in the Wapato and Lucerne basins of Lake Chelan, Manson Lakes, and tributaries and irrigation drains that discharge into Lake Chelan.

17. Coots, R., and Era-Miller, B. 2006. Lake Chelan DDT and PCBs in Fish Total Maximum Daily Load Study. Washington State Department of Ecology, Publication No. 05-03-014, Olympia.

This report describes the water, sediment, and fish tissue analyses conducted to support the TMDL for PCBs and DDT in fish within Lake Chelan. Five water surveys of Lake Chelan tributaries and irrigation drains were conducted between May and November 2003. The tributaries sampled included First Creek, Knapp Coulee, Purtteman Creek, Joe Creek, Stink Creek, Twenty-Five Mile Creek, Prince Creek,

Railroad Creek, and the Stehekin River. Six irrigation drain discharges to the Wapato Basin were also sampled along the north shore of Lake Chelan. The only surface water samples collected from Lake Chelan were from the Riverwalk Park Boat launch near the lake outlet.

Water concentrations of DDT compounds were also estimated from three deployments of semi-permeable membrane devices (SPMDs) during May-June, July-August, and October-November 2003 off Wapato Point (Wapato Basin) and Twenty-Five Mile Creek (Lucerne Basin). The original data published in June 2005 were revised during December 2006 due to the discovery of calculation errors that overestimated DDT concentrations by at least a factor of five.

Sediment samples (top 2 cm) were collected at 15 locations along a transect located in the middle of the Wapato and Lucerne basins and analyzed for DDT, DDE, DDD, total PCBs, TOC, and grain size. Two sediment cores were also collected (one from each basin) and analyzed for DDT compounds and total PCBs for 1 cm increments to a depth of 10 cm. The sediment strata were dated using lead-210 and cesium-137 markers.

Approximately 200 fish were collected during 2003 and analyzed for DDT compounds, Aroclor PCBs, and total lipid for this study. The species analyzed included lake trout, burbot, kokanee, and rainbow trout.

18. Seiders, K., Deligeannis, C., and Kinney, K. 2006. Washington State Toxics Monitoring Program: Toxic Contaminants in Fish Tissue and Surface Water Environments, 2003. Washington State Department of Ecology, Publication No. 06-03-019, Olympia.

This report provides the results of chemical analyses for mercury, total PCB, and DDT compounds in composite samples of largemouth bass collected during 2003 in Roses Lake. No water quality samples were collected in Roses Lake.

19. Schneider, D., and Coots, R. 2006. Lake Chelan Watershed DDT and PCB Total Maximum Daily Load: Water Quality Improvement Report. Washington State Department of Ecology, Publication No. 06-10-022, Olympia.

This report was prepared after the *Lake Chelan DDT and PCBs in Fish Total Maximum Daily Load Study*, and was intended to provide EPA with an assessment of DDT, PCB, and other pollutants identified for the TMDL for Lake Chelan. The report provides a

description of identified sources of pollutants, loads, and reductions needed to meet federal and Washington State water quality standards. Actions to reduce current pollutant loads and monitoring to document the eventual attainment of water quality standards are recommended in the report.

The description of the water column DDT concentrations estimated by the use of SPMDs on page 15 of the report is not accurate. The discussion is based on values published in 2005. The results were revised in December 2006 to correct calculation errors which reduced the estimated concentrations by at least a factor of five. The recommended load reductions are not affected by the changes in the SPMD data.

20. Johnson, A., and Seiders, K. 2005. Quality Assurance Project Plan. PBT Monitoring: Measuring PBDE Levels in Washington Rivers and Lakes. Washington State Department of Ecology, Publication No. 05-03-113, Olympia.

This QAPP describes a study to be conducted during 2006 to analyze fish tissue and water samples for 10 congeners that occur within commercial polybrominated diphenyl ether (PBDEs) products.

Specific study objectives were:

- Measure PBDE concentrations in three fish species from each of 20 waterbodies;
  - Analyze composite fillet samples and limited numbers of whole fish composites;
  - Measure PBDE concentrations in water samples from each of 10 representative fish collection sites;
  - Assess seasonal changes in water column PBDE levels at six sites;
  - Rank the waterbodies in terms of the level of PBDE contamination;
  - Identify spatial, species, and temporal patterns in the environmental distribution and accumulation of PBDEs; and
  - Lake Chelan was proposed as one of the sampling locations for this study.
21. Johnson, A., Seiders, K., Deligeannis, C., Kinney, K., Sandvik, P., Era-Miller, B., and Alkire, D. 2006. PBDE Flame Retardants in Washington Rivers and Lakes: Concentrations in Fish and Water, 2005-2006. Washington State Department of Ecology, Publication No. 06-03-027, Olympia.

This report includes the result of a study to analyze fish tissue and water samples for the predominant PBDE congeners found in commercial flame retardant products. Lake Chelan was among 10 lakes selected for this study. Water concentrations were estimated using SPMDs; however, Lake Chelan was not among the three lakes where water concentrations were estimated.

Composite fish fillets from Lake Chelan cutthroat trout and kokanee were analyzed for PBDEs and lipid. PBDE 99 was the only congener detected in cutthroat trout, with a total PBDE concentration of 0.14 µg/kg. Three congeners (PBDE 99, 153, and 154) were detected in kokanee with a total PBDE concentration of 1.0 µg/kg. The concentration of PBDE in Lake Chelan fish ranked 41 out the 44 (rank 1 is highest) lake and river locations sampled for this study.

22. Geomatrix Consultants, Inc. 2007. DDT Concentrations in Lake Chelan Waters Measured Using Semipermeable Membrane Devices (SPMDs) and a Large-Volume Solid-Phase Extraction Device. Prepared for Chelan County Natural Resource Department, Wenatchee, Washington.

DDT concentrations were measured in deeper waters off Wapato Point at approximately the same location sampled by Ecology during 2003 using two independent sampling technologies that are well established for measuring trace concentrations of organic chemicals. Two arrays of SPMDs, which provide an estimate of the average dissolved chemical concentration over the period of deployment, were anchored in place approximately 20 feet above the sediment surface and at a water depth of 200 feet.

The Infiltrax 300, which is a large-volume solid-phase extraction device developed by Axys Technologies Inc. was used to filter large volumes of water through an XAD resin column which retains both dissolved and particulate DDT for analysis. Use of this instrument provides a point estimate of DDT concentration. Infiltrax samples were collected at the same location and depth as the SPMDs, just prior to their deployment and retrieval. The average dissolved DDT concentration in water processed with the Infiltrax 300 was compared to the average dissolved DDT concentration estimated from the SPMDs.

Dissolved and particulate DDT concentrations above and below the thermocline off Wapato Point were assessed by collecting near-surface and deepwater samples using the Infiltrax 300. The Infiltrax 300 was also used to collect surface water samples off



Riverwalk Park to compare DDT concentrations in this location with near-surface values observed off Wapato Point.

23. Sargeant, D. 2007. Quality Assurance Project Plan: Lake Chelan Wapato Basin Total Phosphorous TMDL Effectiveness Monitoring, 2007. Washington State Department of Ecology, Publication No. 07-03-109, Olympia.

This QAPP describes the 2007 sampling that was conducted to assess total phosphorus in the Wapato Basin of Lake Chelan. The QAPP indicates that field sampling will occur at four locations during seven events at evenly spaced intervals between May and September 2007. No data are presented in the QAPP. The water quality parameters that will be analyzed include temperature, specific conductivity, pH, DO, chlorophyll a, chloride, nitrate+nitrite, total persulfate nitrogen, and total phosphorus.

24. Congdon, G. 1996. Epilimnetic Water Quality in the Wapato Basin of Lake Chelan, Summer 1995. Lake Chelan Water Quality Committee, Wenatchee, Washington.



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**ATTACHMENT B**

Other Studies Conducted Within WRIA 47

**Attachment B**  
**OTHER STUDIES CONDUCTED WITHIN WRIA 47**

**PHYSICAL/GEOLOGICAL/FISH TISSUE/OTHER STUDIES**

1. Geomatrix Consultants, Inc. 2006. Wapato Basin Hydrogeologic Characterization, Lake Chelan TMDL Support Project, Chelan County, Washington. Prepared for Chelan County Natural Resources Program, Wenatchee, Washington.
2. Washington State Department of Ecology. 1996. Washington State Pesticide Monitoring Program: 1994 Fish Tissue and Sediment Sampling Report. Ecology, Publication No. 96-352, Olympia.
3. Seiders, K., Deligeannis, C., and Kinney, K. 2006. Washington State Toxics Monitoring Program: Toxic Contaminants in Fish Tissue and Surface Water in Freshwater Environments, 2003. Washington State Department of Ecology, Publication No. 06-03-19, Olympia.
4. Kendra, W., and Singleton, L. 1987. Morphometry of Lake Chelan. Washington State Department of Ecology, Publication No. 87-1, Olympia.
5. Hopkins, B.S., Clark, D.K., Schlender, M., and Stinson, M. 1985. Basic Water Monitoring Program: Fish Tissue and Sediment Sampling for 1984. Washington State Department of Ecology, Water Quality Investigations Section, Publication No. 85-7, Olympia.
6. Johnson, A. 1997. Wapato Lake – Pesticides Levels, Sediment Bioassays, and Abundance of Benthic Invertebrates. Washington State Department of Ecology, Publication No. 97-e05, Olympia, <http://www.ecy.wa.gov/biblio/97e05.html> (accessed December 22, 2009).
7. Pine, R. 1967. The Effects of the Holden Mine Tailings upon the Aquatic Insect Fauna of Railroad Creek, a Tributary to Lake Chelan. State of Washington, Water Pollution Control Commission, Publication No. 67-e00, Olympia.

8. Federal Energy Regulatory Commission (FERC). 2002. Preliminary Draft Environmental Assessment for Hydropower License: Lake Chelan Hydroelectric Project, FERC Project No. 637, Washington. FERC, Office of Energy Projects, Washington, D.C., <http://www.chelanpud.org/relicense/> (accessed November 7, 2007).
9. Federal Energy Regulatory Commission (FERC). 2003. Final Environmental Assessment for Hydropower License, Lake Chelan Hydroelectric Project, FERC Project No. 637, Washington. FERC, Office of Energy Projects, Washington, D.C.
10. Public Utility District No. 1 of Chelan County. 2001. Stehekin River Sedimentation Summary, Final: Lake Chelan Hydroelectric Project, FERC Project No. 637. Chelan County, Wenatchee, Washington.
11. Geomatrix Consultants, Inc. 2007. Sediment Organochlorine Pesticide Concentrations in the Vicinity of Tributary and Irrigation Drain Discharges to Lake Chelan, Lake Chelan TMDL Support Project, Chelan County, Washington. Prepared for Chelan County Natural Resource Department, Wenatchee, Washington.
12. U.S. Environmental Protection Agency (EPA). 2004. National Study of Chemical Residues in Lake Fish Tissue: Year 1 and Year 2 Data. Office of Water, Office of Science and Technology, EPA-823-C-04-006 (Year 1) and EPA-823-C-04-007 (Year 2), Washington, D.C.
13. Serdar, D., Johnson, A., and Davis, D. 1994. Survey of Chemical Contaminants in Ten Washington Lakes. Washington State Department of Ecology, Environmental Investigations and Laboratory Services Program, Publication No. 94-154, Olympia.
14. Serdar, D. 2005. Quality Assurance Project Plan: Bioaccumulative Chemicals in Hatchery Feed and Hatchery Fish. Washington State Department of Ecology, Publication No. 05-03-104, Olympia.
15. Davis, D., and Johnson, A. 1994. Washington State Pesticide Monitoring Program: Reconnaissance Sampling of Fish Tissue and Sediments (1992). Washington State Department of Ecology, Publication No. 94-194, Olympia.

**TABLE**

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TABLE 1

WATER QUALITY PARAMETERS ANALYZED WITHIN WRIA 47

Chelan County, Washington

Data Collection Period		1969-1980	1972	1982	1983	1986	1986-1987	1990	1991	1994	1994	1995	1996	1996	1999	2002-2003	2003	2006
SOURCE <sup>1</sup>		1	2	3	4	5	6	7	8	9	10	24	12	13	14	15	17	22
Water Quality Parameter	Units																	
Conventionals																		
Alkalinity	mg CaCO3/L	●					●							●		●		
Ammonia	µg N/L	●			●	●	●		●	●								
Bicarbonate	µg/L						●											
Biological Oxygen Demand	mg/L		●															
Chemical Oxygen Demand	mg/L	●	●		●													
Chloride	mg/L						●											
Chlorophyll a	µg/L	●					●					●	●		●	●		
Cyanide	mg/L													●				
Dissolved Oxygen	mg/L			●			●	●	●	●		●	●		●	●		
Dissolved Oxygen Saturation	%						●						●					
Fluorine	µg/L						●											
Light Extinction Coefficient	1/meter						●											
Nitrogen - Nitrite+Nitrate N	µg N/L	●		●	●	●	●		●	●	●	●	●	●	●	●		
Nitrogen - Total N	µg N/L	●			●		●			●					●			
Nitrogen - Total Persulfate N	ng/L											●	●					
Nitrogen - Total Soluble N	µg N/L						●											
pH		●	●	●	●		●	●	●	●	●	●	●	●	●	●		
Phaeophytin	µg/L						●					●	●					
Phosphorus - Orthophosphate	mg/L				●				●							●		
Phosphorus - Soluble Reactive P	µg P/L						●			●								
Phosphorus -Total P	µg P/L	●		●	●	●	●		●	●		●	●	●	●	●		
Phosphorus - Total Soluble P	µg P/L						●											
Secchi Disk Depth	meters			●			●	●				●	●					
Specific Conductance	µmho/cm	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
Sulfate	mg/L													●				
Temperature	°C		●	●	●		●	●	●	●	●	●	●	●	●	●	●	●
Total Chlorine Residual	mg/L				●													

TABLE 1

**WATER QUALITY PARAMETERS ANALYZED WITHIN WRIA 47**  
Chelan County, Washington

Data Collection Period		1969-1980	1972	1982	1983	1986	1986-1987	1990	1991	1994	1994	1995	1996	1996	1999	2002-2003	2003	2006
SOURCE <sup>1</sup>		1	2	3	4	5	6	7	8	9	10	24	12	13	14	15	17	22
Water Quality Parameter	Units																	
<b>Conventionals (continued)</b>																		
Total Dissolved Gas	%														●			
Total Hardness	mg/L													●				
Total Nonvolatile Suspended Solids	mg/L		●															
Total Organic Carbon	mg/L										●						●	
Total Solids	mg/L		●															
Total Settleable Solids	mg/L		●															
Total Suspended Solids	mg/L		●		●		●		●	●	●			●	●	●	●	
Total Nonvolatile Suspended Solids	mg/L		●															
Transparency															●			
Turbidity	NTU		●		●		●		●	●				●		●	●	
<b>Bacteria</b>																		
Fecal Streptococci	#/100 mL						●											
Fecal Coliform	#/100 mL		●		●	●	●		●	●		●						
Total Coliform	#/100 mL			●			●											
<b>Metals</b>																		
Aluminum	µg/L						●							●				
Arsenic	µg/L						●							●				
Cadmium	µg/L													●				
Calcium	µg/L						●											
Copper	µg/L													●				
Iron	mg/L						●							●				
Lead	µg/L													●				
Managanese	µg/L													●				
Mercury	µg/L													●				
Nickel	µg/L													●				
Silver	µg/L													●				
Zinc	µg/L													●				

TABLE 1

**WATER QUALITY PARAMETERS ANALYZED WITHIN WRIA 47**  
Chelan County, Washington

Data Collection Period		1969-1980	1972	1982	1983	1986	1986-1987	1990	1991	1994	1994	1995	1996	1996	1999	2002-2003	2003	2006
SOURCE <sup>1</sup>		1	2	3	4	5	6	7	8	9	10	24	12	13	14	15	17	22
Water Quality Parameter	Units																	
Herbicides																		
2,4-D	µg/L										○							
Atrazine	µg/L										○							
Bromacil	µg/L										○							
Bromoxynil	µg/L										●							
Dacthal	µg/L										○							
Dichlorobenil	µg/L										●							
Dichlofop-methyl	µg/L										○							
MCPA	µg/L										○							
MCPP	µg/L										○							
Norflurzaon	µg/L										●							
Norflurazon Desmethyl	µg/L										●							
Simazine	µg/L										●							
Trillate	µg/L										○							
Insecticides																		
Carbaryl	µg/L										○							
Chlorpyrifos	µg/L										●							
4,4'DDD	ng/L															●	●	●
4,4'DDE	ng/L										○					●	●	●
4,4'DDT	ng/L										●					●	●	●
Total DDT	ng/L										●					●	●	●
Diazinon	µg/L										●							
Diuron	µg/L																	
Hexazinone	µg/L																	
3-hydroxycarbofuran	µg/L										●							
Malathion	µg/L										○							
Ozinphos-methyl (Guthion)	µg/L										●							
Terbacil	µg/L																	

**TABLE 1**

**WATER QUALITY PARAMETERS ANALYZED WITHIN WRIA 47**  
Chelan County, Washington

Data Collection Period		1969-1980	1972	1982	1983	1986	1986-1987	1990	1991	1994	1994	1995	1996	1996	1999	2002-2003	2003	2006
SOURCE <sup>1</sup>		1	2	3	4	5	6	7	8	9	10	24	12	13	14	15	17	22
Water Quality Parameter	Units																	
Other Organics																		
Bromodichloromethane	µg/L						●											
Chlorodibromomethane	µg/L						●											
Pentachlorophenol	µg/L										●							
PCB Aroclors	µg/L																●	
PCB Congeners	µg/L																	
Tribromomethane	µg/L						●											
Trichloromethane	µg/L						●											

Note(s)

- See Attachment A for Source references.
- Analyzed Parameter  
○ Analyzed parameter but not detected



## **Appendix C**

### **Habitat Component**

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## **LAKE CHELAN WRIA 47 Watershed Management Plan: Phase III Habitat Component**

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*Prepared for:*



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*Prepared by:*



**750 Sixth Street South  
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This report was funded in  
part through a grant from  
the Washington  
Department of Ecology.

**March 2011**

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# **LAKE CHELAN WRIA 47 WATERSHED MANAGEMENT PLAN HABITAT COMPONENT**

## **1. INTRODUCTION**

---

This attachment is intended to provide detailed information in supplementation of the Lake Chelan WRIA 47 Watershed Planning, Phase III report. It represents a summary of existing information and analyses pertaining to aquatic habitat in the Chelan Watershed, including previous planning efforts; existing aquatic resources and impacts; and management goals, recommendations, and strategies.

## **2. EXISTING WATERSHED ANALYSIS, HABITAT ASSESSMENT, AND SPECIES STATUS INFORMATION**

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The process of watershed planning includes a review of all existing information so that gaps in knowledge and research can be identified. Where knowledge does exist, a thorough review of all past work is needed to weigh the relative importance of habitat restoration goals in the watershed, and to assess the need for project and action implementation in order to fulfill these goals.

Habitat assessment and restoration in the Lake Chelan Watershed have been the focus of past and ongoing efforts led by Chelan County and other entities. The following studies and documents include analyses of aquatic habitat components, watershed processes, fish species occurrence and use, and other habitat features or components.

### **2.1 WRIA 47 Watershed Planning**

The 1998 Watershed Planning Act (RCW Chapter 90.82) provides funding and structure for locally-based watershed planning in each WRIA. Planning units comprising members from a broad field of water-use interests are formed to guide the planning process. The WRIA 47 planning unit formed in 2007 to oversee technical studies designed to fill data gaps in water resource issues in the Lake Chelan Watershed, as well as to develop and implement strategies that address identified issues.

Watershed planning is divided into four phases. Chelan County, the City of Chelan, and the Lake Chelan Reclamation District applied for Phase I funding

from the Washington Department of Ecology (Ecology) and Chelan County, the lead entity in the process, received a grant of \$50,000 to initiate the first planning phase, Organization. A number of interested parties, including the Colville Confederated Tribes, Yakama Nation, Cascadia Conservation District, the Chelan River Irrigation District, and others expressed interest in participating in the planning process.

One mandatory and three optional elements are the focus of watershed planning. The planning unit selected the optional element of water quality for inclusion, with the mandatory water quantity component, in Phase I watershed planning. The optional elements of instream flow and habitat were omitted because they had been addressed to some extent in previous efforts. Phase I was completed in January 2008. Phase II, Assessment, resulted in the documents introduced below in Sections 2.1.2 and 2.1.3. Phase II was completed in January 2009.

### **2.1.1 Lake Chelan Planning Unit Charter**

The Lake Chelan Planning Unit Charter (RH2 Engineering, Inc. and AMEC Geometrix, Inc. 2007) defines the planning unit's mission, goals, objectives, and strategies for protecting the aquatic resources of the Lake Chelan Watershed. The Charter states as its vision "to recognize, inform, educate, monitor, understand and protect the unique water resource that is Lake Chelan; the ecological processes and pathways essential to maintaining this high quality water body, and the ways in which we can live on this lakeshore, enjoy this unique treasure and protect it for generations to come." The document outlines the organization, roles and responsibilities of each entity participating in WRIA 47 watershed planning under the Watershed Planning Act (RCW 90.82).

### **2.1.2 Phase II Water Quantity Assessment, WRIA 47: Lake Chelan**

This Phase II Water Quantity Assessment (RH2 Engineering, Inc. 2009) is a comprehensive characterization and assessment of the water supply in WRIA 47. It includes analyses of surface and ground water, including seasonal, climatic, and other variations; an estimate of water represented by claims, permits, instream flow rules, and other rights; estimated present and future water use and availability; and identification of aquifers and aquifer recharge areas.

### **2.1.3 Long-term Water Quality Monitoring for Lake Chelan**

Phase II Watershed Planning for WRIA 47 included identifying all potentially impaired waterbodies in the Lake Chelan Watershed for parameters on the Clean Water Act 303(d) list. The work included completion of the Long-Term Monitoring Plan for Lake Chelan (AMEX Geometrix, Inc. 2009), which identifies goals addressing water quality and data gaps, as well as providing recommendations for methods to achieve long-term water quality monitoring objectives.

## **2.2 Lake Chelan Fishery Plan (FERC Project No. 637)**

The Federal Energy Regulatory Commission (FERC) project license for the Lake Chelan Hydroelectric Project No. 637 includes Article 404, which required the Chelan PUD to complete a fishery plan for Lake Chelan in 2007. The plan is intended to demonstrate compliance with efforts to restore and enhance native fisheries in Lake Chelan and its tributaries while supporting a recreational fishery. The Lake Chelan Fishery Plan (LCFP) (Chelan County PUD 2007) includes an overview of historical and current occurrence of fish species in Lake Chelan and its tributaries. It addresses habitat factors impacting the species' success at various life stages, as well as other information related to the success of each species, including the results of recent creel surveys and tributary studies, status as recreational and commercial species, hatchery input, and known species interactions. The LCFP also provides an implementation plan and schedule for developing a food web model for the lake and tributaries, implementing a monitoring and evaluation program, removing fish barriers from the mouths of tributaries to the lake, stocking fish, measuring entrainment, and collecting large woody debris.

## **2.3 Lake Chelan Sub-basin Plan (LCSP)**

This Chelan County-led effort was conducted with the oversight of the Upper Columbia Salmon Recovery Board (UCSRB), which includes representatives from Chelan, Douglas, and Okanogan Counties; the Yakama Nation; and the Colville Confederated Tribes. Public involvement in the plan was largely via Chelan PUD during the FERC relicensing process for the Lake Chelan Hydroelectric Project No. 637, in which landowners, agricultural interests, private businesses, tourism and recreation industries, environmental groups, resource and other governmental agencies, Indian tribes, and County citizens participated through meetings, working groups, newsletters, and presentations.

The 2007 Sub-basin Plan (Laura Berg Consulting 2004) describes the topography, geology, climate, vegetation, and soil characteristics of the Lake Chelan sub-basin (WRIA 47). Fish and wildlife resources, habitat types and conditions, and focal species and habitats are presented in detail.

## **2.4 Draft In-Lieu Fee (ILF) Prospectus Program Prospectus and Compensation Planning Framework for Lower Lake Chelan, Chelan County**

CCNRD is sponsoring the proposed In-Lieu Fee (ILF) Program for lower Lake Chelan under an April 10, 2008 final rule governing compensatory mitigation authorized under Department of the Army permits issued under Section 404 of the Clean Water Act. The ILF Program process begins with completion of the

draft Prospectus, which includes an analysis of the service area. The framework element of the draft Prospectus (The Watershed Company 2010) describes the natural conditions of the Wapato sub-basin. Because one purpose of the ILF Program is to provide a mitigation alternative for projects that have unavoidable impacts on aquatic resources, the framework includes an analysis of historic and present habitat-related resources in the sub-basin. The analysis determines aquatic habitat components that would improve watershed health if restored, as well as identifying locations for potential restoration projects.

### **3. SUMMARY OF RESOURCES AND HABITAT IMPACTS IN THE LAKE CHELAN WATERSHED**

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Issues identified and addressed in past studies in the Lake Chelan Watershed concern management of fish species to promote healthy populations, support recreational fisheries, and monitor management actions. Factors impacting fish populations in the watershed include habitat degradation and loss, passage barriers, dam operations, flooding, species introductions, interspecific breeding, competition for resources, predatory relationships, disease, harvest, and hatchery and stocking operations.

#### **3.1 Hydrology and Water Storage**

The natural hydrology of Lake Chelan is altered by dam operations. Construction of the Lake Chelan Hydroelectric Project raised the elevation of the lake by 21 ft (6.4 m), flooding the surrounding land (from Chelan Chamber of Commerce, <http://www.lakechelan.com/551.html>). Although the current licensing agreement permits the operation of the lake operated between of 1,100 ft (335 m) above sea level and a minimum elevation of 1,079 ft (329 m), it has never been drawn down to the minimum level (Schneider and Coots 2006). The average minimum lake elevation is 1,086 ft (331 m) above sea level (<http://www.chelanpud.org/lake-chelan-lake-levels.cfm>), and operation between June and September is designed to keep the lake elevation at or above 1,098 ft (334 m) whenever possible. An historic high-water event was recorded in June 1894, when the water level was reportedly raised to 11 ft (3.4 m) above the 1892 water level (influenced by an 1889 dam) (Hillman and Giorgi 2000). Flooding in the Stehekin River and Railroad Creek and unusual debris flows in several other creeks indicate a possible increase in frequency and magnitude of floods (Montgomery Group et al. 1995).

Vegetation alteration also has the potential to affect hydrology and water storage in the watershed. Forest changes have resulted in the single largest impact in the Chelan Watershed, affecting most of the watershed at various points in time.



Harvested slopes alter surface water hydrology by producing flashy stream flows (i.e., high but short duration peak flows) and increasing erosion and deposition. However, timber forest was a more significant impact historically, and fire is the primary agent of forest changes in the watershed presently. Widespread fire suppression in the basin and the resultant fuel loads allowed for greatly increased fire severity beginning in the late 1960s. Recent severe fires have caused loss of mature vegetation, further impacting water storage and flow in the watershed.

The cumulative effect of insects, pathogens, noxious weeds, and grazing on overstory and large trees also impacts hydrology indirectly by affecting fire regime. Insects, including mountain pine beetle (*Dendroctonus ponderosae*), bark beetle, and spruce budworm (*Choristoneura occidentalis*), produce heavy fuel loads. Similarly, cheatgrass, facilitated by mostly historic grazing, sets seed earlier than most native species, out-competing them and creating an early fuel source for fire. Other invasive terrestrial plant species with low soil-holding capacities have increased spring soil moisture use as well, drying out and degrading conditions for native plants. Grazing impacts are limited because of the unsuitability of much of the watershed's steep slopes and the discontinued permitting on USFS land in the late 1990s, but past grazing in the forests compacted soils and instigated non-native plant invasions, affecting conditions that persist today.

The impacts of shoreline armoring on hydrology are closely related to habitat impacts and are addressed in the main body of the Lake Chelan Watershed Plan.

## 3.2 Water Quality

Water quality is addressed in detail in main body of the Lake Chelan Watershed Plan. It is included here only as it impacts aquatic habitat in the watershed.

The erosion and sedimentation precipitated by the fire-driven deforestation described in the preceding section impacts water temperature and turbidity, potentially affecting fish and fish habitat. Pesticides are another area of concern in Lake Chelan. DDT is a chlorinated pesticide that was widely used on orchards in the basin from the 1940s, when DDT was developed, until 1972 when it was banned in the U.S. (Schneider and Coots 2006). PCBs are chlorinated compounds widely used in industrial applications as coolants, hydraulic fluids, plasticizers, marine paints, and a variety of other applications. No specific source of PCBs has been identified in the basin, but many potential sources exist, including atmospheric deposition. PCBs can volatilize easily and travel great distances in the atmosphere, to be deposited in remote locations where they were never used. PCBs were banned in the U.S. in 1979. Both DDT and PCBs are slow to break

down in the aquatic environment, which helps to explain their presence in a basin where they have not been used in more than 30 years.

### 3.3 Aquatic Habitat

In addition to water quality and hydrology effects on habitat, more direct impacts have altered and continue to alter aquatic habitat in the Lake Chelan Watershed. Impacts and affected functions are listed in Table 1.

Loss of riparian vegetation due to repeated high-severity fires impacts stream shading and large woody debris recruitment in addition to the hydrologic and water quality impacts presented in the previous sections. Large woody debris is of particular importance and may be limiting in Lake Chelan because of the ultra-oligotrophic conditions in the lake (Lenz 2008). Habitat complexity and nutrient cycling are both important functions of large woody debris.

The Wapato sub-basin experiences the greatest level of human-caused aquatic impacts in the Lake Chelan Watershed. Development in the sub-basin includes the upland conversion to agriculture, the Lake Chelan Hydroelectric project (dam), shoreline clearing and development, shoreline armoring, and docks and piers. Each of these alterations impacts aquatic habitat and the fish community in the watershed.

Wind is naturally funneled down the valley over Lake Chelan, reaching the Wapato sub-basin with high velocities and aligned with the longest wave fetch. This allows the generation of large waves and concentrates force at the most populated and developed parts of the lake. Bulkheads and other shoreline armoring line much of the lakeshore in the Wapato sub-basin to protect the shoreline from wave erosion and, in some cases, to protect properties developed on artificial fill. Shoreline armoring may divert juvenile salmonids to deeper water, where they are subject to increased predation (Kahler et al 2000). Artificial bank protection also eliminates shallow-water and transitional habitat.

Dam operations in Lake Chelan alter the exposed shoreline and have the greatest impact on hydrology in the lake. Dam operations maintain the highest lake levels between July and September, rather than during spring runoff, as would occur under a natural flooding regime. Higher sustained lake levels prevent sediment from depositing on the lower faces of alluvial fans, concentrating deposition on the upper portion of the fan and creating a broad, relatively flat sill. This sill effect results in a wide, shallow flow at the mouth of the stream, which lacks sufficient depth and creates a barrier to upstream migration. In one study of the lake, six of the nine tributaries surveyed suffered from this sill effect (Duke Engineering Services, Inc. 2000a).

The timing of lake level fluctuations can also be problematic for species using the lake, changing accessibility of nearshore areas as lake level rises and falls. All native fish species in the lake except for cutthroat trout spawn in the nearshore areas, peaking from May through July, and juveniles remain to rear and feed. Current timing of lake fluctuation places rearing and feeding juveniles in the most highly developed lake area in terms of armoring and over-water structures.

Lake Chelan has more than 1 million ft<sup>2</sup>, or nearly 72 ac (29 ha), of overwater structures (DNR GIS data (overwater structures); 2007 interpretation of 2002-2006 aerial photographs), including piers, docks, and shoreline fill. The majority of these structures are in the Wapato sub-basin. A comprehensive literature review concerning the impact of over-water structures in freshwater environments (Carrasquero 2001) was conducted and is a source for the summary of impacts presented here.

Overwater structures alter the shore-zone habitat structure, which in turn may alter the fauna and flora assemblages, predator-prey relationships, fish behavior and habitat function. Overwater structures are also often associated with other habitat alterations, including disturbed substrate during construction, altered water movement around structures, installed associated structures like bulkhead and other bank armoring, and increased boat traffic. The overall impact to habitat is a complex interaction of effects that may benefit some species and harm others.

Shoreline armoring has reduced the natural functional value that would be provided by lake-fringe wetlands or vegetation. Bulkheads and other shoreline development have resulted in a highly altered to non-existent shoreline and nearshore vegetation. Natural shoreline vegetation is limited to the Spader Bay area, some properties above Wapato Point, Lake Chelan State Park, and a few other publicly owned parcels on the south shore. Not only does this result in very little overhanging vegetation for aquatic species, but little cover for other wildlife that might use the lake or shoreline. Few lake-fringe wetlands exist, and none are extensive. The present level of armoring and frequency of docks, coupled with the relatively abrupt littoral zone (although milder than the Lucerne sub-basin, it is still considered steep), offers little opportunity to create or restore lake-fringe wetlands.

Both dam operations and shoreline hardening redistribute wave energy, and bulkheads in particular tend to increase wave energy as waves are deflected. This impacts shoreline habitat by promoting erosion of adjacent beaches and alteration of sand and gravel recruitment (Lorang et al. 1993, Mulvihill et al. 1980). The natural accumulation of drift logs, hindered by the increased wave energy, would augment sediment-trapping and protects shorelines from excessive wave action, as well as allowing new riparian habitat to establish and

improving the limnetic environment (Lorang and Stanford 1993). The cumulative effects of wave energy changes and exacerbations in the Wapato Secondary sub-basin have not been measured, but they surely have an impact on large woody debris accumulation, riparian vegetation, and shoreline sedimentation.

A few fish passage barriers apart from those caused by sill effects are present in the Lake Chelan Watershed. Railroad, Safety Harbor, and Prince Creeks all have high water velocity barriers (Duke Engineering Services, Inc. 2000a), the first due to high runoff and the latter two to the stream gradient. Although not caused by the dam, the gradient barriers may be influenced by fluctuating lake elevations. Five streams investigated in the same study showed gradient barriers in the dam drawdown zone. These are formed by wind-driven waves transporting sediment from alluvial fans to deeper water. The five such barriers observed in the Lake Chelan Watershed are indirectly influenced by dam operations, as wind-driven waves create a gradient at the lake elevation at the time they are generated.

Table 1. Major impacts and affected ecological functions in the Lake Chelan Watershed.

<b>Impact Source</b>	<b>Impact Action(s)</b>	<b>Function(s) Affected</b>
Fire suppression	Loss of riparian vegetation, flashy stream flows, erosion and sedimentation	Water quality, hydrology, habitat
Land conversion	Loss of shrub-scrub, wetland, and riparian; pesticide and fertilizer use; irrigation; invasive species propagation	Water quality, habitat
Dam operations	Raised/fluctuating lake levels, entrainment, fish passage barriers	Hydrology, habitat, lake ecology
Docks and piers	Shading, structure in water	Habitat
Bulkheads and armoring	Loss of lakeshore vegetation, wetland loss, wave action alteration, erosion, alteration in recruitment of woody debris and sand/gravel	Hydrology, habitat
Non-fish-passable culverts	Fish passage barriers	Habitat, lake and tributary ecology
Other terrestrial development	Loss of native vegetation, ornamental species propagation, septic systems	Water quality, habitat
Agriculture and grazing	Loss of scrub-shrub, wetland, and riparian; pesticide and fertilizer use; sedimentation and erosion	Water quality, habitat
Fish introduction	Disruption of the food web, complex habitat interactions	Lake and tributary ecology

### **3.4 Fisheries and Species Interactions**

The fish community in Lake Chelan and its tributaries is an assemblage of native and non-native species (Table 2). The lake has a long and complex history

regarding fish populations. The following species accounts for major fish species in the watershed and are taken from the Lower Lake Chelan ILF Prospectus (The Watershed Company 2010). Main impacts and interactions among species are summarized in Table 3.

### 3.4.1 Westslope Cutthroat Trout

Historic and recent surveys and research summaries of native westslope cutthroat trout indicate a decline in cutthroat numbers in the lake from historic healthy levels in the late 1800s and early 1900s (Brown 1984, Duke Engineering 2000, Chelan County PUD 2007). Recent efforts have resulted in the capture of very low numbers of westslope cutthroat trout in both Lake Chelan and its tributaries (Chelan County PUD 2007; Hillman and Giorgi 2000). Resident cutthroat were observed in four of eight electrofished streams in 1999 and 2000. A 1999 survey resulted in the capture of just three fish, however (Duke Engineering Services 2001). Snorkeling surveys in 1999 and 2000 revealed adult cutthroat in Prince Creek in 1999 and resident fish in all nine streams surveyed in 2000. In addition, adfluvial trout were observed in First, Grade, Twenty-Five Mile, Safety Harbor, Prince, and Railroad Creeks. Relicensing documents completed by the Chelan County PUD (2001) support the assertion that cutthroat presently use the lake in very small numbers.

Lake Chelan cutthroat typically spawn from mid-April through June (Berg 2004). Findings of a 2000 study (Duke Engineering Service 2001) indicated late spawning and subsequent late emergence of smaller-than-average fry, likely compromising survival. Adfluvial trout gained access to Grade, Twenty-Five Mile, and Railroad Creeks only after high flows had abated, and Grade and Safety Harbor Creeks likely presented gradient barriers to upstream passage. High discharge appeared to present a velocity barrier in Twenty-Five Mile and Railroad Creeks. Estimated spawning time of trout in Railroad Creek suggests that a passage barrier did not exist until flows lessened or adequate pool elevation was achieved.

A 2009 study revealed no evidence of cutthroat trout spawning in Mitchell, Gold, Grade, or Safety Harbor Creeks in that year (Johnson and Archibald 2009). Later snorkel surveys found three hatchery cutthroat trout in Gold Creek and four resident cutthroats in Safety Harbor Creek, as well as possible cutthroat-rainbow trout hybrids. No adfluvial trout were observed in any of the four creeks. Although low stream flow potentially created a barrier to upstream migration in Mitchell Creek, and gradient and high-flow barriers existed at the mouths of Gold and Grade Creeks during the spawning survey time period, Safety Harbor Creek did not appear to present any passage barriers to upstream migration in 2009; adfluvial cutthroat trout could have potentially migrated upstream during the spawning period.

Hatchery operations that removed fish from the Stehekin River without replacement, coupled with non-native species introduction, resulted in the collapse of the Stehekin cutthroat population. High harvest rates, logging, mining contaminants, lake level fluctuations, and urbanization all probably contributed to the species' decline in the watershed overall.

Reintroduction efforts have been implemented in several tributaries, including First, Rainbow, Railroad, Pyramid, Safety Harbor, Mitchell, Fish, and Twenty-Five Mile Creeks and the Stehekin River and Domke Lake. Hatchery-reared fish release continues in Lake Chelan nearly annually, in an effort by WDFW to replace the rainbow trout population with native cutthroat.

### 3.4.2 Chinook Salmon

Landlocked Chinook salmon were introduced to Lake Chelan in 1974 and supported a strong recreational fishery from the late 1980s through the early 1990s (Chelan County PUD 2007). Since then, populations have exhibited declines. Based on current catch per unit effort statistics, Chinook contribute little to the Lake Chelan fishery, although creel survey numbers were higher when only those fishermen who targeted the species were considered (Duke Engineering Services 2000). Anecdotal evidence and unpublished records also indicate a declining harvest since 1996 (WDFW 2002). Reasons for losses have been investigated and may include low survival of stocked fish, low reproductive rates, rearing condition changes in stocked fish, emigration of smolts, over-harvest, and improved angling techniques (WDFW 2002, Chelan County PUD 2007).

Flood waters in the Stehekin River in 1995 greatly impacted Chinook reproductive success and appear to have been the beginning of an accelerated decline. WDFW hatchery supplementation efforts have been unsuccessful in recent years as well, and lake trout stocking took place from 1980 to 1983, and again from 1990 to 2000. Competition between the trout and Chinook reduced the number of Chinook surviving to adult size (WDFW 2002).

Current management recommendations for the species include managing Chinook with stocked triploid fish at levels high enough to support a sport fishery, but not so high as to preclude cutthroat trout success. This recommendation would involve balancing the Kokanee population as well. Alternatively, efforts to promote a self-sustaining naturally reproducing population could include stocking with diploid fish and eggs in tributaries and limiting harvest so that more landlocked fish spawn.

### 3.4.3 Kokanee

Kokanee were introduced in Lake Chelan in the early 1900s and have become the most popular sport fish in the lake (Duke Engineering Services 2000, WDFW 2002). Populations declined with the introduction of mysis shrimp (*Mysis relicta*) (Brown 1984), but much higher levels have returned since 1990 (Berg 2004).

The majority of spawning Kokanee are in First, Twenty-Five Mile, and Safety Harbor Creeks, and Company and Blackberry Creeks, tributaries of the Stehekin River, with up to 95 percent of spawning occurring in the Stehekin tributaries exclusively since 1990 (Berg 2004). A noted decline in spawners in Company Creek from 1976 to 1981 may have been due to competition from newly introduced mysis shrimp or predation by Chinook, introduced in 1974. A summary of surveys from 1981 to 2008 shows a steady increase in escarpment until 2005 in the five primary spawning creeks (Keese et al. 2009). Chelan County PUD spawner counts from 1981 through 1999 revealed high year-to-year variability in peak numbers, but no trends, and highest returns in 1999. Kokanee appeared to be fully utilizing the available substrate; because the preferred size spawning gravel is scarce, that may be the limiting factor for spawning in the tributaries studied (Duke Engineering Services 2000). A great decrease in 2006 and 2007 was likely the result of a 2003 flood event in the Stehekin Valley which scoured redds (Keese et al. 2009). Recent reports indicate increased numbers. Population expansion in the Stehekin River is of concern to agencies because of possible impacts on native fish and invertebrates, changes in populations of species that eat or scavenge kokanee, increases in human-bear interactions, and alteration of nutrient and pesticide levels (Chelan County PUD 2007), all of which may result from increased Kokanee numbers in the river.

PUD is required by permitting obligations to fund annual salmonid rearing, presently for Kokanee. Stocking by WDFW continues, and despite estimates of approximately 40 percent of the fishery reportedly being hatchery fish, researchers (Duke Engineering Services 2000) had low confidence in their ability to determine hatchery origin from scale analysis.

### 3.4.4 Bull Trout

Bull trout have not been verified in Lake Chelan since the 1950s and are most likely extirpated in the lake (Brown 1984, Chelan County PUD 2001, (Berg 2004). The reasons for extirpation are not certain. Postulations include the floods of 1948-1949 wiping out the species' spawning grounds, a pathogen, and fishing pressure reducing numbers to the point where the species could not recover (Brown 1984).

Several stakeholders, including the USFWS, have proposed investigating the possibility of restoring bull trout to the Chelan Watershed. A survey for remnant

populations and suitable habitat in the basin would precede any reintroduction effort. Limiting factors would need to be identified and eradicated. Concerns about the feasibility of the reintroduction of bull trout focus on non-native species populations in the lake, remaining pathogens, and availability of donor stock, among other considerations (Chelan County PUD 2007).

### 3.4.5 Lake Trout

Lake trout were introduced to Lake Chelan in the early 1980s and were the focus of a sustained stocking program by WDFW from 1990 to 2000 (WDFW 2002). Lake trout have fared well in Lake Chelan and appear to be reproducing naturally based on fry sightings during snorkel surveys. Additionally, sport catch data indicate a rapidly increasing population and, as a result, WDFW removed sport harvest restrictions in 2003. Lake trout became the most popular sport fishery as the landlocked Chinook fishery declined. Several fish over 30 lbs have been caught in the past ten years, including the Washington State record of 35 lbs 7 oz taken on December 31, 2001. Lake trout appear to present negative species interactions as an introduced top predator, and information from other lakes indicates that lake trout can have a significant negative impact on native fisheries. Management and regulatory agencies who participate on the Lake Chelan Fishery Forum recommend discontinuing lake trout stocking programs, evaluating the feasibility of eradication methods, developing a monitoring program to evaluate management actions, and studying natural reproduction of lake trout in the lake and its tributaries.

Concentration of DDT in lake trout adipose tissue has been used as an indicator of DDT in the watershed. Fish tissue concentrations have exceeded health standards and resulted in the inclusion of DDT on the 303(d) list for water quality impairment in Lake Chelan. Lake trout consumption health advisories have been issued by the Chelan-Douglas Health District, which recommended that at-risk populations limit their lake trout intake to appropriate levels.

### 3.4.6 Rainbow Trout

Rainbow trout have been stocked in Lake Chelan since the early 1900s and have been a supplemental recreational fishery to Kokanee as Kokanee production has lagged. Rainbow trout have been shown in other systems to outcompete and hybridize with westslope cutthroat trout, thereby adversely affecting efforts to establish viable native populations of cutthroat trout. Fisheries managers, local interests and regulatory agencies appear to agree that management actions should focus on the eventual elimination of rainbow trout from Lake Chelan by shifting stocking activities to cutthroat trout and eliminating the stocking of rainbow trout in the basin, including the high lakes and tributaries. Since 2005 there has been no stocking of rainbow trout in the basin, with the exception of non-reproducing triploid rainbow trout to support the recreational fishery.



### 3.4.7 Smallmouth Bass

As is the case with many of the “minor” species of fish in Lake Chelan, smallmouth bass were introduced illegally, probably sometime around 1990. There is currently an active, but limited, fishery, and the population appears to be increasing, although the distribution of the species is somewhat unknown. Risks from an increasing population on other species far outweigh the rewards, and management objectives emphasize control and removal of the population, particularly in the Lucerne sub-basin. The Lake Chelan Fishery Forum does not recommend any enhancement measures for smallmouth bass.

### 3.4.8 Eastern Brook Trout

Eastern brook trout have become established in Twenty-Five Mile Creek and the Stehekin River, and during the 1980s and 1990s WDFW stocked eastern brook trout in Twenty-Five Mile Creek and the Manson Lakes. The presence of eastern brook trout adversely affects native fisheries through competition and disease, and is a significant impediment to bull trout and cutthroat trout recovery efforts. There is agreement among the management agencies that the species should be eradicated.

### 3.4.9 Other Species

Other native fish species include pygmy whitefish (*Prosopium coulteri*), mountain whitefish, threespine stickleback (*Gasterosteus aculeatus*), peamouth, chiselmouth (*Acrocheilus alutaceus*), burbot, prickly sculpin (*Cottus asper*), and northern pikeminnow. Pygmy whitefish is listed as a Washington State Species of Concern. The effects of non-native fish stocking on these native species is unclear.

Additional non-native species observed in Lake Chelan and the Chelan River are largemouth bass (*Micropterus salmoides*), pumpkinseed (*Lepomis gibbosus*) and bluegill (*L. macrochirus*). Non-fish introductions in the lake include Eurasian milfoil, zebra mussel and Quagga mussel.

Table 2. Fish species in the Lake Chelan Watershed.

Species	Scientific name	Native	Non-native
Westslope cutthroat trout	<i>Oncorhynchus clarki lewisi</i>	X	
Bull trout	<i>Salvelinus confluentus</i>	X	
Mountain whitefish	<i>Prosopium williamsoni</i>	X	
Pygmy whitefish	<i>P. couterii</i>	X	
Burbot	<i>Lota lota</i>	X	
Largescale sucker	<i>Catostomus macrocheilus</i>	X	
Longnose sucker	<i>C. catostomus</i>	X	
Bridgelip sucker	<i>C. columbianus</i>	X	

## Lake Chelan WRIA 47 Habitat Component

Species	Scientific name	Native	Non-native
Northern pikeminnow	<i>Ptychocheilus oregonensis</i>	X	
Peamouth	<i>Mylocheilus caurinus</i>	X	
Threespine stickleback	<i>Gasterosteus aculeatus</i>	X	
Chiselmouth	<i>Acrocheilus alutaceus</i>	X	
Mottled sculpin	<i>Cottus bairdi</i>	X	
Slimy sculpin	<i>C. cognatus</i>	X	
Prickley sculpin	<i>C. asper</i>	X	
Redside shiner	<i>Richardsonius balteatus</i>	X	
Rainbow trout	<i>O. mykiss</i>		X
Kokanee	<i>O. nerka</i>		X
Landlocked Chinook salmon	<i>O. tshawytscha</i>		X
Lake trout	<i>S. namaycush</i>		X
Smallmouth bass	<i>Micropterus dolomieu</i>		X
Largemouth bass	<i>M. salmoides</i>		X
Eastern brook trout	<i>S. fontinalis</i>		X
Pumpkinseed	<i>Lepomis gibbosus</i>		X
Bluegill	<i>L. macrochirus</i>		X

Table 3. Major fish species interactions, impacts and production in the Lake Chelan Watershed.

Species	Impacts and Interactions	Function/Use	Reproduction/Support
Bull trout	Decline due to over-harvest, interbreeding, disease, loss of spawning habitat; reintroduction hindered by competition from Kokanee and trout	Historic occurrence, threatened species	Not observed in Lake Chelan or tributaries since early 1950s
Chinook salmon	Forage competition from mysids and lake trout, hatchery conditions, flooding, over-harvest, improved angling methods	Strongly supported recreational fishery until early 1990s, community desire to rebuild fishery	Reproduces naturally in low numbers, stocked, declining population
Kokanee	Forage competition from mysids, predation by Chinook, flooding, interbreeding	Strongly supported recreational fishery	Reproduces naturally, expanding population in Stehekin River, stocked previously, 2007 spawners found sufficient to support population
Western cutthroat trout	Gradient and velocity barriers, competition from non-natives, over-harvest, mining contaminants, logging impacts, hatchery operations, interbreeding	Strongly supported recreational fishery	Reproduces naturally in tributaries, stocked with hatchery fish, hybridizes with rainbow trout
Lake trout	Compete with and prey on native fish, exceed DDT health standards in adipose	Popular trophy fish	Reproduce naturally in Lake Chelan, stocked previously

## Lake Chelan WRIA 47 Habitat Component

Rainbow trout	Outcompete and hybridize with native cutthroat trout	Triploids supplement cutthroat fishery	Stocked since early 1990s, hybridize with cutthroat trout, no reproductive fish stocked since 2005, triploids stocked
Smallmouth bass	Danger of competition with or predation of native fish	Recreational fishery	Introduced illegally in 1990, reproducing in and presently limited to Wapato sub-basin
Eastern brook trout	Compete with native fish; spread disease	Recreational fishery	Established in Stehekin River and Twenty-five Mile Creek from historic stocking

In addition to species statuses and interactions, present and historic habitat issues and conditions in the Lake Chelan Watershed are described in the ILF Framework. Anthropogenic impacts on each habitat type affect aquatic habitat in Lake Chelan and its tributaries by altering water quality and/or quantity and availability and quality of habitat. Impacts to habitats present in the watershed are summarized in Table 4.

Table 4. Wildlife habitat types occurring in the Lake Chelan Watershed and main environmental threats (from Johnson and O'Neil 2001).

Habitat Type	Dominant Species	Main Impacts/Threats
<b>Montane mixed conifer forest</b>	<i>Tsuga mertensiana</i> , <i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>	Clear-cutting and plantations, road-building impact structure and composition, affect seral stage distribution, and promote fragmentation
<b>Eastside mixed conifer forest</b>	<i>Pseudotsuga menziesii</i> , <i>Pinus ponderosa</i> , <i>Grandis</i> , <i>Thuja plicata</i> , <i>T. heterophylla</i>	Timber harvest and fire suppression leave shade-tolerant, fire-resistant trees, as well as densely stocked stands lacking snags; late seral forest nearly absent, mid-seral forest artificially abundant
<b>Lodgepole pine forest and woodlands</b>	<i>P. contorts</i> vars. <i>latifolia</i> and <i>murrayana</i>	Fire suppression leaves stands to develop multiple layers; lack of natural regeneration creates "pumice deserts"
<b>Ponderosa pine forest and woodlands</b>	<i>P. ponderosa</i> , <i>P. menziesii</i>	Fire suppression has resulted in heavy fuel loads and stand-replacing fires; forests are increasingly closed-canopy and multi-layered; grazing removes grass cover and favors shrub, oak and conifer growth; most management regimes lead to smaller trees in denser stands

## Lake Chelan WRIA 47 Habitat Component

Habitat Type	Dominant Species	Main Impacts/Threats
<b>Upland aspen forest</b>	<i>Populus tremuloides</i>	Livestock browsing and fire suppression have greatly reduced aspen habitat since 1900
<b>Subalpine parkland</b>	<i>Pinus albicaulis</i> , <i>Larix lyallii</i>	Fire suppression has altered structure and function and resulted in blister rust; logging and other disturbance have a great impact because of naturally slow regeneration rates
<b>Alpine grassland and shrublands</b>	<i>Festuca idahoensis</i> , <i>F. brachyphylla</i> , <i>F. viridula</i> , <i>F. saximontana</i> , <i>Danthonia intermedia</i>	Trampling and other recreational impacts can result in bare ground not suitable for vascular plant growth; exotic ungulates cause degradation and erosion
<b>Eastside grasslands</b>	<i>Pseudoroegneria spicata</i> , <i>F. idahoensis</i> , <i>F. campestris</i>	Livestock have altered vegetative makeup; non-native grasses now dominate in riparian bottomlands
<b>Shrub-steppe</b>	<i>Artemisia tridentate</i> ssp. <i>tridentate</i> , <i>A.t.</i> ssp. <i>Wyomingensis</i> , <i>A.t.</i> ssp. <i>Vaseyana</i> , <i>Purshia tridentate</i> , <i>A. cana</i> , <i>A. tripartita</i>	Conversion to orchard, pasture, other development has reduced this habitat; grazing has altered species composition and promoted conversion to invasive species
<b>Agriculture, pasture and mixed environs</b>	Orchard, vineyard, pasture	May receive fertilizer and pesticide inputs; crops, grazing, and other management and uses prevent reversion to native vegetation; grazing may increase exotic species
<b>Urban and mixed environs</b>	Remnant native vegetation, ornamentals, invasive species	Degraded conditions in these areas are most often irreversible and include many types of anthropogenic impacts
<b>Open water – lakes, rivers and streams</b>	May include aquatic bed	Agricultural runoff, shoreline hardening, overwater structures, dams, passage barriers, flood control measures, forestry practices, and numerous sources of development impact water quality, quantity, and habitat characteristics
<b>Herbaceous wetlands</b>	<i>Typha latifolia</i> , <i>Scirpus</i> spp., <i>Carex</i> spp., <i>Juncus</i> spp. and many others	Channeling, filling, and diverting hydrology for agriculture and development have reduced and degraded wetlands
<b>Montane coniferous wetlands</b>	<i>P. engelmannii</i> , <i>A. lasiocarpa</i> , <i>P. contorta</i> , <i>T. heterophylla</i> , <i>P. menziesii</i> , <i>A. grandis</i>	Roads and clearcutting increase flooding and debris flows; logging reduces woody debris and canopy structural complexity

Habitat Type	Dominant Species	Main Impacts/Threats
Eastside riparian wetlands	<i>P. balsamifera</i> ssp. <i>trichocarpa</i> , <i>P. tremuloides</i> , <i>Alnus rhombifolia</i> , <i>Salix amygdaloides</i> , <i>Betula papyrifera</i> , <i>B. occidentalis</i> , <i>S. lucida</i> ssp. <i>caudate</i> , <i>S. bebbiana</i> , <i>S. boothii</i> , <i>S. exigua</i>	Dams, roads, logging, and excessive grazing all impact habitat, hydrology, water quality, and vegetative structure and composition.

## 4. EXISTING RESTORATION GOALS AND OBJECTIVES

### 4.1 Watershed-specific

A number of studies and reports have defined restoration goals for the Lake Chelan Watershed. These are summarized in the following sections.

#### 4.1.1 WRIA 47 Watershed Planning Phase II

Goals of the Long-Term Monitoring Plan for Lake Chelan for water quality in WRIA 47 habitat restoration by focusing on evaluating water quality. These goals are listed in the plan as follows:

1. Develop a monitoring design supported by water quality models that can be used to evaluate trends in water quality parameters.
2. Evaluate concerns about potential concerns about potential future changes in water clarity and lake eutrophication.
3. Develop a monitoring approach for constituents that have completed TMDLs to allow a determination of the effectiveness of post-TMDL remedies (phosphorus, DDT analogs, PCBs).
4. Develop a monitoring design for 303(d)-listed constituents in Lake Chelan that have not yet been addressed by completing a TMDL.
5. Recommend data quality objectives and analytical methods to ensure greater consistency and comparability of data in the future.
6. Develop a monitoring program that can be used to evaluate best managements practices (BMPs) that may be implemented to address water quality concerns.

#### **4.1.2 WRIA 47 Final Draft Planning Unit Charter**

The WRIA 47 Planning Unit has the goal “to implement a management plan for water use and protection that sustains the environmental, educational, economic and recreational values associated with a healthy lakeside community and watershed.” The following objectives were outlined in the *WRIA 47 Final Draft Planning Unit Charter* (RH2 Engineering and Geometrix Consulting 2007).

1. Assess water supply, use and projected needs.
2. Develop and implement a comprehensive, long-term monitoring program of key parameters that will ensure water quality sustainability throughout the Lake Chelan Watershed.
3. Address waterbodies with constituents on the State 303(d) list and other parameters of potential concern that threaten lake water quality.
4. Inform and educate local communities and visiting populations about water quality protection.
5. Develop a Water Quality Improvement Plan and Water Quality Management Plan to understand, restore and protect water resources.

#### **4.1.2 Lake Chelan Fishery Plan (LCFP)**

The Lake Chelan Hydroelectric Project relicensing article (Chelan County PUD 2007) presents three fishery management goals, and several objectives toward meeting the goals:

***Goals:***

1. Provide guidance for the management of the fishery resources in Lake Chelan.
2. Protect native fish populations while maintaining a healthy recreational sport fishery in Lake Chelan.
3. Develop a monitoring and evaluation program to assess the efficacy of management action.

***Objectives:***

1. Emphasize restoration/enhancement of native species, where feasible.
2. Support the recreational sport fishery.

3. Manage the lake elevation to enhance tributary production and recreation.
4. Determine the compatibility of management actions with potential future bull trout reintroduction.
5. Develop a monitoring and evaluation program that provides flexibility for future changes in both implementation and the monitoring and evaluation program.
6. Monitor and address entrainment of fish from Lake Chelan into the Project intake.

#### **4.1.3 Lake Chelan Sub-basin Plan**

The LCSP (Berg 2004) established the goal to “restore conditions to a more natural state” by employing “ecosystem-based perspectives that consider multiple species, their life histories, and their inter-relationships.” The LCSP includes a detailed inventory, and concludes with a management plan that lists a number of habitat or biological objectives for key species and key habitats in the basin.

Many of the objectives are to conduct additional species/habitat assessments, “identify and provide biological and social conservation measures to sustain focal species populations and habitats,” and in a number of instances to “[m]aintain and/or enhance habitat function (i.e., focal habitat attributes) by improving silvicultural practices, fire management, weed control, livestock grazing practices, and road management...” Because the intention of this portion of the LCSP is to identify and direct aquatic restoration and management approaches, only those goals that directly address aquatic habitat restoration and fish management are summarized here without stated deadlines.

1. Provide sufficient quality and quantity of riparian wetlands to support focal species identified in the sub-basin plan, including the fish species addressed in this list.
2. Remove tributary barriers and /or alter lake level management to make historic westslope cutthroat trout spawning grounds available earlier.
3. Cease stocking of non-native species that negatively impact cutthroat trout.
4. Remove or decrease numbers of key exogenous species.
5. Reduce naturally-produced cutthroat trout harvest impacts.

6. Determine if bull trout exist in the sub-basin.
7. If bull trout are found in the sub-basin, work toward achieving self-sustaining non-migratory populations.
8. Reduce abundance of exogenous fish that may hinder bull trout reintroduction, if it is to occur.
9. Preserve historic bull trout habitat.
10. Reduce negative impacts of mysids on kokanee.
11. Increase kokanee juvenile survival and adult abundance.
12. Achieve self-sustaining kokanee populations.

## 4.2 Other Plans and Programs with Restoration Goals

Several other plans and policies include as goals preservation and/or enhancement of aquatic habitat or related elements. These more general goals are addressed in the following sections.

### 4.2.1 Chelan County Shoreline Master Program Update Draft Shoreline Restoration Plan

The Draft Shoreline Restoration Plan (The Watershed Company and ICF 2010) lists goals from plans, programs and policies for all of Chelan County. Those applicable to WRIA 47 were taken from the Lake Chelan Sub-basin Plan and are listed in Section 4.1.2.

### 4.1.4 Chelan County Comprehensive Plan

The 2005 *Chelan County Comprehensive Plan* was developed in accordance with Section 36.70A.070 of the Growth Management Act to address land uses. The Plan covers the unincorporated areas outside of the city urban growth areas. Seven study areas were identified within the county-wide plan, encompassing the following study areas: Chelan-Manson, Entiat Valley, Malaga-Stemilt-Squilchuck, Lower Wenatchee River Valley, Upper Wenatchee River Valley, Plain-Lake Wenatchee, and Stehekin (Chelan County 2005).

A Rural Coordinating Committee, made of 12 members appointed by the Board of Commissioners to coordinate the Rural Element of the Plan, together with the Planning Commission, went through a process where they identified goals and policies applicable to specific study areas, and goals and policies applicable county-wide. In particular, the Plan expresses a goal of identifying and protecting critical areas and mitigation adverse impacts that may result from



reasonable use. Policies include encouraging the enhancement and restoration of fish and wildlife habitat.

#### **4.2.1 Chelan County Critical Areas Regulations**

Chelan County's critical areas regulations were recently updated (2007), and are considered to be consistent with Growth Management Act "best available science" standards. Many of the issues and concerns that guided the development of the critical area regulations were discussed and addressed in the comprehensive planning process. The land use element of the comprehensive plan is required to review; where applicable, drainage, flooding, and storm water run-off and to provide guidance for corrective actions to mitigate or cleanse those discharges that pollute waters of the state. Included in the goals set by Chelan County are three that pertain directly or indirectly to aquatic habitat, numbered below as they are in the plan:

Goal 1: Protect water quality.

Goal 3: Ensure that development minimizes impacts upon significant natural, historic, and cultural features and to preserve their integrity.

Goal 4: Identify and protect critical areas and provide for reasonable use of private property while mitigating adverse environmental impacts.

#### **4.2.2 City of Chelan Plans and Regulations**

The *City of Chelan Comprehensive Land Use Plan* (2007) follows the recommendation of the Growth Management Act (GMA) by adopting goals and policies to "protect critical areas," that include wetlands, geologically hazardous areas, aquifer recharge areas, fish and wildlife habitat conservation areas and frequently flooded areas. The City of Chelan established critical area goals and policies that were adopted in 1998. Goals include the general "protect water quality."

The City of Chelan's environmental regulations are found in the *Chelan Municipal Code*, Chapter 14.10, and are currently being updated. These regulations "establish special standards for the use and development of lands based on the existence of natural conditions and features including geologically hazardous areas, critical aquifer recharge areas, frequently flooded areas, fish and wildlife conservation areas and wetlands." The standards and procedures established in Chapter 14 are intended to protect environmentally sensitive areas while accommodating the rights of property owners to the use of their property in a reasonable manner. The Code includes a goal of protecting unique and fragile environmental elements, including wetlands.

#### 4.2.3 City of Chelan Parks and Recreation Comprehensive Plan

The *City of Chelan Comprehensive Land Use Plan* (2007) is intended to implement comprehensive land use planning at the local level, maintain local decision making power, and promote desired changes. An element to the Plan is the *Parks and Recreation Comprehensive Plan 2008-14* (2007). The element includes a commitment to managing and expanding the community's resources, including conservation of natural resources and support for the City's economic vitality (City of Chelan Parks and Recreation Department 2007). The Department established goals and objectives, including priority actions. The environment protection goal is:

PRG 6.0: Protect and preserve as open space areas that: are ecologically significant sensitive areas; provide significant opportunities for restoration buffers between uses and link open space; provide trails and/or wildlife corridors; or enhance fish habitat.

#### 4.2.4 City of Chelan Strategic Plan 2008-2009

The 2008 City of Chelan's *Strategic Plan 2008-2009* vision statement includes relevant information "to preserve and improve the quality of life for the citizens of the community and for visitors to the area by achieving/creating....the preservation of natural resources and water quality....and a commitment to maintaining existing city resources/facilities." The relevant strategic goal and objective are as follows:

Goal: To improve the quality of life and environment in the Lake Chelan area;

Objective: Complete Don Morse Park Master Plan and initiate phased development with a focus on shoreline stabilization, beach enhancement, and reassessment of size of marina.

## 5. EXISTING RECOMMENDATIONS AND STRATEGIES

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Various interested agencies and entities in the Lake Chelan Watershed have completed studies or documents outlining aquatic habitat recommendations, and often have proposed strategies for implementing recommendations. The most detailed and specific of these are species-based (see Sections 5.2 and 5.3); species-based summaries are presented in Table 5.

## **5.1 WRIA 47 Final Draft Planning Unit Charter**

The Planning Unit promotes long-term strategies toward the implementation of their water resource goals. These are copied from the Charter below:

1. Fully engage all stockholders through an open accessible and collaborative effort.
2. Develop and implement a comprehensive, long-term monitoring program of key parameters that will ensure water quality sustainability throughout the Lake Chelan Watershed.
3. Address water bodies with constituents on the State 303(d) list and other parameters of potential concern that threaten lake water quality.
4. Inform and educate local communities and visiting populations about water quality protection.
5. Develop a Water Quality Improvement Plan and Water Quality Management Plan to understand, restore and protect water resources.

## **5.2 Lake Chelan Fishery Plan (FERC Project No. 637)**

The LCFP was developed in consultation with the National Park Service (NPS), US Forest Service (USFS), US Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS), Washington Department of Fish and Wildlife (WDFW), Confederated Tribes of the Colville Reservation, Yakama Nation, the Confederated Tribes of the Umatilla Indian Reservation, the City of Chelan, and the Lake Chelan Sportsman's Association, which formed the Lake Chelan Fishery Forum (LCFF). The LCFF proposed a number of recommended actions to meet the management objectives of the LCFP (see Section 3.2.1). Recommendations are almost entirely species-based and have in some cases been implemented or otherwise addressed, although further reporting was generally not required by FERC (see Table 5). The recommended strategies are derived from issues raised by stakeholders during the relicensing process.

### **5.2.1 Westslope Cutthroat Trout**

Recommendations for enhancing cutthroat trout populations are as follows:

1. Replace the 2007 100,000 rainbow trout allotment with increasing proportions of Twin Lakes cutthroat trout over a four-year period, after which only cutthroat trout are stocked. Suggested strategies for stocking Twin Lakes cutthroat include stocking catchable sizes, planting eyed eggs in tributaries, maintaining a recreational trout fishery with Twin Lakes

cutthroat, prioritize Lake Chelan fish management needs in allocation of Twin Lakes eyed eggs, and locate other sources of Twin Lakes cutthroat or other cutthroat stocks for use in other Washington waters.

6. Immediately (as of 2007) eliminate rainbow trout stocking in high lakes and tributaries in the Lake Chelan Watershed.
7. Remove barriers and manage lake water levels to improve tributary access for spawning, incubation and rearing.
8. Implement monitoring and evaluation to assess efficacy of management actions.
9. Maintain fishing restrictions at tributary mouths to protect spring spawning salmonids until the cutthroat trout population recovers.
10. Stock cutthroat trout after completion of spill to enable stocked fish to survive the winter in the lake and return to tributaries to spawn, thereby contributing to natural reproduction.

### 5.2.2 Rainbow Trout

Recommendations for phasing out rainbow trout are:

1. Phase out rainbow trout stocking over a four-year period as cutthroat stocking increases (see Section 4.1.1 (1)); monitor and evaluate the effort as it proceeds.
2. Immediately (as of 2007) eliminate rainbow trout stocking in high lakes and tributaries in the Lake Chelan Watershed and in the Lucerne Basin of Lake Chelan.
3. Explore the feasibility of stocking triploid rainbow trout for recreational angling if the cutthroat trout recreational fishery is insufficient.

### 5.2.3 Kokanee

Although they are non-native, kokanee are the most popular recreational fish in Lake Chelan and therefore subject to Objective 2 (Section 3.1.2) of the Lake Chelan Fishery Plan. Recommendations for achieving goals for kokanee are:

1. Develop an interim stocking plan for all species, but emphasizing the issues regarding kokanee stocking, to be kept in place until monitoring and evaluation can be implemented to provide better information for making long-term management decisions.

2. Develop population size goals that are compatible with native species recovery and protection goals, and with National Park Service goals for the Stehekin River.
3. Monitor populations to provide a basis for the following actions:
  - a. Stock when populations decline below established objectives.
  - b. Maintain a recreational kokanee fishery.
  - c. Develop a monitoring and evaluation program to assess the efficacy of management actions, with particular attention to the effect of stocking on kokanee numbers in the lake and the spawning population in the Stehekin sub-basin.
4. Discontinue stocking after spill has stopped (September or October).

#### **5.2.4 Landlocked Chinook Salmon**

This species was a strong recreational and commercial (guided) fish in the 1980s and 1990s; the Chelan community has shown a strong desire to restore the annual Chinook Derby, which was a significant economic event in the past. However, the NPS and FWS have raised concerns about stocking in Lake Chelan despite continuing declines in native fish populations. Recommendations by the LCFF include attempts to address these divergent issues regarding the species.

1. The suggested Interim Stocking Plan should pay special attention to the issue of stocking landlocked Chinook.
2. Investigate predation aspects of landlocked Chinook salmon; this work should include looking at the feasibility of stocking triploid Chinook, setting interim harvest restrictions to protect populations, and supporting a recreational fishery.
3. Evaluate the impacts of Chinook on native fish species in Lake Chelan and consider management actions that would limit impacts; support a recreational fishery if impacts are found to be minimal.
4. Discontinue stocking lake trout.
  - a. Stop juvenile stocking.
  - b. Reduce the adult population.
  - c. Investigate the presence and absence of natural lake trout reproduction in Lake Chelan and tributaries.

5. Implement monitoring and evaluation to assess efficacy of management actions.

### **5.2.5 Bull Trout**

There have been no documented occurrences of bull trout in Lake Chelan or its tributaries since the early 1950s. Relicensing stakeholders, particularly FWS, expressed a desire to determine the feasibility of restoring the species to the Lake Chelan Watershed. If such an effort is found to be feasible, the goal of the State and federal agencies would be self-sustaining populations in the historical habitat in the Stehekin River and tributaries of the Stehekin River and Lake Chelan. Associated recommendations by the LCFF as are follows:

1. Conduct a feasibility study of reintroducing fluvial and adfluvial bull trout.
2. Prioritize maintaining recreational fishing opportunities for other species.
3. Develop a monitoring and evaluation program to assess efficacy of management actions.
4. Discontinue brook trout and lake trout stocking.
5. Reduce adult brook and lake trout populations.

### **5.2.6 Lake Trout**

1. Discontinue lake trout stocking.
2. Assess population size, recruitment, distribution, and spawning areas and explore potential eradication methods.
3. Develop a monitoring and evaluation program to assess efficacy of management actions.
4. Look at presence/absence of naturally reproducing fish in Lake Chelan and its tributaries.

### **5.2.7 Burbot**

1. Develop a monitoring and evaluation program to assess efficacy of management actions.
2. Monitor abundance, survival, and recruitment trends; evaluate the effects of fishing regulations and disease screening.

### **5.2.8 Smallmouth Bass**

1. Develop a monitoring and evaluation program to assess efficacy of management actions.
2. No enhancement measures directed at this species are recommended (as of 2007).
3. Monitor water temperature and smallmouth bass distribution/abundance in the Lucerne sub-basin and Stehekin Flats.
4. Implement removal actions if smallmouth bass are found in the Lucerne sub-basin.

### **5.2.9 Eastern Brook Trout**

1. Eradicate eastern brook trout from Twenty-five Mile Creek and the Stehekin River using all feasible means.
2. Adopt fishing regulations to encourage harvest of eastern brook trout, provided bull trout restoration has not been implemented and there is no chance of incidental bull trout harvest.

### **5.2.10 Other Native Fish Species**

1. Develop a monitoring and evaluation program to assess efficacy of management actions.

### **5.2.11 Other Non-native Fish Species**

1. No further introduction of non-native species.
2. No introductions of anadromous fish to Lake Chelan.

### **5.2.12 Invasive Aquatic Plant Species**

As part of the Lake Chelan Fishery Plan, the Chelan PUD agreed to provide signage at PUD-operated boat launches to inform the public about invasive species and prevention of transmitting them between water bodies. As well, the Chelan PUD agreed to report to Ecology and the LCFF any invasive species observed during project monitoring and inspection.

## **5.3 Lake Chelan Sub-basin Plan (LCSP)**

The LCSP generally calls for promoting self-sustaining kokanee and westslope cutthroat trout through harvest reduction and eliminating non-native species, and for reintroducing bull trout. The following strategies are aimed at achieving

the aquatic biological goals of the Subbasin Plan. As in the LCFP (Section 5.2), strategies for reaching aquatic goals are species-based.

### 5.3.1 Westslope Cutthroat Trout

In order to reach the goals of improving Lake Chelan Watershed conditions for cutthroat trout, the Sub-basin plan recommends the following strategies.

1. Remove tributaries barriers mechanically.
2. Complete a fish stocking plan for all species that may negatively impact Cutthroat trout.
3. Increase Chinook and lake trout harvest.
4. Remove harvest limits on brook and rainbow trout.
5. Determine cutthroat trout early life history requirements.
6. Investigate interactions, if any, between kokanee spawning and cutthroat fry emergence.
7. Delay fishing season opening near tributary mouths in Lake Chelan until after cutthroat spawning season.

### 5.3.2 Bull Trout

Overall goals pertaining to bull trout are to determine their existence status in the Lake Chelan Watershed, promote a self-sustaining population if they are found to exist, and to protect historic habitat. Recommended strategies are:

1. Investigate areas that may support reserves of non-migratory bull trout.
2. If feasible, reintroduce bull trout in historic bull trout habitat; determine potential interactions with existing populations prior to any introduction.
3. Determine predator-prey interactions among species in Lake Chelan.
4. Increase harvest of Chinook salmon and lake trout.
5. Eliminate harvest limit on brook trout.
6. Preserve or restore geofluvial processes in all tributaries.

### 5.3.3 Kokanee Salmon

The Sub-basin Plan's goal for this species is a self-sustaining population. Strategies to achieve this are:



1. Reduce mysid abundance.
2. Increase Chinook and lake trout harvest.
3. Develop a hatchery fish planting schedule that will meet both native fish production and harvest rate goals.

## **5.4 Other Recommendations**

The Chelan Basin Watershed Analysis (Lenz 2008), the First/Twenty-five Mile Creek Watershed Analysis (Murphy 1995), the Tributary Barrier Analysis (Duke Engineering Services 2000a), and a study of the predation impacts of lake trout and Chinook in Lake Chelan (Schoen and Beauchamp 2010) each contribute to the knowledge base of aquatic habitat and fisheries function in the lake. Unlike the work described in the preceding sections, these documents do not focus on management of the fishery, but on ecological impacts of natural and anthropogenic processes and actions in the watershed. The analyses do, however, make recommendations that pertain to the fish assemblage or individual species in Lake Chelan. They are therefore included in Table 5.

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Table 5. Recommendation and strategy summary for major fish species in the Lake Chelan Watershed.

Species	Recommendation/Strategy	Source(s)*	Status	Conflict(s)
<b>Western cutthroat trout</b>	Replace rainbow trout stocking with cutthroat in phases	LCFF	2010 PUD plan includes Twin Lakes fry stocked in Cascade, Bear, Big, and Mill Creeks and in Lake Chelan; Eyed eggs at Four-miles Creek	Rearing conditions at Chelan hatchery are limited
	Manage water levels for spawning and rearing	LCFF	**	**
	Remove tributary barriers	LCSP, LCFF	PUD/LCFF effort includes reassessment of barriers identified in TBA; priority list to be updated; fish passage in Mitchell and Gold Creeks to begin in early 2011 (Final Design completed Aug 2009)	Watershed instability due to recent fires may thwart efforts; USFS Restoration Assistance Team recommends more time be allowed for tributaries to carve alluvial deposits; WDFW cutthroat restoration efforts could increase natural reproduction if allowed more time
	Determine early life history requirements	LCSP	**	**
	Investigate interactions between cutthroat fry emergence and kokanee spawning	LCSP	**	**
	Delay fishery opening at tributary mouths until after spawning	LCSP	**	**
	Maintain fishing restrictions at tributary mouths	LCFF	**	**
	Implement monitoring and evaluation	LCFF	PUD creel, snorkel and spawning surveys in Lake Chelan and tributaries began in 2009; also abundance monitoring in Stehekin River and tributaries	**

	Stock after spill completion to promote winter survival and natural reproduction	LCFF	**	**
	Maintain Twin Lakes fishery	LCFF	**	**
	Allocate Twin Lakes eyed eggs to Lake Chelan	LCFF	Eyed eggs stocked in Four-mile Creek in PUD 2010 plan	**
<b>Rainbow trout</b>	Eliminate rainbow stocking in high lakes and tributaries	LCFF	2010 PUD stocking only in Lake Chelan and Mill Creek (triploids)	Popular fishery
	Explore feasibility of triploid rainbow stocking if cutthroat fishery is insufficient	LCFF	PUD presently stocks triploids	**
	Phase out stocking	LCFF	Only triploids stocked	Popular fishery
	Remove harvest limits	LCSP	**	**
<b>Bull trout</b>	Conduct reintroduction feasibility study	LCFF	**	**
	Investigate suitable habitat areas	LCSP	**	**
	If feasible, reintroduce into historic habitat	LCSP	**	**
	Determine predator-prey relationships	LCSP	**	**
	Preserve or restore geofluvial processes in tributaries	LCSP	**	**
	Maintain other recreational fisheries	LCFF	**	**
	Monitor to evaluate management actions	LCFF	**	**
<b>Lake trout</b>	Remove harvest limits		**	**
	Discontinue stocking	LCFF	**	Some support for fishery
	Determine whether the species reproduces naturally in the watershed	LCFF	**	**
	Explore eradication methods; locate spawning aggregations	LCFF Schoen and Beauchamps 2010	**	Some support for fishery

## Lake Chelan WRIA 47 Habitat Component

	Assess population parameters (population trends, distribution, and size structure)	LCFF Schoen and Beauchamps 2010	UW research includes diet, distribution	**
	Monitor to evaluate management actions	LCFF	PUD creel, snorkel and spawning surveys in Lake Chelan and tributaries began in 2009	**
	Eliminate harvest limit (for Chinook)	LCFF	**	**
<b>Eastern brook trout</b>	Eradicate from Twenty-five Mile Creek and the Stehekin River	LCFF	**	**
	Encourage fishing	LCFF	**	Chance of incidental bull trout harvest if bull trout are present or reintroduced
	Develop population size goals compatible with native species recovery goals and with NPS goals for the Stehekin River	LCFF	**	**
<b>Kokanee</b>	Monitor populations for stocking, fishing, and evaluation of management practices; assess recruitment and abundance	LCFF Schoen and Beauchamps 2010	PUD creel, snorkel and spawning surveys in Lake Chelan, the Stehekin River, and tributaries began in 2009	**
	Do not stock after spill	LCFF	**	**
	Reduce mysid abundance	LCSP	**	**
	Develop hatchery planting schedule for production and harvest goals	LCSP	**	**
<b>Landlocked Chinook</b>	Investigate predation aspects	LCFF	Research at UW includes diet and predation	**
	Investigate feasibility of stocking triploids	LCFF	2010 PUD triploid stocking in Mill Creek	**
	Investigate setting harvest restrictions	LCFF	**	Bull trout reintroduction recommends increased harvest

	Evaluate impacts on native fish	LCFF	Research at UW includes diet and predation	**
	Wait until kokanee population rebounds before rebuilding Chinook fishery	Schoen and Beauchamps 2010	**	**
<b>Burbot</b>	Monitor abundance, survival, recruitment	LCFF	PUD creel, snorkel and spawning surveys in Lake Chelan and tributaries began in 2009	**
	Evaluate effects of fishing and disease screening	LCFF	**	**
<b>Smallmouth bass</b>	Implement removal if discovered in Lucerne sub-basin	LCFF	**	**
	Monitor water temperature and species distribution in Lucerne sub-basin and Stehekin Flats	LCFF	**	**
	Monitor to evaluate management actions	LCFF	PUD creel, snorkel and spawning surveys in Lake Chelan and tributaries began in 2009	**
<b>Multiple species</b>	Implement Lake Chelan LWD and shoreline erosion management plans	CBWA	**	**
	Reduce runoff and mass wasting from roads and disturbed sites	Creeks WAP, CBWA	**	**
	Create spawning habitat in lower First and Twenty-five Mile Creeks	Creeks WAP	**	**
	Create spawning gravel monitoring plan for First and Twenty-five Mile Creeks	Creeks WAP	**	**
	Analyze riparian areas for connectivity in First and Twenty-five Mile Creeks	Creeks WAP	**	**
	Rehabilitate disturbed vegetation areas and plant areas that are inadequately shaded	Creeks WAP, CBWA	**	**

## Lake Chelan WRIA 47 Habitat Component

	Develop domestic water diversions that provide fish passage in First and Twenty-five Mile Creeks	Creeks WAP	**	**
	Restore riparian vegetation along Twenty-five Mile Creek in State Park	Creeks WAP	**	**
	Lower lake level in late summer/early fall to allow streams to cut through sediment deposits	TBA	**	Depends on stream energy and precipitation
	Raise lake level in winter/spring above barriers	TBA	**	Damage to lakeshore property; would raise aquatic vegetation zone
	Create tributary passage channels	TBA	**	**
	Complete a fish stocking plan	LCFF, LCSP	**	**
	No further introduction of non-native species	LCFF, CBWA	**	**
	No anadromous fish introductions	LCFF	**	**
	Monitor to evaluate management actions on all native species	LCFF	PUD began creel, spawning and snorkel surveys on cutthroat trout, rainbow trout, and Kokanee in Lake Chelan, the Stehekin River, and tributaries in 2009	**

\*LCFF – Lake Chelan Fisheries Forum

LCSP – Lake Chelan Sportman’s Association

CBWA – Chelan Basin Watershed Analysis (Lenz 2008)

Creeks WAP – First/Twenty-five Mile Creek Watershed Analysis (Murphy 1995)

TBA – Tributary Barrier Analysis (Duke Engineering Services 2000a)

\*\*Unknown or not available/applicable

## 5.5 Draft In-lieu Fee Prospectus

The In-lieu Fee Prospectus identifies general restoration recommendations for a number of sub-basins within the lower (Wapato) Lake Chelan Watershed. These are organized by hydrologically defined sub-basin boundaries and based on resource needs at the watershed level. Table 6 provides a summary.

Table 6. General recommendation strategies for the lower Lake Chelan Watershed (The Watershed Company 2010).

Sub-basin	Habitat recommendation(s)
<b>Manson Lakes</b>	Implement grazing controls
	Improve fire control methods
	Eradicate and monitor for new invasive species infestations
	Implement habitat restoration projects
	Implement erosion protection projects
<b>First Creek</b>	Evaluate and reduce fuel load
	Improve fire control methods
	Encourage mature trees through restoration and protection
	Restore post-fire habitat
	Promote a range of successional stages
	Eradicate and monitor for new invasive species infestations
	Reintroduce fire in low-fire regimes
<b>Twenty-five Mile Creek</b>	Improve fire control methods
	Reintroduce fire in low-fire regimes
	Restore degraded riparian areas
	Restore post-fire vegetation
	Improve upstream channel conditions
	Evaluate and reduce fuel load
	Promote a range of successional stages
	Encourage mature trees through restoration and protection
	Remove fish barriers
	Repair existing artificial spawning channel
	Eradicate and monitor for new invasive species infestations
<b>Wapato Secondary</b>	Reestablish lakefringe and aquatic wetlands
	Restore lakeshore vegetation
	Eradicate and monitor for new invasive species infestations

## 6. REFERENCES

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## **APPENDIX H**

### **Operator Certifications**



**WATER WORKS OPERATOR CERTIFICATION  
VALIDATION CARD  
FOR CERTIFICATE OF COMPETENCY**

Certificate No.	Valid for Year	Classification(s)
012175	2018	CCS, WDM 1, WTPO 2

Be it known that the Washington State Department of Health  
Office of Drinking Water has recognized

**LEE H REYNOLDS**  
204 N NAVARRE ST  
CHELAN, WA 98816-9640

as a Certified Water Works Operator.

**This Validation Card must be posted with your certificate.**

(Rev. 8/13)

Certificate temporarily valid 01/01/2019 through 02/28/2019



**WATER WORKS OPERATOR CERTIFICATION  
VALIDATION CARD  
FOR CERTIFICATE OF COMPETENCY**

Certificate No.	Valid for Year	Classification(s)
012767	2018	CCS, WDM 3, WTPO 2

Be it known that the Washington State Department of Health  
Office of Drinking Water has recognized

**ERIC L GOCKE**  
PO BOX 1444  
CHELAN, WA 98816-1444

as a Certified Water Works Operator.

**This Validation Card must be posted with your certificate.**

(Rev. 8/13)

Certificate temporarily valid 01/01/2019 through 02/28/2019



**WATER WORKS OPERATOR CERTIFICATION  
VALIDATION CARD  
FOR CERTIFICATE OF COMPETENCY**

Certificate No.	Valid for Year	Classification(s)
010005	2018	WTPO 3

Be it known that the Washington State Department of Health  
Office of Drinking Water has recognized

**TROY A BROOKS**  
PO BOX 1111  
CHELAN, WA 98816-1111

as a Certified Water Works Operator.

**This Validation Card must be posted with your certificate.**

(Rev. 8/13)

Certificate temporarily valid 01/01/2019 through 02/28/2019

## **APPENDIX I**

### **Cross Connection Control Docs**



## Cross-Connection Control Activities (Blue) Annual Summary Report (ASR) for 2018

PWS ID: 12300J PWS Name: CHELAN WATER DEPT, CITY OF County: CHELAN

### Part 1: Designated Cross-Connection Control Specialist (CCS) Information

<b>CCS Name</b>	Eric L Gocke	<b>CCS Phone</b>	509-682-8799	<b>CCS Cert. #</b>	012767	<b>BAT Cert. #</b>	
<b>CCS is:</b> PWS owner or employee							

### Part 2: Status of Cross-Connection Control (CCC) Program at End of 2018

Provide information about the status of your CCC Program at the end of the reporting year.

<b>PWS has:</b>	<b>A written CCC Program Plan<sup>1</sup></b>	<input type="radio"/> Yes	<input type="radio"/> No	<b>Program Plan Last Updated<sup>3</sup></b>	01/10/2018
	<b>CCC implementation activities<sup>2</sup></b>	<input type="radio"/> Yes	<input type="radio"/> No		

<sup>1</sup> Enter "Yes" if PWS has any type of written CCC Program Plan, policies, or procedures. Written CCC Program Plan must be part of a Water System Plan (WSP) or Small Water System Management Program (SWSMP).

<sup>2</sup> Enter "Yes" if PWS implemented any CCC Program activities during the reporting year, such as establishing legal authority, conducting hazard evaluations, requiring installation of backflow assemblies to protect the PWS, requiring assembly testing, maintaining CCC records, or enforcing the PWS's or CCC Program requirements.

<sup>3</sup> PWS can update the CCC Program Plan at any time (independent of WSP or SWSMP update).

Provide information regarding PWS's specific CCC Program Elements

Program Element Number	Description of Element [See WAC 246-290-490(3)]	This Program Element is:	
		Included in Written Program Plan	Being Implemented or Is Completed
1	Legal Authority Established	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No
2	Hazard Evaluation Procedures and Schedules	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No
3	Procedures/Schedules for Ensuring Installation of Backflow Preventers	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No
4	Certified CCS Provided	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No
5	Backflow Preventer Inspection and Testing	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No
6	Assembly Testing Quality Assurance/Quality Control (QA/QC) Program	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No
7	Backflow Incident Response Procedures	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No
8	Public Education Program	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No
9	CCC Records	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No
10	Reclaimed Water Permit	Yes <input type="radio"/> No <input type="radio"/> N/A	Yes <input type="radio"/> No <input type="radio"/> N/A

### Part 3A: PWS Characteristics at End of 2018

Enter the number of connections (new and existing) served by the PWS by type.

Type of Service Connection	Number
<b>Residential (As defined by PWS)</b>	2447
All Other (include dedicated fire lines, dedicated irrigation lines, and PWS-owned facilities such as water and wastewater treatment plants and pumping stations, parks, piers, and docks)	379
<b>Total Number of Connections</b>	2826



**Part 3B: Cross-Connection Control for Severe and High-Hazard Premises and High-Hazard Dedicated Lines Served by the PWS**

Answer the following questions carefully. These answers control your access to pages 2 and 3 for data entry.

1. Does your PWS serve any severe or high-hazard premises or any high-hazard dedicated fire or irrigation lines? \* Yes No
2. Does PWS serve any high-hazard medical premises? \* Yes No

- If you answer Yes to both questions, you must enter data in at least one row on page 2 and one row on page 3.
- If you answer Yes to Question 1 and No to Question 2, you must enter data on page 2 only.
- If you answer No to both questions, pages 2 and 3 will be grayed out to prevent data entry.

- Count only premises PWS serves water to.
- Report data as accurately as possible. DOH currently bases CCC compliance actions on this information.

Type of Severe or High-Hazard Premises or Dedicated Lines [WAC 246-290-490(4)(b)]	Number of Connections at end of 2018			
	A. Being Served Water by PWS <sup>1</sup>	B. With Premises Isolation by AG/RP <sup>2</sup>	C. With Column B AG Inspected or RP Tested <sup>3</sup>	D. Granted Exception from Premises Isolation
Agricultural (farms and dairies)	0	0	0	0
Beverage bottling plants (including breweries)	0	0	0	0
Car washes	1	1	1	0
Chemical plants	0	0	0	0
Commercial laundries and dry cleaners	8	7	7	0
Both reclaimed water and potable water provided	0	0	0	0
Film processing facilities	1	1	1	0
Dedicated fire lines with chemical addition or using unapproved auxiliary supplies	1	1	1	0
Food processing plants (including canneries, slaughter houses, rendering plants)	1	1	1	0
Hospitals, medical centers, medical, dental and veterinary clinics, mortuaries, nursing homes, etc., reported on Part 3C page 3 (totals imported from page 3)	14	12	12	2
Dedicated irrigation systems using purveyor's water supply and chemical addition <sup>4</sup>	0	0	0	0
Laboratories	3	3	3	0
Metal plating industries	0	0	0	0
Petroleum processing or storage plants	1	1	1	0
Piers and docks	5	5	5	0
Radioactive material processing plants or nuclear reactors	0	0	0	
Survey access denied or restricted	0	0	0	0
Wastewater lift/pump stations (non-residential only)	3	3	3	0
Wastewater treatment plants	1	1	1	
Unapproved auxiliary water supply interconnected with potable water supply	0	0	0	0
<b>Totals</b>	<b>39</b>	<b>36</b>	<b>36</b>	<b>2</b>

<sup>1</sup> Count multiple connections or parallel installations to the same premises as **separate** connections.

<sup>2</sup> Count only connections with premises isolation AGs or RPs. Don't include connections with in-premises preventers only or connections with DCVAs or DCDAs installed for premises isolation. The number in Column B can't be larger than the number in Column A in the same row.

<sup>3</sup> Count only connections whose premises isolation preventers were inspected (AGs) or tested (RPs) during the reporting year.

<sup>4</sup> For example, dedicated irrigation lines to parks, playgrounds, golf courses, cemeteries, estates, etc.

<sup>5</sup> Premises with hazardous materials or processes (requiring isolation by AG or RP), such as aircraft and automotive manufacturers, pulp and paper mills, metal manufacturers, military bases, and wholesale customers that pose a high hazard to the PWS. May be grouped together in categories, for example: "Other manufacturing" or "Other commercial".

**Part 3C: Cross-Connection Control for High-Hazard Medical Premises Served by the PWS**

- Count only medical premises PWS serves water to.
- Don't count the same premises more than once. If you serve different medical category premises through a single connection, count the connection under the medical category you consider to pose the highest hazard to PWS.
- Report data as accurately as possible. **DOH currently bases CCC compliance actions on this information**

Type of High-Hazard Medical Premises <u>[WAC 246-290-490(4)(b)]</u>	Number of Connections at end of 2018			
	A. Being Served Water by PWS <sup>1</sup>	B. With Premises Isolation by AG/RP <sup>2</sup>	C. With Column B AG Inspected or RP Tested <sup>3</sup>	D. Granted Exception from Premises Isolation
<b>Hospitals</b>				
Hospitals (include psychiatric hospitals and alcohol and drug treatment centers)	1	1	1	0
<b>Facilities for Treatment and Care of Patients Not Located in Hospitals Covered Above</b>				
Same day surgery centers	0	0	0	0
Out-patient clinics and offices	3	3	3	0
Alternative health out-patient clinics and offices	0	0	0	0
Psychiatric out-patient clinics and offices	0	0	0	0
Chiropractors with water-connected X-ray equipment	4	2	2	2
Hospice care centers	0	0	0	0
Childbirth centers	0	0	0	0
Kidney dialysis centers	0	0	0	0
Blood centers	0	0	0	0
Dental clinics and offices	2	2	2	0
<b>Facilities for Housing Patients</b>				
Nursing homes	0	0	0	0
Assisted Living Facilities (formerly Boarding Homes)	1	1	1	0
Residential treatment centers	0	0	0	0
<b>Other Medical-Related Facilities</b>				
Mortuaries with embalming equipment	1	1	1	0
Morgues and autopsy facilities (not in hospitals)	0	0	0	0
Veterinarian offices, clinics and hospitals	2	2	2	0
<b>Totals</b>	<b>14</b>	<b>12</b>	<b>12</b>	<b>2</b>

<sup>1</sup> Count multiple connections or parallel installations to the same premises as **separate** connections.

<sup>2</sup> Count only connections with premises isolation AGs or RPs. Don't include connections with in-premises preventers only or connections with DCVAs or DCDAs installed for premises isolation. The number in Column B can't be larger than the number in Column A in the same row.

<sup>3</sup> Count only connections with premises isolation AGs or RPs. Don't include connections with in-premises backflow preventers only or connections with premises isolation DCVAs or DCDAs isolation.



#### Part 4A: Backflow Preventer Inventory and Testing Information for 2018

- Complete all fields. Enter **zero (0)**, if no backflow preventers in a specific category.
- Count only backflow preventers relied on to protect the PWS.
- Count AVBs on *irrigation systems only*. Select No to AVB question above Table 2 if PWS doesn't track AVBs.
- Count multiple tests (or failures) for the same backflow preventer as one test (or failure) for that backflow preventer.
- For multiple service connections or parallel installations, count each assembly separately.
- Count RPDAs and DCDAs as *single* assemblies. Count the tests of the mainline assembly and bypass assembly as *one test*. Count the failure of either the mainline or bypass assembly (or the failure of both) as *one failure*. Count an entire detector assembly taken out of service as *one assembly removed from service*.
- Count assemblies installed on dedicated fire or irrigation lines as **Premises Isolation Assemblies** in Table 1.

Backflow Preventer Category and Inspection/Testing Information		Air Gap	RPBA	RPDA	DCVA	DCDA	PVBA	SVBA	AVB
<b>Table 1: Premises Isolation Preventers (include preventers isolating PWS-owned facilities)</b>									
<b>Existing Premises Isolation Backflow Preventers</b>									
1	In service at beginning of 2018	0	37	0	271	1			
2	Inspected and/or tested in 2018 <sup>1</sup>	0	37	0	281	2			
3	Failed inspection or test in 2018	0	3	0	1	0			
<b>New Premises Isolation Backflow Preventers</b>									
4	Installed in 2018 <sup>2</sup>	0	2	0	61	1			
5	Inspected and/or tested in 2018 <sup>1</sup>	0	2	0	61	1			
6	Failed inspection or test in 2018	0	0	0	0	0			
<b>Premises Isolation Backflow Preventers (existing or new)</b>									
7	Removed from service in 2018 <sup>3</sup>	0	0	0	0	0			
<b>Total Premises Isolation Preventers at End of 2018</b>		0	39	0	332	2	0	0	0
Does PWS track AVBs on irrigation systems? Yes * No									
<b>Table 2: In-Premises Preventers (include preventers within PWS-owned facilities)</b>									
<b>Existing In-Premises Backflow Preventers</b>									
8	In service at beginning of 2018	0	93	2	208	2	4	7	unk
9	Inspected and/or tested in 2018 <sup>1</sup>	0	93	0	207	2	4	7	unk
10	Failed inspection or test in 2018	0	0	0	0	0	0	0	unk
<b>New In-Premises Backflow Preventers</b>									
11	Installed in 2018 <sup>2</sup>	0	0	0	0	0	0	0	unk
12	Inspected and/or tested in 2018 <sup>1</sup>	0	0	0	0	0	0	0	unk
13	Failed inspection or test in 2018	0	0	0	0	0	0	0	unk
<b>In-Premises Backflow Preventers (existing or new)</b>									
14	Removed from service in 2018 <sup>3</sup>	0	0	0	0	0	0	0	unk
<b>Total In-Premises Preventers at End of 2018<sup>4</sup></b>		0	93	2	208	2	4	7	0
<b>Grand Totals at End of 2018</b>		0	132	2	540	4	4	7	0

<sup>1</sup> Initial and/or routine annual inspection (for proper installation and approval status) and/or test (for testable assemblies only, using DOH-approved USC field test procedures).

<sup>2</sup> Includes preventers installed on connections where backflow prevention was not previously required and any preventers that replaced those in service at the beginning of the reporting year. Replacement preventers may be of a different type than the originals.

<sup>3</sup> Existing or new preventers taken out of service, whether or not they were replaced by the same or a different type of preventer.

#### Part 4B: Other Implementation Activities in 2018

Complete all cells. Enter zero if not applicable.

Water Use Questionnaires	
Did your PWS send any water use questionnaires to customers during 2018?	Yes * No

On-site Hazard Surveys			
Did your CCS conduct any on-site hazard surveys during 2018?	* Yes No		
	Service Connection Type		
	New	Existing	Total
1. Number of connections surveyed for cross-connection hazards to PWS.	21	5	26
2. Number of connections requiring backflow prevention to protect PWS. <sup>1,2</sup>	12	2	14

New Exceptions to Premises Isolation	
Did your CCS grant any new premises isolation exceptions in 2018 to high-hazard premises? <sup>3</sup>	Yes * No

CCC Enforcement Actions	
Did your PWS take any enforcement actions during 2018? <sup>4</sup>	Yes * No

<sup>1</sup> Include services where either premises isolation or in-premises preventers were required to protect the PWS.

<sup>2</sup> Include existing services that need new, additional or higher level backflow prevention.

<sup>3</sup> Submit a completed DOH Exception Form (green) for each new exception granted in the reporting year.

<sup>4</sup> "Enforcement actions" means actions taken by the PWS (such as water shut-off, PWS installation or testing of backflow preventer, assessment of fines, etc.) when the customer fails to comply with the PWS's CCC requirements.

#### Part 5: Backflow Incidents and "Off-Normal" Events in 2018

Backflow Incidents, Risk Factors, and Indicators during 2018		Number
<i>Backflow Incidents during 2018</i>		
1	Backflow incidents that contaminated the PWS <sup>5</sup> .	0
2	Backflow incidents that contaminated the customer's drinking water system <i>only</i> <sup>5</sup> .	0
<i>Risk Factors for Backflow during 2018</i>		
3	Distribution main breaks per 100 miles of pipe.	0.12
4	Low pressure events (<20 psi in PWS distribution system).	0
5	Water outage events.	0
<i>Indicators of Possible Backflow during 2018</i>		
6	Total health-related complaints received by PWS. <sup>6</sup>	0
7	Received during BWA or PN events. <sup>7</sup>	0
8	Received during low pressure or water outage events.	0
9	Total aesthetic complaints (color, taste, odor, air in lines, etc.).	3
10	Received during BWA or PN events. <sup>7</sup>	0
11	Number of these complaints received during low pressure or water outage events.	0

<sup>5</sup> Purveyors must submit a Backflow Incident Report form for each backflow incident known to have contaminated the public water system. DOH is also interested in receiving incident report forms for backflow incidents that contaminated the customer's drinking water system only.

<sup>6</sup> Such as stomach ache, headache, vomiting, diarrhea, skin rashes, etc.

<sup>7</sup> "BWA" means **Boil Water Advisory** and "PN" means **Public Notification** for water quality reasons.

## Part 6: Comments and Clarifications

- Enter comments to:
  - Explain or clarify information in this report.
  - Describe challenges faced or accomplishments made in this reporting year.
  - Share your goals and objectives for the coming reporting year.
- Delete comments that are no longer valid.

Part No.	Date Added	Comments
Pt 1	03-22-2019	This program takes a lot of time! Along with other operator duties, this program may suffer due to lack of time to enforce.

## Part 7: Report Certification and Contact Information

I, [Certified by] , certify that the information in this form is true, complete and accurate to the best of my knowledge.

Last Saved	03/22/2019	All ASR Forms Certified/Submitted	
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Designated CCS/CCC Program Manager <sup>1</sup>					
Name	Eric L Gocke	Title	Water Treatment Plant Operator 2, CCC, WDM 3	CCS Cert #	012767
Email Address	egocke@cityofchelan.us	Phone	509-682-8799	Phone Ext	

PWS Manager <sup>2</sup>					
Name	Troy Brooks	Title	Water Treatment Plant Operator	Operator Cert #	010005
Email Address	tbrooks@cityofchelan.us	Phone	509-682-5919	Phone Ext	

<sup>1</sup> The CCS responsible for developing and implementing the PWS's CCC program (CCC Program Manager).

<sup>2</sup> The person the designated CCS/CCC Program Manager reports to or other manager having direct oversight of the CCC Program.



## Cross-Connection Control Program Summary (Cream) Annual Summary Report (ASR) for 2018

PWS ID: 12300J PWS Name: CHELAN WATER DEPT, CITY OF County: CHELAN

Describe the characteristics of the PWS's Cross-Connection Control (CCC) Program at the end of 2018.

### Part 1: CCC Program Characteristics

#### A. Type of Program Implemented

Type of Program	Check One
Premises isolation only.	
Combination program: reliance on both premises isolation and in-premises prevention.	*
In transition from a combination program to a premises isolation only program.	

#### B. Coordination with Authority Having Jurisdiction (AHJ) on CCC Issues

Indicate the status of coordination with AHJs in your service area. The AHJ is the entity that enforces the Uniform Plumbing Code at the local level. The AHJ is usually your county or city building department. Don't list DOH as an AHJ.

AHJ #	Name of AHJ (City or County Building Department) <sup>1</sup>	PWS		AHJ Declined to Coordinate
		Coordinates with AHJ	Has Written Agreement with AHJ	
1	City of Chelan Building and Planning Department	Yes * No	Yes * No	Yes No

<sup>1</sup> Do not enter an individual's name.

#### C. Corrective/Enforcement Actions Available to the Purveyor

Type of Corrective Action/Enforcement Action	Indicate Whether Available	Most Often Used (Check One)
Purveyor denies or discontinues water service.	Yes * No	*
Purveyor installs backflow assembly and bills customer.	Yes * No	
Purveyor assesses fines (in addition to eliminating or controlling cross connection).	Yes * No	
Purveyor tests backflow assembly and bills customer.	Yes No *	

<sup>1</sup> Enter detailed description of other enforcement actions available to PWS. Don't enter "None", "Not Applicable", or "Not Available."



#### D. CCC Program Responsibilities

Do not include enforcement action related procedures or circumstances.

CCC Program Activity	Responsible Party (Check one per row)	
	Customer	Purveyor
Hazard Evaluation by DOH-certified CCS		*
Backflow preventer (BP) ownership	*	
BP installation	*	
BP <i>initial</i> inspection (for proper installation - all BPs)		*
BP <i>initial</i> test (for testable assemblies)	*	
BP <i>annual</i> inspection (Air Gaps and AVBs)	*	
BP <i>annual</i> test (for testable assemblies)	*	
BP maintenance and repair	*	

#### E. Backflow Prevention for Fire Protection Systems

Please remember to enter number of days allowed if you require retrofitting.

PWS coordinates with <i>AHJ</i> on CCC issues for fire sprinkler systems (FSSs)	Yes * No N/A
PWS coordinates with <i>local Fire Marshal</i> on CCC issues for FSSs.	Yes No N/A *
PWS ensures backflow prevention is installed before serving <i>new</i> connections with FSSs.	Yes * No
PWS requires retrofits to <i>high</i> -hazard FSSs.	Yes * No. of days allowed: 30 No N/A
PWS requires retrofits to <i>low</i> -hazard FSSs.	Yes * No. of days allowed: 90 No N/A

#### F. Backflow Prevention for Irrigation Systems

Minimum level of backflow prevention required on irrigation systems <i>without</i> chemical addition.	Not Addressed AVB PV/SVBA DCVA * RPBA
PWS currently inspects AVBs upon <i>initial</i> installation.	Yes * No N/A
PWS currently inspects AVBs upon repair, reinstallation or relocation.	Yes * No N/A

#### G. Used Water

Does PWS prohibit, by ordinance, rules, policy, by-laws or agreement, the intentional return of used water (e.g. for heating or cooling) into the distribution system?	Yes * No
If not prohibited at present, date plan to prohibit use.	N/A
Current number of service connections returning used water to distribution system.	0

#### H. Backflow Prevention for Unapproved Auxiliary Water Supplies<sup>1</sup> NOT Interconnected with PWS

Show the *minimum* backflow preventer and type of protection required for service connections having unapproved auxiliary water supplies *when they are NOT interconnected to the PWS*.

<b>Existing service connections.</b>	None DCVA RPBA * AG
<b>Type of protection required.</b>	N/A In-premises prevention Premises isolation *
<b>New service connections.</b>	None DCVA RPBA * AG
<b>Type of protection required.</b>	N/A In-premises prevention Premises isolation *

<sup>1</sup> An auxiliary water supply is any water supply on or available to customer's premises in addition to the purveyor's potable water supply.

#### I. Backflow Prevention for Tanker Trucks and Temporary Water Connections

<b>Minimum level of backflow prevention (installed on or associated with the truck) required for tanker trucks taking water from PWS.</b>	AG DCVA RPBA * Not Specified Tanker trucks not allowed
<b>PWS requires tanker trucks to obtain water at designated fill sites each equipped with permanently installed backflow preventer(s).</b>	Yes (Minimum preventer: DCVA RPBA ) No * N/A No sites provided
<b>PWS currently accepts tanker trucks approved by other PWSs without further inspection or testing.</b>	Yes No * N/A
<b>Minimum level of backflow prevention required for temporary water connections (e.g., for construction sites).</b>	AG DCVA RPBA * Not specified Temp. connections not allowed
<b>PWS provides approved backflow preventer for temporary connections.</b>	Yes * No N/A (Temp. connections not allowed)
<b>PWS requires testing each time the temporary connection backflow preventer is relocated.</b>	Yes No * N/A (Temp. connections not allowed)

#### J. Backflow Prevention for Non-Residential Connections

For each category shown, indicate whether PWS has non-residential connections of that type and the **minimum level of premises isolation** backflow prevention required (whether or not PWS currently has that type of customer).

Type of Connection	PWS has Customers of this Type	Minimum Premises Isolation Backflow Prevention Required
Commercial	Yes * No	Not Required DCVA RPBA *
Industrial	Yes * No	Not Required DCVA RPBA *
Institutional	Yes * No	Not Required DCVA RPBA *

#### K. Backflow Prevention for Wholesale Customers

Indicate whether the PWS requires backflow prevention at interties with wholesale customers (other PWSs).

Type of Intertie	PWS has Customers of this Type	Minimum Backflow Prevention Required (if prevention is required, indicate minimum level).
Existing	Yes * No	<div>Not specified / Not required</div> <div>Always required *</div> <div>Required only if purchaser's CCC program is inadequate</div> <div>Minimum required (if applicable): DCVA * RPBA</div>
New	Yes No *	<div>Not specified / Not required</div> <div>Always required *</div> <div>Required only if purchaser's CCC program is inadequate</div> <div>Minimum required (if applicable): DCVA * RPBA</div>

#### L. Exceptions to Mandatory Premises Isolation

<b>PWS's written CCC Program Plan allows system to grant exceptions to mandatory premises isolation per WAC 246-290-490(4)(b)(iii)</b>	Yes * No Doesn't Address
<b>PWS currently grants new Exceptions.</b>	Yes * No
<b>PWS granted Exceptions in past reporting years.</b>	Yes * No

**Part 2: CCC Program Record-Keeping Software**

Indicate the type or name of computer software the PWS uses to track CCC records.

BPMS	Cross-Track (BMI) *	Tokay	XC2	Custom developed for or by PWS <sup>1</sup>
Other non-CCC software (e.g. Excel)		Other commercial CCC software (specify)		None Used

<sup>1</sup> Do not include commercial CCC software customized for PWS. If PWS uses customized commercial software, check the box for the appropriate commercial software name.

**Part 3: Comments and Clarifications**

- Enter comments to:
  - Explain or clarify information in this report.
  - Describe accomplishments made in this reporting year.
  - Identify challenges faced in this reporting year.
  - Share your goals and objectives for the coming reporting year.
- Delete comments that are no longer valid.

No Comments

**Part 4: Report Certification and Contact Information**

I, [Certified by], certify that the information in this form is true, complete and accurate to the best of my knowledge.

Last Saved	03/22/2019	All ASR Forms Certified/Submitted	
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The person designated as the CCC Program Manager					
Name	Eric L Gocke	Title	Water Treatment Plant Operator 2, CCC, WDM 3	CCS Cert #	012767
Email Address	egocke@cityofchelan.us	Phone	509-682-8799	Phone Ext	

The person designated as the PWS Manager					
Name	Troy Brooks	Title	Water Treatment Plant Operator	Operator Cert #	010005
Email Address	tbrooks@cityofchelan.us	Phone	509-682-5919	Phone Ext	

<sup>1</sup> The CCS responsible for developing and implementing the PWS's CCC program (CCC Program Manager).

<sup>2</sup> The person the designated CCS/CCC Program Manager reports to or other manager having direct oversight of the CCC Program.





**Backflow Prevention for Severe Health Hazard Facilities (Gray)  
Annual Summary Report (ASR) for 2018**

PWS ID: 12300J PWS Name: CHELAN WATER DEPT, CITY OF County: CHELAN

**Part 1: Backflow Prevention Status**

- Describe the backflow prevention status at the end of the reporting year for each wastewater treatment plant and nuclear facility your system serves.
- If you serve more than one severe health hazard facility, click the "Add Facility" button to display another facility data entry box.
- If you serve more than one connection to the same facility, click the "Add Connection" button to display another connection row for that facility.
- You may add as many facilities and connections as needed.
- To update this form, you may delete facilities and connections which are no longer served.

Facility 1 of 1	
<b>Facility Name</b>	City of Chelan Sewer Plant 1
<b>Physical Address</b>	501 S. Robinson
<b>City</b>	Chelan
<b>Zip</b>	98816
<b>NPDES Permit#</b>	WA0020605D
<b>Facility Type</b>	Wastewater Treatment Plant (WWTP)
<b>Facility Comments</b>	We do not serve this facility with treated water. They are on a well system but we do manage the cross connections for the plant.
Facility 1 Connection 1 of 1	
<b>Connection Name</b>	City of Chelan well pump 1
<b>Backflow Prevention Status</b>	In-Premises (fixture) Backflow Prevention Only
<b>Connection Comments</b>	

**Part 2: Report Certification and Contact Information**

I, [Certified by], certify that the information in this form is true, complete and accurate to the best of my knowledge.

Last Saved	03/22/2019	All ASR Forms Certified/Submitted	
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Name	Eric L Gocke	Title	Water Treatment Plant Operator 2, CCC, WDM 3	CCS Cert #	012767
Email Address	egocke@cityofchelan.us	Phone	509-682-8799	Phone Ext	

Name	Troy Brooks	Title	Water Treatment Plant Operator	Operator Cert #	010005
Email Address	tbrooks@cityofchelan.us	Phone	509-682-5919	Phone Ext	

<sup>1</sup> The CCS responsible for developing and implementing the PWS's CCC program (CCC Program Manager).

<sup>2</sup> The person the designated CCS/CCC Program Manager reports to or other manager having direct oversight of the CCC Program.





**List of Exceptions to High-Hazard Premises Isolation Requirements  
Annual Summary Report for (ASR) for 2018**

PWS ID: 12300J PWS Name: CHELAN WATER DEPT, CITY OF County: CHELAN

**Designated Cross-Connection Control Specialist (CCS) Information**

<b>CCS Name</b>	Eric L Gocke	<b>CCS Phone</b>	509-682-8799	<b>CCS Cert. #</b>	012767
-----------------	--------------	------------------	--------------	--------------------	--------

Use the table below to:

- **Edit, Renew, or Cancel** a saved exception (depending on the buttons listed under Available Actions).
- **Print** any saved Exception form.
- Re-sort the Exceptions List by any column heading (except Available Actions). Click once to sort from A to Z. Click a second time to sort from Z to A.

**Important Reminder!** You must **Renew** or **Cancel** all **expired** exceptions to submit your ASR Forms Package.

#	Premises Name	Premises Type	Status	Expiration Date	Last Saved
1	Valley Spinal Care	Hospitals, medical centers, nursing homes, veterinary, medical and dental clinics, and blood plasma centers	Renewed	03/14/2020	03/22/2019 11:03 AM
2	North Cascades Family Chiropractic	Hospitals, medical centers, nursing homes, veterinary, medical and dental clinics, and blood plasma centers	Renewed	03/14/2020	03/22/2019 11:03 AM

13.05.010 Definitions.

13.05.020 Purpose.

13.05.030 Cross-connections regulated.

13.05.040 Application and responsibilities.

13.05.050 Backflow prevention assembly requirements.

13.05.060 Irrigation systems.

13.05.070 Fire systems.

13.05.080 Wholesale customers.

13.05.090 Mobile units.

13.05.100 Right-of-way encroachment.

13.05.110 Plumbing code.

13.05.120 Access to premises.

13.05.130 Inspections/surveys.

13.05.140 Testing and repairs.

13.05.150 Responsibilities of backflow prevention assembly testers.

13.05.160 Maintenance of assemblies.

13.05.170 Installation requirements and specifications.

13.05.180 Thermal expansion.

13.05.190 Pressure loss.

13.05.200 Parallel installation.

13.05.210 New construction.

13.05.220 Residential service connections.

13.05.230 Rental properties.

13.05.240 Retrofitting.

13.05.250 Costs of compliance.

13.05.260 Termination of service.

13.05.270 Emergency suspension of service.

13.05.280 Nonemergency suspension of service.

13.05.290 Penalties.

13.05.300 Provisions as to availability of materials.

13.05.010 Definitions.Share

Except where specifically designated herein, all words used in this chapter shall carry their customary meanings. Words used in the present tense include the future and plural words include the singular. The word “shall” is always mandatory, and the word “may” denotes a use of discretion in making a decision. Any definition not found in this section will take its meaning from Chapter 246-290 WAC, or as amended.

A. “Air gap” means a physical separation between the free-flowing end of a potable water supply pipeline and the overflow rim of an open or nonpressure-receiving vessel. To be an “approved air gap,” the separation must be at least twice the diameter of the inlet piping (supply pipe) measured vertically, and never be less than one inch.

B. “Approved backflow prevention assembly” or “backflow assembly” or “assembly” means an assembly to counteract back pressures or prevent backsiphonage. This assembly must appear on the list of approved assemblies issued by the Washington State Department of Health.

C. “Auxiliary supply” means any water source or system other than the city of Chelan water.

D. “Backflow” means the flow of water or other liquids, gases or solids from any source back into the distribution system; the flow of water in the opposite direction of its intended flow.

E. “Backflow assembly tester” means a person holding a valid BAT certificate issued in accordance with the WAC.

F. "Backpressure" means a pressure caused by a pump, elevated tank or piping, boiler, or other means that are greater than the pressure provided by the public water system and which may cause backflow.

G. "Backsiphonage" shall mean backflow due to a reduction in system pressure in the purveyor's distribution system and/or consumer's water system.

H. "Building inspector" shall mean the building inspector for the city of Chelan. It shall also include the building inspector for the Chelan County building department.

I. "Chelan" shall mean the city of Chelan.

J. "City" or "the city" shall mean the city of Chelan, Washington.

K. "Closed system" means any water system or portion of a water system in which water is transferred to a higher pressure zone closed to atmosphere.

L. "Contamination" means the entry into or presence in a public water supply system of any substance which may be deleterious to health and/or quality of the water.

M. "Cross-connection" means any physical arrangement where a public water system is connected, directly or indirectly (actual or potential), with any other nondrinkable water system or auxiliary system, sewer, drain conduit, swimming pool, storage reservoir, plumbing fixture, swamp coolers, or any other device which contains, or may contain, contaminated water, sewage, or other liquid of unknown or unsafe quality which may be capable of imparting contamination to the public water system as a result of backflow. Bypass arrangements, jumper connections, removable sections, swivel or changeover devices, or other temporary or permanent devices through which, or because of which, backflow may occur are considered to be cross-connections.

N. "Cross-connection specialist" or "CCS" shall mean a person holding a valid CCS certificate issued in accordance with the WAC.

O. "Cross-connection control manager" means a person or his/her designee appointed to manage the cross-connection control program for the city.

P. "Degree of hazard" means the low or high hazard classification that shall be attached to all actual or potential cross-connections.

Q. "Director" means the director of public works of the city of Chelan, or his/her designee.

R. "DOH" means Washington Department of Health.

S. "Double check valve backflow prevention assembly" or "double check assembly" or "double check" or "DCVA" or "DC" means an assembly which consists of two independently operating check valves which are spring-loaded or weighted. The assembly comes complete with a shut-off valve on each side of the checks, as well as test cocks to test the checks for tightness.

T. "Double check detector assembly" or "DCDA" means an assembly which consists of two independently operating check valves which are spring-loaded or weighted. The assembly comes complete with a shut-off valve on each side of the checks, as well as test cocks to test the checks for tightness. It shall also be provided with a factory bypass feature of a minimum of an approved double check assembly.

U. "Health hazard" means an actual or potential threat of contamination of a physical, toxic or biological nature that would be a danger to health.

V. "High hazard" means the classification assigned to an actual or potential cross-connection that potentially could allow a substance that may cause illness or death to backflow into the potable water supply.

W. "In-premises protection" means a method of protecting the health of consumers served by the customer's plumbing system (i.e., located within the property lines of the customer's premises) by the installation of an approved air gap or backflow prevention assembly at the point of hazard.

X. "Inspector" or "surveyor" shall mean a person holding a valid CCS certificate issued in accordance with the WAC, who meets the stipulations in this chapter and the most recent edition of the city's SOP manual.

Y. "Local administrative authority" means the local official, board, department or agency authorized to administer and enforce the provisions of the Uniform Plumbing Code and all other plumbing codes recognized by the state of Washington.

Z. "Low hazard" means the classification assigned to an actual or potential cross-connection that potentially could allow a substance that may be objectionable, but not hazardous to one's health, to backflow into the potable water supply.

AA. "Mobile unit" shall mean units connecting to the water system through a hydrant, hosebib, or other appurtenance of a permanent nature that is part of the city water system or a permanent water service to a premises. Examples can include but are not limited to the following: water trucks, pesticide applicator vehicles, chemical mixing units or tanks, waste or septage haulers' trucks or units, sewer cleaning equipment, carpet or steam cleaning equipment other than homeowner use, rock quarry or asphalt/concrete batch plants, or any other mobile equipment or vessel. Uses that are excluded from this definition are recreational vehicles at assigned sites or parked in accordance with other city ordinances pertaining to recreational vehicles, and homeowner devices that are used by the property owner in accordance with other provisions of this, or other, city of Chelan ordinances pertaining to provision of water service to a premises.

BB. "Person" means a natural person (individual), corporation, company, association, partnership, firm, limited liability company, joint venture company or association, and other such entity.

CC. "Plumbing hazard" means an internal or plumbing-type cross-connection in a consumer's potable water system that may be either a pollutorial or a contamination-type hazard. This includes, but is not limited to, cross-connections to toilets, sinks, lavatories, wash trays, domestic washing machines and lawn sprinkling systems. Plumbing-type cross-connections can be located in all types of structures including but not limited to homes, apartment houses, hotels and commercial or industrial establishments.

DD. "Point-of-use isolation" shall mean the same as "in-premises protection".

EE. "Pollutional hazard" means an actual or potential threat to the physical properties of the water system or the potability of the public or the consumer's potable water system but which would not constitute a health or system hazard, as defined. The maximum degree of intensity of pollution to which the potable water system could be degraded under this definition would cause a nuisance or be aesthetically objectionable or could cause minor damage to the system or its appurtenances.

FF. "Potable water supply" means any system of water supply intended or used for human consumption or other domestic use.

GG. "Premises" means any piece of property to which water is provided including, but not limited to, all improvements, mobile structures and structures located on it.

HH. "Premises isolation" means a method of protecting a public water system by installation of an approved air gap or approved backflow prevention assembly at the point of service (end of purveyor's service pipe) to separate the customer's plumbing system from the purveyor's distribution system.

II. "Reduced pressure principle backflow prevention assembly" or "reduced pressure principle assembly" or "RP assembly" shall mean an assembly containing two independently acting approved check valves together with a hydraulically operated, mechanically independent pressure differential relief valve located between the check valves and at the same time below the first check valve. The assembly shall include properly located test cocks and tightly closing shut-off valves at each end of the assembly.

JJ. "SOP" means the most recent edition of the city of Chelan's standard operating procedure manual.

KK. "Superintendent" shall mean the operations superintendent in charge of cross-connection control for the city of Chelan or their designee.

LL. "System hazard" means an actual or potential threat of severe danger to the physical properties of the public or consumer's potable water system or of a pollution or contamination which would have a detrimental effect on the quality of the potable water in the system.

MM. "Thermal expansion" means the pressure created in piping, when water is heated.

NN. "Used water" means any water supplied by the city to a customer's property after it has passed through the service connection and is no longer under the control of the city.

OO. "WAC" means the most recent edition of the Washington Administrative Code. (Ord. 1221 § 2 (part), 2001).

#### 13.05.020 Purpose.Share

The purpose of this chapter is to protect the public water system from contamination or pollution due to any existing or potential cross-connections as defined in WAC 246-290-010, or as amended in this chapter. The purveyor shall ensure that cross-connections between the distribution system and a customer's premises are eliminated or protected against by the installation of an approved air gap or approved backflow prevention assembly. (Ord. 1221 § 2 (part), 2001).

#### 13.05.030 Cross-connections regulated.Share

A. No cross-connections shall be created, installed, used or maintained within the territory served by the city, except in accordance with this chapter.

B. The CCC manager for the city shall carry out or cause inspections to be carried out to determine if any actual or potential cross-connection exists. If found necessary, an assembly commensurate with the degree of hazard will be required to be installed at the service connection.

C. The owner, occupant or person in control of the property is responsible for all cross-connection control within the premises.



D. The use of any type of chemical spray attachment connected to the premises plumbing, including but not limited to garden hose fertilizers and pesticide applicators, is prohibited except in accordance with this chapter.

E. The use of any type of radiator flush kits or any other type of attachment connected to the premises plumbing is prohibited except in accordance with this chapter. (Ord. 1221 § 2 (part), 2001).

#### 13.05.040 Application and responsibilities.Share

This chapter applies throughout the city of Chelan and to every premises and property served by the city of Chelan water system. It applies to any premises, public or private, regardless of date of connection to the city water. Every owner, occupant and/or person in control of any concerned premises is responsible for compliance with the terms and provisions contained herein. (Ord. 1221 § 2 (part), 2001).

#### 13.05.050 Backflow prevention assembly requirements.Share

A CCS employed by or under contract with the city shall determine the type of backflow assembly to be installed within the area served by the city. All assemblies shall be installed at the service connection unless it is determined by the CCS to install the assembly at the point of use. An assembly will be required in each of the following circumstances, but the CCS is in no way limited to the following circumstances:

A. The nature and extent of any activity on the premises, or the materials used in connection with any activity on the premises, or materials stored on the premises, could contaminate or pollute the potable water supply;

B. Premises having any one or more cross-connections or potential cross-connections as that term is defined in this chapter and the WAC;

C. When an appropriate cross-connection survey report form has not been filed with the CCC manager;

D. Internal cross-connections are present that are not correctable;

E. Intricate plumbing arrangements or plumbing potentially subject to frequent changes are present that make it impractical to ascertain whether or not cross-connections exist;

F. There is a repeated history of cross-connections being established or re-established;

G. All lawn irrigation systems;

H. There is unduly restricted entry so that inspections for cross-connections cannot be made with sufficient frequency to assure that cross-connections do not exist;

I. Materials are being used such that, if backflow should occur, a health hazard could result;

J. Installation of an approved backflow prevention assembly is deemed to be necessary to accomplish the purpose of these regulations in the judgement of the city;

K. Any premises having an auxiliary water supply;

L. When a building is constructed on commercial premises, and the end use of such building is not determined or could change, a reduced pressure principle backflow prevention assembly will be installed at the service connection;

M. There exists any used or reclaimed water return system;

N. In the event a point-of-use assembly has not been tested or repaired as required by WAC 246-290-490, or as amended, and this chapter, a premises isolation assembly will be required;

O. If it is determined that additions or rearrangements have been made to the plumbing system without obtaining proper permits as required by the city code enforcement division, premises isolation will be required;

P. All high health cross-connection hazard premises which are defined in Table 9 of WAC 246-290-490, or as amended, are required to have premises isolation by installing an approved air gap or reduced pressure principle assembly in accordance with this chapter;

Q. All multihousing/apartments served by a single meter will require an RP assembly unless they comply with Section 13.05.170 of this chapter. (Ord. 1221 § 2 (part), 2001).

#### 13.05.060 Irrigation systems.Share

The type of assembly to be installed on an irrigation system will be commensurate with the degree of hazard but in no case will it be less than a DCVA. The location of the assembly will be determined by the city's CCS. (Ord. 1221 § 2 (part), 2001).

#### 13.05.070 Fire systems.Share

A. An approved double check detector backflow prevention assembly ("DCDA") shall be the minimum protection on all new fire sprinkler systems using piping material that is not approved for potable water use, and/or that does not provide for periodic flow-through during each twenty-four-hour period. A reduced pressure principle detector backflow prevention assembly ("RPDA") must be installed, if any solution other than the potable water can be introduced into the sprinkler system. Retrofitting on fire sprinkler systems will be required in each of the following circumstances:

1. Where improper maintenance has occurred;
2. On all high hazard systems;
3. Wherever an inspector deems necessary; and
4. Wherever required by the WAC.

B. All fire-line systems which are on a designated lateral shall install the assembly on the lateral. The assembly must be installed in accordance with this chapter. (Ord. 1221 § 2 (part), 2001).

#### 13.05.080 Wholesale customers.Share

Any customer that has a wholesale contract for water services with the city must have an active, ongoing cross-connection program. The cross-connection program must be in compliance with WAC requirements pertaining to public water systems. The city reserves the right at all times to require a reduced pressure principle assembly at the interconnect. Wholesale customers shall provide annually to the city a copy of their cross-connection control summary report which was submitted to the DOH. (Ord. 1221 § 2 (part), 2001).

#### 13.05.090 Mobile units.Share

A. Any mobile unit or apparatus, as defined in Section 13.05.010 of this chapter, which uses the water from any premises within the city's water system, shall first obtain a permit from the city and be inspected to assure appropriate backflow prevention is installed in accordance with the most recent edition of the SOP manual.

B. The city reserves the right to revoke the business license of the owner of the apparatus or mobile unit if the owner fails to comply with above procedures. (Ord. 1221 § 2 (part), 2001).

#### 13.05.100 Right-of-way encroachment.Share

A. No person shall install or maintain a backflow prevention assembly upon or within any city right-of-way except as provided in this section.

B. The city reserves the right to have an assembly installed in the right-of-way.

C. A backflow prevention assembly required by the city may be installed upon or within any city right-of-way only if the owner proves to the city that there is no other feasible location for installing the assembly, and installing it in the right-of-way will not interfere with traffic or utilities. The city retains the right to approve the location, height, depth, enclosure, and other requisites of the assembly prior to its installation.

D. All permits required by the city code to perform work in the right-of-way shall be obtained.

E. The assembly shall be installed below or flush with the surrounding grade except when it is not practicable to install it in this manner. Any assembly or portion of an assembly which extends aboveground shall be located no closer than eighteen inches to the face of the curb.

F. A property owner shall, at the request of the city and at the owner's expense, relocate a backflow prevention assembly which encroaches upon any city right-of-way, when such relocation is necessary for street or utility construction or repairs for purposes of public safety.

G. A person commits an offense if he/she fails to relocate a backflow prevention assembly located in or upon any city right-of-way after receiving a written order from the city to do so. (Ord. 1221 § 2 (part), 2001).

#### 13.05.110 Plumbing code.Share

As a condition of water service, customers shall install, maintain, and operate their piping and plumbing systems in accordance with all Washington State plumbing laws. (Ord. 1221 § 2 (part), 2001).

#### 13.05.120 Access to premises.Share

Authorized employees of the city, with proper identification, shall have access during the hours of eight a.m. to five p.m. to all parts of a premises and within the building to which water is supplied. If any water user refuses access to a premises or to the interior of a structure during these hours for inspection by a cross-connection specialist appointed by the city, a reduced pressure principle assembly shall be installed at the service connection to that premises. (Ord. 1221 § 2 (part), 2001).

#### 13.05.130 Inspections/surveys.Share

In the event that a property owner selects to have a point of use assembly program in lieu of premises isolation protection, it will be the responsibility of the property owner to contract with a person certified by the state and who meets all requirements stipulated in the most recent edition of the city's SOP manual to carry out the initial and periodical inspections. The recommendations for protection of

internal premises for all actual and potential cross-connections shall meet all state plumbing codes, the WAC 246-290-490, or as amended, this chapter and the most recent edition of the city's SOP manual. (Ord. 1221 § 2 (part), 2001).

#### 13.05.140 Testing and repairs.Share

Backflow prevention assemblies shall be tested in accordance with the requirements set out in the WAC, or as amended, this chapter and the most recent edition of the city's SOP manual. (Ord. 1221 § 2 (part), 2001).

#### 13.05.150 Responsibilities of backflow prevention assembly testers.Share

All backflow assembly testers operating within the city shall be certified in accordance with all applicable regulations of the WAC, or as amended, and shall comply with all of the stipulations in this chapter and the most recent edition of the city's SOP manual. (Ord. 1221 § 2 (part), 2001).

#### 13.05.160 Maintenance of assemblies.Share

Backflow prevention assemblies shall be maintained in accordance with the requirements set out in the WAC, or as amended, and the most recent edition of the city's SOP manual. (Ord. 1221 § 2 (part), 2001).

#### 13.05.170 Installation requirements and specifications.Share

Backflow prevention assemblies shall be installed in accordance with the requirements set out in the WAC, or as amended, and the most recent edition of the city's SOP manual. (Ord. 1221 § 2 (part), 2001).

#### 13.05.180 Thermal expansion.Share

If a closed system has been created by the installation of a backflow prevention assembly, it is the responsibility of the property owner to eliminate the possibility of thermal expansion. (Ord. 1221 § 2 (part), 2001).

#### 13.05.190 Pressure loss.Share

Any reduction in water pressure caused by the installation of a backflow assembly is not the responsibility of the city. The city will give reasonable assistance to the owner regarding information on

adequate sizing of assemblies and proper plumbing practices to provide for required pressure and flows for fire protection. (Ord. 1221 § 2 (part), 2001).

#### 13.05.200 Parallel installation.Share

Premises where noninterruption of water supply is critical shall be provided with two assemblies of the same type installed in parallel. They shall be sized in such a manner that either assembly will provide the minimum water requirements while the two together will provide the maximum water requirements. (Ord. 1221 § 2 (part), 2001).

#### 13.05.210 New construction.Share

A. In all new construction, an approved backflow assembly shall be installed at the service connection. The type of the assembly will be commensurate with the degree of hazard as determined by an inspector.

B. When a building is constructed on commercial premises, and the end use of the building is not determined or could change, a reduced pressure principle backflow prevention assembly shall be installed at the service connection to provide protection of the public water supply in the event of the most hazardous use of the building. (Ord. 1221 § 2 (part), 2001).

#### 13.05.220 Residential service connections.Share

Any residential property which has been determined to have an actual or potential cross-connection and/or has violated the plumbing code or this chapter in any way, shall be required to install an approved backflow prevention assembly in accordance with this chapter. (Ord. 1221 § 2 (part), 2001).

#### 13.05.230 Rental properties.Share

The property owner is responsible for the installation, testing and repair of all backflow assemblies on their property. When the tenants change, or, if the plumbing is altered in any way, it is the responsibility of the owner to notify the city. (Ord. 1221 § 2 (part), 2001).

#### 13.05.240 Retrofitting.Share

Retrofitting shall be required on all service connections where an actual or potential cross-connection exists, and wherever else the city deems retrofitting necessary. (Ord. 1221 § 2 (part), 2001).

#### 13.05.250 Costs of compliance.Share

All costs associated with purchase, installation, inspections, testing, replacement, maintenance, parts, and repairs of the backflow assembly are the financial responsibility of the property owner. (Ord. 1221 § 2 (part), 2001).

#### 13.05.260 Termination of service.Share

Failure on the part of any property owner, their renter, agent or personal representative to discontinue the use of all cross-connections or to physically separate cross-connections in accordance with this chapter is sufficient cause for the immediate discontinuance of public water service to the premises. (Ord. 1221 § 2 (part), 2001).

#### 13.05.270 Emergency suspension of service.Share

The director and/or his/her designee may, without prior notice, suspend water service to any premises when such suspension is necessary to stop the eminent threat of any actual or potential cross-connection as defined in this chapter and the most recent edition of the city's SOP manual. (Ord. 1221 § 2 (part), 2001).

#### 13.05.280 Nonemergency suspension of service.Share

The director and/or his/her designee may suspend, with twenty-four hours' notice, the water supply to any premises where the conditions of this chapter or the most recent edition of the city's SOP manual have been violated. (Ord. 1221 § 2 (part), 2001).

#### 13.05.290 Penalties.Share

Any person, firm, corporation or business entity violating this chapter shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined a sum not exceeding two thousand dollars. Each continuing day's violation under this chapter shall constitute a separate offense. The penal provisions imposed under this chapter shall not preclude Chelan from filing suit to enjoin the violation. The city of Chelan retains all legal rights and remedies available to it pursuant to local, state and federal law. (Ord. 1221 § 2 (part), 2001).



13.05.300 Provisions as to availability of materials.Share

The city clerk/treasurer is hereby directed to maintain at all times one copy of Chapter 246-290 WAC, and one copy of the most recent edition of the Pacific Northwest Section American Water Works Association Cross-Connection Control Manual, Accepted Procedure and Practice, for public use and inspection during regular city business hours. (Ord. 1221 § 2 (part), 2001).

*Assembly Tests by Make/Model**1/1/2011 - 12/31/2015*

<i>Make</i>	<i>Model</i>	<i>Passed</i>	<i>Repaired</i>	<i>Failed</i>	<i>Other</i>	<i>Total</i>
<b>AMES</b>						
	2000 B	2	0	0	0	2
	2000B	18	0	0	0	18
	2000BM3	4	0	0	0	4
	2000SS	19	0	0	0	19
	20055	5	0	0	0	5
	3000B	3	0	0	0	3
	3000SS	4	0	0	0	4
	300BF	4	0	0	0	4
	4000B	5	0	0	0	5
	4000SS	4	1	1	0	6
	7000B	2	0	0	0	2
	957	3	1	2	0	6
	COLT 200	4	0	0	0	4
	DC2000SS	1	0	0	0	1
<b>AMES Total:</b>		<b>78</b> 7.04%	<b>2</b> 0.18%	<b>3</b> 0.27%	<b>0</b> 0.00%	<b>83</b> 7.49%
<b>Apollo</b>						
	DC4A	2	0	0	0	2
	DCLF4A	1	0	0	0	1
	OCLF4A	1	0	0	0	1
<b>Apollo Total:</b>		<b>4</b> 0.36%	<b>0</b> 0.00%	<b>0</b> 0.00%	<b>0</b> 0.00%	<b>4</b> 0.36%
<b>CONBRACO</b>						
	4010672	2	0	0	0	2
	40107A2	3	0	0	0	3
	40107A2T	9	0	0	0	9
	4010802	2	0	1	0	3
	4010872	1	1	1	0	3
	DC4A	6	0	0	0	6
	DCLF4A	5	2	0	0	7
	RPLF4A	9	0	0	0	9
<b>CONBRACO Total:</b>		<b>37</b> 3.34%	<b>3</b> 0.27%	<b>2</b> 0.18%	<b>0</b> 0.00%	<b>42</b> 3.79%

*Assembly Tests by Make/Model**1/1/2011 - 12/31/2015*

<i>Make</i>	<i>Model</i>	<i>Passed</i>	<i>Repaired</i>	<i>Failed</i>	<i>Other</i>	<i>Total</i>
<b><i>FEBCO</i></b>						
	007M1QT	3	0	2	0	5
	805Y	6	3	2	0	11
	805YB	5	0	1	0	6
	805YD	3	0	0	0	3
	825Y	11	1	1	0	13
	825-Y	7	1	0	0	8
	825YD	0	1	0	0	1
	850	19	4	1	0	24
	850Y	1	0	0	0	1
	856	5	0	0	0	5
	860	5	2	1	0	8
	870V	11	1	3	0	15
	N/A	0	2	1	0	3
	ND	2	0	0	0	2
<b><i>FEBCO Total:</i></b>		<b>78</b> 7.04%	<b>15</b> 1.35%	<b>12</b> 1.08%	<b>0</b> 0.00%	<b>105</b> 9.48%
<b><i>RAINBIRD</i></b>						
	VB200	3	0	2	0	5
<b><i>RAINBIRD Total:</i></b>		<b>3</b> 0.27%	<b>0</b> 0.00%	<b>2</b> 0.18%	<b>0</b> 0.00%	<b>5</b> 0.45%

# Assembly Tests by Make/Model

1/1/2011 - 12/31/2015

Make	Model	Passed	Repaired	Failed	Other	Total
<b>WATTS</b>						
	007	4	0	0	0	4
	00711QT	1	1	0	0	2
	007M1	4	2	1	0	7
	007M1DC	3	0	0	0	3
	007M1QT	69	2	3	0	74
	007M2QT	8	0	0	0	8
	007M3QT	5	0	0	0	5
	007MI QT	4	0	0	0	4
	007MQ2T	5	0	0	0	5
	007MQT	3	0	0	0	3
	007QT	4	0	0	0	4
	008PCQT	13	2	4	0	19
	008QT	5	0	1	0	6
	009M1	8	0	0	0	8
	009M1QT	5	0	1	0	6
	009M2	3	1	0	0	4
	009M2QT	27	1	1	0	29
	009M3QT	10	1	0	0	11
	009QT	12	0	0	0	12
	009-QT	11	0	0	0	11
	009U2QT	2	1	0	0	3
	774DCVA	0	1	2	0	3
	775	1	0	0	0	1
	775 QT	2	0	0	0	2
	775QT	0	0	1	0	1
	8004QT	5	0	1	0	6
	800m4QT	9	2	3	0	14
	800MQT	3	0	0	0	3
	909QT	1	0	0	0	1
	LF007M1QT	9	1	0	0	10
	LF007M3QT	3	0	0	0	3
	LF007MZQT	1	0	0	0	1
	LF007QT	1	0	0	0	1
	LF009M2QT	4	0	0	0	4
	LF009M3QT	3	0	1	0	4
	LF009QT	1	0	0	0	1
	LF009-QT	4	0	0	0	4
	M2QT	3	0	0	0	3
<b>WATTS Total:</b>		<b>256</b>	<b>15</b>	<b>19</b>	<b>0</b>	<b>290</b>
		23.10%	1.35%	1.71%	0.00%	26.17%

*Assembly Tests by Make/Model**1/1/2011 - 12/31/2015*

<i>Make</i>	<i>Model</i>	<i>Passed</i>	<i>Repaired</i>	<i>Failed</i>	<i>Other</i>	<i>Total</i>
<b>WILKINS</b>						
	180F	3	0	0	0	3
	350	77	9	2	0	88
	350 ADA	4	0	0	0	4
	350A	11	0	0	0	11
	350ADA	19	0	0	0	19
	350AST	1	0	0	0	1
	350VC	3	0	0	0	3
	350XL	38	0	1	0	39
	350XL2	1	0	0	0	1
	350XLT	2	0	0	0	2
	360	2	0	0	0	2
	375	2	0	0	0	2
	375ADA	3	1	1	0	5
	375XL	1	0	0	0	1
	550	8	0	0	0	8
	660	3	0	0	0	3
	750XLT	3	0	0	0	3
	950	10	1	0	0	11
	950 XLT	4	0	0	0	4
	950DC	0	1	0	0	1
	950XCT	4	1	0	0	5
	950XL	51	9	2	0	62
	950XLD	1	0	0	0	1
	950XLS	1	2	0	0	3
	950XLT	76	13	9	0	98
	950XLT2	26	4	2	0	32
	975	2	2	1	0	5
	975- XL	4	0	0	0	4
	975XL	91	12	3	0	106
	975XL TCU	3	0	0	0	3
	975XL2	31	5	2	0	38
	97-5XL2	4	0	0	0	4
	975XLT2	2	0	0	0	2
	N/A	2	0	0	0	2
	PK 1 350	1	0	0	0	1
	XLTCU	1	1	0	0	2
<b>WILKINS Total:</b>		<b>495</b> 44.68%	<b>61</b> 5.51%	<b>23</b> 2.08%	<b>0</b> 0.00%	<b>579</b> 52.26%
<b>GRAND TOTAL:</b>		<b>951</b>	<b>96</b>	<b>61</b>	<b>0</b>	<b>1108</b>

## **APPENDIX J**

### **Unsatisfactory Routine Coliform Sample**

April 2016

DOH 331-187

Revised

# Follow-up to an unsatisfactory routine coliform sample

A drinking water sample is unsatisfactory whenever coliform bacteria are present. If your water system receives unsatisfactory sample results, you must collect a set of repeat samples. If your water system uses groundwater, you must also collect triggered source samples from every groundwater source that was in use when you collected the unsatisfactory routine sample. You must collect triggered source samples before treatment. If your water system has an approved triggered monitoring plan, follow your plan.

**Repeat samples** confirm the presence or absence of coliform bacteria in the system. If present, sample results can help you find the possible cause of contamination.

**Triggered source samples** indicate whether the groundwater source is contaminated with the fecal indicator *E. coli* bacteria.

You must collect repeat and triggered source samples within 24 hours after you learn about the unsatisfactory routine sample result. **Do not** shock-chlorinate the system or source before collecting any samples unless you have prior approval from us.

## Review your sampling procedure

Review your sampling procedure to make sure you collect your samples correctly. For help, see *Coliform Sampling Procedure* (331-225).

## Collect repeat samples

You *must* collect **THREE REPEAT** samples for every unsatisfactory ROUTINE sample. Three must come from the following locations:

1. The same tap as the original unsatisfactory routine sample.
2. An active service within 5 active connections upstream from the original unsatisfactory sample location.\*
3. An active service within 5 active connections downstream from the original unsatisfactory sample location.\*

You must also collect a raw water sample at each groundwater source that was in use when you collected the unsatisfactory routine sample and test it for *E. coli*.

\* You may deviate from these locations if your state-approved Coliform Monitoring Plan includes one of the following:

- A standard operating procedure (SOP) for selecting alternate repeat sites.
- Defined alternate repeat site locations.



## **Thoroughly inspect your water system**

Try to identify potential sources of contamination, such as “openings” in the system or treatment equipment failure. If you find obvious sources of contamination, call us (see below).

## **The month after an unsatisfactory sample**

**The month after an unsatisfactory routine sample, you must collect your usual number of ROUTINE samples from the distribution system.**

**Very small noncommunity groundwater systems not required to sample every month** must collect ONE ROUTINE sample the month following an unsatisfactory sample even if they normally would not be required to collect a sample that month.

## **Call us if:**

- You cannot sample as outlined above.
- You would like to discuss the triggered source sample requirement.
- Any repeat samples or triggered source samples are unsatisfactory.

**Northwest Region: Kent**  
253-395-6750

**Southwest Region: Tumwater**  
360-236-3030

**Eastern Region: Spokane Valley**  
509-329-2100

Our publications are online at <https://fortress.wa.gov/doh/eh/dw/publications/publications.cfm>





**APPENDIX K**  
**Draft Rate Structure Analysis**

**RESOLUTION NO. 2018-1349**

**A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF CHELAN,  
WASHINGTON, AMENDING RESOLUTION NO. 2018-1345 SETTING  
THE FEES TO BE CHARGED FOR WATER AND SEWER FEES AND  
OTHER CHARGES.**

---

THE CITY COUNCIL OF THE CITY OF CHELAN, WASHINGTON, HEREBY RESOLVES AS  
FOLLOWS:

SECTION 1. The following fees, charges, and City Resolution No. 2018-1345 are hereby amended effective  
March 1, 2019 to read as follows:

- A. General Facilities Charges and installation fees for new connection to City water and sewer service shall be as shown on Exhibit "A", attached hereto.
- B. General Facilities Charges and installation fees for redevelopment or expansion of an existing connection to City water and sewer service shall be as shown on Exhibit "B", attached hereto.
- C. Calculation of Equivalent Residential Units (ERUs) for Water and Sewer accounts shall be as shown on Exhibit "C", attached hereto.

SECTION 2. The following fees, charges, and City Resolution No. 2018-1345 are hereby amended effective  
January 1, 2019 to read as follows:

- D. Monthly service charges for City water and sewer services shall be as shown on Exhibit "D", attached hereto.
- E. Fees charged for City sanitation service shall be as shown on Exhibit "E", attached hereto
- F. Charges for certain City Facilities, and miscellaneous charges shall be as shown on Exhibit "F", attached hereto.
- G. The fees charged for the use of the Park and Recreation facilities shall be as shown on Exhibit "G", attached hereto.
- H. The fees charged for the use of the Lake Chelan Municipal Golf Course shall be as shown on Exhibit "H", attached hereto.
- I. The fees charged for the Building Department shall be as shown on Exhibit "I", attached hereto.
- J. The fees charged for the Planning and Community Development Department shall be as shown on Exhibit "J", attached hereto.
- K. The fees charged for general services shall be shown on Exhibit "K", attached hereto.
- L. The fees charged for Public Records Request & Copies shall be shown on Exhibit "L", attached hereto.


SECTION 3. Severability. If any section, sentence, clause or phrase of this resolution should be held to be invalid or unconstitutional by a court of competent jurisdiction, such invalidity or unconstitutionality shall not affect the validity or constitutionality of any other section, sentence, clause or phrase of this resolution.

RESOLVED THIS 18<sup>TH</sup> DAY OF DECEMBER, 2018.

APPROVED:

  
\_\_\_\_\_  
MICHAEL COONEY, MAYOR

ATTEST/AUTHENTICATED:

  
\_\_\_\_\_  
PERI S. GALLUCCI, CITY CLERK

## **EXHIBIT A.**

### **General Facilities Charges and Installation Fees for New Connections**

Any property owner applying for water and/or sewer service shall pay, in full, all General Facilities Charges and Installation Charges as established herein prior to issuance of the building permit. Purchase of water and/or sewer service can only be done through the building permit application.

**General Facilities Charge for New Water Service:** Water Equivalent Residential Unit (ERU) description and maximum allowable amount as determined in 2018 Rate and General Facilities Charge study.

\$11,926 per Water Equivalent Residential Unit

**General Facilities Charge for New Sewer Service:** Sewer ERU description and maximum allowable amount as determined in 2018 Rate and General Facilities Charge study.

\$5,531 per Sewer Equivalent Residential Unit

ERU determination will be as per Exhibit C. "Calculation of Equivalent Residential Units"

#### **Reservoir Impact Fee:**

An additional Reservoir Impact Fee in the amount of \$1,750 per water ERU will be charged to all new services within the area formerly known as the Chelan River Isenhardt Domestic Water System (CRIDWS) prior to transfer to the City of Chelan per CRIDWS Resolution #221 and CRIDWS interlocal agreement with City.

#### **Lord Acres Local Facility Charge Area Fee:**

An additional Lord Acres Local Facility Charge Area Fee per sewer ERU in the amount of \$1,970 will be charged to all new services within the area defined in the Lord Acres Sewer Benefit Area Map, Figure 1.

#### **Water Rights – Payments in Lieu of:**

Charges related to water rights will be per Ordinance No. 2006-1322.

#### **Water Installation Charge:**

Any property owner applying for water service shall pay in full an installation charge in addition to the General Facilities Charge prior to issuance of the water service permit. The installation charge will include the cost of connection, meter, appurtenances, and laying the pipe from the city water main to the property line of the property to which service is desired, or at a distance of sixty (60) feet from the main toward such property line, whichever is shorter. The Standard Installation Charge so established for service is as follows:

## Standard Water Installation Charge

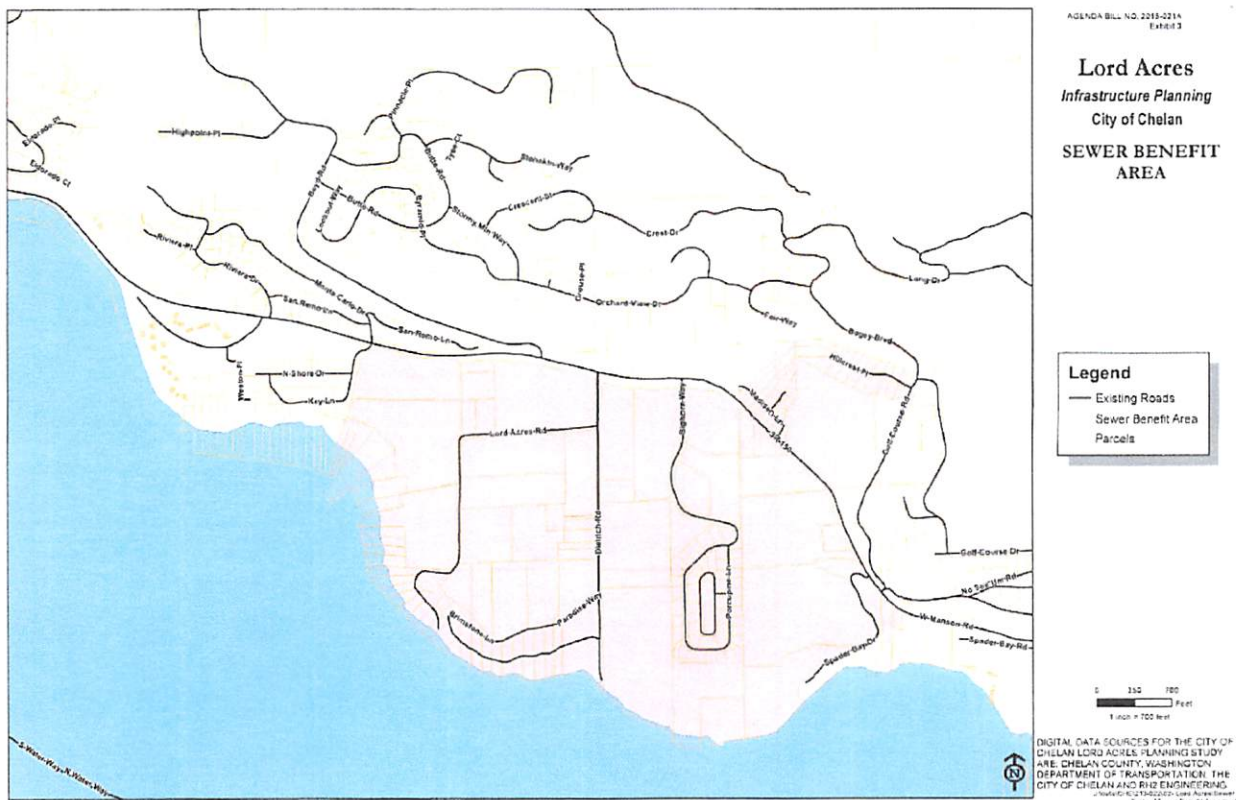
	Meter Drop Fee	Full Installation by City – City Street	Full Installation by City – State Highway
5/8" meter	\$290	\$2,740	\$4,360
3/4" meter	\$342	\$2,812	\$4,432
1" meter	\$417	\$2,907	\$4,927
1.5" meter	\$1,573	\$5,844	\$7,464
2" meter	\$1,799	\$6,009	\$7,629

*In cases where the actual cost of installation exceeds the above schedule of fees, the installation charge shall be the actual cost of the connection, meter, appurtenances, and installation, in addition to administrative overhead.*

On any connection over 2", the installation charge shall be the actual cost of the connection, meter, appurtenances, and installation, in addition to administrative overhead.

Note: Sewer installations are to be performed by the property owner.

**Figure 1. Lord Acres Sewer Benefit Area Map**



## EXHIBIT B.

### General Facilities Charges and Installation Fees for Redevelopment or Change in Use

Any property owner applying for water and/or sewer service shall pay, in full, all General Facilities Charges and Installation Charges as established herein prior to issuance of the building permit. Purchase of water and/or sewer service can only be done through the building permit application.

#### General Facilities Charge for Water Service for Redevelopment or Change in Use:

\$11,926 per Water Equivalent Residential Unit

When an existing water customer applies for a Building permit, the need for additional water capacity beyond what has already been paid for shall be evaluated by the Public Works Director. The customer shall pay a Water General Facilities Charge proportional to the amount of increase in ERUs.

New Water ERU Determination (per Exhibit C)

*Less:* Existing Water ERUs Paid

*Equals:* Water ERUs Owed for Redevelopment or Change in Use

If the Existing Water ERUs Paid exceeds the New Water ERU Determination, no GFC is owed. A Water Installation Charge may still be owed if a change to the meter or service is required.

For properties connected to the system prior to January 1, 2019, the Existing Water ERUs Paid will be based on the schedule below.

#### ERU Equivalencies for Redevelopment or Change in Use

Existing Meter Size	Existing Water ERUs
5/8" meter	1
3/4" meter	1.5
1" meter	2.5
1.5" meter	5
2" meter	8
3" meter	15
4" meter	25

#### General Facilities Charge for Sewer Service for Redevelopment or Change in Use:

\$5,531 per Sewer Equivalent Residential Unit

When an existing sewer customer applies for a Building permit, the need for additional sewer capacity beyond what has already been paid for shall be evaluated by the Public Works Director. The customer shall pay a Sewer General Facilities Charge proportional to the amount of increase in ERUs.

New Sewer ERU Determination (per Exhibit C)

*Less:* Existing Sewer ERUs Paid

*Equals:* Sewer ERUs Owed for Redevelopment or Change in Use



### Reservoir Impact Fee:

An additional Reservoir Impact Fee in the amount of \$1,750 per additional water ERU will be charged to all redeveloped services within the area formerly known as the Chelan River Isenhardt Domestic Water System (CRIDWS) prior to transfer to the City of Chelan per CRIDWS Resolution #221 and CRIDWS interlocal agreement with City.

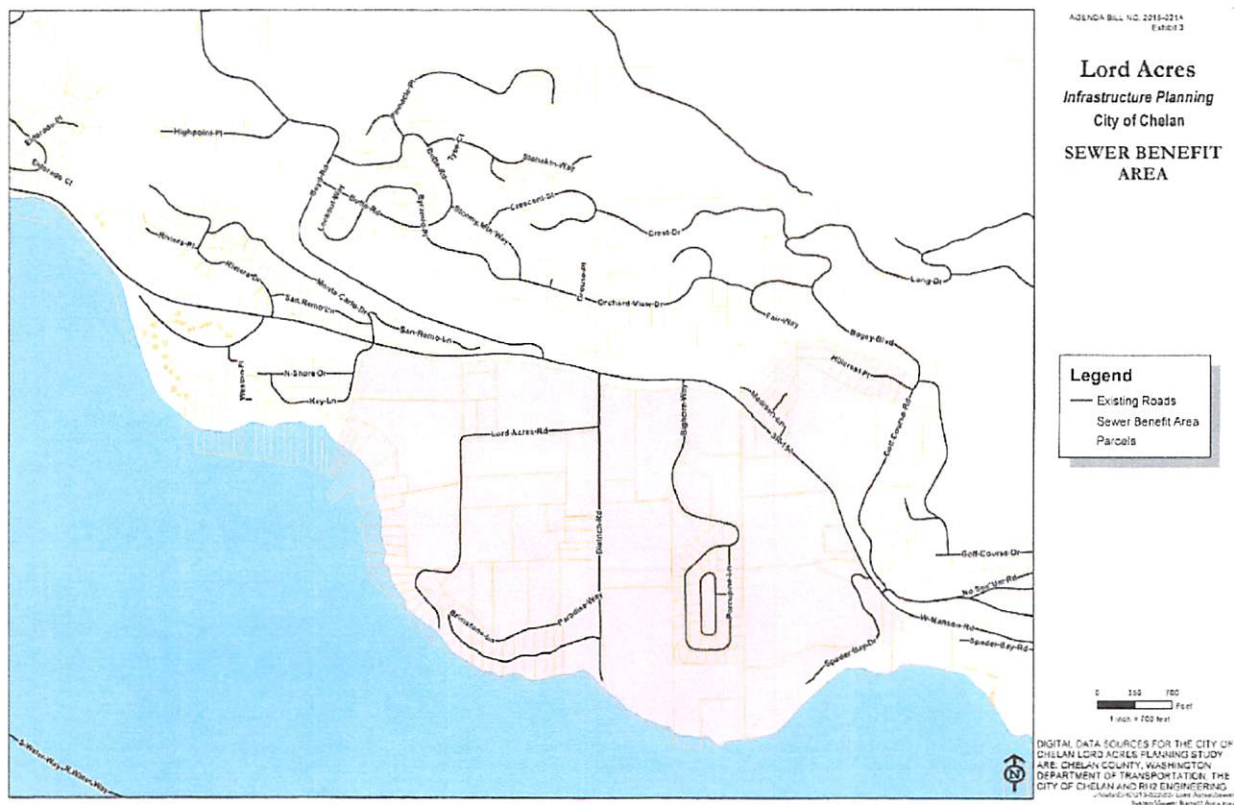
### Lord Acres Local Facility Charge Area Fee:

An additional Lord Acres Local Facility Charge Area Fee per additional sewer ERU in the amount of \$1,970 will be charged to all redeveloped services within the area defined in the Lord Acres Sewer Benefit Area Map, Figure 1.

### Water Installation Charge:

If a new meter or service is required as part of redevelopment or change in use, the property owner shall pay a Water Installation charge based on the actual cost of the connection, meter, appurtenances, and installation, in addition to administrative overhead.

**Figure 1. Lord Acres Sewer Benefit Area Map**



## **EXHIBIT C.**

### **Calculation of Equivalent Residential Units**

Water Equivalent Residential Units and Sewer Equivalent Residential Units will be calculated in reference to the number of fixture units in the currently adopted Uniform Plumbing Code Table 610.3—Water Supply Fixture Units.

One Water Equivalent Residential Unit is defined as 30 interior and exterior fixture units, excluding fixture units associated with fire suppression systems.

One Sewer Equivalent Residential Unit is defined as 24 interior fixture units excluding fixture units associated with fire suppression systems, with a minimum of one ERU for a residential connection.

The calculation of ERUs shall be rounded up to a 0.1 ERU increment.

At the discretion of the Public Works Director, a determination of Water Equivalent Residential Units may be made based on the projected maximum day demand of the new connection, divided by 950 gallons per day per ERU, as defined in the 2018 Water System Plan.

#### **Approval by Public Works Director**

All final decisions and appeals on Equivalent Residential Unit calculations shall be made by the Public Works Director.

**EXHIBIT D.****Monthly Service Rates***Water*

The City water fees and charges shall be as follows:

Monthly Water Service Rates	2019	2020	2021	2022	2023
Water Base Rate per Unit:	\$43.26	\$47.26	\$51.63	\$56.41	\$61.63
<b><u>Fixed Charge by Meter Size:</u></b>					
3/4" meter	\$3.95	\$4.32	\$4.72	\$5.16	\$5.64
1" meter	\$15.78	\$17.24	\$18.83	\$20.57	\$22.47
1.5" meter	\$31.43	\$34.34	\$37.52	\$40.99	\$44.78
2" meter	\$74.67	\$81.58	\$89.13	\$97.37	\$106.38
3" meter	\$293.50	\$320.65	\$350.31	\$382.71	\$418.11
4" meter	\$511.04	\$558.31	\$609.95	\$666.37	\$728.01
<b><u>Volumetric Charges</u></b>					
Water Allowance: (gallons per unit)	7,000	7,000	7,000	7,000	7,000
Water Service Volume Rate: (per 1,000 gal)	\$1.29	\$1.41	\$1.54	\$1.68	\$1.84
<b><u>Single-Family Residential and Multifamily Only:</u></b>					
Conservation Allowance: (gallons per unit)	33,000	33,000	33,000	33,000	33,000
Conservation Volume Rate: (per 1,000 gal)	\$2.58	\$2.82	\$3.08	\$3.36	\$3.68

*These rates are inclusive of the City Utility Tax of 9.5%.*

Each bill consists of three separate components: A monthly base rate per unit associated with the account, a fixed charge that is calculated based on the meter size of the account, and a volumetric charge, which is based on the amount of water used. Each unit receives an allowance of 7,000 gallons per month, which is included in the fixed charge. Usage above this amount is charged at the Water Service Volume Rate. For Single-Family Residential and Multifamily customers, an Conservation Volume Rate is implemented for use above 40,000 gallons per unit per month (7,000 gallons of base usage allowance and 33,000 of regular usage allowance). Usage above the base usage and regular usage allowances will be charged at the Conservation Volume Rate.

**Determination of Billing Units for Multiple-Use Connections:**

Where more than one family, firm, business, association or corporation uses water from the same connection, the number of units shall be the same as if each family, firm, business association or corporation were separately connected thereto. When multiple businesses reside within one office space or work area and have only one employee, it will be regarded as one business.

Accounts with a separate fire service connection shall be subject to a monthly charge as follows, in addition to any other monthly service charges:



Stand-by Fire Service Connection	2019	2020	2021	2022	2023
1.5" pipe	\$12.85	\$14.04	\$15.34	\$16.76	\$18.31
2" pipe	\$15.40	\$16.82	\$18.38	\$20.08	\$21.94
3" pipe	\$22.39	\$24.46	\$26.72	\$29.19	\$31.89
4" pipe	\$28.88	\$31.55	\$34.47	\$37.66	\$41.14
5" pipe	\$38.54	\$42.10	\$45.99	\$50.24	\$54.89
6" pipe	\$51.39	\$56.14	\$61.33	\$67.00	\$73.20
8" pipe	\$84.85	\$92.70	\$101.27	\$110.64	\$120.87
10" pipe	\$129.64	\$141.63	\$154.73	\$169.04	\$184.68
12" pipe	\$185.10	\$202.22	\$220.93	\$241.37	\$263.70

*These rates are inclusive of the City Utility Tax of 9.5%.*

Miscellaneous Charges	2019	2020	2021	2022	2023
Turn-Off	\$25.00	\$25.00	\$25.00	\$25.00	\$25.00
Turn-On (during regular business hours 8:00 a.m. to 5:00 p.m.)	\$15.00	\$15.00	\$15.00	\$15.00	\$15.00
Turn-On (before/after regular business hours)	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00

*These rates are inclusive of the City Utility Tax of 9.5%.*

Bulk Water Users	2019	2020	2021	2022	2023
Initial hydrant connection fee	\$38.25	\$41.79	\$45.66	\$49.88	\$54.49
	\$10.18	\$11.12	\$12.15	\$13.27	\$14.50
Cost per day of use					
Volume rate	\$3.70	\$4.04	\$4.41	\$4.82	\$5.27

*These rates are inclusive of the City Utility Tax of 9.5%.*

## Sewer

The City sewer fees and charges shall be as follows:

Monthly Sewer Rates	2019	2020	2021	2022	2023
<b>Fixed Charge per ERU:</b>					
Monthly rate per ERU	\$43.46	\$47.15	\$49.51	\$51.99	\$54.59

*These rates are inclusive of the City Utility Tax of 9.5%.*

For purposes of the monthly sewer rates, Equivalent Residential Units are to be determined based on the following table, Monthly Rates – Equivalent Residential Unit Table (Sewer)

## Monthly Rates - Equivalent Residential Unit Table (Sewer)

CLASSIFICATION	ERUs
<b>OFFICES, SMALL BUSINESSES, STORES, ETC.</b>	
1 thru 3 employees	1.6
4 thru 6 employees	2.6
7 thru 9 employees	3.6
10 thru 12 employees	4.6
13 thru 15 employees	5.6
16 thru 18 employees	6.6
19 thru 21 employees	7.6
22 or more employees	8.0
<b>MOTEL, HOTEL, ETC.</b>	
1st unit	1.5
Each additional unit	0.8
Resident unit	1.0
<b>RV PARK, ETC.</b>	
1st unit	1.5
Each additional unit	0.4
<b>SCHOOLS</b>	
Elementary, per capita	0.05
Junior High, per capita	0.05
High School, per capita	0.07
<b>SINGLE FAMILY RESIDENTIAL BUILDINGS</b>	
Per connection	1.0
<b>MULTIPLE FAMILY RESIDENTIAL BUILDINGS</b>	
First unit	1.0
Each additional unit	1.0
<b>HOSPITAL, CLINIC, DENTIST, ETC.</b>	
Per each 7,000 gal water used	1.0
Per each disposal unit	2.5
But no less than	1.6
<b>ASSISTED LIVING FACILITIES</b>	
Per available bed	0.4
Per each disposal unit	2.5
<b>NURSING HOMES</b>	
Per available bed	0.4
Per each disposal unit	2.5
Per each building	1.2
Per each kitchen	0.6
Per each disposal unit	2.5
Per each lounge seat	0.025
<b>CAR WASH</b>	
Per each station	2.5
<b>SERVICE STATION</b>	
Per each station	2.5
Per each dump unit	2.5
<b>MUSEUM</b>	
Per facility, for each 3 employees	0.4
<b>BARBER, BEAUTY SHOP</b>	
Per each station	0.35
But not less than	1.60

<b>THEATER</b>	
Per seat	0.01
<b>MORTUARY</b>	
Per facility	2.0
<b>LAUNDROMAT</b>	
Per establishment	1.25
Per machine (coin op)	0.60
Per machine (commercial)	0.85
<b>SUPERMARKET</b>	
Per each 3 employees	1.0
Per each butcher shop	3.0
Per each disposal unit	3.0
<b>PARKS, POOL HOUSE OR FACILITY, MARINA (does not include RV Hook-ups)</b>	
Per toilet	0.45
Per shower	0.75
<b>FOOD SERVICE ESTABLISHMENTS</b>	
Per each 7,000 gal water used	1.0
Per each disposal unit	3.0
But no less than	1.6
<b>WATERPARK</b>	
Per business	Site-Specific Analysis

At the discretion of the Public Works Director, a site-specific analysis may be required to establish the appropriate number of ERUs for a new connection.

#### **Rates for High Strength Wastewater**

Rates for users discharging “High Strength Wastewater” into the City’s domestic wastewater facility will be determined after an analysis by the Public Works Director of the High Strength Wastewater proposed to be discharged and the relative costs of treating the High Strength Wastewater by the City’s domestic wastewater facility as compared to wastewater discharged by a typical residential ERU. For this Rate Resolution, the term “High Strength Wastewater” means wastewater having a BOD<sub>5</sub> and/or TSS strength exceeding 225mg/L. The rates indicated by this analysis, and any other relevant terms dealing with the conveyance, discharge, and treatment of the High Strength Wastewater will be set out in a service agreement between the City and the discharger. All questions regarding the discharge and treatment of High Strength Wastewater will be resolved by the Public Works Director. The discharger shall reimburse the City for the cost of the Public Works Director for the analysis of the High Strength Wastewater and the City’s Attorney in drafting the service agreement.

**EXHIBIT E.****SANITATION**

*Customers are allowed a maximum of two 64 gallon or 96 gallon cans. If additional containers are needed, the customer must upsize to a larger container.*

<b>Sanitation Service</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>
<b>Residential, including churches</b>				
Per month for 1 can (maximum 64 gallons)	\$18.08	\$19.53	\$21.09	\$22.77
Per month for 1 can (maximum 96 gallons)	\$29.74	\$32.12	\$34.69	\$37.47
64 gallon can, extra pick up per can--1 can minimum	\$8.16	\$8.82	\$9.52	\$10.29
96 gallon can, extra pick up per can-1 can minimum	\$14.00	\$15.12	\$16.33	\$17.63
<b>Commercial</b>				
Per month for 1 can (maximum 64 gallons)	\$18.08	\$19.53	\$21.09	\$22.77
Per month for 1 can (maximum 96 gallons)	\$29.74	\$32.12	\$34.69	\$37.47
64 gallon can, extra pick up per can--1 can minimum	\$8.16	\$8.82	\$9.52	\$10.29
96 gallon can, extra pick up per can-1 can minimum	\$14.00	\$15.12	\$16.33	\$17.63
<b>Dumpster Delivery</b>				
Initial delivery to site (any size dumpster)	\$39.07	\$42.20	\$45.58	\$49.22
<b>300 Gallon (1.5 yard) Container</b>				
Pickup once a week, per month	\$105.09	\$113.50	\$122.58	\$132.39
Dumpster rental per month	\$11.08	\$11.97	\$12.92	\$13.96
(Rates for dumpster pickup above shall be multiplied by the number of times per week that garbage is collected)				
<b>Eighteen, Twenty and Thirty Yard Loose Bins</b>				
Daily rental fee	\$8.16	\$8.82	\$9.52	\$10.29
Per pick up and disposal (+1.05 x actual landfill fees)	\$205.87	\$222.34	\$240.13	\$259.34
<b>Fifteen, Eighteen, or Twenty Yard Compacting Bin (Customer owned)</b>				
Per pick up and disposal (+1.05 x actual landfill fees)	\$146.38	\$158.09	\$170.74	\$184.40
<b>Saturday, Sunday, or holiday service, extra pickups and loose garbage</b>				

Charge per pick up, 1.5 yard dumpster	\$29.16	\$31.49	\$34.01	\$36.73
Additional charge per pick up, compacting bins	\$46.77	\$50.51	\$54.56	\$58.92
Extra pickups outside of the established weekly scheduled service (per yard)	\$18.08	\$19.53	\$21.09	\$22.77
Loose garbage (outside of dumpster)	\$21.00	\$22.67	\$24.49	\$26.45
<b>Dumpsters (Less than 30 day rentals) Private individuals/contractors/businesses (1.5 &amp; 4 yd cont)</b>				
Daily rental fee	\$2.92	\$3.15	\$3.40	\$3.67
Per yard	\$29.16	\$31.49	\$34.01	\$36.73
<b>Dumpsters (Less than 30 day rentals) Events sponsored by a non-profit organization (1, 1.5, 2 &amp; 4 yard containers only)</b>				
Daily rental fee	No Charge	No Charge	No Charge	No Charge
Delivery	No Charge	No Charge	No Charge	No Charge
Per yard - Actual landfill fees				

## **EXHIBIT F.**

### **City Facilities and Miscellaneous Charges**

1. The following City facilities shall be charged at the following rates for water and sewer fees:

Facility	Rate
Lakeside Park	50% of standard rates
Don Morse Park (day use)	50% of standard rates
Pingrey Park	50% of standard rates
Ball fields	50% of standard rates
Highway Landscaping	50% of standard rates
Golf Course Irrigation	Standard volumetric rate. No charge is to be made for irrigation water pumped directly from Lake Chelan to the golf course.

2. Miscellaneous Charges:

Category	Charge
Billing Transfer Fee:	\$12.00
Non-Sufficient Funds Check Return Fee:	\$25.00
Credit Card Charge:	\$2.00

3. Sanitation

- Park facilities - at the established per cubic yard rate when service is provided by the Public Works Sanitation Department and no charge when Park employees provide their own service.
- All other City facilities to be charged the established base rate and volume rate.

4. Low Income Elderly/Disabled Persons Rate:

The following households will qualify for Low Income Elderly/Disabled Persons rate reductions, which shall be fifty percent (50%) less than those shown for water base rate, water volume rates, and sewer base rate provided that the following low income eligibility criteria are satisfied:

Individuals and couples income limits (50% level) for the City of Chelan shall be those that are effective for Chelan County as of January 1 each year and posted on the Department of Community, Trade and Economic Development's website at [cted.wa.gov/cdbg](http://cted.wa.gov/cdbg).

To qualify, the resident(s) shall submit an affidavit on a form to be provided by the City showing qualifications by age and income.

5. Property outside City Limits

Pursuant to Section 13.08.050 of the Chelan Municipal Code, all of these rates and charges to properties lying outside the corporate limits of the City, except for Water/Sewer General Facilities Charges and Installation Fees, shall be at one and one-half times the established fees and charges, unless otherwise provided by separate contract.

6. Sewer Standby Fee

A Sewer Standby Fee of \$4 per month shall be assessed on relevant accounts, pursuant to Chelan Municipal Code section 13.08.060.

7. Lakeview Maintenance Association:

The Lakeview Maintenance Association is a wholesale purchaser of water and is charged one and one-quarter times the established fees and charges for water per agreement with the City.

8. Meter Tests:

The City will, at its own expense, inspect and test its meters as required to insure a high standard of accuracy. Additional tests at the request of a customer will be made and if the meter is found to register within two percent of accuracy a fee of \$30 shall be charged for all such tests made.

**EXHIBIT G.**  
**PARKS & RECREATION DEPARTMENT**

**Rates include tax**

	<b>2018</b>		<b>2019</b>		<b>2020</b>	
<b>LAKESHORE RV PARK per night</b>	<b>RV</b>	<b>Tent</b>	<b>RV</b>	<b>Tent</b>	<b>RV</b>	<b>Tent</b>
<b>Extra Value Season:</b>						
January 1 through March 31	\$32	\$25	\$34	\$27	\$35	\$29
<b>Value Season:</b>						
April 1 through May 31	\$37	\$30	\$40	\$33	\$42	\$35
<b>Peak Season:</b>						
Friday, Saturday, and Sunday of Memorial Weekend	\$51	\$40	\$55	\$45	\$57	\$47
June 1 through Sat. after Labor Day	\$51	\$40	\$55	\$45	\$57	\$47
<b>Peak Season Prime Sites:</b>						
Areas D sites: 69, 70, 71, 72, 73, 74, 75, 77	\$62		\$65		\$67	
Area E sites: 107, 108, 109, 111, 112, 113, 114	\$62		\$65		\$67	
<b>Fall Season:</b>						
Sunday after Labor Day through September 30	\$42	\$30	\$45	\$33	\$47	\$35
October 1 through December 31	\$34	\$27	\$36	\$30	\$38	\$32
<b>Monthly Winter Rate:</b>						
October 1 through April	\$430		\$445		\$455	



**Loops D & E - 7 Night Minimum (Saturday to Saturday)** beginning the first Saturday following July 4<sup>th</sup> through the third Saturday in August.

Reservation Administration Fee (non-refundable) \$ 5

Cancellation Fee \$ 25

Cancellations under 21 day notice will forfeit up to the first two night's bookings plus the \$5 non-refundable administration fee.

Memorial Day weekend and Labor Day weekend require three (3) night MINIMUM – Friday, Saturday, and Sunday

**BASE RATE INCLUDES:**

Water, sewer, cable, and electric at RV sites, up to four people (children 5 years old and under no charge)  
two (2) licensed vehicles (includes all trailer types).

**ADDITIONAL CHARGES:** Rates include tax

Replacement wristband	\$50
Extra person per day	\$ 5
Reservation Change Fee	\$ 15
Dump Fee - Residential	\$ 1
Dump Fee - Regular	\$ 5
Dump Fee - Commercial .07¢ per gallon	\$ 5 minimum fee

**Daily Parking Lot Fees          Per Parking Lot**

Don Morse Memorial Park – Closes at 11:00 p.m. Lakeside Park – Closes at 11:00 p.m.	0-2 Hours	\$5
	2-6 Hours	\$10
	6+ Hours	\$15

Lakeshore Marina Parking Lot – Open 24/7	0-2 Hours	\$5
	2-6 Hours	\$10
	6+ or Daily	\$15

Parking lot fees in Don Morse park and marina lots per occupied space per day.

Parking fees for special events held within the City of Chelan may be waived for the time period authorized by the City Administrator.

Annual Parking Passes (maximum 2 per household) are non-transferable between individuals or vehicles. Purchaser must provide valid license plate number of vehicle at the time of purchase. Pass numbers not matching vehicle license plates of record will constitute a parking violation and result in a citation. **Annual parking passes valid in parks lots only.**

- \*City of Chelan resident \$10
- \*\*Non-Resident City of Chelan \$25

\*A City of Chelan Resident is a person whose primary residence is within the Chelan city limits. A Chelan Valley Resident is a person whose primary residence is within the following zip codes: 98816 (Chelan and Holden Village); 98817 (Chelan Falls); 98831 (Manson); and 98852 (Stehekin). Conducting business or owning a second home within the City of Chelan or the Chelan Valley **does not constitute residency**. Residency is verified by valid Washington State driver's license or voter registration.

\*\*Non-Resident City of Chelan homeowners are entitled to purchase an annual parking pass. Proof of ownership (utility bill or property tax statement in owner's name showing physical address of property) along with government issued photo identification must be established to purchase pass.

### LAKESHORE MARINA

Rates include tax

**LAUNCH:** (each motorized floating vessel) \$ 8

**SEASONAL PERMIT** (residents launch permit) \$20 (\*)

\*A City of Chelan Resident is a person whose primary residence is within the Chelan city limits. Residency is verified by valid Washington State driver's license or voter registration.

**TRANSIENT TIE-UP** (for up to one hour in designated area) Free

**SHORT TERM MOORAGE** (by the hour, not to exceed four hours) \$ 5

### DAILY MOORAGE

Five hours or longer from 8:00 a.m. to the following day at 12:00 p.m. (noon)

	2018		2019		2020	
	No Power	Power	No Power	Power	No Power	Power
Boat Slip 20' in length	\$14	\$17	\$16	\$19	\$18	\$21
Boat Slip 26' in length	\$17	\$20	\$19	\$22	\$21	\$24
Boat Slip 30' in length	\$21	\$24	\$23	\$26	\$25	\$28

Any tax exempt non-profit company, association, corporation, or co-partnership of whatever kind as defined by the Federal or State government which operates or conducts a community festival or event shall be exempt from daily moorage fees during that event contingent upon approval of the City Administrator.

### 2019 SEASONAL MOORAGE

Rates include 12.84% leasehold tax. From Marina opening (late May) to closing (October 1), approximately 130 days depending on lake level.

Boat Slip 20' in length NO POWER \$908.36 + tax = \$1025

Boat Slip 30' in length POWER \$1280.57 + tax = \$1445

## **2020 SEASONAL MOORAGE:**

Rates include 12.84% leasehold tax. From Marina opening (late May) to closing (October 1), approximately 130 days depending on lake level.

Boat Slip 20' in length NO POWER	\$943.81 + tax = \$1065
Boat Slip 30' in length POWER	\$1333.75 + tax = \$1505

Launch, short term moorage, and daily moorage rates include Washington State Sales Tax (8.2%)

Seasonal moorage rates include Washington State Leasehold Tax (12.84%)

**Parking is not included in your moorage rate or camping rate.** Parking is payable at the pay kiosk located in the marina parking lot.

## **PUTTING COURSE**

Rates include tax

Greens fees and time restrictions for the Putting Course shall be set forth as follows:

Adult (18 years and older)	\$10 per 18 holes after 7:00 pm
Adult (18 years and older)	\$ 9 per 18 holes prior to 7:00 pm
Junior (14 years thru 17 years of age)	\$ 9 all day
Youth (5 years thru 13 years of age)	\$ 8 all day

Resident Rate: All residents of the City of Chelan shall receive \$1 off adult, junior and youth rates at all times.

Tournament Play: 16 players or more at a rate of \$8.00. Tournaments shall not be allowed on Memorial Day Weekend (Friday, Saturday, and Sunday) and not allowed during the months of July and August. Advance reservations required.

## **BALLFIELD COMPLEX**

Rates include tax

### **ATHLETIC FIELD USE FEES:**

Athletic field rental with lights	\$100 per day per field
Athletic field rental without lights	\$ 75 per day per field
Local tournament fee	\$ 50 per day per field
Ballfield camping per couple – Director approved event use only	Price TBD by Staff

## **YOUTH/AAU PROGRAMS**

### **No tax on AAU Programs**

#### **Athletic Team Sponsorship:**

Package A	Soccer or Volleyball	\$100
Package B	Tee Ball	\$100
Package C	Baseball or Softball	\$200
Package D	Basketball	\$100
Package E	Annual Sponsorship (one team in each rec. sport)	\$600

Baseball	Ages 5–8	\$25	Ages 9–12	\$35
Basketball	Grades K–2	\$25	Grades 3–6	\$35
Soccer	Grades Pre-K & K	\$25	Grades 1–6	\$35
Volleyball			Grades 5–6	\$35
Jr. Golf	Age 9–16		4 weeks for	\$75
Swim Lessons	Age 3–12			\$35
AAU Card				\$17

## GENERAL PARK FEES

Rates include tax

**Special Events Fees** – See Exhibit “F”

**Shelter Fees** include a \$5 non-refundable reservations fee

A. For groups of less than 100, user fees and times are as follows:

4 hours	\$45 (*)
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8 hours	\$85
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(\*) Before or after 1:00 PM

B. Shelter Groups in excess of 100, but less than 200 people must submit a Special Events Application and upon approval, shall pay a Shelter Fee of \$105 per day.

C. Shelter Groups in excess of 200 must submit a Special Events Application and upon approval, shall pay a Shelter Fee of \$155 per day.

D. Any tax exempt or non-profit company, association, corporation, or co-partnership of whatever kind as defined by the Federal or State government which operates or conducts a community festival or event shall be exempt from shelter fees for that event.

## DOWNTOWN FLOWER POTS & PLANTING BOXES

The hanging baskets are watered for 4 months from May until September. Watering these baskets also includes fertilizing with Miracle-Gro and performing pest control. The following rates will be charged for watering and care of the baskets:

1 to 5 pots or 1 planting box	\$40 per season (June to September)
6 to 10 addl. pots or 1 addl. planting box	\$60 per season (June to September)

**MAXIMUM OF 10 POTS OR 2 BOXES PER BUSINESS**

## EXHIBIT H.

### LAKE CHELAN MUNICIPAL GOLF COURSE

Rates do not include tax

#### ANNUAL GREENS FEES

	Full	After 2 p.m.
Family	\$1,132.16	\$520
Junior	\$120.37	
Individual	\$693.16	\$363
Golf Cart Usage	\$250.00	
Cart Storage (Does not include usage) <i>Price does not include Leasehold Tax of 12.84%</i>	\$375.00	

Family includes a married couple and all dependent children 17 years and under residing in the same household. Single is any adult 18 years of older.

Junior is any child 17 years or under. Senior is any adult 55 years and over.

Cart Storage participants are required to pay Annual Greens fees as well as all storage and usage fees.

DAILY FEES	Regular Off-Season	After 2 p.m. Weekday	Peak Season (Memorial Weekend through October 10)	Peak Season After 2 p.m. Weekdays
Adult 9 holes	\$22.00	\$18.00	\$27.73	\$20.00
Adult 18 holes	\$34.00	\$26.00	\$49.91	\$29.00
Junior/Senior 9 holes		\$15.00		\$17.00
Junior/Senior 18 holes		\$21.00		\$24.00

Note: Daily play before 2 p.m. is restricted to the 18-hole rate on weekends during May, June and September and daily during July and August. If scheduling allows, the Golf Pro-Manager and/or Assistant Golf Professional may authorize 9-hole play during this time.

After 2:00 p.m. fees are Monday through Thursday only and do not include holidays.

#### POWER GOLF CAR RENTAL

9 Holes– per seat \$6.47	Annual Cart Lease	\$540.00
18 Holes – per seat \$13.86	Couples Lease	\$702.00

Cart lease program will include a couple's rate of \$702. Only one cart on the course at a time.

## GOLF LESSONS

Individual—½ hour for \$30	1 hour for \$50	Special Group (series of six 45 minute lessons)	\$120
Series of 6—½ hour for \$150	1 hour for \$250	Junior Camp Group (series of six 45 minute lessons)	\$150
Playing lessons (per round) \$50			
Professional Caddie \$100 per round			

## SEATTLE GOLF SHOW “GOLF BUCKS’ PROMOTION

\$1 per hole daily to a maximum of 500 “Golf Bucks” redeemed annually.

Golf Club Rental	9 holes:	\$12.04	18 holes:	\$19.44
Golf Cart Usage (Daily)		\$12.04		
Pull Cart Rental	9 holes:	\$3.70	18 holes:	\$5.56
Driving Range Balls	Large:	\$6.47	Small:	\$4.62
Annual:	Single:	\$150.00		
Range ball/rental club package		\$9.26		

## SPECIAL TOURNAMENTS

1-Day Event	\$605.00
2-Day Event	\$968.00

The Special Tournaments are:

1. Ladies Invitational
2. Chelan Invitational
3. Theubet Invitational
4. Chelan Fall Scramble
5. Men’s Member Classic

## SPECIAL FUNDRAISING TOURNAMENTS (Non-Profit Chelan Valley youth groups only)

The Parks & Recreation Director may approve reduced rates for tournaments held for fund raising efforts. Times will be at the recommendation of the Golf Pro and will not interfere with normal operations.

## UPSTAIRS/DOWNSTAIRS MULTIPURPOSE ROOM DAILY RENTAL

Downstairs Conference Room		
	Non-golf functions, excluding non-profit groups	\$75.00
	With outside catering (excludes special tournaments)	\$200.00
Upstairs Common Area Fee for outside catering (excludes special tournaments)		\$250.00

Current contracted Golf Course concessionaire has first right of refusal to provide services for private parties. Outside caterers will not have access to the concession area for any reason whatsoever. Delivery, staging and Storage of outside food will be the responsibilities of the customer and/or outside caterer. The Golf Course contracted concessionaire is responsible only for product they provide.

## GOLF LESSONS

Individual—½ hour for \$30	1 hour for \$50	Special Group (series of six 45 minute lessons)	\$120
Series of 6—½ hour for \$150	1 hour for \$250	Junior Camp Group (series of six 45 minute lessons)	\$150
Playing lessons (per round) \$50			
Professional Caddie \$100 per round			

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Golf Cart Usage (Daily)		\$12.04		
Pull Cart Rental	9 holes:	\$3.70	18 holes:	\$5.56
Driving Range Balls	Large:	\$6.47	Small:	\$4.62
Annual:	Single:	\$150.00		
Range ball/rental club package		\$9.26		

## SPECIAL TOURNAMENTS

1-Day Event	\$605.00
2-Day Event	\$968.00

The Special Tournaments are:

1. Ladies Invitational
2. Chelan Invitational
3. Theubet Invitational
4. Chelan Fall Scramble
5. Men’s Member Classic

## SPECIAL FUNDRAISING TOURNAMENTS (Non-Profit Chelan Valley youth groups only)

The Parks & Recreation Director may approve reduced rates for tournaments held for fund raising efforts. Times will be at the recommendation of the Golf Pro and will not interfere with normal operations.

## UPSTAIRS/DOWNSTAIRS MULTIPURPOSE ROOM DAILY RENTAL

Downstairs Conference Room		
	Non-golf functions, excluding non-profit groups	\$75.00
	With outside catering (excludes special tournaments)	\$200.00
Upstairs Common Area Fee for outside catering (excludes special tournaments)		\$250.00

Current contracted Golf Course concessionaire has first right of refusal to provide services for private parties. Outside caterers will not have access to the concession area for any reason whatsoever. Delivery, staging and Storage of outside food will be the responsibilities of the customer and/or outside caterer. The Golf Course contracted concessionaire is responsible only for product they provide.

Above rates DO NOT include Washington State Sales Tax. The tax will be added where applicable.



## **EXHIBIT I.**

### **Building Department Permit Fees**

Fees shall be assessed in accordance with this fee schedule. All fees are exclusive of any state building code fees, which shall be additional, as applicable.

**Permit Fees.** The fee for each permit shall be set forth in the fee schedule. The determination of value or valuation under any of the provisions of this code shall be made by the building official with the most current ICC Building Valuation Data. The value to be used in computing the building permit and building plan review fees shall be the total value of all construction work for which the permit is issue, as well as all finish work, painting, roofing, electrical, plumbing, heating, air conditioning, elevators, fire extinguishing systems and any other permanent equipment. A permit fee multiple of 0.009 will be applied to the valuation to determine the building permit fee.

**Plan Review Fees.** When submittal documents are required by Section 106 of the International Building Code and International Residential Code, a plan review fee shall be paid at the time of the submitting the submittal documents for plan review. Said plan review fee shall be 65 percent of the building permit fee.

The plan review fees specified are separate from the permit fees specified and are in addition to the permit fees.

When submittal documents are incomplete or changed so as to require additional plan review or when the project involves deferred submittal items as defined in Section 106.3.4.2 of the International Building Code, an additional plan review fee shall be charged at the rate shown in the Building Permit Fee Table.

**Reinstatement of expired building permit –** Permits which have been expired more than 6 months and less than 36 months. (Note 7).

1. No inspections have been completed:
  - a. Resubmittal – Note 6
  - b. Permit – 100% of original permit fee
  - c. Plan Review – Note 1 & 2
  - d. Valuation – Note 3 & 4
2. Footing and foundation inspection has been completed and approved:
  - a. Resubmittal – Note 5
  - b. Permit – 50% of original permit fee
  - c. Plan Review – Note 1 & 2
  - d. Valuation – Note 3 & 4
3. All rough in inspections have been completed and approved:
  - a. Resubmittal – Note 5
  - b. Permit – 25% of original permit fee
  - c. Plan Review – Note 1 & 2
  - d. Valuation – Note 3 & 4

4. All inspections have been completed except for final approval:
  - a. Resubmittal – Note 5
  - b. Permit - \$47 per hr. with 1 hour minimum  
(not to exceed 25% of original permit fee)
  - c. Plan Review – Note 1
  - d. Valuation – Note 3

**Notes:**

1. No plan review fee is charged if the same approved plans are being used
2. A new plan review fee of 65% of the permit fee is charged when the original approval plans are not being reused.
3. Use the original valuation if the original approved plans are being reused.
4. The valuation shall be based on the proposed construction if the original approved plans are not being reused.
5. Reuse the original approved plans and all paperwork as long as no changes are being made.
6. All paperwork is required to be resubmitted.
7. Permits which have been expired greater than 36 months must be resubmitted and are subject to current building permit fees.

**BUILDING PERMIT FEES**

Total Valuation	Fee
\$1.00 to \$500.00	\$23.50
\$501.00 to \$2,000.00	\$23.50 for the first \$500.00 plus \$3.50 for each additional \$100.00, or fraction thereof, to and including \$2,000.00
\$2,001.00 to \$25,000.00	\$76.00 for the first \$2,000.00 plus \$14.00 for each additional \$1,000.00, or fraction thereof, to and including \$25,000.00
\$25,001.00 to \$50,000.00	\$398.00 for the first \$25,000.00 plus \$10.10 for each additional \$1,000.00, or fraction thereof, to and including \$50,000.00
\$50,001.00 to \$100,000.00	\$650.50 for the first \$50,000.00 plus \$7.00 for each additional \$1,000.00 or fraction thereof, to and including \$100,000.00
100,001.00 to \$500,000.00	\$1,000.50 for the first \$100,000.00 plus \$5.60 for each additional \$1,000.00, or fraction thereof, to and including \$500,000.00
\$500,001.00 to \$1,000,000.00	\$3,240.50 for the first \$500,000.00 plus \$4.75 for each additional \$1,000.00 or fraction thereof, to and including \$1,000,000.00
\$1,000,001.00 and up	\$5,615.50 for the first \$1,000,000.00 plus \$3.15 for each additional \$1,000.00, or fraction thereof

**Other Inspections and Fees:**

Inspections outside of normal business hours.....	\$47.00 per hour (1)
(minimum charge – two hours)	
Re-inspection fees assessed under provisions of Section 305.8.....	\$47.00 per hour (1)
Inspections outside of normal business hours.....	\$47.00 per hour (1)
(minimum charge- one-half hour)	
Additional plan review required by changes, additions, revisions to plans *(minor changes) ...	\$47.00 per hour (1)
(minimum charge- one-half hour)	
Additional plan review required by changes, additions, revision to plans *(major changes).....	New permit fees apply
Outside consultant use for plan check and/or inspections.....	Actual Cost (2)
Deferred submittal.....	\$47.00 per hour (1)
Signature Fee .....	\$75.00
(Example: Verifying permit for Manufactured Home installation for Title Company.)	

\*Minor and/or Major changes to plans are determined by the Building Official

(1) Or the total hourly cost to the jurisdiction, whichever is the greatest. This cost shall include supervision, overhead, equipment, hourly wages and fringe benefits of the employees involved.

(2) Actual costs include administrative and overhead costs.

**PLAN CHECK FEES FOR IDENTICAL PLANS**

A. An owner, builder or developer seeking to build more than one structure of an identical design may obtain a discount on the plan check fee required by this chapter and the International Building Code for subsequent identical design submissions within a period of twelve months of the original submission. The discounted fee shall be thirty percent (30%) of the full fee applicable at the time of payment, or the actual cost to the city for plan check review if conducted by an outside official, whichever is greater. The plans must be identical to those submitted by the same applicant within the previous twelve months for which a full fee was paid.

B. At the time of submission of the original plans, the applicant may submit up to four minor construction alternatives for a common design, and pay the applicable additional fee based on the value of the alternative as determined by the building official. The approved alternative plans shall be considered part of the original plans for purposes of determining what constitutes an identical plan.

C. The decision of the building official as to what constitutes a minor construction alternative and identical plan, for purposes of the discount provided by this section, shall be final and binding.

**\*\*The above plan check fees for identical plans shall not apply in the event of an applicable code change**

## MISCELLANEOUS PERMIT FEES

Residential Pools	\$200*
Commercial Pools	\$300*
Re-roof	\$100

\*mechanical and plumbing fees still apply

### Temporary Occupancy Permits for Single Family Residential Units (not to exceed six months)

1 <sup>st</sup> Permit	\$ 0
2 <sup>nd</sup> Permit	\$250
3 <sup>rd</sup> Permit	\$500

### Temporary Occupancy Permits for Commercial Buildings

A cash security equal to 1 ½ times the cost to complete the remaining conditions and/or corrections to be completed prior to issuance of the Certificate of Occupancy. The cash security shall be refunded after the Certificate of Occupancy is issued by the building official. If the corrections and/or conditions have not been completed within the specified period of time, the cash security may be utilized by the City to correct the deficiencies such that a Certificate of Occupancy can be issued for the building. The building official also has the option to revoke the Temporary Certificate of Occupancy and vacating the building until such time that the corrections and/or conditions have been corrected and approved and a Certificate of Occupancy can be issued.

## DEMOLITION PERMITS

0 – 500 square feet	\$ 20.50
501 – 2,000 square feet	\$ 47.00
2,001 – 10,000 square feet	\$ 75.00
10,000 and above	\$150.00

## GRADING PLAN REVIEW FEES

50 Cubic yards (38.2m3) or less.....	No Fee
51 to 100 cubic yards (40 m3 to 76.5 m3).....	\$23.50
101 to 1,000 cubic yards (77.2 m3 to 764.6.....	\$37.00
1,001 to 10,000 cubic yards (765.3 m3 to 7645.5 m3).....	\$49.25
10,001 to 100,000 cubic yards (7646.3 m to 7645.5 m3) - \$49.25 for the first 10,000 cubic yards (7645.5 m3), plus \$24.50 for each additional 10,000 yards (7645.5 m3) or fraction thereof.	
100,001 to 200,000 cubic yards (76 456 m3 to 152 911 m3) - \$269.75 for the first 100,000 cubic yards (76 455 m3), plus \$13.25 for each additional 10,000 cubic yards (7645.5 m3) or fraction thereof.	
200,001 cubic yards (152 912 m3) or more - \$402.25 for the first 200,000 cubic yards (152 911 m3), plus \$7.25 for each additional 10,000 cubic yards (7645.5 m3) or fraction thereof.	
Other fees:	
Additional plan review required by changes, additions or revisions to approved plans .....\$50.50 per hour* (minimum charge - one-half hour)	
Deferred submittal.....	\$50.50 per hour*

\*Or the total hourly cost to the jurisdiction, whichever is the greatest. This cost shall include supervision, overhead, equipment, hourly wages and fringe benefits of the employees involved.

## GRADING PERMIT FEES

50 Cubic yards (38.2 m3) or less.....	\$23.50
51 to 100 cubic yards (40 m3 to 76.5 m3).....	\$37.00
101 to 1,000 cubic yards (77.2 m3 to 764.6 m3).....\$37.00 for the first 100 cubic yards (76.5 m3) plus \$17.50 for each additional 100 cubic yards (76.5 m3) or fraction thereof.	

1001 to 10,000 cubic yards (765.3 m3 to 7645.5 m3).....\$194.50 for the first 1,000 cubic yards (764.6 m3), plus \$14.50 for each additional 1,000 cubic yards (764.6 m3) or fraction thereof.
10,001 to 100,000 cubic yards (7646.3 m3 to 76 455 m3)...\$325.00 for the first 10,000 cubic yards (7645.5 m3), plus \$66.00 for each additional 10,000 cubic yards (7645.5 m3) or fraction thereof.
100,001 cubic yards (76 456 m3) or more.....\$919.00 for the first 100,000 cubic yards (76 455 m3), plus \$36.50 for each additional 10,000 cubic yards (7645.5 m3) or fraction thereof.
<p>Other Inspection and Fees:</p> <p>Inspections outside of normal business hours.....\$50.50 per hour (minimum charge - two hours)</p> <p>Re-inspection fees assessed under provisions of Section 108.8.....\$50.50 per hour</p> <p>Inspections for which no fee is specifically indicated.....\$50.50 per hour (minimum charge – one-half hour)</p>

1. The fee for a grading permit authorizing additional work to that under a valid permit shall be the difference between the fee paid for the original permit and the fee shown for the entire project.
2. Or the total hourly cost to the jurisdiction, whichever is the greatest. This cost shall include supervision, overhead, equipment, hourly wages and fringe benefits of the employees involved.

## MECHANICAL PERMIT FEES

### Permit Issuance and Heaters

For the issuance of each mechanical permit.....\$23.50

For issuing each supplemental permit for which the original permit has not expired, been canceled or finalized  
.....\$7.25

### Unit Fee Schedule (Note: The following do not include permit- issuing fee.)

#### 1. Furnaces

For the installation or relocation of each forced- air or gravity- type furnace or burner, including ducts and vents attached to such appliance, up to and including 100,000 Btu/h (29.3 kW) .....\$14.80

For the installation or relocation of each forced- air or gravity- type furnace or burner, including ducts and vents attached to such appliance over 100,000 Btu/h (29.3 kW) ..... \$18.20

For the installation or relocation of each floor furnace, including vent.....\$14.80

For the installation or relocation of each suspended heater, recessed wall heater or floor mounted unit heater.....\$14.80

#### 2. Appliance Vents

For the installation, relocation or replacement of each appliance vent installed and not included in an appliance permit.....\$7.25

#### 3. Repairs or Additions

For the repair of, alteration of, or addition to each heating appliance, refrigeration unit, cooling unit, absorption unit, or each heating, cooling, absorption or evaporative cooling system, including installation of controls regulated by the International Mechanical Code.....\$13.70

#### 4. Boilers, Compressors and Absorption Systems

For the installation or relocation of each boiler or compressor to and including 3 horsepower (10.6 kW), or each absorption system to and including 100,000 Btu/h (29.3kW) .....\$14.70

For the installation or relocation of each boiler or compressor over three horsepower (10.6 kW) to and including 15 horsepower(52.7kW), or each absorption system over 100,000 Btu/h(29.3kW) to and including 5,000,000Btu/h (146.6kW).....\$27.15

For the installation or relocation of each boiler or compressor over 15 horsepower (52.7 kW) to and including 30 horsepower (150.5 kW) to and including 30horsepower (105.5kW), or each absorption system over 500,000 Btu/h (146.6kW) to and including 1,000,000 Btu/h (293.1kW).....\$37.25

For the installation or relocation of each boiler or compressor over 30 horsepower (105.5kW) to and including 50 horsepower (176kW), or each absorption system over 1,000,000 Btu/h (293.1kW) to and including 1,750,000 Btu/h (512.9kW) .....\$55.45

For the installation or relocation of each boiler or compressor over 50 horsepower (176kW) or each absorption system over 1,750,000 Btu/h (519.89kW).....\$92.65

#### 5. Air Handlers

For each air-handling unit to and including 10,000 cu ft per minute (cfm) (4719 L/s), including ducts attached thereto.....\$10.65

Note: this fee does not apply to an air-handling unit which is a portion of a factory assembled appliance, cooling unit, evaporative cooler or absorption unit for which a permit is required elsewhere in the Mechanical Code.

For each air- handling unit over 10,000 cfm (4719L/s).....\$18.10

#### 6. Evaporative Cooler

For each evaporative cooler other than portable type.....\$10.65

#### 7. Ventilation and Exhaust

For each ventilation fan connected to a single duct.....\$ 7.25

For each ventilation system which is not a portion of any heating or air- conditioning system authorized by a permit.....\$10.65

For the installation of each hood which is served by mechanical exhaust, including the ducts for such hood.....\$10.65

#### 8. Incinerators

For the installation or relocation of each domestic-type incinerator.....\$18.20

For the installation or relocation of each commercial or industrial-type incinerator.....\$14.50

#### 9. Miscellaneous

For each appliance or piece of equipment regulated by the Mechanical Code but not classed in other appliance categories, or for which no other fee is listed in the table.....\$10.65

#### Other Inspections and Fees:

1. Inspections outside of normal business hours, per hour (minimum charge- two hours) .....\$45.50\*

2. Re-inspection fees assessed under provisions of Section 116.6, per inspection.....\$49.50\*

3. Inspections for which no fee is specially indicated, per hour (minimum charge - one- half hour)..\$49.50\*

4. Additional plan review required by changes, additions or revisions to plans or to plans for which an initial review has been completed (minimum charge - one-half hour.....\$49.50\*

5. Deferred submittal (per hour).....\$49.50\*



\* Or the total hourly cost to the jurisdiction, whichever is the greatest. This cost shall include supervision, overhead, equipment, hourly wages and fringe benefits of the employees involved.

## PLUMBING PERMIT FEES

### Permit Issuance

1. For issuing each permit .....\$20
2. For issuing each supplemental permit.....\$10

### Unit Fee Schedule (in addition to items 1 and 2 above)

1. For each plumbing fixture on one trap or a set of fixtures on one trap (including water, drainage piping and backflow protection therefore.....\$ 7
2. For each building sewer and each trailer park sewer.....\$15
3. Rainwater system - per drain (inside building).....\$ 7
4. For each cesspool (where permitted).....\$25
5. For each private sewage disposal system.....\$40
6. For each water heater and/ or vent.....\$ 7
7. For each gas-piping system of one to five outlets..... \$ 5
8. For each additional gas-piping system outlet, per outlet.....\$ 1
9. For each industrial waste pretreatment interceptor including its trap and vent, except kitchen-type grease interceptors functioning as fixture traps.....\$ 7
10. For each installation, alteration or repair of water piping and/or water treating equipment each...\$ 7
11. For each repair or alteration of drainage or vent piping, each fixture.....\$ 7
12. For each lawn sprinkler system on any one meter including backflow protection devices therefore.....\$ 7
13. For atmospheric- type vacuum breakers not included in item 12:
  - 1 to 5 .....\$ 5
  - over 5, each .....\$ 1
14. For each backflow protective device other than atmospheric type vacuum breakers:
  - 2 inch (51 mm) diameter and smaller.....\$ 7
  - Over 2 inch (51 mm) diameter..... \$15
15. For each gray water system.....\$40
16. For initial installation and testing for a reclaimed water system.....\$30

17. For each annual cross-connection testing of a reclaimed water system (excluding initial test)....\$30
18. For each medical gas piping system serving one to five inlet(s)/outlet(s) for a specific gas.....\$50
19. For each additional medical gas inlet(s)/outlet(s).....\$ 5

#### Other Inspections and Fees

1. Inspections outside of normal business hours.....\$30\*
2. Re-inspection fee.....\$30\*
3. Inspections for which no fee is specially indicated .....\$30\*
4. Additional plan review required by changes, additions or revisions to approved plans  
(minimum charge - one-half hour).....\$30\*
5. Deferred submittal (per hour).....\$30\* per hour

\*Per hour for each hour worked or the total hourly cost to the jurisdiction, whichever is greater. This cost shall include supervision, overhead, equipment, hourly wages and fringe benefits of all the employees involved.

#### MANUFACTURED HOME INSTALLATION PERMIT FEES

- |                 |       |
|-----------------|-------|
| 1. Single Wide: | \$300 |
| 2. Double Wide: | \$400 |
| 3. Triple Wide: | \$500 |

Manufactured home permit fees do not include foundation permit fees

#### PERMIT AND PLAN HOLDERS

- |           |       |
|-----------|-------|
| 1. Small  | \$ 10 |
| 2. Medium | \$ 50 |
| 3. Large  | \$100 |

## ALARM/DETECTION FEES

### New Fire Alarm or Detection System

FACP.....	\$150
Transmitter.....	\$150
FACP and Transmitter.....	\$200

### Devices

1 to 100.....	\$330
101 to 200.....	\$410
201 and up.....	\$410 for the first 200 plus \$50 per 100 or fraction thereof

### Replace Fire Alarm Monitoring System and/or Components

FACP.....	\$110
Transmitter.....	\$110
FACP and Transmitter.....	\$120

### Tenant Improvement of Fire Alarm or Detection System Devices

1 to 5.....	\$110
6 to 10.....	\$150
11 to 20.....	\$200
21 to 40.....	\$260
41 to 100.....	\$330
101 to 200.....	\$410
201 and up.....	\$410 for the first 200 plus \$50 per 100 or fraction thereof

## FIRE SUPPRESSION FEES

### New Fire Sprinkler System NFPA 13 or 13R

#### Sprinkler Heads

1 to 100.....	\$330
101 to 200.....	\$410
201 to 300.....	\$500

301 and up.....	\$500 for the first 300 and \$50 per 100 devices or fraction thereof
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#### Risers or Supplies

Per riser.....	\$ 25
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Per supply.....	\$ 25 (post/wall indicator valve, double detector check valve connection)
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One “supply” shall consist of a Post or Wall Indicator Valve, a Double Detector Check Valve Assembly, and a Fire Department Connection (one each).

One “riser” shall consist of an interior zone supply with all accompanying trim with flow switch or pressure switch. It may be either a stand-alone vertical riser, one vertical riser of a manifold system, or where zones are controlled at floors, one floor control valve and all accompanying trim and flow switch.

#### NFPA 13 D

##### Sprinkler Heads

1 to 40.....	\$180
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41 and up.....	\$240
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##### Risers or Supplies

Per riser.....	\$ 25
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#### Tenant Improvement or Modification of Fire Sprinkler Systems

##### NFPA 13, 13R, OR 13D

##### Sprinkler Heads

1 to 5.....	\$110
-------------	-------

6 to 10.....	\$150
--------------	-------

11 to 20.....	\$200
---------------	-------

21 to 40.....	\$260
---------------	-------

41 to 100.....	\$330
----------------	-------

101 to 200.....	\$410
-----------------	-------

201 to 300.....	\$500
-----------------	-------

301 and up.....	\$500 for the first 300 plus \$50 per 100 devices or fraction thereof
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**Fire Suppression System other than Sprinklers (e.g. Hood & Duct, FM 200 etc.)**

**New System Per**

1 TO 20.....	\$160
21 to 40.....	\$200
41 and up.....	\$200 for the first 40 plus \$40 per each 40 additional devices or portion thereof
Standpipe.....	\$160

**Tenant Improvement or System Modification for other than Sprinklers**

1 to 5.....	\$100
6 to 10.....	\$120
11 to 20.....	\$160
21 and up.....	\$160 for the first 20 and \$40 per each 20 additional devices or fraction thereof
Standpipe.....	\$160

## Other Inspections and Fees:

1. Inspections outside normal business hours (minimum charge—two hours).....\$118.50
2. Re-inspection fees, per inspection when such portion of work for which inspection is called is not complete or when corrections called for are not made.....\$ 79
3. Inspection for which no fee is specifically indicated, per hour (minimum charged one-half hour).....\$ 79
4. Additional plan review required by changes, additions, or revisions to plans or to plans for which an initial review has been completed (minimum charge one-half hour).....\$ 79
5. Deferred submittal (per hour).....\$ 79

## REFUND POLICY

The building official may authorize the refunding of permit and/or plan review fees, upon written application filed by the original applicant no later than one hundred eighty days (180) after the date the fee was paid:

1. One hundred percent (100%) of any permit fee erroneously paid or collected;
2. Up to eighty percent (80%) of the *permit fee* paid when no work has been done pursuant to a permit issued in accordance with the building code;
3. Up to eighty percent (80%) of the *plan review* fee paid when an application for a permit for which a plan review fee has been paid is withdrawn or canceled before any plan reviewing is done.

**EXHIBIT J.**  
**PLANNING DEPARTMENT FEES**

If Title 19 requires a public hearing, the application fee and the Hearing Examiner fee are required.

**PLAT ADMINISTRATION**

A.	Preliminary Plat	\$1,500 + \$75/lot
B.	Final Plat	\$300 + \$20/lot
C.	Plat Alteration or Change of Conditions requiring a public hearing	\$500 + \$20/lot
D.	Change of Condition/Design (w/o Public Hearing) - requests by the proponent for modifications requiring referral to reviewing departments and agencies.	\$750
E.	Plat Vacation	\$750
F.	Short Plat Review and Decision	\$575 + 75/lot
G.	Short Plat Mylar Review	\$150 + \$20/lot
H.	Short Plat Alteration	\$400 + \$70/lot
I.	Variance to Development Standards	\$500
J.	Preliminary Binding Site Plan	\$1,500 + 75/lot
K.	Binding Site Plan Mylar Review (final)	\$300 + \$20/lot
L.	Revision or alteration of Binding Site Plan	\$500 + \$70/lot
M.	Appeal of Administrative Decision	\$500
N.	Latecomers Agreement Application Fee	\$400
O.	Boundary Line Adjustment	\$300 + \$75/lot
P.	Pre-application	
	Single Family Residential	\$150 after initial meeting
	Commercial under 4,000 square feet	\$150 after initial meeting
	Commercial over 4,000	\$250
	Land Division	
	Short Plat	\$150 + \$50 for additional
	meeting (example: 1 <sup>st</sup> meeting is \$150, 2 <sup>nd</sup> meeting is \$200, 3 <sup>rd</sup> meeting is \$250)	
	Subdivision	\$150 + \$50 for additional
	meeting (see Short Plat example)	

**ZONING ADMINISTRATION**

A.	Zone Reclassification or Planned Development	\$2,500 + \$75/acre
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B.	Final Planned Development District (PDD)	\$750
C.	Planned Development-minor amendment	\$500
D.	Zoning Code Text Amendment	\$1,250
E.	Comprehensive Plan Amendment, Text or Designation	\$1,250
F.	Conditional Use Permit (CUP)	\$500
G.	Administrative Conditional Use Permit, Home occupation	\$ 50
H.	Amendment to Low Impact CUP	\$ 50
I.	Single Family Residential Variance	
	1. Before any construction takes place	\$400
	2. After any construction has started	
	Value of structure that is seeking variance:	
	\$0 - \$100,000	\$550
	Over \$100,000	\$750
	3. Administrative Variance	\$300
J.	Variance associated with land division or commercial	\$1,355
K.	Appeal of Administrative Decision	\$500
L.	Appeal of Hearing Body Decision	\$485
M.	Hearing Examiner	\$625
N.	Hearing Examiner-Special Hearing (determined after comment period required)	\$130 per hour (deposit required)
O.	Annexation	\$250
P.	Annexation by Election	Actual cost of election
Q.	Legal Fees on Appeal	Cost
R.	Code Interpretation	\$250
ADMINISTRATIVE PERMITS/REVIEWS/DECISION BUILDING PERMITS		
A.	Commercial/Industrial	\$200
	With Critical Area/Resource Land	\$240
B.	Multi-family dwelling (3 + units)	\$170
	With Critical Area/Resource Land	\$200
C.	Single Family and Duplex Dwelling	\$ 85
	With Critical Area/Resource Land	\$120



D.	Manufactured Home	\$ 60
	With Critical Area/Resource Land	\$ 95
E.	Other Building Permits	\$ 50
	With Critical Area/Resource Land	\$ 85
F.	Modification or previously approved permits/site plan	\$ 50
G.	Sign Permit (per sign)	\$ 50
H.	Expedited Review	Cost per hour at planner's rate

## SHORELINE MANAGEMENT ADMINISTRATION

A.	Substantial Development (If more than one permit is required, the higher fee applies plus ½ of each additional required permit)	
	1) Non-exempt docks	\$950
	2) Non-exempt bulkheads	\$950
	3) Boat lifts (permanent)	\$400
	4) Landfill and bulkheads beyond OHWM	\$1,500
	5) Landfill, utility and road construction above OHWM	\$800
	6) Residential development 2-4 units	\$950
	7) Bed & Breakfasts and all others	\$800
	8) All other shoreline substantial developments	\$950
	9) Buoy	\$100
B.	Variance	\$800
C.	Conditional Use Permit	\$950
D.	Time Extension	\$300
E.	Revision	\$800
F.	Environment change	\$1,500
G.	Text Amendment	\$1,500
H.	Non-permit service	
	1) Site Inspection	\$100
	2) Written Exemption	\$100

## STATE ENVIRONMENTAL POLICY ACT (SEPA)

A.	Environmental Checklist	
	1) Determination of Non-Significance (DNS)	\$250
	2) Mitigated DNS (MDNS)	\$250 + cost/hour
	3) Environmental Impact Study (EIS)	Cost/hour* \$750 min. deposit
	4) Additional information	Cost/hour*

\*Hourly cost is based upon project planner hourly rate + 25%

## CODE ENFORCEMENT

<b>Violation of:</b>	<b>CMC</b>	<b>First Violation</b>	<b>Second Violation</b>	<b>Third Violation</b>
Codes adopted under CMC 15.04.020	15.04.020 15.04.060	\$100	\$250	\$500
Nuisance	8.26.020(J) 8.26.075	\$100	\$250	\$500
Public Disturbance Noises	8.31.040	\$100	\$250	\$500
Graffiti	8.42.035	\$100	\$250	\$500
Commercial Activities in Parks	9.22.050	\$100	\$250	\$500
Sidewalk Business Licenses	5.60.060	\$100	\$250	\$500
Sewer System	13.06.100	\$100	\$250	\$500
Violations within Critical Areas	14.10.100	\$100	\$250	\$500
Care and Maintenance of Trees	14.20.160	\$100	\$250	\$500
Key Boxes	15.14.050	\$100	\$250	\$500
Manufactured/Mobile Homes	15.20.060	\$100	\$250	\$500
Telecommunication – Right of Way Use	15.22.340	\$100	\$250	\$500
Livestock and Poultry	17.04.065	\$100	\$250	\$500
Zoning Code	17.12.030	\$100	\$250	\$500
Recreational Vehicles and Park Models	17.13.050	\$100	\$250	\$500
Manufactured home parks	17.54.100	\$100	\$250	\$500
Conditional Uses	17.56.040	\$100	\$250	\$500
Land Division Code	16.44.050	\$100	\$250	\$500
Development Standards	25.05.100	\$100	\$250	\$500
Nuisance or Junk Vehicles	2.80.030 10.38	\$100	\$250	\$500
Watercraft Rental Licenses	5.44.085	\$100	\$250	\$500
Adult Entertainment Facilities	5.06.150	\$100	\$250	\$500
Business Licenses	5.13.090 5.02.046	\$100	\$250	\$500
Beer and/or Wine Gardens	5.48.050	\$100	\$250	\$500
Business and Occupation Tax	5.08.170(B)	\$100	\$250	\$500
Hawkers, Peddlers, Transient Businesses	5.20.065	\$100	\$250	\$500
Special Events License	5.50.060	\$100	\$250	\$500
Other Violations of the CMC	CMC	\$100	\$250	\$500

## REFUND POLICY

1. 75% refund of fees will be provided if the Planning Director or his/her designee determines that, although the application has been accepted, no processing by the City has occurred.
2. 50% refund of fees will be provided, if the Planning Director or his/her designee determines that the request is made after processing by the City has occurred.
3. No refund of fees will be provided after an administrative decision or interpretation is rendered or after the mailing of notice unless the application is withdrawn at a City Department's request.

4. Full refund of fees, minus the pre-conference fee, may be authorized if the City has inappropriately told an applicant that a permit/action is required and later is determined by the City that the permit/application was not necessary/required.

#### **GENERAL ADMINISTRATION OF FEE SCHEDULE**

All of the required fees will be paid at time of application or when applicant requests information or service for which a fee is charged above and is rendered without an application being filed provided that for hourly fees, the applicant will be billed and the fee paid before the decision is made and the findings signed.

- A. Each action for which there is a listed fee above will constitute a separate action, and the fee will be computed as determined above. Each variance required is a separate action.
- B. Measurement of acreage will be rounded to the nearest full acre except for areas less than one acre, which will be computed as one acre.
- C. Hourly wages will be rounded to the nearest 1/4 hour except for hours less than 1/4 hour, which will be computed as 1/4 hour.
- D. Value of projects and/or construction shall be determined by building permit value if issued within the last year. If no building permit was required or the building permit was issued more than one year ago, the value shall be determined per County Assessor records, awarded construction bid, estimated construction cost or other comparable means.
- E. Fees shall be doubled for work begun without a valid permit.

#### **MISCELLANEOUS BUILDING/PLANNING FEES**

G.I.S. Mapping	per 11 x 17" Page	\$10
Custom Mapping		Planner hourly rate + 25%
Permit transfer fee		\$12
Permit extension fee		\$47
Technology surcharge fee		5% fee based on uilding permit and plan review fee with a project valuation over \$10,000

**EXHIBIT K.**  
**CHELAN GENERAL CITY FEES**

Copy charges:	standard 8 ½ x 11" paper:	.15
(Fees may be waived if costs to be billed are less than \$2.00)		
	other sizes:	.003 per square inch
Tape duplications		\$ 5/tape
Certified copy		\$ 5/document
NSF check		\$25
Stop payment fee for lost warrant		\$30
Parking fines (Ordinance #2014-1470)		\$25
Parking delinquent fee (Ordinance #2014-1470)		\$20
Room rental fees – No food or beverages served		\$ 0
Room rental fees – Food and/or beverages served		\$25
(Fees may be waived if city sponsored or city participant event)		
<b>SPECIAL EVENTS FEES</b>		
Use of city property or right-of-way		\$100 per event
(may be waived per event application conditions)		
Commercial booth operating fee		\$100 per event
Beer and wine gardens		\$100 per event
Electrical or water hook-up		\$ 25 per event
Additional fees if event is held in city park:		
Vehicle in park for unload/load (where authorized)		\$10 per vehicle per day
Vehicle on turf area (event staging/food vending, etc.)		\$50 per vehicle per day
(Vehicles in parks may incur mitigation charges)		
Staffing for event monitoring and event contact		Actual labor costs

## **PUBLIC DANCE FEES**

Annual public dance license fee	\$200
Single public dance license fee	\$ 50
Security deposit	\$200

## **BUSINESS LICENSE FEES**

General business license	\$50 for first 3 employees/\$15 each additional employee, not to exceed \$410
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Sidewalk café business license	\$50
(In addition to annual business license)	

### **Businesses with pool tables:**

First two tables	\$50 per year
Each additional table	\$ 5 per year
(In addition to annual business license)	

Vehicles for hire	\$ 2.50 per year
(In addition to annual business license)	

Peddlers/hawkers license	\$ 10/day up to \$100/max for 120 day
Transient business license	\$ 10/day up to \$100 max for 120 day

## **CHELAN COMMUNITY BUILDING FEE**

### **CATEGORY I - Civic and Youth Groups**

Category I includes civic, youth and human service oriented programs or activities. This includes user groups that provide direct benefits to the community. This would include but not be limited to: Organizations conducting fund raising activities for charitable purposes benefitting youth, low income or the Community's Service Groups; Chartered youth groups (e.g. Boy Scouts, Girl Scouts, Camp Fire Girls, 4H, etc.); Entities with which the City has entered into a Joint Use Agreement (Lake Chelan School District, Manson School District).

#### **FACILITY**

Fireside Room	\$10.00/hour
Large Downstairs Room	\$20.00/hour
Large Upstairs Meeting Room	\$20.00/hour

### **CATEGORY II - Private Non Profit Groups**

Category II is defined as any individual, group, political, religious or non-commercial organization. This would include, but not be limited to: Governmental agencies; Non-profit organizations, civic and service groups who do not provide direct support or service to children or low income groups; Individuals renting the facility for anniversary or birthday parties, neighborhood or other meetings, dances, weddings, receptions, baptisms, or other similar events generally not open to the public at large.

#### **FACILITY**

Fireside Room	\$15.00/hour plus \$20 non-refundable administrative fee
Large Downstairs Room	\$40.00/hour plus \$20 non-refundable administrative fee
Large Upstairs Meeting Room	\$40.00/hour plus \$20 non-refundable administrative fee

### **CATEGORY III - Profit Groups**

Category III includes profit-making activities, fee based events, commercial enterprises.

#### **FACILITY**

Fireside Room	\$30.00/hour plus \$20 non-refundable administrative fee
Large Downstairs Room	\$60.00/hour plus \$20 non-refundable administrative fee
Large Upstairs Meeting Room	\$60.00/hour plus \$20 non-refundable administrative fee

#### **DAMAGE AND CLEANING DEPOSITS**

For weddings, quinceaneras, dances, similar events, and all events serving alcohol:	\$500
For meetings and other hourly events*	\$ 50
For Governmental agencies	\$ 0
Event attendant** per hour	\$ 15

\*For frequent renters, the damage deposit will be retained by the city and returned when use is no longer scheduled.

\*\*At the discretion of Park staff, certain events may require an attendant be present during the event.



## **EXHIBIT L.**

### **PUBLIC RECORDS REQUESTS FEES**

- (1) The City shall charge the following fees for copies of public records or use of city equipment to make copies:

<b>TYPE OF RECORD/DELIVERY</b>	<b>FEE</b>
Standard sized (8 ½ x 11) black and white paper copies of public records maintained on paper or maintained electronically and printed on paper	\$0.15 per page (each side is one page)
Standard sized (8 ½ x 11) color paper copies of public records maintained on paper or maintained electronically and printed on paper	\$0.15 per page (each side is one page)
Scanned paper records	\$0.10 per page (each side is one page)
Nonstandard copies (oversized copies, photographs, and similar types of records)	\$0.003 per square inch 18x24 - \$1.30 (each side is one page) 24x36 - \$2.59 (each side is one page)
Records copied by an outside vendor. An outside vendor may be used due to volume, current workload of city staff, unique nature of the request, or any other reason	Actual cost
Electronic files or attachments uploaded to email, cloud-based data storage service, or other means of electronic delivery	\$0.05 per each four files or attachments
Transmission of records in an electronic format	\$0.10 per gigabyte
Container, packaging materials, or envelope used to mail copies	Actual cost
Digital storage media or device (DVD, CD, thumb drive, flash drive, and other similar items)	Actual cost
Postage or delivery charge	Actual cost
Use of information technology expertise to prepare data compilations, or to provide customized electronic access services	Actual cost

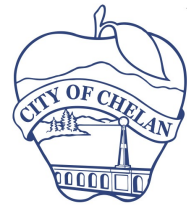
(2) Combined Fees. The fees in subsection (1) of this section may be combined to the extent that more than one type of fee applies to copies provided in response to a particular public record request.

(3) Deposit. Prior to making any copies, the City may require a deposit in an amount not to exceed 10 percent of the estimated fee for providing copies of the public records to the requester.

(4) Advance Payment of Fees. The City may require payment of any or all fees prior to providing the copies of the public records to the requester.

(5) Waiver of Fees. The City's Public Records Officer may waive any or all fees for a requester when the total estimated fees for copies of public records for a particular public record request are \$2.00 or less.

# City of Chelan



## WATER COST OF SERVICE RATE STUDY

DRAFT REPORT  
October 2019

### **Washington**

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Redmond, WA 98052  
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**FCS GROUP**  
Solutions-Oriented Consulting

October 2019

Mike Jackson, City Administrator  
City of Chelan  
P.O. Box 1669  
Chelan, WA 98816

Subject: Water Cost-of-Service Rate Study Report

Dear Mike:

FCS GROUP is pleased to submit this Draft report on the 2018 Water Cost-of-Service Rate Study, conducted for the City of Chelan. This report sets forth and summarizes the methodology, assumptions, analysis, and results of the rate study process that occurred between January 2018 and December 2018.

The rate study process was a collaborative effort among FCS GROUP staff, Gray & Osborne staff, City Staff, and City Councilmembers. Brooke Tacia, Luke Slaughterbeck, Angie Sanchez Virnoche and I wish to express our appreciation for the friendly cooperation and assistance of all those who provided the information and review necessary to successfully complete the study. In particular we'd like to acknowledge the efforts of Jake Youngren in assisting us in this effort.

Once again, we appreciate the opportunity to be of service to the City.

Yours very truly,



Andy Baker  
Project Manager

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# Section I. INTRODUCTION

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## I.A. GENERAL BACKGROUND

In 2017, the City of Chelan (the City) contracted with FCS GROUP to conduct a Water Cost-of-Service Rate Study. The City owns and operates its water system, which is responsible for procuring, treating, and distributing water to residential, commercial, and industrial customers. The existing facilities in the City's water system include a raw water intake from Lake Chelan, a water treatment plant, fifteen storage reservoirs, thirteen booster stations, nineteen pressure reducing valve stations, and approximately 36 miles of water transmission and distribution lines.

The City's water utility operates as an enterprise fund, and serves approximately 2,300 connections within its existing service area.

The City Council establishes rates and charges for the furnishing of water service so that revenues will be sufficient to support the long-term sustainable operating and capital needs of the water utility. A five-year schedule of water rates based on the prior Rate and General Facility Charge Study in 2014 were adopted by the City Council in Resolution 2014-1289, and has subsequently been revisited annually as part of the City's budgeting process.

## I.B. PURPOSE OF THE REPORT

The purpose of this report is to document the analyses that were completed for this project. Specific analyses and results summarized in this report include the following:

- The projection of the water utility's revenue requirements developed by the project team for the ten-year study period from 2019 through 2028 (study period)
- The level of future rate increases that may be necessary to fund future operating and capital needs
- A cost-of-service analysis
- A rate design analysis
- A schedule of proposed water rates for 2019 through 2023
- Adopted rates for 2019 through 2023, effective January 1, 2019

The key assumptions underlying the various projections and analyses prepared in this Water Cost-of-Service Rate Study are discussed in this report. Meetings and phone calls were held among City staff and the project team to review assumptions, data used in the study, and the preliminary results and additions were made to the study as a result of these meetings and phone conversations. After review by City staff, the draft revenue requirements analysis, cost-of-service analysis, and proposed water rate schedules were presented to the City Council in October 2018. The City Council approved the final rate recommendation in December 2018. The adopted rates are shown later in Section VI.A.

## I.C. PROJECT APPROACH

The methods used to complete the study are based on analytical principles that are generally accepted and widely followed throughout the industry – rates and charges should generate enough revenue to maintain self-supporting and financially viable utilities.



Throughout the study, we worked with the City to arrive at rate conclusions that meet forecasted utility financial obligations, achieve City goals and policies, comply with legal requirements, and adhere to industry best practices. Meetings were held with City staff to validate input parameters, review interim findings, and receive policy direction.

## I.D. INTENDED USE AND USERS

This report is intended to provide a summarized discussion of the analysis developed by FCS GROUP in completing the listed steps shown in the Purpose of the Report. As such, this report explains our methodologies, materials considered, key assumptions, findings and recommendations. No other use is intended or implied.

The report has been completed for the City of Chelan under a Professional Services Agreement between the City and FCS GROUP. The report and its contents are the property of the City of Chelan and the City is the only intended user of the report. The City of Chelan may choose to distribute this report to others. However, the report itself was prepared solely for the use of the City of Chelan.

## I.E. SOURCES OF INFORMATION USED IN THE REPORT

We have reviewed a number of documents provided by the City during the course of our study. A summary of the key information reviewed for our report is as follows:

- Detailed line-item budgets for the Water Fund, Water/Sewer Bond Redemption Fund, and Water Capital Fund.
- Historical actual and budgeted expenditures.
- 2010 Water System Plan and Draft 2018 Water System Plan.
- Water Capital Improvements Summary.
- Customer billing data from the City's billing database.
- Water asset information provided by the City.

## Section II. PROJECTION OF CUSTOMER SERVICES AND WATER SALES

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Future operating results of the City's water utility will be influenced by a number of factors, including the number and usage characteristics of City water connections, variations in precipitation amounts, and the response of water users to the City's conservation efforts and water pricing policies. Although there are a variety of revenue sources available to the City's water utility enterprise, the primary revenue source is derived from its rates and charges for metered water sales. Thus, reliable projections of future customer services and water sales are important components of the rate study process.

### II.A. KEY ASSUMPTIONS AND METHODOLOGY

The following is a summary of the key assumptions that were used to develop the projections of customer services and water sales volume for the study period.

- The growth in customer services was assumed to be 1.0 percent based on discussion with City staff.
- Water sales volume was conservatively assumed to be zero percent in total, or an effective -1.0 percent annual reduction on a per-connection basis.
- Although year-to-year variations in rainfall and temperature are expected to occur and to impact actual water sales volumes, it is assumed that normal or average weather conditions will generally prevail during the study period and are assumed to occur in each year of the study period.

Key components of the methodology used to develop customer and water sales projections include the following:

- Three years of customer billing data was evaluated (2015 through 2017). Based on discussion of the prior years, 2017 was selected as a representative test year of customer data.
- Water meters aren't read between November and March of each year, with the usage for that period being read in April of each year. In order to project monthly water usage, it was assumed that usage during that period was spread evenly between November and April.
- The number of projected customer services was developed by applying the assumed annual growth rate to the number of connections by customer class for the previous year.
- Projected water sales volume was developed by applying the assumed annual growth rate to the water sales volume by customer class for the previous year.

### II.B. PROJECTED CUSTOMER SERVICES & WATER SALES

Table 1 summarizes the projected customer services for the projection period. Table 2 summarizes the projected water sales for the projection period.



## Section III. REVENUE REQUIREMENT

---

### III.A. BACKGROUND

To provide for the continued operation of a utility on a sound financial basis, revenues must be sufficient to meet the cash requirements for operation and maintenance (O&M) expenses, debt service requirements, and cash-funded capital expenditures, including rate-funded system reinvestment. The sum of these cost components for a given year is referred to as a utility's revenue requirement. Additionally, debt service coverage requirements and additional requirements resulting from City financial policies must be taken into account.

Projections of the City's water utility revenues and revenue requirements for the study period are described in this section.

### III.B. KEY ASSUMPTIONS

Key assumptions used in developing the City's water utility revenue and revenue requirements projections through 2028 are described below. Additional assumptions are described throughout this section as the various components of the revenue requirements are presented.

- Projected customer services and consumption by customer class used to project revenues for the study period are described in Section II.
- The City's 2018 operating budget is the primary basis for O&M expenditure estimates used in this analysis. Projections for 2019 through 2028 are in general based on the previous year's data, adjusted based on an escalation rate selected depending on the type of expenditure.
- The City's 2017 year-end fund balances are used as the beginning fund balance in 2018.
- The City's operating revenues are based on 2017 actual revenues, validated with an analysis of the City's billing data for 2017.
- The projected annual inflation rate is 2.0 percent per year, based on the historical 10-year average CPI-U for the Seattle, Tacoma, Bellevue region, the nearest statistical region for which a separate CPI-U is computed.
- Capital project costs are escalated at a rate of 3.03 percent per year, based on the historical 10-year average of the *Engineering News Record* 20-City Construction Cost Index.
- Labor costs are escalated at a rate of 1.76 percent per year, based on the historical 10-year average of the Employment Cost Index, Wages and Salaries, as compiled by the Bureau of Labor Statistics.
- Benefits costs are escalated at a rate of 6.0 percent per year, per City Staff input based on recent local benefits costs.
- Investment Interest is calculated at a rate of 0.64 percent, based on the Washington State Local Government Investment Pool rate.
- Projected capital improvements for the study period (2019 through 2028) are based on the City's 20-year Capital Improvement Plan, and average \$3.2 million per year. Capital improvement costs will be discussed in more detail in subsequent sections.

### III.C. METHODOLOGY

There are two generally accepted methodologies used in determining the revenue requirements of a water utility. The first method, the “cash basis approach”, is determined using the cash flow requirements of the utility. The cost components analyzed include O&M expenses, debt service requirements, and cash-financed capital improvements. When using the cash basis approach, depreciation, a non-cash expense, is not included in the analysis.

The second method of determining revenue requirements is the “utility basis approach”. This approach includes depreciation as an expense and excludes debt service principal and cash-financed capital improvement expenses. Typically, the utility basis approach also includes the calculation of a rate of return on the utility’s rate base.

Most government-owned utilities use the cash basis approach in determining revenue requirements. Investor-owned utilities are typically required by a state utility commission or other regulatory body to use the utility basis approach in determining revenue requirements.

The cash basis approach is used in this study.

The revenue requirement analysis presented in this report are based on meeting certain financial goals including:

- *Debt Service Coverage.* The level of required rate adjustments is based on meeting a minimum debt service coverage ratio (DSC ratio) of 1.5. While the City’s debt covenants only require a 1.25x DSC ratio, a 1.5 benchmark was used for financial planning purposes in order to account for potential future changes in key assumptions that could negatively impact debt service coverage.
- *Operating Fund Ending Balance.* Under current City fiscal policies, the Operating Fund shall maintain a minimum ending fund balance equivalent to 90 days of O&M expenditures.
- *Capital Fund Ending Balance.* The Capital Fund is recommended to maintain a minimum ending fund balance equivalent to 1.0 percent of net plant in service.
- *Rate-Funded System Reinvestment.* Planning for ongoing system reinvestment funded by rate revenues encourages both ongoing system integrity and avoids an overreliance on debt. Based on discussion with City Staff, a target was set of fully funding the City’s main replacement program through rate revenues.

### III.D. REVENUES

**Table 3** summarizes operating revenues for historical years 2015 – 2017, and budget year 2018. Between 2015 and 2017, operating revenues increased on average 7.0 percent per year.

**Table 3. Historical Operating Revenues**

<b>Historical Revenues</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>Budget 2018</b>	<b>Avg. Annual Change, '15 - '17</b>
Collections Revenues:					
Water Service Fees	\$1,866,219	\$2,087,691	\$2,129,151	\$2,079,405	6.8%
Repairs & Lines	223	241	2,638	0	244%
Total Collections Revenues:	\$1,866,441	\$2,087,931	\$2,131,789	\$2,079,405	6.9%
Miscellaneous Revenues:					
Investment Interest	\$1,678	\$3,892	\$6,615	\$1,000	99%
Sale of Metal	\$40	\$0	\$0	\$0	-100%
Aug 15 Fire Fed Indir Grant	\$0	\$31,995	\$0	\$0	n/a
State Grant from Military Dept	\$0	\$5,332	\$0	\$0	n/a
Other Miscellaneous	\$185	\$235	\$482	\$0	61%
Total Miscellaneous Revenues:	\$1,903	\$3,892	\$6,615	\$1,000	86%
<b>Total Operating Revenue</b>	<b>\$1,868,345</b>	<b>\$2,091,824</b>	<b>\$2,138,404</b>	<b>\$2,080,405</b>	<b>7.0%</b>

Table 4 summarizes the City's projected total operating revenues before rate adjustments through 2023, including water sales revenues under existing rates and other revenue sources. Consistent with the growth assumptions discussed under Section II, projected revenues under existing rates from water sales are increased only by the number of new accounts, not by increased total water usage. Consistent with the City's budgeting practice, miscellaneous revenues are not projected going forward, as they are intermittent sources of revenue which cannot be relied on to recur each year. The 2018 revenue projection differs from the City's 2018 budget amount due to an adjustment for adopted 2018 rates and connections, based on the analysis of the City's billing data.

**Table 4. Projected Revenues Under Existing Rates**

<b>Projected Revenues under Existing Rates</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
Water Service Fees	\$2,163,264	\$2,181,219	\$2,199,323	\$2,217,577	\$2,235,983	\$2,254,542
Miscellaneous Revenues	0	0	0	0	0	0
<b>Total Operating Revenue</b>	<b>\$2,163,264</b>	<b>\$2,181,219</b>	<b>\$2,199,323</b>	<b>\$2,217,577</b>	<b>\$2,235,983</b>	<b>\$2,254,542</b>

### III.E. OPERATION AND MAINTENANCE EXPENDITURES

The City's water enterprise fund is organized into three divisions, consisting of:

- Administration
- Water Production
- Water Distribution

Table 5 summarizes historical O&M expenditures for the City's water utility. Historical expenditures were obtained from City records.

**Table 5. Historical O&M**

Historical O&M	2015	2016	2017	Budget 2018	Avg. Annual Change, '15 - '17
Administration	\$334,371	\$544,423	\$569,286	\$657,937	30.5%
Water Production	309,854	383,298	385,245	398,568	11.5%
Water Distribution	509,190	504,645	573,034	604,819	6.1%
<b>Total O&amp;M</b>	<b>\$1,153,415</b>	<b>\$1,432,367</b>	<b>\$1,527,565</b>	<b>\$1,661,324</b>	<b>15.1%</b>
Transfer to Capital	\$700,000	\$700,000	\$700,000	\$700,000	0.0%

There is a significant increase shown in 2016 in the Administration line item. This increase is due to a change in how the internal City utility tax of 9.5 percent is tracked. Prior to 2016 this amount was transferred directly to the City's general fund, but was changed to be recorded as an internal tax in the Administration department, with a corresponding increase in water service revenues in 2016, as can be observed in Table 3.

Table 6 summarizes projected O&M expenditures for the City's water utility, based on the escalation assumptions discussed in this section. Overall, operating expenditures are expected to increase at an average of 2.4 percent per year, slightly above the general rate of inflation. This is largely due to the ongoing increase in benefits costs.

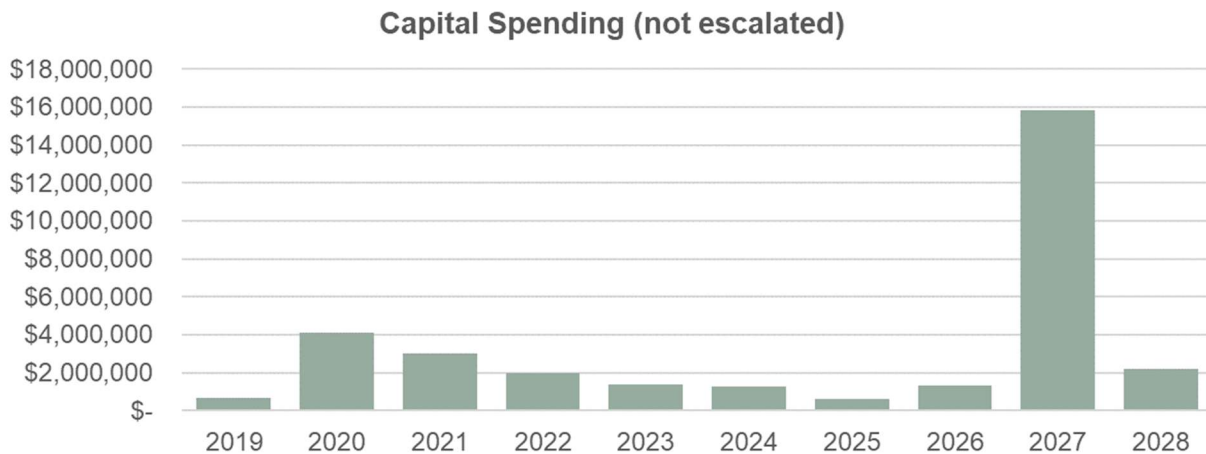
**Table 6. Projected O&M**

Projected O&M	2018	2019	2020	2021	2022	2023
Administration	\$678,478	\$730,407	\$743,408	\$736,823	\$750,669	\$764,969
Water Production	398,568	406,523	414,636	422,912	431,352	439,962
Water Distribution	604,819	621,000	637,748	655,089	673,050	691,659
<b>Total O&amp;M</b>	<b>\$1,681,865</b>	<b>\$1,757,930</b>	<b>\$1,795,793</b>	<b>\$1,814,824</b>	<b>\$1,855,072</b>	<b>\$1,896,589</b>
Transfer to Capital	<i>Tracked separately, reported in a subsequent section.</i>					

### III.F. CAPITAL IMPROVEMENT PROGRAM

The City's consulting engineering firm, Gray & Osborne, developed the water utility capital improvement program as part of the 2018 Water System Plan. The capital improvement program used in the water rate study is based on the projects and costs identified by Gray & Osborne, with input from City Staff. The summary of unescalated capital projects by year are presented in Figure 1.

**Figure 1. Capital Improvements By Year**



The major projects include annual pipe replacement, with an estimated cost of \$369,600 per year, other transmission and distribution improvements, with an estimated cost of \$8.3 million in the study period, and the Water Treatment Plant (WTP) capacity improvements, with an estimated cost of \$14.0 million in 2027. Per the 2018 Water System Plan, the existing WTP is operating at between 70-76 percent of its maximum capacity during heavy summertime use. Based on Department of Health (DOH) requirements, planning for additional treatment capacity must begin when a water treatment facility exceeds 80 percent of its design capacity. Based on current water use behavior and growth rate assumptions, the City is expected to exceed this threshold in 2025.

### III.G. CAPITAL FUNDING SOURCES

Feasible capital funding strategies are essential to the long-term sustainability of a water utility. Capital funding can be sourced from both internal resources (cash reserves, rate revenues, and general facilities charges) as well as external sources (grants, low-interest loans, and bond financing).

**Utility Funds and Cash Reserves** are a primary funding source for all utility activities. The City funds its capital improvements through its Water Capital Fund (Fund number 406). While operating expenses cannot be funded from funds in the capital fund, transfers from the Water Operating Fund (Fund number 401) can be made to meet capital needs. Additionally, rate revenue can pay for capital projects by paying for debt service, which the City pays through its Water/Sewer Bond Redemption Fund (Fund number 402).

**Rate Revenues** can be used to fund capital projects, after operating expenses and debt service obligations have been met. However, overreliance on current-year rate revenue to cash fund current-year capital projects can create rate volatility, as the capital project can vary materially from year to



year. A regular transfer of operating revenues to fund system reinvestment projects is a common best management practice to reduce this volatility. The City has a policy of funding at least ongoing main replacement through rate-funded system reinvestment transfers.

**General Facilities Charges** are a one-time charge imposed on new customers of the water system as a condition of connection to the system. Authorized by Revised Code of Washington (RCW) 35.92.025, general facilities charges (GFC) are a proportional share of the cost of system capacity necessary to serve the new connection. Revenues from the City's General Facilities Charge can only be used to fund capital improvements or to pay for debt service – they cannot be used for operating and maintenance expenditures.

**Federal and State Grant and Loan Programs** are a valuable but dwindling source of capital funding for water utilities. Planning, pre-development, and feasibility study grants are more common, while pre-construction, design, and construction activities are typically loan funded. The following are some of the grant and loan programs available to the City, although the availability of funding for each varies based on federal and state appropriations.

*Community Development Block Grant (CDBG)* is administered by the Washington State Department of Commerce, and provides grant funding for comprehensive plans, non-routine infrastructure plans, feasibility studies, and low-income housing assistance. General Purpose CDBG grants can be used for final design and construction of water projects in support of economic development or affordable housing.

*USDA Rural Development (RD)* provides grant funding for water infrastructure planning work, and loans for construction related to building, repairing, or improving drinking water facilities.

*Community Economic Revitalization Board (CERB)* is administered by the Washington State Department of Commerce, and provides grant funding for feasibility and pre-development studies that advance community economic development. Loans are available for construction projects that support significant job creation or private investment.

*Rural Community Assistance Corporation (RCAC)* provides loan funding for water system and infrastructure planning, pre-construction, and construction projects. Loan authorizations vary depending on the project phase and type.

*Drinking Water State Revolving Fund (DWSRF)* is administered by the Washington State Department of Health (DOH). It provides grant funding for feasibility studies and planning projects for water systems, and loan funding for drinking water system infrastructure projects that improve public health.

*Rural Water Revolving Loan Fund* is administered by Evergreen Rural Water of WA, and provides loans for short-term costs incurred to replace equipment, small-scale extension of services, or other small capital projects that are not a part of regular operations and maintenance.

**General Obligation (GO) Bonds** are bonds secured by the full faith and credit of the issuing agency, committing all available tax and revenue to debt repayment. The amount of debt which may be issued is limited by state statute based on the assessed value within their jurisdiction. GO Bonds are infrequently used by municipal water utilities, but under some circumstances may be used by a city to meet their water funding needs. This typically occurs when issuing a water revenue bond would result in materially higher interest rates, coverage requirements, or issuance costs.

**Water Revenue Bonds** are bonds secured by the revenues of the issuing utility. With this more limited pledge of revenues, Revenue Bonds typically have higher interest rates than GO Bonds, in

addition to bond covenants related to maintenance of bond reserves and bond debt service coverage. Revenue bonds are typically issued with seniority over other non-bond debt.

Revenue bonds can be issued in Washington without a public vote. There is no bonding limit, except the practical limit of each utility's ability to generate sufficient revenue to repay the debt and provide coverage.

### III.G.1. Summary of Proposed Capital Funding

Due to the limited availability of grants and low-interest loans, for purposes of this rate study it is assumed that capital projects will need to be funded through internal resources or through bond financing. Because this study has not considered the general capital needs of the City beyond the water fund, the extent to which GO bonding capacity is available is unknown. As a result, where debt financing is necessary to meet the full Capital Improvement Program needs, Water Revenue Bonds are assumed.

The City's Water Utility has not issued revenue bonds since 2009, so bond financing terms on recently issued bonds are not available to inform our assumptions. Based on discussion with the City and similar utilities, the following bond financing terms were used for this Rate Study:

- Bond Term: 20 years
- Interest Cost: 5.0 percent
- Issuance Expense: 1.0 percent
- DSC Ratio: 1.25x
- Bond Reserve: equal to one year of annual debt service payments, funded from proceeds

Table 7 summarizes the projected capital funding sources by year, presented in escalated dollars.

**Table 7. Capital Funding Sources by Year**

<b>Funding Source</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
General Facilities Charges	\$322,865	\$326,093	\$329,354	\$332,648	\$335,974
System Reinvestment Funding	377,329	392,339	404,228	416,477	429,098
Additional Transfers from Operating	0	12,292	327,353	460,704	684,927
Miscellaneous Capital Revenue	0	44,962	36,423	22,177	23,297
Use of Capital Reserves	0	1,339,475	2,234,679	0	122,584
Bond Proceeds	0	2,700,000	0	700,000	0
<b>Total Funding</b>	<b>\$700,194</b>	<b>\$4,815,161</b>	<b>\$3,332,037</b>	<b>\$1,932,006</b>	<b>\$1,595,881</b>

<b>Funding Source</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>
General Facilities Charges	\$339,334	\$342,727	\$346,155	\$349,616	\$353,112
System Reinvestment Funding	442,100	455,497	469,300	483,521	498,173
Additional Transfers from Operating	737,209	(30,929)	891,852	245,477	648,532
Miscellaneous Capital Revenue	0	0	0	36,574	33,269
Use of Capital Reserves	0	0	0	518,386	1,427,645
Bond Proceeds	0	0	0	19,100,000	0
<b>Total Funding</b>	<b>\$1,518,643</b>	<b>\$767,296</b>	<b>\$1,707,307</b>	<b>\$20,733,575</b>	<b>\$2,960,732</b>

### III.H. EXISTING AND PROPOSED DEBT OBLIGATIONS

The City has historically used debt to pay for major capital improvements to its water system, including United States Department of Agriculture (USDA) loans, water & sewer revenue bonds, Drinking Water State Revolving Fund (DWSRF), and Public Works Trust Fund (PWTF) loans, with the selection of debt instrument dependent on the terms and availability of such funds.

As of this rate study, the City's water utility has one outstanding debt obligation, a 1999 DWSRF loan (loan number 99-65199-014), originally issued for \$2,040,000. Repayment of this loan is scheduled to be completed in 2020. The schedule of remaining payments is summarized in Table 8. Based on discussions with City Staff, it is understood that these loan payments are junior to any future revenue bond debt that may be issued, and carry no specific debt service coverage or reserve covenant.

**Table 8. Summary of Existing Debt Obligations**

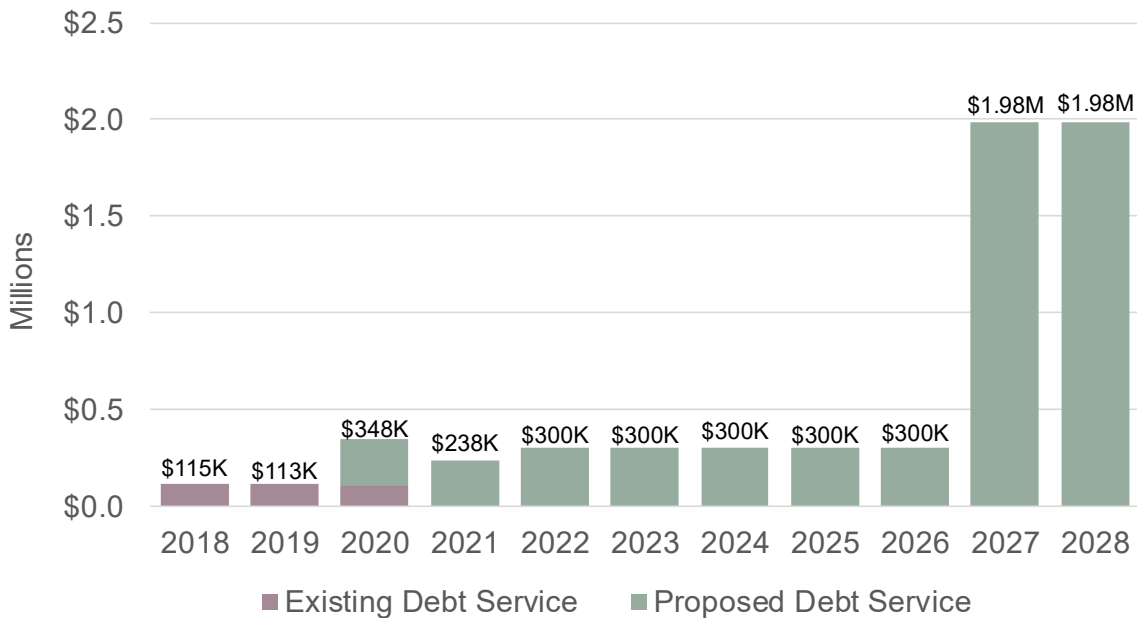
<b>DWSRF 1999</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Total Outstanding Principal</b>
Principal	\$107,368	\$107,369	\$107,367	<b>\$322,104</b>
Interest	8,053	5,368	2,684	
<b>Total Annual Payments</b>	<b>\$115,421</b>	<b>\$112,737</b>	<b>\$110,051</b>	

As discussed in Section III.G.1, water revenue bonds are the assumed debt financing mechanism used in this Rate Study. Based on the capital funding sources analysis, three bond issuances are required to support the City's Capital Improvement Program while optimizing rate adjustments:

- \$2,700,000 of net proceeds in 2020
- \$700,000 of net proceeds in 2022
- \$19,100,000 of net proceeds in 2027

Figure 2 summarizes the projected annual debt service payments associated with the existing and proposed debt financing.

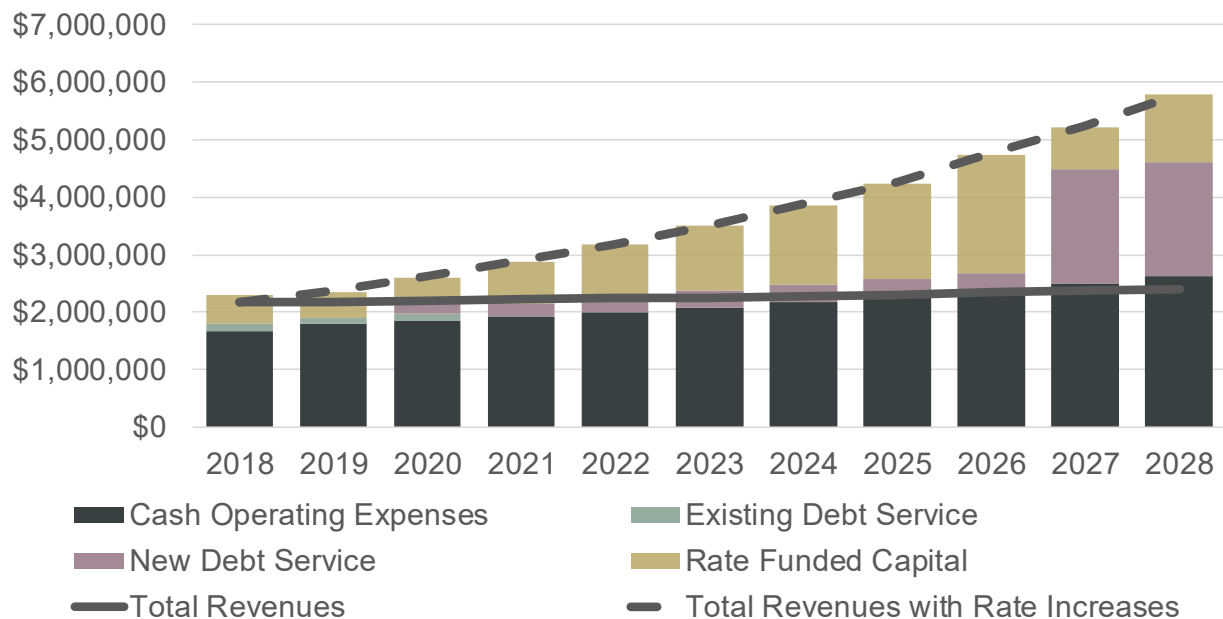
**Figure 2. Annual Debt Service Payments**



### III.I. SUMMARY OF REVENUE REQUIREMENTS

The operating forecast components of O&M expenses, debt service, rate funded system reinvestment, and cash-funded capital improvements come together to form the multi-year revenue requirement. The revenue requirement compares the overall revenue available to the water system to the expenses to evaluate the sufficiency of rates on an annual basis. Figure 3 presents the Revenue Requirement forecast for the study period.

**Figure 3. Revenue Requirement Forecast**

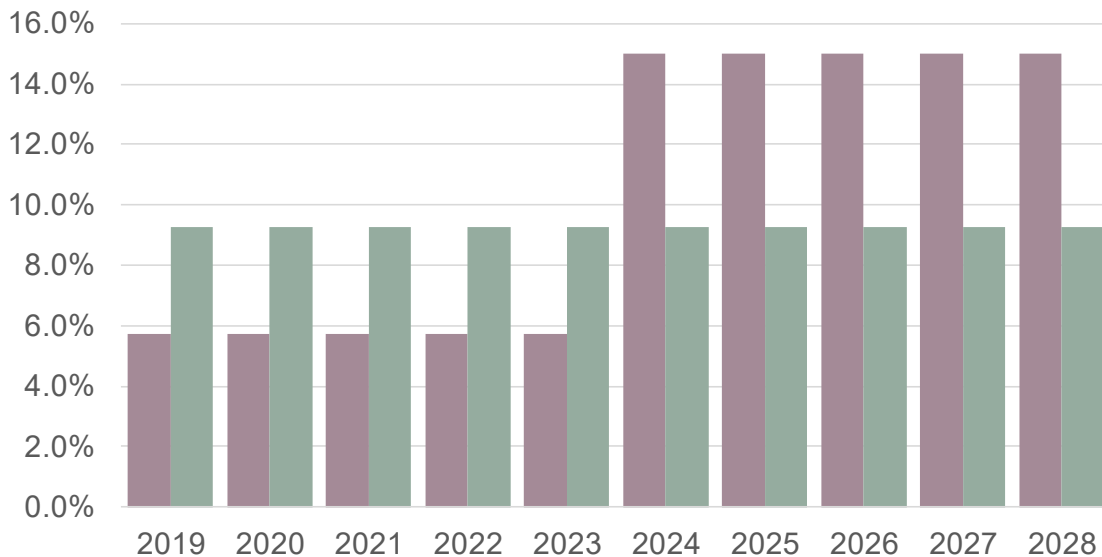


Summary of the water utility revenue requirement:

- Current rate revenue levels are sufficient to meet the City’s operating and debt service obligations through 2020, but are insufficient to meet the City’s capital improvement needs.
- Existing revenue levels are insufficient to meet the full revenue requirement beginning in 2019, and will be significantly below the revenue requirement by the end of the study period. The deficiency is a result of:
  - » Operating costs increasing an average of 2.4 percent annually, outpacing revenue growth before rate adjustments.
  - » Debt obligations increasing with the planned bond issuances in 2020, 2022, and 2027. Critically, meeting the debt service coverage target of 1.50 after issuance of the 2027 bond of \$19.1 million for the Water Treatment Plant capacity expansion requires a dramatic increase in revenue.

These water utility revenue requirements were reviewed with City Staff and City Council in an October 25, 2018 Council Workshop. Two primary alternatives were discussed for meeting the revenue requirements: one in which rates are minimized between 2019 and 2023, but with significant increases between 2024 and 2028 to raise the rates to the level necessary to support the WTP debt issuance, and a second alternative in which rate adjustments are levelized between 2019 and 2028 to reduce the amount of rate shock and to better position the utility to receive favorable terms in the bond market. Figure 4 summarizes these two alternatives considered. Based on discussion with Council and the intent to avoid rate increases in excess of 10 percent, the second alternative was recommended as the preferred approach, with annual rate adjustments of 9.25 percent per year.

**Figure 4. Rate Adjustment Alternatives**



### III.I.1. Financial Performance Indicators

The revenue requirement analysis reflects attainment of the City’s key financial policies and metrics. \_\_\_\_\_ summarizes the financial performance indicators in each year, with metrics that are close to

the policy minimum highlighted. These represent the ‘critical factors’ that drive the overall rate adjustment levels identified in the preceding section.

**Table 9. Financial Performance Metrics**

<b>Performance Metric</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
Operating Reserve Balance	\$440,690	\$458,049	\$471,639	\$491,425	\$512,588
Operating Reserve Days Cash on Hand	90 days	90 days	90 days	90 days	90 days
Capital Reserve Balance	\$3,915,583	\$2,576,108	\$341,429	\$517,154	\$394,570
Combined Days Cash on Hand	890	596	155	185	159
Senior Debt Service Coverage		4.3	5.2	4.8	5.6

<b>Performance Metric</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>
Operating Reserve Balance	\$535,249	\$559,542	\$587,810	\$616,059	\$646,453
Operating Reserve Days Cash on Hand	90 days	90 days	90 days	90 days	90 days
Capital Reserve Balance	\$614,921	\$1,883,992	\$2,599,861	\$2,081,475	\$653,829
Combined Days Cash on Hand	193	393	488	394	181
Senior Debt Service Coverage	6.5	7.5	8.8	1.5	1.7

## Section IV. COST-OF-SERVICE ANALYSIS

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### IV.A. BACKGROUND

The design of an equitable water rate structure typically starts with a cost-of-service analysis that includes the appropriate allocation of revenue requirements to each customer class in order to determine their respective cost-of-service requirements. The allocation of revenue requirements among the various customer classes takes into account the quantity of water used by each customer class, the relative peak demand of each customer class, and the number and size of customer service connections in each customer class. In this way, adjustments to the rates for various customer classes can be considered by comparing existing rates with the cost-of-service levels.

The results of the cost-of-service analysis also provide guidance for evaluating various rate design options including changes to the usage charge structure.

### IV.B. KEY ASSUMPTIONS AND METHODOLOGY

The typical methodology used in performing an historically based cost-of-service analysis involves a number of steps that are described by the American Water Works Association (AWWA) in its rate-setting manual, M1: Principles of Water Rates, Fees, and Charges. These three analytical steps are: (1) functionalization, (2) classification, and (3) allocation.

As a first step, *functionalization*, the utility's assets and revenue requirements are categorized into the various water service functions they provide. In this cost-of-service analysis, seven system functions were identified: supply and treatment, storage, transmission and distribution, meters & services, fire protection, and general plant.

The second step in performing a cost-of-service analysis is *classification*. This analysis involves the development of factors that are used to classify the functionalized revenue requirement into cost components reflecting why the costs are incurred. In this cost-of-service analysis, five classification cost components were used: customers, meters and services, base demand, peak demand, fire protection, and pumping.

- Customer costs are those costs that are associated with serving customers regardless of the amount of water used (including meter reading, bill preparation, and revenue collection expenditures).
- Meter and Service costs are those costs that are associated with the physical meter and service for each customer (including the meter replacement program, service line installations, and meter maintenance and repairs), and those that are proportional to the overall capacity requirements of the water system, rather than actual metered water use. For purposes of this analysis, future capital investment that is made based on meeting system capacity obligations is allocated based on meter size.
- Base costs are those costs associated with providing customers potable water service under average demand conditions.
- Peak Demand costs are those costs associated with providing customers with water service in excess of average demand requirements up to the maximum day demand requirement. For

purposes of this analysis, a peaking factor of 2.4 (max day demand/average day demand) was assumed to estimate peak demand costs, based on the 2018 Water System Plan.

- Fire protection costs are those costs associated with providing adequate water service to meet the needs of both public and private fire protection systems (including a proportion of storage and transmission & distribution).
- Pumping costs are those costs associated with pumping water from the treatment plant to serve higher elevation pressure zones. This cost classification was included due to the City's existing rate structure including a booster pumping rate.

The third step of the cost-of-service analysis is *allocation* and involves allocating the revenue requirement for each classified cost component among the City's customer classes based on each classes' usage characteristics. Five customer classes were analyzed: Single Family, Multi Family, Commercial, Municipal, and All Other. A key allocation factor was the ratio of peak to average demand for each customer class. The peaking factors derived for each class, based on analysis of the City's 2017 billing data, are presented in Table 10.

**Table 10. Peaking Factors by Class**

Class	Peaking Factor
Single Family	2.54
Multi Family	2.14
Commercial	1.87
Municipal	2.83
All Other	2.56
<b>Total</b>	<b>2.40</b>

These peaking factors are generally in line with expectations for each customer class type, with Single Family, Municipal, and All Other classes showing high peaking due to the amount of outdoor irrigation associated with each. Multifamily, which tends to have less irrigated area per dwelling unit than Single Family, shows an expected lower peaking factor, while Commercial has the lowest peaking, consistent with a predominantly indoor usage. The peaking factor for all classes is higher than observed in many water utilities, due to the highly seasonal nature of the community.

## IV.C. COST OF SERVICE FINDINGS

This cost-of-service analysis was performed using 2019 as a Test Year, based on the revenue requirements developed as discussed in Section III. Because of the significant variation in capital spending needs over the study period, the proportion of capital spending in the revenue requirement was normalized to the average for 2019 through 2028. Table 11 summarizes these findings.

**Table 11. Classification of Revenue Requirement**

2019 Revenue Requirement	Total Costs	Classification of Water Service					
		Customer	Meter & Services	Base	Peak	Fire Protection	Pumping
Revenue Requirement	\$2,382,982	\$352,736	\$830,454	\$437,943	\$460,087	\$232,654	\$69,108
Allocation Percentages		14.8%	34.9%	18.4%	19.3%	9.8%	2.9%



Table 12 summarizes the cost-of-service findings by class, relative to the overall revenue that would be collected with across-the-board rate increases. These findings are aligned closely with the peaking factor differences observed in Table 10.

**Table 12. Cost-of-Service Findings by Class**

Class	2019 Revenue, ATB	%	COSA 2019 Revenue	%	\$ Difference	%
Single Family	\$1,264,730	53.1%	\$1,497,917	62.9%	\$233,187	18.4%
Multi Family	560,007	23.5%	283,609	11.9%	(276,398)	-49.4%
Commercial	412,568	17.3%	397,583	16.7%	(14,985)	-3.6%
Municipal	92,966	3.9%	126,305	5.3%	33,339	35.9%
All Other	52,711	2.2%	77,569	3.3%	24,858	47.2%
<b>Total</b>	<b>\$2,382,982</b>	<b>100%</b>	<b>\$2,382,982</b>	<b>100%</b>	<b>\$0</b>	<b>0.0%</b>

It is unknown when or whether a previous cost-of-service analysis was completed for the City's water utility. The prior rate study, completed in 2014, considered revenue recovery relative to total water usage, but did not evaluate the impact of peaking on the cost-of-service.

## Section V. PROPOSED RATE ADJUSTMENTS

### V.A. BACKGROUND

The last City water rate structure change took place in 2014, based on recommendations from the City's 2014 Water Rate and General Facility Charge Study. At that time, it was observed that the existing rate structure had some inequities, based on a comparison of revenue to total annual water use. In order to phase towards a more equitable rate structure, the City Council adopted the following rate policies:

- Decrease the amount of water included in the Base Rate from 7,000 gal/month in 2014 to 6,600 gal/month in 2019.
- Increase the volume charge at 2.0 percent per year and the other rates at 1.55 percent per year.

Table 13 presents the water rates adopted at that time.

**Table 13. Existing Rate Schedule**

Rate Component	2015	2016	2017	2018	2019
Water Service Base Rate	\$34.53	\$35.06	\$35.61	\$36.16	\$36.72
Amount of Water in Base Rate (gal/mo)	7,000	6,900	6,800	6,700	6,600
¾" meter (per month)	\$3.15	\$3.20	\$3.25	\$3.30	\$3.35
1" meter (per month)	\$12.59	\$12.79	\$12.99	\$13.19	\$13.39
1-1/2" meter (per month)	\$25.08	\$25.47	\$25.87	\$26.27	\$26.67
2" meter (per month)	\$59.61	\$60.53	\$61.47	\$62.42	\$63.39
3" meter (per month)	\$234.28	\$237.91	\$241.59	\$245.34	\$249.14
4" meter (per month)	\$407.93	\$414.25	\$420.67	\$427.19	\$433.81
Water service volume rate (per 1,000 gal.)	\$1.02	\$1.04	\$1.06	\$1.08	\$1.10
Booster pump surcharge	\$2.64	\$2.68	\$2.72	\$2.76	\$2.81

### V.B. RATE POLICY CONSIDERATIONS

Based on the AWWA Manual M1, *Principles of Water Rates, Fees, and Charges*, the following are the general objectives of a rate structure evaluation:

- Yielding necessary revenue in a stable and predictable manner;
- Minimizing unexpected changes to customer bills;
- Discouraging wasteful use and promoting efficient uses;
- Promoting fairness and equity (cost-based);
- Avoiding discrimination;
- Maintaining simplicity, certainty, convenience, feasibility, and freedom from controversy;
- Complying with all applicable laws.

In applying these objectives and the findings of the Revenue Requirements and Cost-of-Service analyses, the following major conclusions were identified:

- 1) Rate adjustments to all customer classes are necessary to generate sufficient revenue to meet the ongoing revenue requirement.
- 2) The single greatest driver of the need for rate adjustments is the WTP project, the need for which is driven by summer peak demand.
- 3) The existing rate structure is weighted heavily to the base rate, due to both the relative level of the base and volumetric rates, and the base allowance.
- 4) Existing customer peaking behavior reflects this low volumetric rate, with very high summer peak usage, especially for Single Family customers.
- 5) The existing booster pump charge, assessed on a per-month basis, is not aligned with the cost driver for pumping, which is the total water usage pumped to high pressure zones and associated electrical costs.

## V.C. RATE STRUCTURE ANALYSIS

Based on the cost-of-service findings and discussions with City Staff, two key factors were identified for further rate structure analysis: whether the Base Rate allowance should continue to be decreased, and whether a conservation-oriented rate should be implemented to address summer peaking.

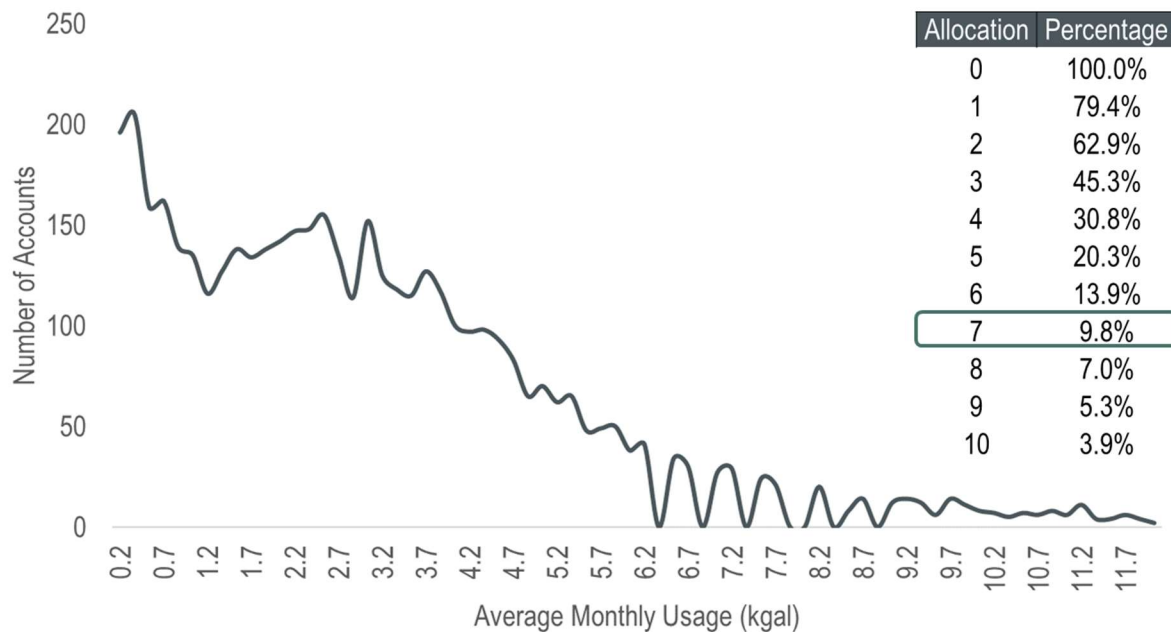
### **Base Rate Allowance**

The Base Rate Allowance is nominally 6,700 in 2018, and set to decrease to 6,600 in 2019. However, in the course of analyzing the City's billing data, it was observed that the City's existing billing system does not have the capability of applying an allowance in increments smaller than one thousand gallons (one kgal). As a result, there is effectively a 7 kgal allowance, rather than 6.7 kgal.

The intent of the Base Rate Allowance is to provide for a reasonable estimate of indoor single family usage, such that customers are not charged an additional volumetric rate charge for the amount of water use that corresponds to essential drinking water use. In order to evaluate the level of the Base Rate Allowance, a bill distribution was developed for usage during the winter months. From this bill distribution analysis, presented in

Figure 5, it was determined that 90 percent of accounts use 7 kgal or fewer. Based on this analysis, it was recommended that the effective 7 kgal allowance be retained.

**Figure 5. Bill Distribution - Indoor (Winter) Water Use**



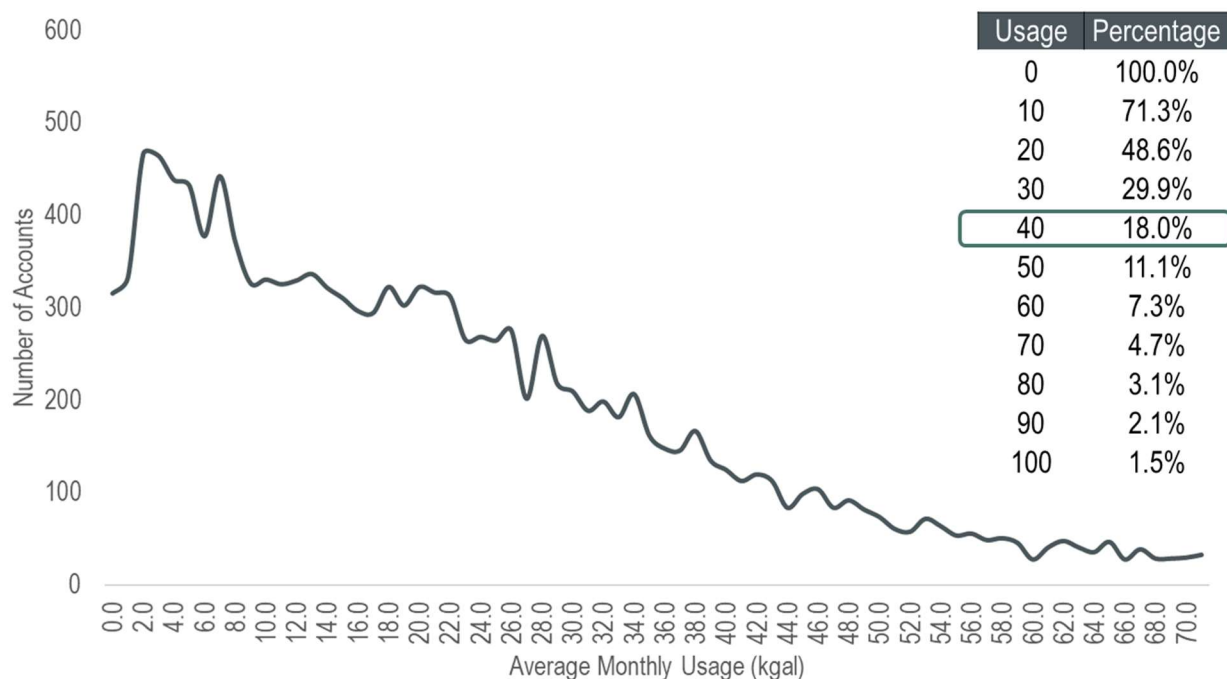
### Conservation-Oriented Rate

The intent of implementing a conservation-oriented rate is to provide an economic incentive for customers to reduce excessive summertime water use, which is contributing to both existing high summer operating costs as well as the need for rate increases to prepare for the WTP capacity expansion project. Inducing existing customers to change their summertime peak usage behavior could delay the need for that project, reducing the short-term rate increases.

However, not all outdoor usage is excessive or wasteful: a well-designed conservation-oriented rate is set high enough that it should be achievable for typical single family customers. There are numerous methods by which this can be evaluated – because irrigated area data was not readily available for the City’s single family customers, existing usage behavior was used to evaluate what level of peak month usage is achievable based on what is typical for the customer class.

Figure 6 presents this bill distribution analysis. Based on this data, 82 percent of single family customers stay below 40 kgal of usage in their peak month. Selecting a conservation tier threshold of 40 kgal represents an achievable level for a typical single family customer, while balancing the amount of usage that will be subject to the higher tier, maintaining revenue stability of the rate structure.

**Figure 6. Bill Distribution - Peak Month Usage**



## V.D. RATE DESIGN RECOMMENDATIONS

Based on discussions with City Staff and feedback from City Council, the following Rate Design Recommendations were developed.

Rate Recommendation	Rate Policy Objective Alignment
Include City Utility Tax in the rate rather than below the line.	Increase the simplicity of the bill. Comport with utility tax & rate ordinance.
Remove existing booster pump charge.	Promote equity. Increase the simplicity of the rate structure.
Base Rate Allowance of 7 kgal.	Maintain certainty. Minimize unexpected changes in rate structure.
Residential Conservation Volume Rate at 40 kgal per unit.	Discourage wasteful use. Promote long-term revenue sufficiency.

Further, it was recommended that any further major cost-of-service adjustments be deferred to a subsequent rate study. The basis for this recommendation is that the new Conservation Volume Rate is intended to materially change the peaking behavior of the Residential customers. A material change to the peaking behavior for the customer class would have a corresponding shift in the cost-of-service findings. Any major shift or phasing of the rates to address the cost-of-service differences should be made once the impact of the Conservation Volume Rate on Residential peaking has been studied.

## V.E. RECOMMENDED WATER RATES

Table 14 presents the recommended water rates based on the Revenue Requirements, Cost-of-Service Analysis, and Rate Design Analysis described in this report.

**Table 14. Recommended Water Rates**

Monthly Water Service Rates	2019	2020	2021	2022	2023
Water Base Rate per Unit:	\$43.26	\$47.26	\$51.63	\$56.41	\$61.63
<b><u>Fixed Charge by Meter Size:</u></b>					
3/4" meter	\$3.95	\$4.32	\$4.72	\$5.16	\$5.64
1" meter	\$15.78	\$17.24	\$18.83	\$20.57	\$22.47
1.5" meter	\$31.43	\$34.34	\$37.52	\$40.99	\$44.78
2" meter	\$74.67	\$81.58	\$89.13	\$97.37	\$106.38
3" meter	\$293.50	\$320.65	\$350.31	\$382.71	\$418.11
4" meter	\$511.04	\$558.31	\$609.95	\$666.37	\$728.01
<b><u>Volumetric Charges</u></b>					
Water Allowance: (gallons per unit)	7,000	7,000	7,000	7,000	7,000
Water Service Volume Rate: (per 1,000 gal)	\$1.29	\$1.41	\$1.54	\$1.68	\$1.84
<b><u>Single-Family Residential and Multifamily Only:</u></b>					
Conservation Allowance: (gallons per unit)	33,000	33,000	33,000	33,000	33,000
Conservation Volume Rate: (per 1,000 gal)	\$2.58	\$2.82	\$3.08	\$3.36	\$3.68

*These rates are inclusive of the City Utility Tax of 9.5%.*



## Section VI. PUBLIC PROCESS

The rate study findings discussed in this report were presented to the City Council during a public Council Workshop on October 25, 2018.

Feedback gathered during this workshop was incorporated into the final recommended rates. A resolution for adopting the recommended rates had its first reading at the regular City Council meeting on November 27, 2018, a second reading on December 4, 2018, and was adopted on December 18, 2018.

### VI.A. ADOPTED RATE SCHEDULE

#### Monthly Service Rates

##### *Water*

The City water fees and charges shall be as follows:

Monthly Water Service Rates	2019	2020	2021	2022	2023
Water Base Rate per Unit:	\$43.26	\$47.26	\$51.63	\$56.41	\$61.63
<b><u>Fixed Charge by Meter Size:</u></b>					
3/4" meter	\$3.95	\$4.32	\$4.72	\$5.16	\$5.64
1" meter	\$15.78	\$17.24	\$18.83	\$20.57	\$22.47
1.5" meter	\$31.43	\$34.34	\$37.52	\$40.99	\$44.78
2" meter	\$74.67	\$81.58	\$89.13	\$97.37	\$106.38
3" meter	\$293.50	\$320.65	\$350.31	\$382.71	\$418.11
4" meter	\$511.04	\$558.31	\$609.95	\$666.37	\$728.01
<b><u>Volumetric Charges</u></b>					
Water Allowance: (gallons per unit)	7,000	7,000	7,000	7,000	7,000
Water Service Volume Rate: (per 1,000 gal)	\$1.29	\$1.41	\$1.54	\$1.68	\$1.84
<b><u>Single-Family Residential and Multifamily Only:</u></b>					
Conservation Allowance: (gallons per unit)	33,000	33,000	33,000	33,000	33,000
Conservation Volume Rate: (per 1,000 gal)	\$2.58	\$2.82	\$3.08	\$3.36	\$3.68

*These rates are inclusive of the City Utility Tax of 9.5%.*

Each bill consists of three separate components: A monthly base rate per unit associated with the account, a fixed charge that is calculated based on the meter size of the account, and a volumetric charge, which is based on the amount of water used. Each unit receives an allowance of 7,000 gallons

per month, which is included in the fixed charge. Usage above this amount is charged at the Water Service Volume Rate. For Single-Family Residential and Multifamily customers, a Conservation Volume Rate is implemented for use above 40,000 gallons per unit per month (7,000 gallons of base usage allowance and 33,000 of regular usage allowance). Usage above the base usage and regular usage allowances will be charged at the Conservation Volume Rate.

#### **Determination of Billing Units for Multiple-Use Connections:**

Where more than one family, firm, business, association or corporation uses water from the same connection, the number of units shall be the same as if each family, firm, business association or corporation were separately connected thereto. When multiple businesses reside within one office space or work area and have only one employee, it will be regarded as one business.

Accounts with a separate fire service connection shall be subject to a monthly charge as follows, in addition to any other monthly service charges:

<b>Stand-by Fire Service Connection</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
1.5" pipe	\$12.85	\$14.04	\$15.34	\$16.76	\$18.31
2" pipe	\$15.40	\$16.82	\$18.38	\$20.08	\$21.94
3" pipe	\$22.39	\$24.46	\$26.72	\$29.19	\$31.89
4" pipe	\$28.88	\$31.55	\$34.47	\$37.66	\$41.14
5" pipe	\$38.54	\$42.10	\$45.99	\$50.24	\$54.89
6" pipe	\$51.39	\$56.14	\$61.33	\$67.00	\$73.20
8" pipe	\$84.85	\$92.70	\$101.27	\$110.64	\$120.87
10" pipe	\$129.64	\$141.63	\$154.73	\$169.04	\$184.68
12" pipe	\$185.10	\$202.22	\$220.93	\$241.37	\$263.70

*These rates are inclusive of the City Utility Tax of 9.5%.*

<b>Miscellaneous Charges</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
Turn-Off	\$25.00	\$25.00	\$25.00	\$25.00	\$25.00
Turn-On (during regular business hours 8:00 a.m. to 5:00 p.m.)	\$15.00	\$15.00	\$15.00	\$15.00	\$15.00
Turn-On (before/after regular business hours)	\$50.00	\$50.00	\$50.00	\$50.00	\$50.00

*These rates are inclusive of the City Utility Tax of 9.5%.*

<b>Bulk Water Users</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
Initial hydrant connection fee	\$38.25	\$41.79	\$45.66	\$49.88	\$54.49
Cost per day of use	\$10.18	\$11.12	\$12.15	\$13.27	\$14.50
Volume rate	\$3.70	\$4.04	\$4.41	\$4.82	\$5.27

*These rates are inclusive of the City Utility Tax of 9.5%.*

**APPENDIX L**  
**SEPA**



## Community Development Department

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135 E Johnson Ave.  
P.O. Box 1669  
Chelan, Washington, 98816

(509)682-8017  
Fax (509)682-8050

### DETERMINATION OF NONSIGNIFICANCE

SEPA2019-06 Water System Plan

**Description of proposal:** The Water System plan is a planning tool to be used by the City of Chelan in conjunction with the City's current Comprehensive Plan under the Growth Management Act (GMA). The Water System Plan describes the location and type of facilities needed to provide municipal water service to the planning area to meet present and future needs. The proposal provides a method of implementing the various proposed projects based on need and the effect financing may have on water rates.

**Applicant:** Jake Youngren, Public Works Director. City of Chelan Public Works. 50 Chelan Falls Hwy, Chelan, WA, 98816.

**Location of proposal:** 50 Chelan Falls Hwy, Chelan, WA, 98816

**Lead Agency:** City of Chelan

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

☐ There is no comment period for this DNS.

☐ This DNS is issued after using the optional DNS process in WAC 197-11-355. There is no further comment period on the DNS.

☒ This DNS is issued under WAC 197-11-340(2); the lead agency will not act on this proposal for 14 days from the date below. *Comments must be submitted by March 6<sup>th</sup>, 2019.*

**Responsible official:** Craig Gildroy

**Position/title:** Planning Director

**Address:** 135 E. Johnson Avenue/PO Box 1669, Chelan, WA 98816

**Date:** February 12th, 2019

**Signature:**



persons desiring to object to the proposed improvement district file their written protests with the Secretary of the Board no later than ten days following the public hearing.

The owners of at least 60% of the area of land within the proposed utility local improvement district file written protests with the Secretary of the Board, or the Commissioners of the Board, to proceed with the proposed utility improvement district shall be considered.

The name of the Secretary of the Board is Bill Knechtel. The name of the Secretary of the Board is 93 McGinty Lane, Chelan, Washington, 98816.

The names of the property owners within the proposed utility local improvement district are available for public perusal at 93 McGinty Lane, Chelan, Washington, 98816, during the hours of 9:00 am to 5:00 pm.

Secretary of the Board

### **NOTICE OF RECEIPT OF RESOLUTION AND ADOPTION OF RESOLUTION OF INTENTION TO CREATE AND NOTICE OF PUBLIC HEARING ON CREATION OF UTILITY LOCAL IMPROVEMENT DISTRICT NO. 3**

YOU ARE NOTIFIED that the Chelan Mountain Water District, Chelan, Washington, is proposing to form its Utility Local Improvement District ("ULID") No. 3 to order the construction and maintenance of improvements to the water system of the District said ULID No. 3. The provisions of the proposed improvements are as set forth in Resolution No. 19-02, adopted by the Board of Commissioners on February 23, 2019.

The proposed improvements consist of the construction and maintenance of an intertie to the District's water system sourced from Lake Chelan; and the construction of infrastructure; and necessary engineering, construction and plan upgrades.

The proposed ULID No. 3 affects your property. Although your property will not be included within the ULID, and you will not be assessed for the cost of the improvements within the ULID, RCW 80A.073 requires that adjoining property owners be given notice of the District's intention to form the ULID if such property owners could be required to contribute up to the water system to be constructed in the LID as a condition of federal home loan guarantee.

A public hearing on the ULID will be held at the Chelan Fire District No. 7 House, 232 E Wapato Ave., Chelan, Washington, 98816, at 7:00 pm, on February 27, 2019. The time and place are fixed.

On the 12th day of February, 2019, the City Council of the City of Chelan, Washington, passed Ordinance No. 2019-1557. A summary of the content of said Ordinance provides as follows:

### **AN ORDINANCE AMENDING PORTIONS OF THE CITY OF CHELAN'S DEVELOPMENT STANDARDS TO ALLOW AGRICULTURAL TOURISM BY PRIVATE ROADS**

The full text of the Ordinance will be mailed upon request.

DATED this 13th day of February, 2019.

Peri S. Gallucci  
City Clerk

Published in the Lake Chelan Mirror on February 20, 2019.  
#84511

### **SUMMARY OF ORDINANCE NO. 2019-1558 of the City of Chelan, Washington**

On the 12th day of February, 2019, the City Council of the City of Chelan, Washington, passed Ordinance No. 2019-1558. A summary of the content of said Ordinance provides as follows:

### **AN ORDINANCE MODIFYING THE 2019 SALARY SCHEDULE FOR ELECTED/FULL TIME POSITIONS FOR THE CITY BUILDING OFFICIAL**

The full text of the Ordinance will be mailed upon request.

DATED this 13th day of February, 2019.

Peri S. Gallucci  
City Clerk

Published in the Lake Chelan Mirror on February 20th, 2019.  
#84513

### **PUBLIC RECORD NOTICE Chelan County Public Hospital District #2 Special Meeting of the Board of Commissioners**

Chelan County Public Hospital District #2 will be holding a special board meeting on Thursday February 21, from 10a.m. until 12:00p.m., in the Board room, located at Lake Chelan community Hospital, 503 E Highland Ave., Chelan, Washington. This special meeting is scheduled for the Accountable Care Organization Re-Launch with a representative from Caravan Health in attendance. Published in the Lake Chelan Mirror February 20, 2019.  
#84514

Submit letter to the District Secretary, Entiat Irrigation District, 2800 Entiat Way, Entiat, WA 98822.

By: Phyllis Griffith, Secretary.  
Published in the Lake Chelan Mirror February 13, 20, and 27 2019. #84360

### **DETERMINATION OF NONSIGNIFICANCE SEPA2019-06 Water System Plan**

Description of proposal: The Water System plan is a planning tool to be used by the City of Chelan in conjunction with the City's current Comprehensive Plan under the Growth Management Act (GMA). The Water System Plan describes the location and type of facilities needed to provide municipal water service to the planning area to meet present and future needs. The proposal provides a method of implementing the various proposed projects based on need and the effect financing may have on water rates.

Applicant: Jake Youngren, Public Works Director. City of Chelan Public Works, 50 Chelan Falls Hwy, Chelan, WA, 98816.

Location of proposal: 50 Chelan Falls Hwy, Chelan, WA, 98816

Lead Agency: City of Chelan

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

There is no comment period for this DNS.

This DNS is issued after using the optional DNS process in WAC 197-11-355. There is no further comment period on the DNS.

This DNS is issued under WAC 197-11-340(2); the lead agency will not act on this proposal for 14 days from the date below.  
**Comments must be submitted by March 6th, 2019.**  
Published in the Lake Chelan Mirror February 20, 2019.  
#84503

**NCW MARKET.COM**  
**CLASSIFIED ADS**



**REDUCE  
REUSE  
RECYCLE**

No comments received.

# **SEPA ENVIRONMENTAL CHECKLIST**

## ***Purpose of checklist:***

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

## ***Instructions for applicants:***

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown. You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

## ***Instructions for Lead Agencies:***

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

## ***Use of checklist for nonproject proposals:*** [\[help\]](#)

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the [SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS \(part D\)](#). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

## **A. Background** [\[help\]](#)

1. Name of proposed project, if applicable: [\[help\]](#)

**City of Chelan Water System Plan**

2. Name of applicant: [\[help\]](#)

**City of Chelan**

3. Address and phone number of applicant and contact person: [\[help\]](#)

**Mr. Jake Youngren**  
**Public Works Director**  
**Chelan Public Works Department**  
**50 Chelan Falls Highway**  
**Chelan, WA 98816**

4. Date checklist prepared: [\[help\]](#)

**January 7, 2019**

5. Agency requesting checklist: [\[help\]](#)

**City of Chelan**

6. Proposed timing or schedule (including phasing, if applicable): [\[help\]](#)

**The Water System Plan is in the process of review and approval by the City. Projects proposed in this Plan are prioritized for consideration by the City of Chelan. Separate projects will be constructed as funding is provided through various financing methods, loans and grants. Projects are scheduled to occur within the new 20-year period, though 2038. A detailed time schedule and plan is listed in the Plan.**

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain. [\[help\]](#)

**No, this proposal is the result of a Water System Plan. Future plan updates may identify additional water system needs that are not identified in the present plan.**

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal. [\[help\]](#)

**None known.**

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain. [\[help\]](#)

**None known.**

10. List any government approvals or permits that will be needed for your proposal, if known. [\[help\]](#)



**Permits will be required for construction of the proposed improvements identified in the Water System Plan including City of Chelan building permits, City of Chelan Shoreline Substantial Development Permit, Washington State Department of Natural Resources Aquatic Permit; Department of Ecology Construction Stormwater General permit; Army Corp Permits; and right-of-way permits for with within Department of Transportation and Chelan County rights-of-way.**

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.) [\[help\]](#)

**The Water System plan is a planning tool to be used by the City of Chelan in conjunction with the City's current Comprehensive Plan under the Growth Management Act (GMA). The Water System Plan describes the location and type of facilities needed to provide municipal water service to the planning area to meet present and future needs. The proposal provides a method of implementing the various proposed projects based on need and the effect financing may have on water rates. This prioritization is shown in Chapter 8 of the Water System Plan. Individual projects will be constructed as funding and permitting allow.**

**The following are the proposed projects descriptions as presented in the Plan:**

#### **WATER TREATMENT IMPROVEMENTS**

##### **WTP-1: Interior and Exterior Valve and Instrumentation Replacement**

**All the process valves in the WTP have leaky seals. The City has estimated that they lose 40,000 – 55,000 gallons/day which leak through these valves. The expected life of these valves is ~15 years and all of these valves are ~20 years old. There is no good way to get the valves out of and into the WTP and this project will include extensive renovations such as some type of hoist and door so they can be removed or replaced again in the future. This project will also include new, more accurate flow meters and new turbidimeters and a single SC200 controller. The project will reduce the lost water and allow the City to more accurately determine exactly how much water the plant is producing and better forecast when the WTP will need more extensive capacity upgrades.**

##### **WTP-2: Backwash Basin Cover Installation**

**DOH performed a sanitary survey of Chelan's WTP and indicated that backwash basin #2 which is open to air is considered a contamination risk. Filter backwash water flows to the basin, settles for 1-3 days, and then is recycled and used to backwash the existing media filters. Additional raw water is used as required to make up the flow and pressure required to backwash the filters. The fact that this basin does not contain a cover presents a risk of contamination to the filters and subsequently, the finished water produced by the WTP. This project includes the installation of a fiberglass reinforced plastic (FRP) cover on the north backwash basin located directly west of the existing finished water reservoir. The**

style and color of the proposed cover will match the existing cover on the south backwash basin and will include a 7-foot access door, ventilation, and interior/exterior lighting. The existing north basin already contains access to the center of the tank, and the proposed cover will be situated to allow access to this existing platform. The proposed cover will be shipped in sections, assembled onsite adjacent to the existing basin, then installed and secured using cranes.

**WTP-3: Chemical Dosing System Improvements**

The existing alum dosing pumps are old and require significant maintenance in order to ensure consistent and accurate performance. The existing pumps are Milton Roy motor driven diaphragm pumps and require a full rebuild approximately once per year. The VFD motor starters for these pumps were replaced in 2017 and are working well. This project includes the removal of all pumps, piping, appurtenances, and connections between the existing alum dosing pumps and alum dosing tank. A new, fabricated duplex pump skid would be provided and installed on the existing concrete equipment pad. The new skid would include a calibration column, backpressure and pressure relief valves, isolation valves, gauges, pumps, and pump motors to deliver alum to the raw water upstream of the existing flocculation basins. Additionally, flexible connections will be provided for the pumps and alum storage tank, and new seismic straps will be provided for the alum dosing tank. New pumps will be Grundfos, Prominent, or other high-quality, long-lasting motor driven pump designed for use with alum coagulant. The project also includes replacement of the existing FilterAid polymer dosing pumps. These pumps are also Milton Roy motor driven diaphragm pumps and have maintenance requirements similar to the alum dosing pumps. A new duplex pump skid would be proved as described above. Lastly, the existing HVAC system within the chemical dosing room will be analyzed and upgraded with new air conditioning equipment and/or exhaust fans to help maintain a consistent, comfortable working environment for WTP staff.

**WTP-4: Treatment System Improvements**

The WTP is currently operating around 70-76% of their maximum 6.7 MGD capacity during heavy summertime use. Per DOH requirements, when any water treatment facility produces 80% of its design capacity, the Owner must begin planning for adding additional treatment capacity. Several planned residential developments, if completed, could push the City over 80% of their existing treatment capacity (5.3 MGD). In addition, the City is losing water due to leaking valves in the WTP and flow meters that may not be accurately recording all the flows. CIP project #33 will replace the leaky valves and install new flow meters so the City will be better able to determine exactly how much water the plant is currently producing and better forecast exactly when the WTP will need to be upgraded to add additional capacity. When required, WTP improvements should include an additional flocculation basin, four additional filter bays, additional raw water storage, and additional finished water storage.

**WTP-5: Generator Load Bank Study**

The City has indicated that during the last power outage that the generator may not be

sized to provide full operations of the WTP during an emergency outage. With additional small electrical loads being added to the WTP a load bank study and a generator analysis should be conducted and an additional generator should be provided if required. Upgrades would include an automatic transfer switch if desired.

**WTP-6: Raw Water Pump Station Improvements**

The existing raw water pump station is located at the west end of Sayles Street and moves water from the Chelan River to the WTP. The station is completely below grade and lacks adequate security from vandalism and protection against injury to the public. The station includes one 100 hp pump and three 250 hp pumps and only the 100 hp pump utilizes a VFD motor starter. This project will install a new VFD motor starter for one of the 250 hp pumps which will allow the pump to more effectively match summer peak demands, which will increase the pump's efficiency and reduce annual electrical costs. To make room in the existing station for the new VFD, the existing portable generator cable connections will be relocated to the surface. This will reduce the time required to connect the City's portable generator. Additional security fencing will be provided to restrict access to the facility, and a roof structure with security cameras will provide additional protection from weather and vandalism.

**STORAGE IMPROVEMENTS**

**S-1: Pinnacle Reservoir No. 2**

In the 2010 WSP it was determined that the Boyd Rd Pressure Zone was fire flow deficient. The Pinnacle Reservoir No. 2 project provides for construction of another reservoir to supplement the existing reservoir. Due to property size constraints and the potential to acquire nearby land, the City has placed this project on hold.

**S-2: Wilmoth Reservoir No. 2**

This project includes the construction and connection of a new storage reservoir to complement the existing Wilmoth Reservoir in the Washington Street pressure zone. This reservoir will be sized to better supply Fire Suppression Storage to the zone.

**BOOSTER STATION IMPROVEMENTS**

**B-1: Washington St. 12-inch Loop and Booster Station Improvements**

This project completes the 12-inch loop between the Washington St. Booster Station and the Water Treatment Plant effectively increasing Fire Flow potential and increasing pressure to users near the Booster stations during a Fire Flow event. This project will also provide analysis and construction of an upgrade to the Washington St. Booster Station to decrease the likelihood of over-pressurization upon fire pump startup.

**B-2: High Street Booster Station Improvements**

This project includes an analysis and replacement of the High Street Booster Station.

**B-3: Darnell's Booster Station Improvements**

The Darnell's Booster Pump Station is essential to maintain water service to the north shore of Lake Chelan. The station currently has two pumps and at periods of high water use, both pumps operate at the same time. This project will add a 3rd pump to provide backup and redundancy in the event that one of the pumps is out of service when the demand is too

high for a single pump.

**B-4: Pinnacle Booster Station Improvements**

The City's Fire Marshal has indicated that 1,500 gpm fire flow is desired in the Pinnacle pressure zone. This project would be designed to increase fire flow capabilities to this zone and add redundancy to the existing booster station.

**B-5: Wilmorth Booster Station Improvements**

The City Fire Marshal has indicated a desire to provide Fire flow to the Wilmorth pressure zone. This project would be designed to provide 1,500 gpm of fire flow and increase the redundancy of the Wilmorth booster station.

**PRV STATION IMPROVEMENTS**

**P-1: Spader Bay PRV Station**

The Spader Bay area is designated as an area that requires a fire flow of 2,500 gpm for 2 hours. Due to the limited size of pipes that provide water to the area the City is not able to supply required fire flow. This project adds a PRV station near the outlet of the Darnell's Booster Station that feeds from the Darnell's zone to the Main zone in order to provide additional fire flow to the Spader Bay area. Additional components of this project include telemetry improvements to the Darnell's Booster Station to disable Booster Station Pumping while the new PRV is active.

**P-2: Key Bay PRV Station**

It is anticipated that development in the Key Bay area will increase the demand and potentially fire flow requirements. This project provides a PRV Station to the Key Bay area and loops the zone for added fire flow capacity.

**P-3: PRV Station No. 9 Upgrade**

This upgrade will incorporate new pressure reducing valves for domestic and fire flow in an accessible vault.

**P-4: PRV Station No. 1 Replacement**

This project includes the replacement of PRV Station No. 1 in the City's right-of-way inside of an accessible vault.

**P-5: PRV Station No. 5 Replacement**

This project includes the replacement of PRV Station No. 5 in the City's right-of-way inside of an accessible vault.

**P-6: Golf Course Rd PRV Station**

This project includes the addition of a PRV station in Golf Course Rd to loop the Golf Course Dr Pressure zone.

**WATER DISTRIBUTION SYSTEM IMPROVEMENTS**

**D-1: Annual Main Zone Pipe Replacement**

This project is intended to be an annual project to replace and upsize aging and undersized pipes with the Main Pressure Zone to 8-inch.

**D-2: Submarine Line Replacement**

The City owns a submarine waterline that provides water to the Farnham Booster Station. This line is a steel line that sits at the bottom of the Lake/River near the dam. The waterline

is a safety risk due to the potential for cross connection and damage. This project includes the replacement of the 8-inch submarine line with a new 12-inch line that crosses the Webster Ave Bridge. This new waterline will connect to lines that end in Webster Ave and Sander St.

**D-3: Sanders Street Transmission main Upgrade**

This project includes replacing the existing 6-inch AC water main in Sanders Street with a new 10-inch pipe. This project, in conjunction with the Submarine Line Replacement increase fire flow capabilities to the southern portion of the Main pressure zone.

**D-4: Chelan High School Loop**

The Chelan High School property is currently listed as an area required to have a fire flow of 2,000 gpm for 4 hours. Due to the size limitations of the waterlines feeding this area the City is not able to provide the required fire flow to this area. This project includes replacing the 8-inch loop at the Chelan High School with a 10-inch pipe. This project, in conjunction with the submarine line replacement and Sanders St upgrades provides added fire flow capabilities to the southern portion of the Main pressure zone.

**D-5: Webster Avenue Transmission Main Upgrade**

This project includes replacing the 8-inch AC line in Webster Avenue with a 10-inch line to increase fire flow capabilities to southern portion of the Main pressure zone.

**D-6: Woodin Ave. Transmission Line Upgrade**

This project upsizes the Transmission Main within Highway 97A/Woodin Ave to 16-inch to provide domestic/fire flow for future developments along the South Shore of Chelan.

**D-7: Highland Avenue Transmission Main Upgrades**

This project upsizes the 6-, and 8-inch; lines in Highland Avenue to 12-inch from Highway 150 to the Highland Booster Station Inlet. This project provides more flow for the Highland Avenue booster during high demands such as during fire flow events.

**D-8: Clifford Street Waterline Upgrade**

This project upsizes the waterline in Clifford Street from Woodin Avenue to Johnson Avenue to provide added fire flow to the north-eastern corner of the Main pressure zone.

**D-9: Lakeside Zone Waterline Upgrades**

This improvement consists of upsizing 2-, 4-, and 6-inch waterlines in High St, Millard St, Prospect St, and the Alleyway north of Prospect St to increase fire flow capacity on the western-half of the Lakeside pressure zone. Additionally, this project is intended to connect the Prospect Alley waterline to Water St.

**D-10: Hospital Zone Waterline Upgrades**

This project upsizes 2-, 4-, and 6-inch pipes to 8-inch to better-provide fire flow to the Hospital pressure zone. Additionally, this project connects the crossing waterlines in Bradley St to loop the zone better.

**D-11: Key Bay Waterline Upgrades**

Upsize pipes within Key bay to provide increased fire flow capacity and provide sufficient capacity for new developments.

- D-12: Eldorado Loop Upgrade**  
Upsize 4-inch pipes in the Eldorado Loop to 8-inch to increase fire flow capacity and replace aging AC waterlines.
- D-13: Highpoint Place Waterline Upgrade**  
Upsize the Highpoint Place Transmission Line to increase fire flow capacity for the region south of the Chelan Hills Reservoirs.
- D-14: Monte Carlo Drive Waterline Upgrade**  
Upsize waterline in Monte Carlo Drive to increase fire flow capacity.
- D-15: Lake Chelan Shores Condos Waterline Upgrades**  
The Lake Chelan Condos area of the North Shore of Chelan has a high required fire flow than most of the North Shore. Due to the size of pipes serving this area the required flow rate is not achievable. This project upsizes the 8-inch AC watermain that crosses Highway 150 and the main line within the condo's main drive to provide sufficient fire flow to the area. This project also upsizes the 6-inch AC water main that follows the boat launch drive to increase fire flow capabilities in the area as well.
- D-16: Pinnacle Pl. Waterline Upgrades**  
Upsize 6-inch pipes from the Boyd Booster Station to the Pinnacle Booster Station to 8-inch to increase fire flow capacity in the Boyd pressure zone.
- D-17: Junior Pt. Waterline Upgrades**  
Upsize waterline in Junior Pt to increase fire flow capacity.
- D-18: Stehekin Way Waterline Upgrades**  
Upsize Waterline in Stehekin way to increase fire flow capacity.
- D-19: Crescent St. Waterline Upgrades**  
Upsize Waterline in Crescent St to increase fire flow capacity.
- D-20: Golf Course Pl. Waterline Upgrade**  
Upsize the waterline in Golf Course Pl and the southern end of Golf Course dr.
- D-21: Butte Rd loop Upgrades**  
Upsize the Butte Rd Loop to provide increase fire flow capacity.
- D-22: Lookout and Pyramid Loop Upgrades**  
Upsize the Lookout and Pyramid Loops to increase fire flow capacity.
- D-23: Orchard View Dr. Waterline Upgrades**  
Upsize the Orchard View waterline to increase fire flow capacity.
- D-24: Stormy Way Waterline Upgrades**  
Upsize the Stormy Way waterline to increase fire flow capacity.
- D-25: Wilmoth Rd Transmission Main**  
Due to the amount of commercial fruit packing sheds and increase in development for the industry in the Washington Street zone, a fire flow requirement of 2,750 gpm for 2 hours is required in the zone. This project adds a 12-inch line along Wilmoth Rd to loop the southern portion of the Washington Pressure zone.
- D-26: Isenhardt Rd. Waterline Upgrades**  
This project in conjunction with the Wilmoth Rd Transmission Main is intended to further

increase fire flow capacity in the Washington Street Zone. This project upsizes the Isenhardt Rd waterline and connects to improvements in Wilmoth Rd to loop and increase the fire flow capacity in the Washington Pressure zone.

**D-27: Washington St. and Shop Ave. Transmission Line Upgrades**

Water users in close proximity to the Washington Street Booster Station have noticed surges in water pressure when the Fire pumps at the Booster Station activate. This project is intended to relieve some of the surging and increase fire flow capabilities throughout the Washington Street Zone. This project upsizes the discharge pipe from the Washington Street Fire Booster Station through Shop Avenue.

**PLANNING**

**PLAN-1: Water Treatment Plant Capacity Evaluation**

The Water Treatment Plant is estimated to be at 80% capacity in the year 2025 which will trigger planning for improvements to increase the capacity of the plant to approximately 10 MGD. This analysis will examine one years' worth of more accurate production and consumption data after the WTP Interior and Exterior Valve and Instrumentation Replacement project has been completed and also look at the latest development projections to determine more exactly when the WTP capacity will need to be increased.

**PLAN-2: 2028 Water System Planning**

Water System plans are required to be updated every 10 years. This Plan will be scheduled to begin in 2025.

**PLAN-3: 2028 Water System Planning**

Water System plans are required to be updated every 10 years. This Plan will be scheduled to begin in 2035.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist. [\[help\]](#)

The Water System Plan was developed for the City's Urban Growth Area (UGA) as outlined in Chapter 1 of the Water System Plan. Mapping of the specific locations of each project is also shown in the Water System Plan.

**B. ENVIRONMENTAL ELEMENTS [\[help\]](#)**

**1. Earth [\[help\]](#)**

a. General description of the site: [\[help\]](#)

(circle one): Flat, rolling, hilly, steep slopes, mountainous, other \_\_\_\_\_

b. What is the steepest slope on the site (approximate percent slope)? [\[help\]](#)

**Approximately 30%.**

- c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils. [\[help\]](#)

**Typical soils located at the site of the proposed improvements within the City of Chelan include Chelan gravelly sandy loam, Antilon gravelly sandy loam, and riverwash.**

- d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe. [\[help\]](#)

**No, there are no indications of unstable soils in the immediate vicinity of the proposed improvements.**

- e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill. [\[help\]](#)

**No filling or grading of significance is anticipated other than minor grading required in constructing of water lines and reservoirs.**

- f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe. [\[help\]](#)

**Open construction excavations could expose soils to erosive forces such as wind and water. Construction work would include practices to prevent the possible minor erosion problems that may occur at that time.**

- g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)? [\[help\]](#)

**Less than five percent of the total area of the proposed construction projects would result in additional impervious surfaces as most of the construction work will occur within already impervious areas.**

- h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any: [\[help\]](#)

**Construction specification will require submission of erosion control features and will require the use of Best Management Practices (BMPs) as defined by the Washington State Department of Ecology to control erosion.**

## **2. Air [\[help\]](#)**



- a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known. [\[help\]](#)

**Exhaust emissions from construction equipment will occur as is typical during construction. Dust may be emitted during excavation and backfill operations, the quantities of which are unknown. Dust will be mitigated by moistening exposed soil with water.**

- b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe. [\[help\]](#)

**There are no off-site sources of emissions of odor that may affect the proposed improvements identified in the Water System Plan**

- c. Proposed measures to reduce or control emissions or other impacts to air, if any: [\[help\]](#)

**Construction specifications will require watering during construction of the proposed improvements to control dust emissions.**

### 3. **Water** [\[help\]](#)

- a. Surface Water:

- 1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into. [\[help\]](#)

**Yes, The City is located on the shores of Lake Chelan which flows into the Columbia River.**

- 2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans. [\[help\]](#)

**Water system improvements identified within the Water System Plan are located within 200 feet of and also over Lake Chelan. Construction plans for these improvements have not yet been developed as these are proposed projects.**

- 3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material. [\[help\]](#)

**It is not anticipated that any work will be performed in surface waters or wetlands.**

- 4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known. [\[help\]](#)

**The City of Chelan water system functions solely on a water diversion from Lake Chelan. The proposed improvements will not require additional surface water withdrawals or diversions.**

- 5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan. [\[help\]](#)

**A portion of the City of Chelan water system existing within the 100-year floodplain. A project is proposed within this proposal that eliminates this part of the water system and replaces it above the 100-year floodplain elevation. The proposed improvements do not lie within a 100-year floodplain. Most of the City lies at or above the 500-year floodplain and as such other projects included in this proposal do not lie within the 100-year floodplain.**

- 6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge. [\[help\]](#)

**It is not anticipated that any work will involve any discharges of waste materials to surface waters.**

b. Ground Water:

- 1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known. [\[help\]](#)

**Water will not be discharged to groundwater during or after construction of the proposed improvements identified in the Water System Plan. Some groundwater may be pumped from the project sites to prevent flooding of construction trenches should groundwater levels be sufficient to inundate work areas.**

- 2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve. [\[help\]](#)

**There will be no waste materials discharged into the ground as a result of construction of the proposed improvements.**

c. Water runoff (including stormwater):

- 1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe. [\[help\]](#)

**Stormwater runoff is currently collected by catch basins and directed through storm drainage pipes and infiltrated into the ground at various locations throughout the City. Proposed improvements identified in the Water System Plan are not anticipated to affect existing stormwater collection and disposal.**

2) Could waste materials enter ground or surface waters? If so, generally describe. [\[help\]](#)

**No waste materials will enter ground or surface waters as a result of the proposed improvements. The construction specifications will require bypass pumping during construction of the proposed improvements to avoid contamination of ground and surface waters.**

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe. [\[help\]](#)

**New reservoirs will alter drainage patterns at the proposed project sites, however, runoff will be drained to existing drainage features.**

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any: [\[help\]](#)

**Methods to minimize and mitigate construction related erosion will be provided within the construction specifications. Methods include the placement of filter fabric over catch basins to restrict silt from entering the existing storm drainage system. Disturbed areas will be covered during rain events to minimize turbid runoff. Disturbed vegetated areas, if any, will be seeded with grass and native vegetation to minimize erosion potential.**

#### 4. Plants [\[help\]](#)

a. Check the types of vegetation found on the site: [\[help\]](#)

\_\_\_deciduous tree: alder, maple, aspen, other

\_\_\_evergreen tree: fir, cedar, pine, other

\_\_\_shrubs

\_\_\_grass

\_\_\_pasture

\_\_\_crop or grain

\_\_\_Orchards, vineyards or other permanent crops.

\_\_\_ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other

\_\_\_ water plants: water lily, eelgrass, milfoil, other

\_\_\_ other types of vegetation

b. What kind and amount of vegetation will be removed or altered? [\[help\]](#)

**Most of the proposed improvements will be constructed under City streets. Consequently, it is not likely that construction of the proposed improvements in the Water System Plan will directly be the**

**cause of vegetation removal or alteration. Where appropriate, sod, trees, and other vegetation will be replaced and open land will be reseeded with its natural grasses per City code.**

- c. List threatened and endangered species known to be on or near the site. [\[help\]](#)

**There are no known threatened or endangered plant species on or near the site of the proposed improvements.**

- d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any: [\[help\]](#)

**Any disturbed vegetated areas will be replaced in kind.**

- e. List all noxious weeds and invasive species known to be on or near the site. [\[help\]](#)

**There are no known noxious weeds or invasive species known to be on the proposed improvement sites.**

## 5. Animals [\[help\]](#)

- a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site. [\[help\]](#)

Examples include:

birds: hawk, heron, eagle, songbirds, other:

mammals: deer, bear, elk, beaver, other:

fish: bass, salmon, trout, herring, shellfish, other \_\_\_\_\_

- b. List any threatened and endangered species known to be on or near the site. [\[help\]](#)

**The Washington State Department of Fish & Wildlife Priority Habitat Species Database lists the following species of threatened or endangered species to be near the City of Chelan:**

- Western Gray Squirrel

**Most of the proposed improvements are located within previously disturbed areas such as City streets. The Western Gray Squirrel is not known to be located within areas of proposed new structures.**

- c. Is the site part of a migration route? If so, explain. [\[help\]](#)

**Not known. Most of the proposed projects are located within the existing City UGA limits and should not affect the migration of birds.**

- d. Proposed measures to preserve or enhance wildlife, if any: [\[help\]](#)

**There are no measures to preserve or enhance wildlife at this time.**

e. List any invasive animal species known to be on or near the site. [\[help\]](#)

**There are no known invasive animal species on or near the proposed improvement sites.**

## **6. Energy and Natural Resources** [\[help\]](#)

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc. [\[help\]](#)

**Electric energy will be used for any new infrastructure besides distribution system improvements. Minimal electrical energy will be required for the construction of distribution upgrades within the City.**

b. Would your project affect the potential use of solar energy by adjacent properties?  
If so, generally describe. [\[help\]](#)

**No, the proposed improvements will not affect the solar energy potential of adjacent properties.**

c. What kinds of energy conservation features are included in the plans of this proposal?  
List other proposed measures to reduce or control energy impacts, if any: [\[help\]](#)

**The water system utilizes and maintains a number of reservoirs that provide gravity-fed water to the distribution system, lessening costs for pumping. Projects that propose upgrades to existing booster stations will evaluate energy conservation measures such as utilizing variable frequency drives.**

## **7. Environmental Health** [\[help\]](#)

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal?  
If so, describe. [\[help\]](#)

**Potential environmental health hazards associated with construction of the proposed improvements identified in the Water System Plan include construction equipment fuel, lubricant and coolant spill. The construction specifications will require construction equipment to be fitted with hazardous materials spill kits and operators to be trained in their use.**

1) Describe any known or possible contamination at the site from present or past uses.  
[\[help\]](#)

**There are seven active cleanup sites and one awaiting clean-up site within the City of Chelan. The proposed improvements are not anticipated to disturb these locations or hinder active**

cleanup.

- 2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity. [\[help\]](#)

**There are no known hazardous chemicals/conditions including liquid and gas transmission pipelines located with the proposed project areas or in the vicinity.**

- 3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project. [\[help\]](#)

**Potential toxic or hazardous chemicals that might be stored or used during the proposed improvements include construction equipment fuels, lubricants, coolants, glue, and any others necessary to provide construction of the proposed improvements. The construction specification will require construction equipment to be fitted with hazardous material spill kits and operators to be trained in their use.**

- 4) Describe special emergency services that might be required. [\[help\]](#)

**No special emergency services will be required as a result of construction of the proposed improvements.**

- 5) Proposed measures to reduce or control environmental health hazards, if any: [\[help\]](#)

**Proposed measures to reduce or control environmental health hazards during construction of the proposed improvements includes the requirement of construction equipment to be fitted with hazardous materials spill kits and the training of operators in their use.**

b. Noise [\[help\]](#)

- 1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)? [\[help\]](#)

**No foreseeable noises are present in the area of the proposed improvements that would affect the project.**

- 2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site. [\[help\]](#)

**There would be short-term heavy equipment used during construction of the proposed improvements identified in the Water System Plan.**

- 3) Proposed measures to reduce or control noise impacts, if any: [\[help\]](#)

**Most construction activities will be limited to normal daytime working hours.**

8. **Land and Shoreline Use** [\[help\]](#)

- a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe. [\[help\]](#)

**Most of the proposed improvements will be constructed within existing public rights-of-way, easements, and on City-owned properties.**

- b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use? [\[help\]](#)

**The sites on which the proposed improvements will be constructed are comprised primarily of City streets and other City-owned facilities, which have not been used for agricultural use since the establishment of the streets and facilities. Most of the proposed improvements will be constructed in impervious roadway surfaces.**

- 1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how: [\[help\]](#)

**It is not anticipated that the proposed improvements will affect surrounding working farm or forest land normal business operations.**

- c. Describe any structures on the site. [\[help\]](#)

**Structures located within the boundaries of the proposed improvements include existing water booster pump stations, underground valve vaults, reservoirs, and the various water treatment facilities.**

- d. Will any structures be demolished? If so, what? [\[help\]](#)

**No above ground structures are anticipated to be demolished as part of the proposed improvements. Two underground pressure reducing valve vaults are anticipated to be removed or abandoned as part of the proposed improvements.**

- e. What is the current zoning classification of the site? [\[help\]](#)

**Most of the proposed improvements are located within City of Chelan rights-of-way, existing easements, or on City property zoned Public Lands & Facilities.**

- f. What is the current comprehensive plan designation of the site? [\[help\]](#)

**The majority of the proposed improvement sites are located within City of Chelan rights-of-way, existing easements, with the remainder being designated as Public.**

- g. If applicable, what is the current shoreline master program designation of the site? [\[help\]](#)

**Current shoreline master program designation of sites adjacent to proposed improvements identified in the Water System Plan are Shoreline Park/Public, Shoreline Residential – SF, Shoreline Residential – MF, and High Density, where applicable.**

- h. Has any part of the site been classified as a critical area by the city or county? If so, specify. [\[help\]](#)

**There are areas identified as sensitive by the City of Chelan that include potential Wetland & Floodplain, and slopes averaging 35 through 45%. Most of the proposed improvements are located within previously improved areas such as City streets and will not adversely affect the areas of the proposed improvements or are located in areas that are not identified as sensitive.**

- i. Approximately how many people would reside or work in the completed project? [\[help\]](#)

**No one will reside in the completed project. Less than ten people will continue to work at the City's Water Treatment Plants after completion of proposed improvements.**

- j. Approximately how many people would the completed project displace? [\[help\]](#)

**The proposed improvements will not displace anyone.**

- k. Proposed measures to avoid or reduce displacement impacts, if any: [\[help\]](#)

**Not applicable.**

- l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any: [\[help\]](#)

**The proposed improvements identified in the Water System Plan will not change existing or project land uses.**

- m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any: [\[help\]](#)

**The proposed improvements are not anticipated to impact agricultural and forest lands. There are no proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance.**

9. **Housing** [\[help\]](#)



- a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing. [\[help\]](#)

**No housing units will be provided.**

- b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing. [\[help\]](#)

**No housing units will be eliminated.**

- c. Proposed measures to reduce or control housing impacts, if any: [\[help\]](#)

**Construction of the proposed improvements identified in the Water System Plan may cause temporary interruption of water service to adjacent housing. The City will notify homeowners when this interruption may occur and what measures, if any, will be necessary at that time. Should service be interrupted for extended durations, the City will take steps to provide temporary facilities during the interruption.**

**10. Aesthetics** [\[help\]](#)

- a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed? [\[help\]](#)

**All pipelines would be below grade aside from pipelines proposed to be suspended from the Woodin Avenue Bridge. Proposed booster stations may be below ground or in an above-ground structure no taller than a single-story house. No building materials have yet been identified for the proposed improvements, however, these stations would most likely be constructed of concrete masonry unit block, although the City will evaluate the use of alternative building materials in order to match any surrounding facilities. The proposed reservoir heights will be dependent on its site, as the overflow elevation will match the existing adjacent reservoirs.**

- b. What views in the immediate vicinity would be altered or obstructed? [\[help\]](#)

**Most of the proposed improvements will not obstruct or alter any views. Proposed improvements that add a reservoir will alter the view a minor amount similar to existing reservoirs of which the proposed reservoir will be placed next to.**

- b. Proposed measures to reduce or control aesthetic impacts, if any: [\[help\]](#)

**Design of above ground improvements will be undertaken with surrounding facilities in mind. The landscape will be revegetated in-kind per City code.**

**11. Light and Glare** [\[help\]](#)

- a. What type of light or glare will the proposal produce? What time of day would it mainly occur? [\[help\]](#)

**Light and glare from the reflection of sunlight off metal and glass surfaces of construction equipment would be associated with construction of the proposed improvements. Once the proposed improvements are completed, potential light and glare from window surfaces could result from the constructed facilities.**

- b. Could light or glare from the finished project be a safety hazard or interfere with views? [\[help\]](#)

**Light and glare from the completed improvements identified in the Water System Plan are not anticipated to become a safety hazard or interfere with views as the proposed buildings would be located on City of Chelan rights-of-way or existing easements.**

- c. What existing off-site sources of light or glare may affect your proposal? [\[help\]](#)

**No existing off-site sources of light or glare will affect the proposed improvements identified in the Water System Plan.**

- d. Proposed measures to reduce or control light and glare impacts, if any: [\[help\]](#)

**There are no proposed measures to reduce or control light and glare impacts at this time.**

## **12. Recreation** [\[help\]](#)

- a. What designated and informal recreational opportunities are in the immediate vicinity? [\[help\]](#)

**Lakeside City Park, Lakeshore Park, Lake Chelan Golf Course, City Baseball Fields, and Lake Chelan are all located adjacent to proposed improvements identified in the Water System Plan.**

- b. Would the proposed project displace any existing recreational uses? If so, describe. [\[help\]](#)

**Proposed improvements will not displace any existing recreational use or opportunity.**

- c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any: [\[help\]](#)

**Excavation sites for the proposed improvements will be flagged to minimize potential traffic impacts in accordance with the traffic control plan that will be required by the construction specifications.**

## **13. Historic and cultural preservation** [\[help\]](#)

- a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers ? If so, specifically describe. [\[help\]](#)

**The Lake Chelan Hydroelectric Dam, Richard Hinton Lard House, Ruby Theater and St. Andrews Episcopal Church located are all listed on the National Register of Historical Places and located near proposed improvements identified in the Water System Plan.**

- b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources. [\[help\]](#)

**None known.**

- c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc. [\[help\]](#)

**The City will consult with local tribes and the department of archaeology and historic preservation, and will provide cultural resource monitoring as necessary during exploratory excavations.**

- d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required. [\[help\]](#)

**During construction, if any locations are found to contain objects of suspected historical interest work will halt immediately and appropriate State or tribal authorities will be contacted. If the project is state funded the City will administer the project per Executive Order 0505. If federal funding is utilized for a proposed project, the City will administer the project per the National Historic Preservation Act and Department of Archaeology and Historic Preservation.**

#### **14. Transportation [\[help\]](#)**

- a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any. [\[help\]](#)

**The various sites of the proposed work are served by the highway and a network of public and private roads. Several figures in the Water System Plan indicate these roads.**

- b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop? [\[help\]](#)

**Routes 20 and 21 of the Link Transit Bus system stop in the City of Chelan. These routes generally operate on Highway 97, 97A, and 150.**

- c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate? [\[help\]](#)

**The completed projects will neither create nor eliminate parking spaces.**

- d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private). [\[help\]](#)

**The project will only provide surface restoration to existing public roads where construction activities will occur.**

- e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe. [\[help\]](#)

**It is not anticipated that the proposed improvements will not use water, rail, or air transportation.**

- f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates? [\[help\]](#)

**It is not anticipated that the proposed improvements will generate any additional vehicular trips per day.**

- g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe. [\[help\]](#)

**It is not anticipated that the proposed improvements will interfere with, affect or be affected by the movement of agricultural and forest product.**

- h. Proposed measures to reduce or control transportation impacts, if any: [\[help\]](#)

**Construction Specifications will require temporary traffic control plans to provide temporary traffic signage and detours as necessary to control traffic, provide alternate routes and mitigate traffic congestion. Priority will be given to emergency vehicles and school buses as necessary.**

#### **15. Public Services** [\[help\]](#)

- a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe. [\[help\]](#)

**Any proposed buildings will require fire protection, which is currently available.**

- b. Proposed measures to reduce or control direct impacts on public services, if any. [\[help\]](#)

**Any water system shut downs will be evaluated for timing during non-peak/non-daylight hours.**

#### **16. Utilities** [\[help\]](#)

- a. Circle utilities currently available at the site: [\[help\]](#)  
**electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system,**  
other \_\_\_\_\_
- b. Describe the utilities that are proposed for the project, the utility providing the service,  
and the general construction activities on the site or in the immediate vicinity which might  
be needed. [\[help\]](#)

**The utilities proposed in the Water System Plan include construction of potable water lines, booster stations, and water treatment facility upgrades, all of which will be operated and maintained by the City. Electrical service will be provided at the proposed improvements by the Public Utility District No. 1 of Chelan County. Any sewer or storm necessary will be provided by the City of Chelan.**

**General construction activities on the various proposed sites include clearing and grubbing, trench excavation, dewatering, pipeline installation, backfill and compaction, building construction, reservoir construction, and surface restoration.**

### **C. Signature** [\[help\]](#)

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: \_\_\_\_\_

Name of signee  \_\_\_\_\_ Jake Youngren

Position and Agency/Organization Public Works Director

Date Submitted: 1/7/2019

### **D. supplemental sheet for nonproject actions** [\[help\]](#)

**(IT IS NOT NECESSARY to use this sheet for project actions)**

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

**During the construction of the proposed distribution system improvements and construction of above-ground improvements, noise typical of a construction site will be generated, and the running of construction equipment will result in engine exhaust.**

Proposed measures to avoid or reduce such increases are:

**No additional measure beyond what is normally required for general construction of this type are deemed necessary for the construction of the projects in this Water System Plan. The City's growth management planning practices provide planning to manage growth related projects.**

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

**The majority of the work will take place within asphalt or gravel surfaced right-of-way except for the construction of new reservoirs, which may require the removal of vegetation in the area where the buildings are constructed. Vegetation in disturbed areas will be replanted, and minimal impact to animal life is expected.**

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

**No additional measures beyond what is normally required for general construction of this type are deemed necessary.**

3. How would the proposal be likely to deplete energy or natural resources?

**Not applicable.**

Proposed measures to protect or conserve energy and natural resources are:

**The City has a water use efficiency plan.**

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

**The proposal is not likely to directly affect these areas as improvements such as City streets have already been placed in many of the project locations within sensitive areas.**

Proposed measures to protect such resources or to avoid or reduce impacts are:

**No additional measures are required for this proposal.**

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

**Projects will support existing land use and development plans.**

Proposed measures to avoid or reduce shoreline and land use impacts are:

**No additional measures are required for this proposal.**

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

**The proposal is not likely to directly affect these uses.**

Proposed measures to reduce or respond to such demand(s) are:

**No additional measures are required for this proposal.**

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

**No Known Conflicts.**

**APPENDIX M**  
**Consistency Statements**



## Local Government Consistency Determination Form

Water System Name: City of Chelan Water Department PWS ID: 12300J

Planning/Engineering Document Title: Water System Plan Plan Date: March 2019

Local Government with Jurisdiction Conducting Review: City of Chelan

Before the Department of Health (DOH) approves a planning or engineering submittal under Section 100 or Section 110, the local government must review the documentation the municipal water supplier provides to prove the submittal is consistent with **local comprehensive plans, land use plans and development regulations** (WAC 246-290-108). Submittals under Section 105 require a local consistency determination if the municipal water supplier requests a water right place-of-use expansion. The review must address the elements identified below as they relate to water service.

By signing this form, the local government reviewer confirms the document under review is consistent with applicable local plans and regulations. If the local government reviewer identifies an inconsistency, he or she should include the citation from the applicable comprehensive plan or development regulation and explain how to resolve the inconsistency, or confirm that the inconsistency is not applicable by marking N/A. See more instructions on reverse.

Local Government Consistency Statement	For use by water system	For use by local government
	Identify the page(s) in submittal	Yes or Not Applicable
a) The water system service area is consistent with the adopted <u>land use and zoning</u> within the service area.	Fig 1-2	Yes
b) The <u>growth projection</u> used to forecast water demand is consistent with the adopted city or county's population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection and methodology.	2-16	Yes
c) For <u>cities and towns that provide water service</u> : All water service area policies of the city or town described in the plan conform to all relevant <u>utility service extension ordinances</u> .	2-18	Yes
d) <u>Service area policies</u> for new service connections conform to the adopted local plans and adopted development regulations of all cities and counties with jurisdiction over the service area.	1-13	Yes
e) <u>Other relevant elements</u> related to water supply are addressed in the water system plan, if applicable. This may include Coordinated Water System Plans, Regional Wastewater Plans, Reclaimed Water Plans, Groundwater Management Area Plans, and the Capital Facilities Element of local comprehensive plans.	1-1 through 1-4	Yes

I certify that the above statements are true to the best of my knowledge and that these specific elements are consistent with adopted local plans and development regulations.

Craig Gildroy  
Signature  
Craig Gildroy Planning Director  
Printed Name, Title, & Jurisdiction City of Chelan

3/19/19  
Date

## Consistency Review Guidance

### ***For Use by Local Governments and Municipal Water Suppliers***

This checklist may be used to meet the requirements of WAC 246-290-108. When using an alternative format, it must describe all of the elements; 1a), b), c), d), and e), when they apply.

For **water system plans (WSP)**, a consistency review is required for the service area and any additional areas where a municipal water supplier wants to expand its water right's place of use.

For **small water system management programs**, a consistency review is only required for areas where a municipal water supplier wants to expand its water right's place-of-use. If no water right place-of-use expansion is requested, a consistency review is not required.

For **engineering documents**, a consistency review is required for areas where a municipal water supplier wants to expand its water right's place-of-use (water system plan amendment is required). For noncommunity water systems, a consistency review is required when requesting a place-of-use expansion. All engineering documents must be submitted with a service area map (WAC 246-290-110(4)(b)(ii)).

**A) Documenting Consistency:** The planning or engineering document must include the following when applicable.

- a) A copy of the adopted **land use/zoning** map corresponding to the service area. The uses provided in the WSP should be consistent with the adopted land use/zoning map. Include any other portions of comprehensive plans or development regulations that relate to water supply planning.
- b) A copy of the **growth projections** that correspond to the service area. If the local population growth projections are not used, explain in detail why the chosen projections more accurately describe the expected growth rate. Explain how it is consistent with the adopted land use.
- c) Include water service area policies and show that they are consistent with the **utility service extension ordinances** within the city or town boundaries. *This applies to cities and towns only.*
- d) All **service area policies** for how new water service will be provided to new customers.
- e) **Other relevant elements** the Department of Health determines are related to water supply planning. See Local Government Consistency – Other Relevant Elements, Policy B.07, September 2009.

**B) Documenting an Inconsistency:** Please document the inconsistency, include the citation from the comprehensive plan or development regulation, and explain how to resolve the inconsistency.

**C) Documenting a Lack of Local Review for Consistency:** Where the local government with jurisdiction did not provide a consistency review, document efforts made and the amount of time provided to the local government for review. Please include: name of contact, date, and efforts made (letters, phone calls, and emails). To self-certify, please contact the DOH Planner.

The Department of Health is an equal opportunity agency. For persons with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY 1-800-833-6388).

## Local Government Consistency Determination Form

Water System Name: City of Chelan Water Department PWS ID: 12300J

Planning/Engineering Document Title: Water System Plan Plan Date: March 2019


Local Government with Jurisdiction Conducting Review: Chelan County

Before the Department of Health (DOH) approves a planning or engineering submittal under Section 100 or Section 110, the local government must review the documentation the municipal water supplier provides to prove the submittal is consistent with **local comprehensive plans, land use plans and development regulations** (WAC 246-290-108). Submittals under Section 105 require a local consistency determination if the municipal water supplier requests a water right place-of-use expansion. The review must address the elements identified below as they relate to water service.

By signing this form, the local government reviewer confirms the document under review is consistent with applicable local plans and regulations. If the local government reviewer identifies an inconsistency, he or she should include the citation from the applicable comprehensive plan or development regulation and explain how to resolve the inconsistency, or confirm that the inconsistency is not applicable by marking N/A. See more instructions on reverse.

Local Government Consistency Statement	For use by water system	For use by local government
	Identify the page(s) in submittal	Yes or Not Applicable
a) The water system service area is consistent with the adopted <u>land use and zoning</u> within the service area.	1-21	Yes
b) The <u>growth projection</u> used to forecast water demand is consistent with the adopted city or county's population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection and methodology.	2-16	Yes
c) For cities and towns that provide water service: All water service area policies of the city or town described in the plan conform to all relevant <u>utility service extension ordinances</u> .	-	Not Applicable
d) <u>Service area policies</u> for new service connections conform to the adopted local plans and adopted development regulations of all cities and counties with jurisdiction over the service area.	1-13	Yes
e) <u>Other relevant elements</u> related to water supply are addressed in the water system plan, if applicable. This may include Coordinated Water System Plans, Regional Wastewater Plans, Reclaimed Water Plans, Groundwater Management Area Plans, and the Capital Facilities Element of local comprehensive plans.		Not Applicable

I certify that the above statements are true to the best of my knowledge and that these specific elements are consistent with adopted local plans and development regulations.

  
Signature  
David Kirk Director Chelan County  
Printed Name, Title, & Jurisdiction

3/27/19  
Date

**APPENDIX N**  
**Notification to Utilities**

Will Kirby

---

From: Jennifer Collins <jcollins@lcrd.org>  
Sent: Tuesday, February 26, 2019 6:14 AM  
To: Will Kirby  
Subject: Re: City of Chelan - Water System Plan  
Attachments: image001.png

Follow Up Flag: Follow up  
Flag Status: Completed

Thanks Will, yes please forward me the link.  
Thanks again,  
Jennifer

Sent from Jennifer's iPhone

On Feb 25, 2019, at 4:38 PM, Will Kirby <[wkirby@g-o.com](mailto:wkirby@g-o.com)> wrote:

Good Afternoon,

On behalf of the City of Chelan, please be advised that the City's Water System Plan is available for review. A draft can be forwarded via link at your request. Comments can be received at the upcoming City of Chelan council meeting on March 12, 2019, or before via email. Please contact myself with any questions.

Thank you,

*Will Kirby, E.I.T. | 509.853.2460 p | 425.443.0574 c  
Gray & Osborne, Inc. | 11 Spokane St., Suite 207, Wenatchee, WA, 98801*

<image001.png> *Please consider the environment before printing this email.*

*Electronic File Transfer-*

*Note that these electronic files are provided as a courtesy only. Gray & Osborne, Inc. in no way guarantees the accuracy or completeness of the digital data contained within these files. Furthermore, Gray & Osborne, Inc. assumes no liability for any errors or omissions in the digital data herein. Anyone using the information contained herein should consult the approved or certified hard copy drawings or reports for the most current information available.*

Will Kirby

---

From: donotreply@g-o.com  
Sent: Tuesday, February 26, 2019 7:33 AM  
To: wkirby@g-o.com  
Subject: Gray & Osborne Inc. E-Transfer



## SENT CONFIRMATION

---

The Sender's name was entered as : **Will Kirby**

The Sender's email address was entered as : **wkirby@g-o.com**

The file download link below has been sent to the following recipients: jcollins@lcrd.org amiller@g-o.com

### Message:

Jennifer, Please see the following link for the Draft City of Chelan Water System Plan. Thank you, Will Kirby

**Link to download Zip file from Gray & Osborne Inc. :**

[A817EA7B-155D-0008-1FB8B43E1A00E80F.ZIP](#)

Size: 31.01 MB

**File will be available until: 03/05/2019**

**Zip file contains the following:**      **Size**

DOH WSP Submittal Copy 8.31.18.pdf 32.63 MB

### Sender IP:

IP Address of Sender: 209.210.123.76

Will Kirby

---

From: Rod Anderson <randerson@lcrd.org>  
Sent: Tuesday, February 26, 2019 8:01 AM  
To: Will Kirby; Jennifer Collins  
Cc: Adam Miller; 'Jake Youngren'  
Subject: RE: City of Chelan - Water System Plan  
Attachments: image001.png

Good morning Will –

Yes could you send me the link to the City Water System Plan? - thanks

*-Rod  
LCRD  
509/687-3548*

---

**Notice of Confidentiality:**

The information transmitted is intended only for the person or entity to which it is addressed and may contain confidential and/or privileged material. Any review re-transmission or other use of or taking any action in reliance upon this information by persons or entities other than the intended recipient is prohibited. If you received this in error please contact the sender immediately by return electronic transmission and then immediately delete this transmission including all attachments without copying, distributing or disclosing same.

---

From: Will Kirby [mailto:wkirby@g-o.com]  
Sent: Monday, February 25, 2019 4:39 PM  
To: Rod Anderson <randerson@lcrd.org>; Jennifer Collins <jcollins@lcrd.org>  
Cc: Adam Miller <amiller@g-o.com>; 'Jake Youngren' <jyoungren@cityofchelan.us>  
Subject: City of Chelan - Water System Plan

Good Afternoon,

On behalf of the City of Chelan, please be advised that the City's Water System Plan is available for review. A draft can be forwarded via link at your request. Comments can be received at the upcoming City of Chelan council meeting on March 12, 2019, or before via email. Please contact myself with any questions.

Thank you,

*Will Kirby, E.I.T. | 509.853.2460 p | 425.443.0574 c  
Gray & Osborne, Inc. | 11 Spokane St., Suite 207, Wenatchee, WA, 98801*



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Will Kirby

---

From: donotreply@g-o.com  
Sent: Tuesday, February 26, 2019 8:16 AM  
To: wkirby@g-o.com  
Subject: Gray & Osborne Inc. E-Transfer



## SENT CONFIRMATION

---

The Sender's name was entered as : **Will Kirby**

The Sender's email address was entered as : **wkirby@g-o.com**

The file download link below has been sent to the following recipients: randerson@lcrd.org

### Message:

Rod, Please see the following link for the Draft City of Chelan Water System Plan. Thank you, Will Kirby

**Link to download Zip file from Gray & Osborne Inc. :**

[A98BFAB6-155D-0008-1F6C8053DE6FA3D2.ZIP](#)

Size: 31.01 MB

**File will be available until: 03/05/2019**

**Zip file contains the following:**      **Size**

DOH WSP Submittal Copy 8.31.18.pdf 32.63 MB

### Sender IP:

IP Address of Sender: 209.210.123.76

Will Kirby

---

From: Will Kirby <wkirby@g-o.com>  
Sent: Monday, February 25, 2019 4:39 PM  
To: 'lbpoa.gr@gmail.com'  
Cc: Adam Miller; 'Jake Youngren'  
Subject: City of Chelan - Water System Plan

Good Afternoon,

On behalf of the City of Chelan, please be advised that the City's Water System Plan is available for review. A draft can be forwarded via link at your request. Comments can be received at the upcoming City of Chelan council meeting on March 12, 2019, or before via email. Please contact myself with any questions.

Thank you,

*Will Kirby, E.I.T. | 509.853.2460 p | 425.443.0574 c  
Gray & Osborne, Inc. | 11 Spokane St., Suite 207, Wenatchee, WA, 98801*



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Will Kirby

---

From: donotreply@g-o.com  
Sent: Tuesday, February 26, 2019 9:35 AM  
To: wkirby@g-o.com  
Subject: Gray & Osborne Inc. E-Transfer



## SENT CONFIRMATION

---

The Sender's name was entered as : **Will Kirby**

The Sender's email address was entered as : **wkirby@g-o.com**

The file download link below has been sent to the following recipients: lbpoa.gr@gmail.com

### Message:

Grant, Please see the following link for the Draft City of Chelan Water System Plan. Thank you, Will Kirby

**Link to download Zip file from Gray & Osborne Inc. :**

[AC5A2F8B-155D-0008-1FEEDA227F2D13D4.ZIP](#)

Size: 31.01 MB

**File will be available until: 03/05/2019**

**Zip file contains the following:**      **Size**

DOH WSP Submittal Copy 8.31.18.pdf 32.63 MB

### Sender IP:

IP Address of Sender: 209.210.123.76

Will Kirby

---

From: Will Kirby <wkirby@g-o.com>  
Sent: Monday, February 25, 2019 4:39 PM  
To: 'jpbatdorf@gmail.com'; 'vickhere@rmtw.com'  
Cc: Adam Miller; 'Jake Youngren'  
Subject: City of Chelan - Water System Plan

Good Afternoon,

On behalf of the City of Chelan, please be advised that the City's Water System Plan is available for review. A draft can be forwarded via link at your request. Comments can be received at the upcoming City of Chelan council meeting on March 12, 2019, or before via email. Please contact myself with any questions.

Thank you,

*Will Kirby, E.I.T. | 509.853.2460 p | 425.443.0574 c  
Gray & Osborne, Inc. | 11 Spokane St., Suite 207, Wenatchee, WA, 98801*



Please consider the environment before printing this email.

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Will Kirby

---

From: donotreply@g-o.com  
Sent: Monday, March 04, 2019 1:01 PM  
To: wkirby@g-o.com  
Subject: Gray & Osborne Inc. E-Transfer

# Gray & Osborne Inc.

## FILE TRANSFER

### SENT CONFIRMATION

---

The Sender's name was entered as : **Will Kirby**

The Sender's email address was entered as : **wkirby@g-o.com**

The file download link below has been sent to the following recipients: vickhere@rmtw.com

#### Message:

Paul, Please see the following link for a Draft copy of the City of Chelan's Water System Plan. Thanks, Will Kirby

**Link to download Zip file from Gray & Osborne Inc. :**

<E8C5D1A4-155D-0008-1FF8E811F4C3CDB9.ZIP>

Size: 31.01 MB

**File will be available until: 03/11/2019**

**Zip file contains the following:           Size**

DOH WSP Submittal Copy 8.31.18.pdf 32.63 MB

#### **Sender IP:**

IP Address of Sender: 209.210.123.76

Will Kirby

---

From: marcm@nwi.net  
Sent: Wednesday, May 15, 2019 9:10 AM  
To: wkirby@g-o.com  
Cc: 'Doug Willcox'  
Subject: Chelan WSP Comments

Follow Up Flag: Follow up  
Flag Status: Flagged

Will,

These comments are submitted on behalf of BMWWD. Per your request, I dug up a bit more background info regarding what BMWWD understands is the agreed boundary of the retail service area for the City of Chelan along the south shore. Approximately 10years ago Bob Janklenson was looking for water for his Tuscany Project. The city desired a line extension which would provides sewer and water to the property at great expense. Mr. Jankelson resisted and hired an attorney from Perkin Coie to represent him. For practical reasons and after consultation with DOH, it was determined that BMWWD could best service this area rather than the City and that City service would end at Lakeside. The County subsequently approved master plans for the project which indicate that water service will be provided by BMWWD. Ecology subsequently approved water changes for the Tuscany project which identify BMWWD's points of withdrawal as the authorized source. Therefore, it appears pretty clear that the southern boundary for the City does in fact end at Lakeside rather than what appears in the draf

Marc Marquis  
Peterson & Marquis Law Office  
1267 Wheat Ridge Road  
East Wenatchee, WA 98802  
(509) 679-0337  
[www.h2oattorneys.com](http://www.h2oattorneys.com)

**APPENDIX O**  
**Public Form**

## Adam Miller

---

**From:** WA Dept of Health <SurveySupport@doh.wa.gov>  
**Sent:** Thursday, April 04, 2019 9:07 AM  
**To:** amiller@g-o.com  
**Subject:** Copy of Your Responses: Water Use Efficiency Goal Setting Public Forum \*

Your submission has been received for:  
Water Use Efficiency Goal Setting Public Forum \*

**1. Water System Name:**  
City of Chelan

**2. ID Number:**  
12300

**3. County:**  
Chelan

**4. Contact Name:**  
Jake Youngren

**5. Phone Number with Area Code:**  
509-682-8032

**6. Date and Time of Public Forum:**  
4/23/2019 6:00 pm

**7. Location of Public Forum: Street Address:**  
155 E Johnson Avenue

**8. Location - City, State and Zip Code:**  
Chelan, WA 98816

**9. Purpose of Forum:**

Water Use Efficiency goals and discussion. Water System Plan comments and approval.

**10. Where to find more information about goal:**

Discussed on local radio. Posted at City buildings. Advertisement in paper. Included in council meeting agenda packet.

**11. Directions to Public Forum:**



\_\_\_\_\_  
In City Council Chambers at City Hall in Chelan, WA with an address of 155 East Johnson Avenue.

**12. If you would like to receive email confirmation of your submission, please enter your email address in the space below.**

\_\_\_\_\_  
amiller@g-o.com

April 23, 2019  
6:00 p.m.

**CITY OF CHELAN  
CITY COUNCIL  
AGENDA**

Chelan City Hall  
Council Chambers

1. CALL TO ORDER, PLEDGE OF ALLEGIANCE, ROLL CALL
2. AGENDA CHANGES
3. CITIZEN COMMENTS  
Items not on the agenda. Time limited per the Mayor.
4. MINUTES
  - A. Approve March 26, 2019 Minutes of the Regular City Council Meeting 4 - 11  
(City Clerk Gallucci)  
[March 26, 2019](#)
  - B. Approve April 6, 2019 Minutes of the Strategic Council Retreat (City Clerk Gallucci) 12 - 15  
[April 6, 2019](#)
  - C. Approve April 9, 2019 Minutes of the Regular City Council Meeting 16 - 23  
(City Clerk Gallucci)  
[April 9, 2019](#)
5. CONSENT AGENDA  
All items under the Consent Agenda are approved with one motion.
  - A. Approve April 23, 2019 Claim & Payroll Warrants (Councilmember Dobbs)
  - B. Excuse Councilmember McCardle from the April 23, 2019 Meeting (Mayor Cooney)
6. SPECIAL PRESENTATIONS
  - A. Deep Water Home & Electronics - New Equipment Training for Councilmembers (Deep Water Home & Electronics)
  - B. Cascadia Conservation District (Mike Cushman)
7. PUBLIC HEARINGS
  - A. Water Use Efficiency Goals (Public Works Director Youngren) 24 - 27  
[Agenda Bill No. 2019-031A](#)  
*Suggested Motion: None.*
  - B. Ordinance No. 2019-1561 - Small Cell Code Revisions (Planning Director Gildroy) 28 - 257  
[Agenda Bill No. 2019-025A](#)  
*Suggested Motion: I move to accept Planning Commission's recommendation and approve the wireless small cell revisions to CMC 17.70 and CMC 15.22 as presented and authorize the Mayor to sign Ordinance No. 2019-1561*
8. MOTION CONSIDERATIONS
  - A. Draft Agreement with Lakerider Sports 258 - 273  
[Agenda Bill No. 2011-022F](#)  
*Suggested Motion: I move to authorize the Mayor to finalize and execute the agreement with Lakerider Sports.*

- B. Lakeshore RV Park Irrigation & Electrical Improvements Change Order No. 1 (Public Works Director Youngren) 274 - 295  
[Agenda Bill No. 2016-021D](#)  
*Suggested Motion: I move to authorize the Mayor to finalize and execute Change Order No. 1 for the Lakeshore RV Park Irrigation and Electrical Improvements Project.*
- C. Don Morse Park Restrooms Bid Award for Lakeshore RV Park Restroom Remodel (Public Works Director Youngren) 296 - 299  
[Agenda Bill No. 2017-026F](#)  
*Suggested Motion: I move to award the Don Morse Park Restrooms Project to the lowest responsive bidder, Blew's Construction, and authorize the Mayor to finalize and execute the agreement.*
- D. WSDOT Paving and ADA Ramp Project Easement Request (Public Works Director Youngren) 300 - 321  
[Agenda Bill No. 2019-027](#)  
*Suggested Motion: I move to authorize the Mayor to finalize and execute all necessary documents associated with requested permanent easement by the Washington State Department of Transportation to maintain ADA compliant pedestrian sidewalk access in the vicinity of State Route 97 Alt and West Center St.*
- E. Utility Extension Agreement with Zuluaga Family LLLP (Public Works Director Youngren) 322 - 330  
[Agenda Bill No. 2019-028](#)  
*Suggested Motion: I move to authorize the Mayor to finalize and execute the Utility Extension Agreement with Zuluaga Family LLLP.*
- F. Professional Services Agreement with SCJ Alliance for Johnson/Sanders Intersection 331 - 358  
[Agenda Bill No. 2019-029](#)  
*Suggested Motion: I move to authorize the Mayor to finalize and execute the Professional Services Agreement with SCJ Alliance for the design of traffic improvements at Johnson Avenue and Sanders Street intersection.*
- G. City Utilities in County Right-of-Way Franchise Agreement (Public Works Director Youngren) 359 - 379  
[Agenda Bill No. 2019-030](#)  
*Suggested Motion: I move to authorize the Mayor to finalize and execute the proposed Resolution by Chelan County granting a franchise to the City of Chelan for Domestic Water and Sanitary Sewer Facilities on County Rights-of-Way.*

## 9. ADMINISTRATIVE REPORTS

- A. Draft Skatepark/Pumptrack Design Agreement (City Administrator Jackson) 380 - 382  
[Agenda Bill No. 05-011C](#)  
*Suggested Motion: None.*
- B. 2018 Year End Financial Report (Finance Director Thornton) 383 - 420  
[Agenda Bill No. 2017-029S](#)  
*Suggested Motion: None.*
- C. Water Comprehensive Plan Update (Public Works Director Youngren) 421 - 1140  
[Agenda Bill No. 2019-031](#)  
*Suggested Motion: None.*

## 10. INFORMATIONAL ITEMS



# CITY OF CHELAN

CITY COUNCIL

23 Apr 2019

Subject/Title: Water Use Efficiency Goals  
Department: Public Works  
Staff Contact: Jake Youngren  
Reviewed By: City Administrator

## GOVERNING LEGISLATION

WAC 246-290-830 Water use efficiency goal setting. (1) The elected governing board or governing body of the public water system shall establish water use efficiency goals within one year of the effective date of this rule for systems serving one thousand or more total connections, and within two years of the effective date of this rule for systems serving less than one thousand total connections.

(2) Water use efficiency goals must be designed to enhance the efficient use of water by the water system's consumers.

## PREVIOUS COUNCIL ACTION TAKEN

None.

## OVERVIEW

The Water Use Efficiency (WUE) Rule requires a water system's elected governing body to establish WUE goals that are measurable and have a time frame. The goals of Chelan's WUE Program have been discussed by the City public works staff and are as follows:

1. Supply Side Goal - Maintain DSL below 10 percent for the next six years.
2. Demand Side Goal - Reduce ADD 5 percent by December 31, 2024.

The WUE Rule requires all municipal water systems to implement and evaluate certain mandatory water use efficiency measures as well as identify additional demand (customer) side measures. Refer to the Table 4-2 and 4-3 in the attached

document for details.

#### FINANCIAL IMPLICATIONS

None.

#### ATTACHMENTS

1. City of Chelan Water Use Efficiency Goals

#### SUGGESTED MOTION

Suggested Motion: None.

**City of Chelan**  
**Water Use Efficiency Goals**

**WATER USE EFFICIENCY GOALS**

The Water Use Efficiency (WUE) rule requires a water system's elected governing body to establish WUE goals that are measurable and have a timeframe. The goals of Chelan's WUE Program have been discussed by the City public works staff and are as follows:

1. Supply Side Goal - Maintain DSL below 10 percent for the next six years.
2. Demand Side Goal - Reduce ADD 5 percent by December 31, 2024.

**WATER USE EFFICIENCY MEASURES**

The WUE Rule requires all municipal water systems to implement and evaluate certain mandatory water use efficiency measures. The City is also required to identify additional demand (i.e., customer) side measures. The purpose of adopting a particular set of water use efficiency measures is to develop a strategy to meet the City's water use efficiency goal as described above. The mandatory measures the City is required to address are summarized in Table 4-2.

**TABLE 4-2**  
**Mandatory Water Use Efficiency Measures**

<b>Measure</b>	<b>Requirement</b>	<b>Status: City of Chelan</b>
Install source meters	Implementation	Completed
Install service and intertie meters	Implementation	Completed
Calibrate meters per industry standards	Implementation	As Needed
Water loss control action plan if DSL > 10%	Implementation	N/A
Educate customers about WUE practices once per year	Implementation	On-going every year
Water conservation rates	Evaluation	Completed, evaluated inclined

		block rates
Evaluate water reclamation opportunities	Evaluation	Completed

In addition to the mandatory measures shown in Table 4-2, WAC 246-290-810(4)(d) requires systems with more than 2,500 but less than 9,999 connections to adopt another 6 demand (i.e., customer) side water use efficiency measures. The Guidebook provides that a qualified WUE measure that is implemented for different customer classes counts as multiple WUE measures. Table 4-3 summarizes the demand-side water use efficiency measures the City plans to implement over the next six years.

**TABLE 4-3**

**Demand-Side Water Use Efficiency Measures**

<b>Demand Side Measure</b>	<b>Customer Classes Affected</b>	<b>Number of Measures<sup>(1)</sup></b>	<b>Estimated Annual Water Savings<sup>(2)</sup></b>	<b>Status</b>	<b>Cost</b>
Notify customers of unusually high water use	(3)	5	5%	Ongoing	Minimal
Include consumption history on water bill	(3)	5	5%	Ongoing	Minimal
<b>Total Measures (6 Required)</b>		<b>10</b>			

- (1) Per the Guidebook, if a qualified WUE measure is implemented for different customer classes, it counts a multiple WUE measures.
- (2) 5% reduction in end use (USEPA Water Conservation Plan Guidelines – Appendix B) by end of 2024.
- (3) Customer classes include single-family residential, multi-family residential, commercial, schools, and municipal.

As indicated, the City plans to adopt, in addition to the mandatory measures, two demand-side measures for five of its customer classes, which results in a total of 10 measures, 4 more than required. The City has determined that the cost to implement these measures will be minimal. The City believes these measures, in addition to ongoing efforts to educate its customers about water use efficiency, will enable it to meet its second WUE goal to reduce average day demand by 5% by December 31, 2024.



## CITY OF CHELAN

CITY COUNCIL

23 Apr 2019

Subject/Title: Water Comprehensive Plan Update  
Department: Public Works  
Staff Contact: Jake Youngren  
Reviewed By: City Administrator

### GOVERNING LEGISLATION

WAC 246-290-100 Water system plan. (1) The purpose of this section is to establish a uniform process for purveyors to:

(a) Demonstrate system capacity as defined in WAC 246-290-010; (b) Demonstrate how the system will address present and future needs in a manner consistent with other relevant plans and local, state, and federal laws, including applicable land use plans; (c) Establish eligibility for funding under chapter 246-296 WAC....

### PREVIOUS COUNCIL ACTION TAKEN

None.

### OVERVIEW

This will be an update on the City's Draft Water System Plan. Refer to the attached for details.

### FINANCIAL IMPLICATIONS

None.

### ATTACHMENTS

1. DRAFT Water System Plan

### SUGGESTED MOTION

Suggested Motion: None.





**CITY OF CHELAN**  
**City Council Meeting - April 23, 2019**

**COUNCIL AND ADMINISTRATIVE PERSONNEL PRESENT**

**Mayor:**

Michael Cooney

**Councilmembers:**

Kelly Allen  
Ray Dobbs  
Tim Hollingsworth  
Wendy Isenhart  
Servando Robledo  
Ty Witt

**Staff Present:**

City Administrator Mike Jackson  
City Attorney Quentin Batjer  
City Clerk Peri Gallucci  
Finance Director Steve Thornton  
Planning Director Craig Gildroy  
Public Works Director Jake Youngren  
Receptionist/Clerical Assistant Patty Michajla

**Excused Absences:**

Erin McCardle

1. CALL TO ORDER, PLEDGE OF ALLEGIANCE, ROLL CALL  
**The meeting was called to order at 6:00 p.m.**

2. AGENDA CHANGES  
A. None.

3. CITIZEN COMMENTS  
**Items not on the agenda. Time limited per the Mayor.**

4. MINUTES
  - A. March 26, 2019 Minutes of the Regular City Council Meeting
  - B. April 6, 2019 Minutes of the Strategic Council Retreat
  - C. April 9, 2019 Minutes of the Regular City Council Meeting

**Motion to approve the minutes**

Moved by Councilmember Isenhart, seconded by Councilmember Allen.

***Motion passed unanimously.***

5. CONSENT AGENDA  
**All items under the Consent Agenda are approved with one motion.**
  - A. April 23, 2019 Claim Warrants No. 92234 - 92315 totaling \$665,944.79 and Payroll Warrants No. 54821 - 54909 totaling \$194,68391.
  - B. Excuse Councilmember McCardle from the April 23, 2019 Meeting.

**Motion to approve the consent agenda.**

Moved by Councilmember Dobbs, seconded by Councilmember Isenhart.

***Motion passed unanimously.***

**6. SPECIAL PRESENTATIONS**

**A. Deep Water Home & Electronics - New Equipment Training for Councilmembers**

Matt Mathews provided training on operation of the new microphones for Councilmembers and staff.

**B. Cascadia Conservation District**

Mike Cushman provided information about the free brush disposal that will take place at the Chelan Transfer Station on May 3, 4, 10, & 11, 2019 from 10:00 a.m. to 5:00 p.m. He will be asking for volunteers to assist.

The roving chipper program is a free service for residents of Chelan County taking place this spring. Citizens can sign up on the Cascadia Conservation District website to have their extra tree limbs up to 8" in diameter, trimmings and brush chipped after they have cut them and placed in piles to be picked up for chipping.

Another service is the free home ignition zone assessments where Chelan Fire and Rescue or Cascadia Conservation District will assess homes and provide recommendations on how to reduce the risk of fire to their structures.

The Firewise Community USA program is a program aimed at working with communities to assess their risk, develop action plans, and implement projects to reduce wildfire risks.

Several other activities were mentioned including involvement in Earth Day, Arbor Day and outreach for Keep it Blue Lake Chelan.

**7. PUBLIC HEARINGS**

**A. Water Use Efficiency Goals**

Will Kirby, Gray and Osborne, Inc., provided information regarding water use efficiency goals and measures. The City last updated the Water Comprehensive Plan in 2010.

The Water Use Efficiency (WUE) Rule requires a water system's elected governing body to establish WUE goals that are measurable and establish a time frame. The goals of Chelan's WUE Program have been discussed by the City Public Works staff and are as follows:

1. Supply Side Goal - Maintain DSL below 10 percent for the next six years.
2. Demand Side Goal - Reduce ADD 5 percent by December 31, 2024.

The WUE Rule requires all municipal water systems to implement and evaluate certain mandatory water use efficiency measures as well as identify additional demand (customer) side measures.

The Public Hearing was opened at 6:30 p.m.

Stan Morse, Chelan, asked Mr. Kirby about about several concerns related to various water use issues. Mr. Kirby responded to his concerns.

The Public Hearing was closed at 6:38 p.m. No action was requested.

**B. Ordinance No. 2019-1561 - Small Cell Code Revisions**

Building and Planning Director, Craig Gildroy, provided an overview of the FCC ruling that was issued to allow 4G and 5G. The Planning Commission held a public hearing last week on the proposed revisions to CMC 15.22 Telecommunication Small Wireless and CMC 17.72 Wireless Telecommunications Facilities and unanimously recommended approval.

The FCC adopted a ruling and order in the matter of Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment. The ruling preempts cities' authority over permit processing by requiring specific standards and timelines and prohibits any limits to deployment in the right-of-way for small cellular facilities.

The City of Chelan has reviewed for compliance of relevant codes pertaining to telecommunications, master license, and right-of-way permit processing procedures. The FCC has provided jurisdictions until April 29, 2019 to update and revise their code for compliance with the FCC order.

The Public Hearing was opened at 6:50 p.m.

Jason Verduzco of Verizon Wireless in Spokane Valley, worked with over a dozen cities on their codes to adhere to the Order. He attended as a resource to provide information and answer questions regarding health, safety and aesthetics.

Nick Pascoe, Chelan, spoke about material inhibition which addresses the law of what the City can do. He thinks the closest location to a building might be 100 feet.

The Public Hearing was closed at 7:08 p.m.

**Motion to accept Planning Commission's recommendation and approve the wireless small cell revisions to CMC 17.70 and CMC 15.22 as presented and authorize the Mayor to sign Ordinance No. 2019-1561 with modifications as required by the City Attorney.**

Moved by Councilmember Dobbs, seconded by Councilmember Hollingworth.

***Motion passed 5 - 1 with Councilmember Isenhardt voting nay.***

**8. MOTION CONSIDERATIONS**

**A. Draft Agreement with Lakerider Sports**

City Administrator Jackson presented the request to continue the concession agreement with Lakerider Sports for 2019-2021. Owner Teague Block will not use the additional storage area until 2020. There is a cost reduction from the previous contract since this pertains to an active outdoor sport which must be prohibited when smoke levels are considered to be dangerous to health resulting in closing the business.

**Motion to authorize the Mayor to finalize and execute the agreement with Lakerider Sports.**

Moved by Councilmember Isenhardt, seconded by Councilmember Allen.

***Motion passed unanimously.***

**B. Lakeshore RV Park Irrigation & Electrical Improvements Change Order No. 1**

The implementation of Senate Bill 5493 regarding new labor rates by the Washington State Department of Labor and Industries occurred during the bid period of this project in 2018. SCJ Alliance has reviewed the contractor's (KRCI) claim for a change order to account for the increase in wages (\$57,413.44) and finds it to be in line with the provisions of the Contract requirements.

**Motion to authorize the Mayor to finalize and execute Change Order No. 1 for the Lakeshore RV Park Irrigation and Electrical Improvements Project.**

Moved by Councilmember Allen, seconded by Councilmember Hollingsworth.

***Motion passed unanimously.***

**C. Don Morse Park Restrooms Bid Award for Lakeshore RV Park Restroom Remodel**

Four bids were received for the restroom remodel at the Lakeshore RV Park. The bids have been reviewed by Forte Architects and they recommend the bid be awarded to the lowest bidder, Blews Construction.

**Motion to award the Don Morse Park Restrooms Project to the lowest responsive bidder, Blew's Construction, and authorize the Mayor to finalize and execute the agreement.**

Moved by Councilmember Witt, seconded by Councilmember Allen.

***Motion passed unanimously.***

**D. WSDOT Paving and ADA Ramp Project Easement Request**

The WSDOT paving project next year will include ADA ramps. In order to install the ramps, WSDOT requires a permanent easement from the City. The City will be compensated with a one time payment of \$2300.

**Motion to authorize the Mayor to finalize and execute all necessary documents associated with requested permanent easement by the Washington State Department of Transportation to maintain ADA compliant pedestrian sidewalk access in the vicinity of State Route 97 Alt and West Center St.**

Moved by Councilmember Isenhardt, seconded by Councilmember Allen.

***Motion passed unanimously.***

**E. Utility Extension Agreement with Zuluaga Family LLLP**

A request has been made by the Dave Zuluaga Family LLLP for a utility extension to his lot on Dietrich Road for water and sewer. This is within the Urban Growth Boundary and the developer will bear the cost 100%. The Latecomers Agreement will come forward at the next Council meeting. The property is in the city limits and the extension is in the County.

**Motion to authorize the Mayor to finalize and execute the Utility Extension Agreement with Zuluaga Family LLLP.**

Moved by Councilmember Allen, seconded by Councilmember Isenhardt.

***Motion passed unanimously.***

F. Professional Services Agreement with SCJ Alliance for Johnson/Sanders Intersection

The City received \$300,000 in State money to assist with the mitigation on the Johnson/Sanders intersection. This contract is for design of the improvements. The consultant will work on the best way to mitigate the intersection and will involve public feedback. They are required to look at options before using funds. The design is \$97,000. Additional grant money will be requested from the Chelan-Douglas Transportation Council.

**Motion to authorize the Mayor to finalize and execute the Professional Services Agreement with SCJ Alliance for the design of traffic improvements at Johnson Avenue and Sanders Street intersection.**

Moved by Councilmember Isenhart, seconded by Councilmember Allen.

***Motion passed unanimously.***

G. City Utilities in County Right-of-Way Franchise Agreement

The City currently owns and operates Domestic Water and Sanitary Sewer Facilities in Chelan County right-of-way without a Franchise Agreement in place. City of Chelan staff submitted a franchise application with Chelan County for domestic water and sanitary sewer facilities in County right-of-way (ROW) in January 2019 as required by Chapter 8.25 in the Chelan County Code. The proposed franchise is structured as a blanket agreement to cover all City facilities within County ROW. In lieu of the City paying a \$450 ROW permit fee each time the City works within County ROW, there is an annual fee in place of \$2,500.

**Motion to authorize the Mayor to finalize and execute the proposed Resolution by Chelan County granting a franchise to the City of Chelan for Domestic Water and Sanitary Sewer Facilities on County Rights-of-Way.**

Moved by Councilmember Dobbs, seconded by Councilmember Witt.

***Motion passed unanimously.***

9. ADMINISTRATIVE REPORTS

A. Draft Skatepark/Pump track Design Agreement

City Administrator Jackson presented a video produced in Leavenworth regarding a pump track that was installed in their community. A pump track is a series of hills and turns that allows skaters and bicyclists to keep their momentum without pedaling. Councilmember Allen reported that the Red Bull Pump Track Championship will be held in Leavenworth on May 26, 2019 and she highly recommends attending. Leavenworth's pump track was implemented through community support for about \$150K. Their Chamber assisted as a funding source.

On May 14, 2019, a motion consideration will be brought to Council for a contract with American Ramp Company to provide the conceptual design services for construction of the pump track to the existing skatepark located in Don Morse Park. The cost of \$7,500 is included in the 2019 budget. Councilmembers provided comments including liability, cost, funding sources, and community support.

B. 2018 Year End Financial Report

Finance Director Thornton provided the ending balances of the 2018 Budget.

C. Water Comprehensive Plan Update

Will Kirby, Gray and Osborne, Inc., provided a brief overview of the City's Water

Comprehensive Plan. It is a long-term planning strategy that determines what will be required to meet the City's infrastructure needs over the next 20 years. The draft Plan is available for viewing in the Public Works Department. The Plan will be brought to Council on May 14, 2019 for adoption.

10. INFORMATIONAL ITEMS

**These items are for informational purposes only and are generally not discussed.**

A. Tentative Advanced Agenda

11. MAYOR AND COUNCIL COMMENTS

A. Councilmember Allen

- The PFD will meet on April 25, 2019 at noon. The Lake Chelan Chamber of Commerce will be requesting \$5,000 for assistance for the 4th of July fireworks.
- Attended the Flywheel Conference which is a full-day event that promotes bringing entrepreneurs into the area. One company out of Cashmere, Beta Hatch, will raise meal worms for livestock feed, won first prize and was awarded \$135,000.
- Encouraged everyone to attend the April 29, 2019 drug program focusing on our youth.
- The annual "Shine On" dinner and auction in memory of Kelly's son will be held May 10, 2019. Last year over \$65,000 was raised for scholarships for our youth.

B. Councilmember Dobbs

- Thanked Councilmember Allen for attending the Port District meetings over the winter when he was unable to attend. The funding for Pangborn Airport is an issue. Their operation is \$.5M per year and Douglas County Port has said they don't have the funds for this. Chelan and Douglas Port Districts formed a task force to try to figure out what to do about Pangborn. One option is the consolidation of both Port Districts where they can save \$380K off the top of operational money. They may possibly do this as early as June 1, 2019 but no later than January 2020.
- Attended the Link Transit meeting. They may be a viable owner for the Airport. It's a public transit benefit area and they can access sales tax revenue.
- The Port also discussed the Kelly Trust property. Attorney Pete Fraley is working on the water options to attain fireflow out to the Airport.

C. Councilmember Hollingsworth

- Julie Brunner was here for several days. It was good to have Councilmember Robledo and other community members attend the workshops. We have our work cut out for us as a community to come up with some ways to get inexpensive housing built. We have a good plan and he applauds City Planner Gildroy's efforts on this. He will keep everyone posted in the future.

D. Councilmember Isenhardt

- Had a wonderful time in Maui, returning home just this morning, so does not have a committee report.
- Made a declaration to encourage people to run for Council. She will not run this year and is a strong believer in term limits. She will finish out her two

terms on the Council and stated that she has had a wonderful time and it's been exciting and educational. It can be hard when you may vote against something and later support it. Government by the people is made possible.

E. Councilmember Robledo

- Attended a crash course on the Chelan Valley Housing Trust. There is a lot of content in Julie Brunner's presentations, sometimes too much to comprehend, but this time she explained it better. He feels more prepared to help the community members understand what we are trying to achieve.

F. Councilmember Witt

- The Solid Waste meeting will be held next Monday.
- On April 29, 2019 a group will speak about drug use involving our youth. Councilmembers are encouraged to attend. The medical leadership in the community will attend to discuss opiate problems. It will be held at Chelan High School Performing Arts Center with dinner at 5:15 p.m. and presentations beginning at 6:00 p.m. The Lake Chelan School District website contains information about this event.

G. Mayor Cooney

- There will be an all Spanish Housing Trust meeting on May 29, 2019 at the Chelan Senior Center. The Housing Trust Board feels that this is an effort that crosses races, income, etc. This meeting will be all in Spanish. It could be a very uniting force in the community.
- Recognized the staff for working long days on Council meeting days as they are here from early in the morning until late at night.
- Spent Earth Day at the Seattle transfer station that was interactive and educational. We generate an enormous amount of garbage.
- The Chelan Earth Day Fair was great.
- Encouraged everyone to walk down to the Woodin Avenue Bridge and see the general concept. It's about one-third of the way complete. The workers are there non-stop and he called Selland Construction earlier today to thank them.
- A bike path planning meeting will be held tomorrow, April 24, 2019 at the Chelan Senior Center at 3:00 p.m. Another one will be held on May 8 at 3:00 p.m. They will take input from cyclists. The project will be dovetailed into the WSDOT highway paving project and the City bike and pedestrian plans.

12. CITY ADMINISTRATOR/DEPARTMENT REPORTS

A. City Administrator Jackson

- The Arbor Day celebration last Thursday went well and he congratulated Kim Fogle for her work on the event. The Moe Elementary 5th graders attended. It was a nice event for the Parks and City. Hats off to them!
- Working with Prothman on a proposal for the Parks & Recreation Maintenance Management & Facilities Plan. They have some seasoned Parks and Recreation Directors helping to put together a proposal and developing a job description prior to hiring the new Parks Director. This will be brought to Council on May 14, 2019. They are looking at moving the Parks maintenance operations to Public Works. It will take about 30-45 days until the Director position opening is announced. The salary savings due to the vacancy will cover the cost of this plan.

B. City Clerk Gallucci

- Everyone planning to attend the Association of Washington Cities (AWC) Conference has been registered in the conference hotel. We need three voting delegates and a flag bearer for the parade of flags.

- City Council will not meet on June 25, 2019 due to the AWC Conference as there will not be a quorum.
- The Mayor added that he would like to send Peri Gallucci to AWC this year as City Clerks do attend this conference.

C. Finance Director Thornton

- None.

D. Planning Director Gildroy

- They are going forward with the Wayfinding Sign Project. If anyone wants to be interviewed by the consultant on May 16, please let him know.

E. Public Works Director Youngren

- None.

13. RECESS - AIRPORT BOARD MEETING

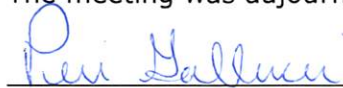
- A. The City Council meeting was recessed at 8:29 p.m. to allow the Mayor and Councilmembers to participate in the Airport Board meeting. The Council meeting reconvened at 8:30 p.m. following adjournment of the Airport Board meeting.

14. EXECUTIVE SESSION

- A. None.

15. ADJOURNMENT

The meeting was adjourned at 8:30 p.m.

  
 Peri Gallucci  
 City Clerk

  
 Michael Cooney  
 Mayor

DATE APPROVED  
 BY COUNCIL:

May 14, 2019



# North Central

## WASHINGTON

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**A2**

Sunday, May 19, 2019

# Chelan looks to improve water use efficiency

 By **BRIDGET MIRE**  
 World staff writer

**CHELAN** — The city is trying to cut back on its water use and reduce the amount lost to leaks.

Two main goals will be included in Chelan's Water System Plan:

◆ Maintain distribution system leakage below 10 percent for the next six years.

◆ Reduce average daily demand by 5 percent by Dec. 31, 2024.

City Council must approve

the plan, Public Works Director Jake Youngren said.

Youngren said the average daily water use is about 193 gallons per person, and the city's average daily production last year was about 1.5 million gallons.

"We see massive seasonal fluctuation, so averaging the amount works but doesn't totally tell the whole story," he said.

"(Water use) is far greater in the summer."

Distribution system leakage had a three-year average of 8.9 percent, he said.

Youngren said the city's water system has 2,322 connections, including houses, apartments, schools, commercial and municipal facilities.

The goals will increase efficiency without costing the city a lot of money, he said.



**Jake Youngren**  
Chelan's public works director

"And then there's obviously other goals that increase efficiency that do cost money, like repairing leaks, upgrading the infrastructure and things like that," he said. "If we see unusual water consumption information when we read meters, we'll notify the homeowner that there may be a leak and they'll, most of the time, have that fixed."

Use history is also included on water bills.

Youngren said residents can help the city reach its goals.

"They can use fixtures that

are efficient — shower heads, faucets and toilets that are efficient or low-usage," he said. "Be cognizant of irrigation and how much is really needed."

The state Legislature in 2003 passed the Municipal Water Law requiring municipalities to use water efficiently. They must publicly establish goals, develop a program to support those goals, and annually evaluate and report progress toward the goals.

Bridget Mire: 665-1179  
 mire@wenatcheeworld.com

# NOT A DRY RUN



## **APPENDIX P**

### **Water System Plan Approval**



## CITY OF CHELAN

CITY COUNCIL

28 May 2019

Subject/Title: Water Comprehensive Plan Adoption  
Department: Public Works  
Staff Contact: Jake Youngren  
Reviewed By: City Administrator

### GOVERNING LEGISLATION

WAC 246-290-100 Water system plan. (1) The purpose of this section is to establish a uniform process for purveyors to:

(a) Demonstrate system capacity as defined in WAC 246-290-010; (b) Demonstrate how the system will address present and future needs in a manner consistent with other relevant plans and local, state, and federal laws, including applicable land use plans; (c) Establish eligibility for funding under chapter 246-296 WAC....

### PREVIOUS COUNCIL ACTION TAKEN

On April 23, 2019, a Public Hearing was held on Water Use Efficiency Goals. An Administrative Report was also provided on the Water Comprehensive Plan.

### OVERVIEW

The 2018 City of Chelan Water System Plan (Plan) provides a long-term planning strategy for the City's water department over 10-year and 20-year planning periods. The objectives of this Plan are to evaluate the performance and adequacy of the existing City of Chelan Water system, to determine what will be necessary to meet the infrastructure demands for the next twenty years, and to identify the compliance issues that may effect operation of the water system. In addition, the Plan incorporates the elements of the Municipal Water Supply – Efficiency Requirements Act, Chapter 5 Laws of 2003 and the Water Use Efficiency Rule (WUE Rule), which were adopted in January 2007. The Plan was prepared in accordance with the Washington State Department of Health (DOH) requirements specified in Washington Administrative Code (WAC) 246-290.

The following elements are addressed in this Plan:

- Chapter 1: Water system history, inventory of facilities, policies and the relationship of this plan to other planning documents.
- Chapter 2: Basic planning data including existing and future estimates of population, water production, and water consumption.
- Chapter 3: Identification of system performance standards, and facility analyses of source capacity, water rights, storage capacity, booster pumping stations, treatment and distribution. Overview of water quality standards, monitoring results, and a schedule of future monitoring requirements. Analysis of distribution system hydraulic capacity to meet existing and future peak hour demand and fire flow demand.
- Chapter 4: Water Use Efficiency Program. Discussion of existing and future water conservation measures.
- Chapter 5: Watershed Control Program description and management plan.
- Chapter 6: The Operation and Maintenance section contains an analysis of existing operation and maintenance procedures, cross connection control program, coli form monitoring plan, and recommendations for improvements to the operation and maintenance of the water system.
- Chapter 7: Distribution facilities design and construction standards.
- Chapter 8: Discussion of proposed capital improvements to address system deficiencies and a 6- and 20-year financial plan for improvements identified in Chapter 8 along with identification of potential funding mechanisms.
- Chapter 9: Discussion of past, current, and ongoing efforts to establish and modernize the City of Chelan's water rates.
- Appendices: Additional required planning elements, including: water rights, construction standards, water quality monitoring documents, power outage information, modeling data, preliminary cost estimates, watershed plan, operator certifications, cross-connection control documents, the unsatisfactory routine coli form sample procedure, Rate Structure analysis by FCS Group, SEPA documentation, governmental consistency statements, notifications to local utilities and public meeting documentation.

## FINANCIAL IMPLICATIONS

None.

## ATTACHMENTS

1. Water Comprehensive Plan

## SUGGESTED MOTION

Suggested Motion: I move to adopt the Water Comprehensive Plan contingent on Washington State Department of Health approval.



# North Central

## WASHINGTON

Page  
**A2**

Thursday, May 30, 2019

# Technical problems shorten school board meeting

*Meeting planned Tuesday*

**McDANIELS**  
staff writer

EE —  
culties that  
concerns  
day's  
chool Board  
quick end.  
ive board  
resident Sunny  
Vice President  
— were present  
g. Sarah Knox  
t Michele  
Karina Vega

Villa planned to attend the meeting by phone.

State law requires a quorum of three of the five members to be present — physically or virtually — to conduct official business.

Sandberg's phone connection was severed several times and she had trouble hearing what was being said when she was connected. Vega Villa was able to see and hear the meeting's livestream video, she said, but a problem with

her phone connection and a delay made comments, questions and voting problematic.

With two hours worth of presentations planned, the set-up created concerns.

"If at some point we lose our quorum, we have to stop the meeting," Hemphill said.

After trying a variety of technical options that didn't improve the connections, she called the meeting — about 25 minutes after it started.

"I'm sorry folks," she said.

Board members will pick up where they left off at a special meeting starting

at 4 p.m. Tuesday in the district office, taking care of field trip requests and some contracts pulled from the consent agenda for further discussion, along with an update on the 10-year capital projects plan.

Other presentations from Tuesday's agenda are being rescheduled for the next regular meeting on June 11. Those items include the district learning team update, budget status and enrollment reports, as well as ASB reports. The special education department update will be rescheduled at a later date.

A group of teachers and school district employees cut short in addressing the board about restoring budget cuts with a Legislature-approved lift of the local levy cap also will have an opportunity to have their say at both the Tuesday and June 11 meetings. A time for citizen comment is included on both agendas.

"It's a very awkward meeting operation," Jaecks said of the phone-in technical problems. "This isn't fair to the people who are coming to speak to the board and it's an atrocious way to conduct government business."

## DEER-LICIOUS





workshop between the county commissioners and their staff, Community Development Director Dave Kuhl said. The county will hold public hearings where testimony can be given on vacation rentals at a later date.

The first public hearing will in front of the Chelan County Planning Commission from 7 to 9 p.m., July 24 at the Chelan County Administrative Building on 400 Douglas St., Wenatchee, according to the county website.

Vacation rentals have been a hot button issue in Chelan County. The city of Leavenworth has a partial ban on vacation rentals and the Manson Urban Growth Area has regulations.

The city of Leavenworth ban actually extends from a law created in 1987. The city started applying it in 2016 and hired a security company to gather information about properties listed as vacation rentals and send notices to the owners about the ban.

Manson also has regulations on vacation rentals, according to previous Wenatchee World reporting. Manson resides in unincorporated Chelan County.

Properties that are occupied for less than 30 days must pay a \$100 county permit fee, be supervised by a local manager, and control noise, parking and trash, according to previous Wenatchee World reporting.

Tony Buhr: 664-7123  
buhr@wenatcheeworld.com or  
On Twitter @TonyBuhr

**WENATCHEE** — It was a packed house Tuesday night for a hearing on a plan trying to balance the interests of cross-country skiers and snowmobilers in the Squilchuck and Stemilt basins.

The plan was developed by the Chelan County Natural Resource Department with input from state agencies, said Erin McKay, county natural resource specialist. It outlines a management strategy for recreational uses in the area, as well as future goals for development for things such as parking areas, campgrounds and shooting ranges.

The Chelan County Commission will consider adopting the plan from 6 to 8 p.m. Tuesday, at the Confluence Technology Center.

Almost 50 people attended the Tuesday hearing and at least eight out of the 11 people who spoke expressed concern about limitations the plan would place on snowmobilers.

"I've been using the area we're talking about since I was almost 5 years old," said Delbert Hankins, of Wenatchee. "And I've put a foot on almost every inch of that ground. To have somebody tell me that I have to

and I can't use it anymore is ridiculous to me."

The Stemilt-Squilchuck Recreation Plan covers 17,000 acres, according to county documents. The land is owned by multiple agencies including Chelan County, the state departments of Natural Resources and Fish and Wildlife, as well as the U.S. Forest Service.

The current plan is a compromise agreement between motorized and non-motorized users and would reserve 3,026 acres for non-motorized use, such as cross-country skiing and snowshoeing, McKay said. The non-motorized use area would include land around Lake Clara, over to the Stemilt-Squilchuck State Park and down to Upper Wheeler Reservoir.

It is this part of the plan that has received the most comments from the public, McKay said. Both motorized and non-motorized users are unhappy with the compromise.

The El Sendero Backcountry Ski and Snowshoe Club wanted 4,535 acres for non-motorized use and quit participating in the plan development over the compromise, she said. The motorized users originally offered only 1,882 acres.

One of the areas that snowmobilers

to is a series of bowls and open terrain east of Mission Ridge, she said.

Tom Hendrickson, of Cashmere, said he started participating in the development of the plan because he didn't feel the snowmobilers were being adequately represented.

The land should remain open for all users, Hendrickson said. Snowmobilers have never asked that non-motorized users be denied access.

"Why do we need to mandate that someone can't use part of that land?" Hendrickson asked.

Matthew Crane, of Wenatchee, said he and his wife live near the recreation area and like to snowshoe and hike there. He and his wife appreciate solitude in the wilderness and he thinks the compromise plan is a good idea.

"One of the things that is really important to us is the quietude," Crane said. "It seems to me that setting aside a non-motorized area is very much of what I value and what I appreciate and what my wife and I love about Wenatchee."

Tony Buhr: 664-7123  
buhr@wenatcheeworld.com

## Briefly

### CHELAN

#### Chelan OKs water plan

City Council on Tuesday approved Chelan's Water System Plan, which includes trying to improve water-use efficiency.

Two main goals are in the plan:  
◆ Maintain distribution system leakage below 10 percent for the next six years.

◆ Reduce average daily demand by 5 percent by Dec. 31, 2024.

Public Works Director Jake Youngren said the average daily water use is about 193 gallons per person, and the city's average daily production last year was

about 1.5 million gallons. Distribution system leakage had a three-year average of 8.9 percent, he said.

Youngren said the city's water system has 2,322 connections, including houses, apartments, schools, commercial and municipal facilities.

The state Legislature in 2003 passed the Municipal Water Law requiring municipalities to use water efficiently. They must publicly establish goals, develop a program to support those goals, and annually evaluate and report progress toward the goals.

— Bridget Mire, World staff

### QUINCY

#### UW Marching Band to play concert

The University of Washington's Husky Marching Band will perform a

"Thank You Celebration" at Quincy High School on June 2.

Last November, one of the buses carrying the UW Husky Marching Band had an accident near George Cup. Dozens of people turned up at George Elementary to shelter and feed UW students stranded after the crash.

The celebration seeks to help UW thank the Quincy Valley community for its help in the crash's aftermath, and it will include a performance by the university's band, remarks by UW President Ana Mari Cauce, a video message from UW Athletics, and a free barbecue afterward.

The celebration will begin at 3 p.m.  
— Quincy Valley Post-Register

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**CITY OF CHELAN**  
**City Council Meeting - May 28, 2019**

**COUNCIL AND ADMINISTRATIVE PERSONNEL PRESENT**

**Mayor:**

Michael Cooney

**Councilmembers:**

Ray Dobbs  
Tim Hollingsworth  
Wendy Isenhardt  
Erin McCardle  
Servando Robledo  
Ty Witt

**Staff Present:**

City Administrator Mike Jackson  
City Attorney Quentin Batjer  
City Clerk Peri Gallucci  
Finance Director Thornton  
Public Works Director Jake Youngren  
Receptionist/Clerical Assistant Patty Michajla

**Excused Absence:**

Kelly Allen

1. CALL TO ORDER, PLEDGE OF ALLEGIANCE, ROLL CALL

**The meeting was called to order at 6:00 p.m.**

2. AGENDA CHANGES

A. None.

3. CITIZEN COMMENTS

**Items not on the agenda. Time limited per the Mayor.**

- A. Stan Morse, Chelan, stated his concerns regarding the vehicles that parked in his Lakeside neighborhood during Memorial Weekend. His concerns centered around fire danger and limited access for fire trucks. He requested that local access barriers be provided on future holiday weekends similar to what the City provides for the streets near Don Morse Park to prevent the extra vehicular traffic on those private streets.
- B. John Olson, Chelan, recently provided testimony to the Link Transit Board in Wenatchee. He shared that letter with City Council which addresses his desire for the City of Chelan to be more prepared for the future regarding transportation and lake access.

4. MINUTES

- A. May 7, 2019 Minutes of the City Council Workshop
- B. May 14, 2019 Minutes of the City Council Regular Meeting

**Motion to approve the minutes.**

Moved by Councilmember Isenhardt, seconded by Councilmember Witt.

***Motion passed unanimously.***

5. CONSENT AGENDA

**All items under the Consent Agenda are approved with one motion.**

- A. May 28, 2019 Claim Warrants No. 92419 - 92498 totaling \$1,685,976.90 and Payroll Warrants No. 55012 - 55112 totaling \$211,964.46.
- B. Excuse Councilmember Allen from the May 28, 2019 City Council Meeting

**Motion to approve the consent agenda.**

Moved by Councilmember Witt, seconded by Councilmember Isenhardt.

***Motion passed unanimously.***

6. SPECIAL PRESENTATIONS

A. American Viticulture Area Proclamation

Mayor Cooney read the American Viticulture Area (AVA) Proclamation in celebration of the ten years since Chelan Valley became a member of the AVA. Four representatives from the AVA attended, including Cheryl Nelson, Shane Collins, Lacey Lybecker, and Denny Evans. There will be a weekend long event including a welcome reception on June 7, 2019 from 6-8 p.m. at the Chamber, and two tasting seminars on June 8, 2019. A grand tasting will be held on June 8, 2019 including 23 wineries and six restaurants.

B. Port of Chelan & Port of Douglas County Consolidation Update

Rory Turner, Port of Chelan County Commissioner, Monica Lough, Port of Chelan County Director of Finance and Administration, Lisa Parks, Port of Douglas County Executive Director, and Jim Huffman, Port of Douglas County Commissioner attended on behalf of the two County Ports to engage in a conversation regarding the consolidation of the two Ports.

This consolidation effort is to minimize the loss of funds at Pangborn Airport. The two Ports are working on governing and funding and a task force reached out to members of the community. The vote will take place in June and the consolidation will take effect in January 2020 with meetings twice per month. Both Port Districts will remain and be elected by their respective districts. There would be reduction in staffing, including Ms. Park's Executive Director position. Joint operating procedures were explained.

7. PUBLIC HEARINGS

A. Six Year Transportation Improvement Plan Public Hearing

In order to qualify for State and Federal grants, the City is required to adopt a Six Year Transportation Improvement Plan. A public hearing is also required prior to adoption. The Plan was presented by Public Works Director Youngren who indicated that it can be amended.

Councilmembers provided input regarding downtown alleys; delivery trucks unable to park in alleys due to low powerlines; Farnham and Johnson/Sanders intersections; traffic corridors and alternate routes through town; crosswalks; Boyd Road; and striping in front of the Post Office. Mayor Cooney suggested that Council discuss



further during a workshop to evaluate and modify the list to make it more of an active planning document.

The Public Hearing was opened at 6:55 p.m. There was no testimony. The Public Hearing was closed at 6:56 p.m.

## 8. MOTION CONSIDERATIONS

### A. Thrive Funding Reallocation Request

Thrive originally requested \$13,000 plus \$7,000 for transportation costs from the 2019 City of Chelan budget. Since those funds were approved by Council, Thrive no longer needs the transportation funding as they received a donated van. Amy Davis, Executive Director, has submitted a request to use the \$7,000 for alternate expenditures for the Center.

**Motion to allow Thrive to reallocate the transportation funds for other necessary expenditures.**

Moved by Councilmember Dobbs, seconded by Councilmember Robledo.

***Motion passed unanimously.***

### B. Lift Stations Improvement Project Construction Services Agreement - Amendment No. 1

Gray and Osborn Engineers has submitted Amendment No. 1 for Construction Management Services associated with the incorporation of Lift Station No. 7 into the re-bid package as well as office and field support services during construction. Public Works Director Youngren provided an overview of the management service tasks at an estimated cost of \$27,960.

**Motion to authorize the Mayor to finalize and execute Construction Services Amendment No. 1 with Gray & Osborne Engineers for the Lift Stations Improvement Project.**

Moved by Councilmember Isenhardt, seconded by Councilmember McCardle.

***Motion passed unanimously.***

### C. Water Comprehensive Plan Adoption

The 2018 City of Chelan Water System Plan provides a long-term planning strategy for the City's water department over 10-year and 20-year planning periods. The objectives of this Plan are to evaluate the performance and adequacy of the existing City of Chelan water system, to determine what will be necessary to meet the infrastructure demands for the next twenty years, and to identify the compliance issues that may affect operation of the water system. On April 23, 2019, a Public Hearing was held, in addition to an Administrative Report, on Water Use Efficiency Goals.

**Motion to adopt the Water Comprehensive Plan contingent on Washington State Department of Health approval.**

Moved by Councilmember Isenhardt, seconded by Councilmember McCardle.

***Motion passed unanimously.***

## 9. ADMINISTRATIVE REPORTS

A. Woodin Avenue Landing Park Stairs Discussion

Public Works Director Youngren provided an explanation of the Woodin Avenue Landing Park stairs that were initially included in the original park design. In the spirit of the partnership with the City, he felt that Council should be made aware that it has been decided to not include stairs along with the ramp. Councilmember McCardle explained that the HDCA looked at the views that would be blocked by a staircase and that they had decided to not be included in the project.

10. INFORMATIONAL ITEMS

**These items are for informational purposes only and are generally not discussed.**

A. Tentative Advanced Agenda

11. MAYOR AND COUNCIL COMMENTS

A. Councilmember Dobbs

- Link Transit passed a request for \$38,500 to fund shuttle service in Chelan from July 4 to September, only for this year. General Manager Richard DeRock wants to see a minimum ridership of five per hour. City Administrator Jackson added that this shuttle concept can be added to the 2020 RCO grant application as they had voiced a concern regarding parking. Councilmember Dobbs would like to see the City invest money to exceed the ridership so that it can be offered again next year. He asked Council to approve \$2,500 from marketing and advertising to promote riding the bus. Councilmember Isenhardt suggested adding this advertising to all in-house publications. **Councilmember Dobbs moved to approve the appropriation of \$2,500 this summer from marketing and advertising to promote Link Transit ridership. Councilmember Isenhardt seconded the motion. It was passed unanimously.** City Administrator Jackson indicated that the City would commit to find the funds in the budget. Councilmember McCardle wants the advertising to indicate where and when to locate the shuttles. Signage and parking spaces will need to be provided for riders. City Administrator Jackson stated that staff time will be needed to promote the advertising.

B. Councilmember Hollingsworth

- Councilmember Hollingsworth stated that parking is a big problem at the parks and suggested that the City provide more temporary stalls so people can drop off large groups, family members and belongings and then find parking elsewhere.
- The Woodin Avenue Bridge looks nice with all of the new plants.
- Received letter from Mike Kaputa regarding the Watershed Planning Committee. Mike Steele was instrumental and secured significant funding from DOE to move forward the water supply solutions that have been holding up the water rights considerations. Some solutions will require studies but the \$464,000 will go a long way to get the process moving forward again.

C. Councilmember Isenhardt

- Thanked the Mayor for letting her take his place at the Memorial Day Visitors Center. The family of Saul Gallegos attended, along with sheriffs and first responders. There were five marching bands and it was a wonderful parade. She asked why Chelan doesn't have a float and stated that she will volunteer to start one as she wants a presence in parades as other cities have floats.

- The Cascadia Conservation District is happy to hear that their chipping was well received. There are lots of programs for kids in the forest and kids in the river, but where is Chelan's "Kids in the Lake" program?
- She wants to keep working on the small boat harbor project proposal. If we still have permits that were taken out when we did our Don Morse permit, then we should move forward.

D. Councilmember McCardle

- Every year she works with 4th grade students to bring them into the Council Chambers to see how a Council works. She proposed two dates and would like to have more representation. It was decided that the morning of June 11, 2019 works for Councilmembers Robledo and Isenhardt and Mayor Cooney. Councilmember Hollingsworth will be an alternate.
- Memorial Day was uneventful. The traffic camera on the bridge showed a lot of confused people pulling into Campbells.

E. Councilmember Robledo

- Attended the HDCA board meeting which was one of the most interesting and engaged board meetings. He applauded Councilmember McCardle.

F. Councilmember Witt

- Spoke about Horseshoe Park behind the ballfields that is PUD land near the dam. Rotary will be taking on this centennial project to revitalize and clean up the park for events, BBQs, etc. The land was previously maintained by the Eagles and he plans to attend their meeting later this evening to address the Rotary's request to let them take over the maintenance.
- Noticed a lot of police that were contracted over the Memorial Weekend.
- He will miss the June 4, 2019 City Council Workshop.

G. Mayor Cooney

- Attended a meeting in Wenatchee involving representatives from Microsoft regarding purchasing power from Chelan County PUD for their main campus and some of their auxiliary campuses. Top executives and mayors attended to make a connection.
- Echoed Councilmember Witt's comments regarding the contracted law enforcement during the Memorial Weekend. Everything was handled well with their presence and there were no major incidents.

12. CITY ADMINISTRATOR/DEPARTMENT REPORTS

A. City Administrator Jackson

- Jim Brennan was here recently to look at city right-of-ways, parking, and bike paths. Ten acres of property at Spader Bay has been for sale. Mr. Brennan can put together a scope of work, concept plan and look at feasibility to determine how the site can be used for trails, access, etc. Public input will be requested. The plan will cost \$15,000. Councilmembers provided comments regarding the property including scenic area, recreational value, potential water access, access points, and dead-end road lake access.

B. Finance Director Thornton

- Passed.

C. Public Works Director Youngren

- Passed.

13. RECESS - AIRPORT BOARD MEETING

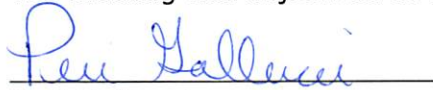
- A. The City Council meeting was recessed at 7:57 p.m. to allow the Mayor and Councilmembers to participate in the Airport Board meeting. The Council meeting reconvened at 7:58 p.m. following adjournment of the Airport Board meeting.

14. EXECUTIVE SESSION

- A. None.

15. ADJOURNMENT

The meeting was adjourned at 7:58 p.m.



Peri Gallucci  
City Clerk



Michael Cooney  
Mayor

DATE APPROVED  
BY COUNCIL:

June 11, 2019