City of Tillamook
The Dairylands

City of Tillamook
Oregon

Master Water Plan

2014

Final Draft
5-11-2015

Boatwright Engineering, Inc.
Salem, Oregon

City of Tillamook
Oregon

Master Water Plan

2014

Boatwright Engineering, Inc.
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INDEX

Chapter 1
Introduction

Chapter ONE: **Introduction**

1.1 Background

Previous Plan: **Tillamook Water Commission**
Water System Master Plan
April 1997
Lee Engineering, Inc.,
Oregon City, Oregon

In 1997, The Tillamook Water Commission received the current Water System Master Plan. That plan is nearing the end of its intended lifespan.

The Tillamook City Charter established The Water Commission in 1905 to provide drinking water services for the city. In 1999, the City of Tillamook took over the operation and management of the water system from the Commission and operates it under the City's Public Works Department. Water is provided to residents and businesses within the city limits, several services within the Urban Growth Boundary, rural services along the transmission mains. Surplus water is also sold to eleven surrounding independent water districts and to the Port of Tillamook Bay which operates the airport and industrial lands located on the former Tillamook Naval Air Station south of the city.

1.2 Scope of Study

The purpose of this study is to provide the City of Tillamook with a Water Master Plan that will be in compliance with Oregon Administrative Rules OAR 333-061-0060 as delineated in Appendix B of the State of Oregon's *Guidelines for the Preparation of Planning Documents for Developing Community Water System Projects.*

This study will edit and update the evaluations of the 1997 plan and compile new data that reflects additions to the system, changes in the operation of the system, and changes in jurisdictional requirements that have occurred in the interim. A new schedule of capital improvements will be completed which will be based on current needs and projected long-term growth and demand.

The specific tasks to be undertaken are:

1. Describe the existing system including the pipelines and facilities, service area and its characteristics, supply sources, water rights, water quality, compliance with regulatory standards, use quantities, and general operation and maintenance.

2. Evaluate capacity and quality to meet future service goals, including existing and future regulatory requirements, flow and pressure requirements, and fire flows.

3. Assess the projected growth of the water system over the time covered by the Master Plan and the impacts that growth will have on the system and sources and the availability to serve the City's customers.

4. Provide an engineering evaluation of the entire existing water system, including sources, treatment, storage, distribution, operation, and maintenance. This evaluation will address the City's ability to meet water quality and service requirements and identify any existing deficiencies or future deficits projected to occur within the 20-year life of the Master Plan.

5. Describe and evaluate the current water rights to determine additional water availability and the impacts of drinking water quality regulations. Assess existing and future outside pressures and regulations which affect surface water sources.

6. Provide a list of engineering alternatives to correct identified current and future system deficiencies and expansion, along with capital and operation and maintenance costs.

7. Prepare, in conjunction with the Oregon Association of Water Utilities, a financing plan to fund water system improvement, including a Rate Study.

8. Prepare an improvement program which utilizes the recommended alternatives and includes maps of the proposed facilities, the recommended financing alternative and a schedule for design and construction.

9. Provide the City with paper and electronic copies of the Master Plan and all supporting documents, maps, tables, and calculations.

10. Assist the City with the development of governance and contractual relationship documents with the Service Districts.

11. Research, tabulate, and map the City's water line easements.

NOTE: *To facilitate a cost savings to the City, information, data, evaluations and text contained within the 1997 study that are still factual and pertinent are included in this current study.*

1.3 Authorization

This Mater Plan was authorized by the City of Tillamook under Contract for 2013 Water Master Plan & Rate Study with Additional Services, signed by the Mayor of Tillamook on May 23, 2013.

This master plan was partially financed by the Oregon Infrastructure Financing Authority.

1.4 Acknowledgements

Individuals involved in the preparation, review, and implementation of this Study include:

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   Randy Foshee, City Councilor, Ward 2
   Cheryl Davy, City Councilor, Ward 3
   Aaron Burris, City Councilor, Ward 4
   John Sandusky, City Councilor, Ward 5
   Doug Henson, City Councilor, Ward 6

   Paul Wyntergreen, City Manager
   Tim Lyda, Public Works Director
   Shawn Burge, Water Department Supervisor
   Yuriy Ukhach, Water Division Clerk

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3. Oregon Association of Water Utilities

   Jason Green, Executive Director
   Tim Tice, Project Manager

Chapter 2
Planning Period, Area, & Population

Chapter TWO: **Planning Period, Area & Population**

2.1 Period of Study

This Master Plan will cover the 20-year period from 2014 to 2034.

2.2 Planning Area

2.2.1 Existing Service Area

The City of Tillamook provides water to all properties within the City of Tillamook city limits. Some added individual services are provided outside the city limits. These are located along the route of the transmission mains from the Killam Creek and Fawcett Creek sources and most of these hook-ups were provided in exchange for access easements from property owners in the early decades of the 20th century.

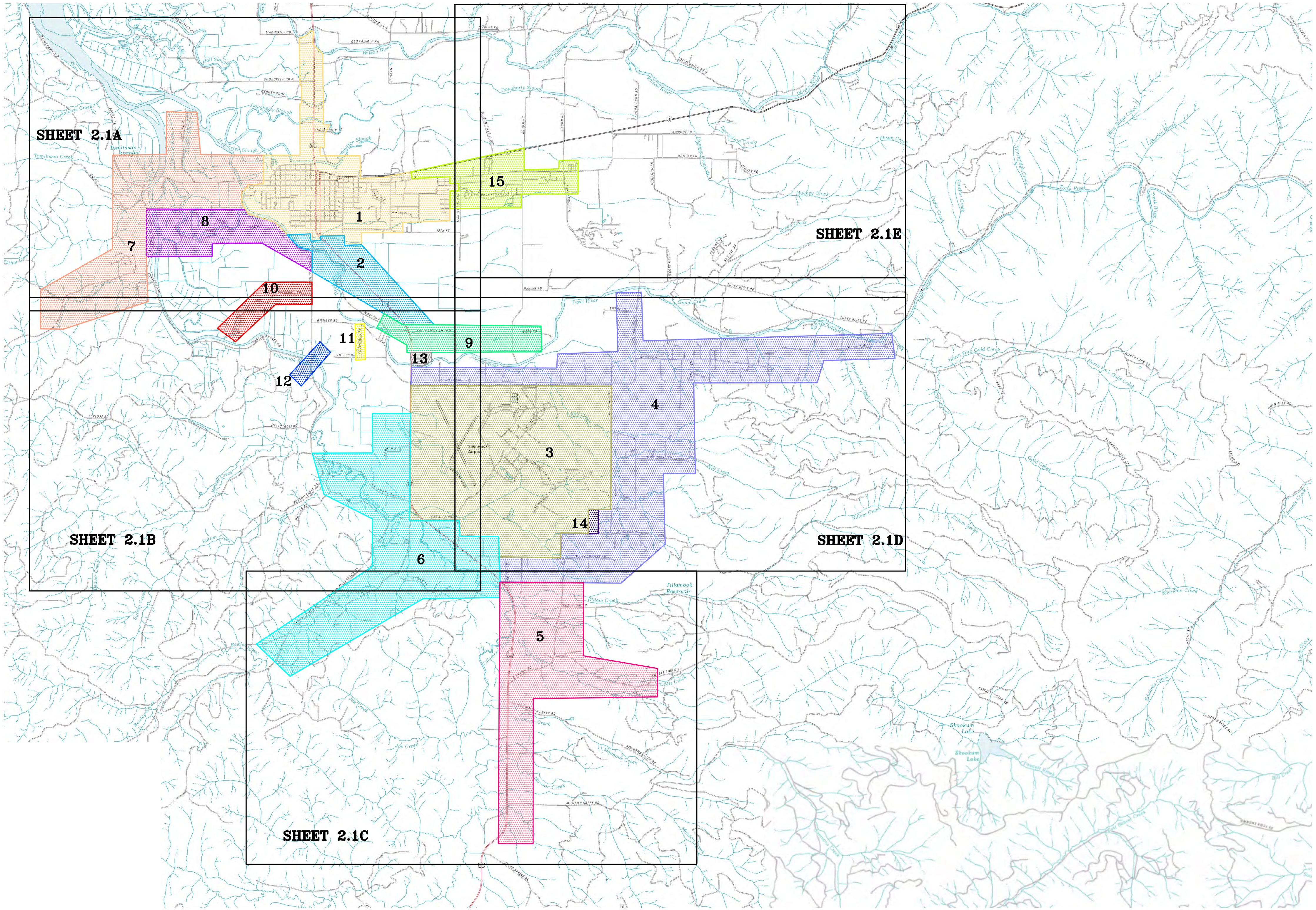
Currently, the City provides surplus water to eleven rural water districts which fringe the City to the west, south and southeast. More than half of these are adjacent to the surface water transmission mains, thereby enabling the districts to access the treated water as it passes towards the City. See **Table 2-1**.

TABLE 2-1

TILLAMOOK SERVICE DISTRICTS

District	Oregon Health Authority Public Water System ID No.	1996 Services	2013 Services
Baseline Water Cooperative	-----	3	6
Fitzpatrick Water Association	01414	14	20
Highway 101 South Water District	-----	4	4
Hunt Water District	00888	24	22
Long Prairie Water District	00890	257	268
Pleasant Valley Water Company	00884	175	245
Rogers Waterline Users Association	06072	16	13
South Prairie Water Association	00892	120	122
Tillamook River Water District	05437	6	8
Tone Water District	01035	32	28
West Hills Water Company, Inc.	00895	173	100
TOTAL		**824**	**836**
Port of Tillamook Bay	01329		53 Industrial

As of December 2013, the City provides water to 2005 services within the City and to individual customers outside the City. The Port of Tillamook Bay facilities at the former Naval Air Station has 53 industrial services. Altogether, the eleven water



WATER DISTRICTS

1. CITY OF TILLAMOOK
2. CUSTOMERS OUTSIDE CITY LIMITS
3. PORT OF TILLAMOOK BAY
4. LONG PRAIRIE WATER DISTRICT
5. PLEASANT VALLEY WATER DISTRICT
6. SOUTH PRAIRIE WATER ASSOCIATION
7. WEST HILLS WATER CO.
8. TONE WATER DISTRICT
9. HUNT WATER DISTRICT
10. ROGER LINE WATER USERS
11. FITZPATRICK WATER DISTRICT
12. TILLAMOOK RIVER WATER DISTRICT
13. HWY 101 S. WATER DISTRICT
14. BASELINE WATER DISTRICT
15. FAIRVIEW WATER DISTRICT WITHIN UGB (NOT SERVED BY CITY)

NORTH

GRAPHIC SCALE

0 6000 12000

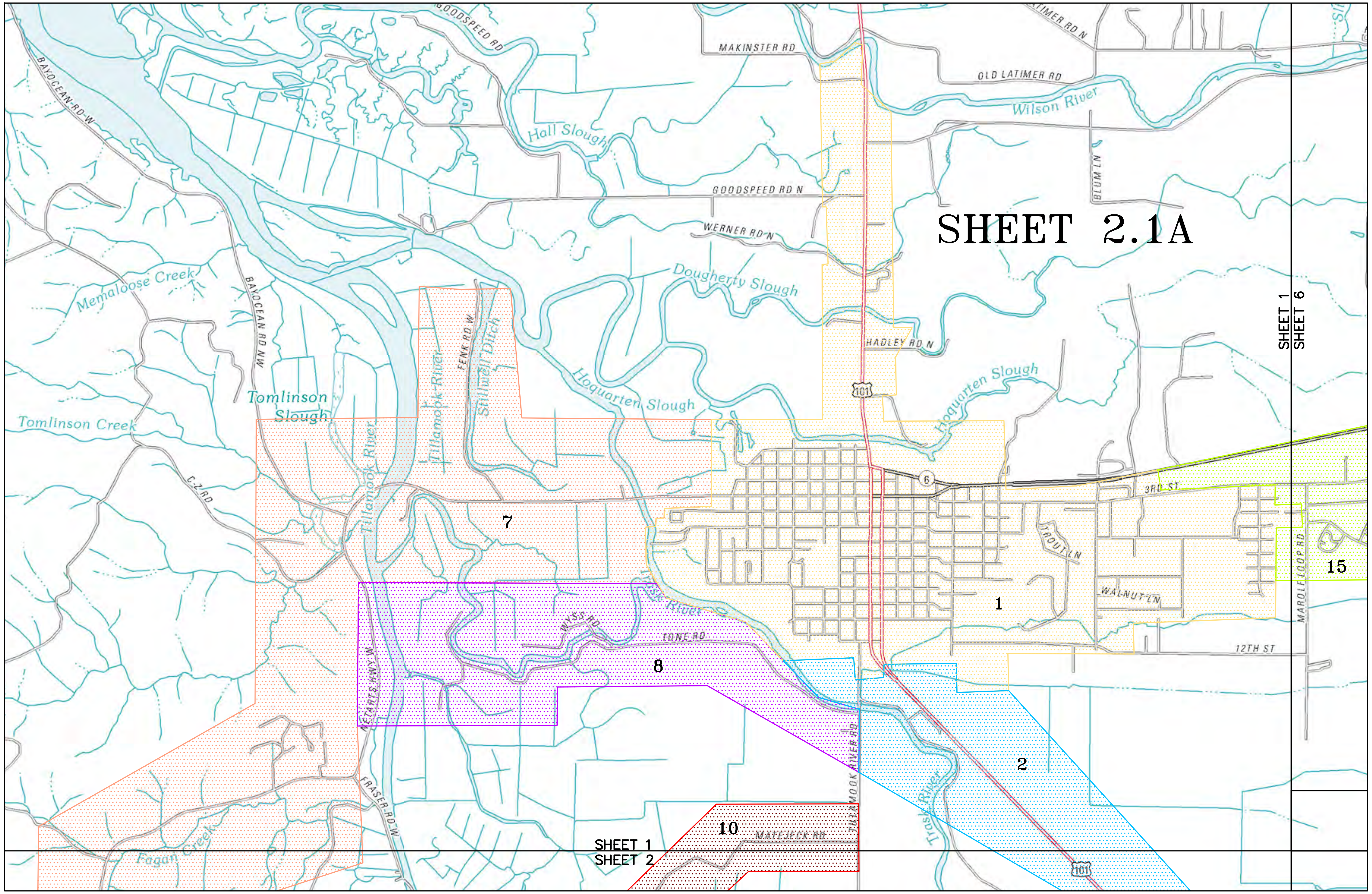
(IN FEET)
1 inch = 6000ft.

Map Source: USGS

BOATWRIGHT ENGINEERING, INC.

Water System Master Plan
City of Tillamook, Oregon

FIGURE 2.1



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NORTH

GRAPHIC SCALE

0 2000 4000

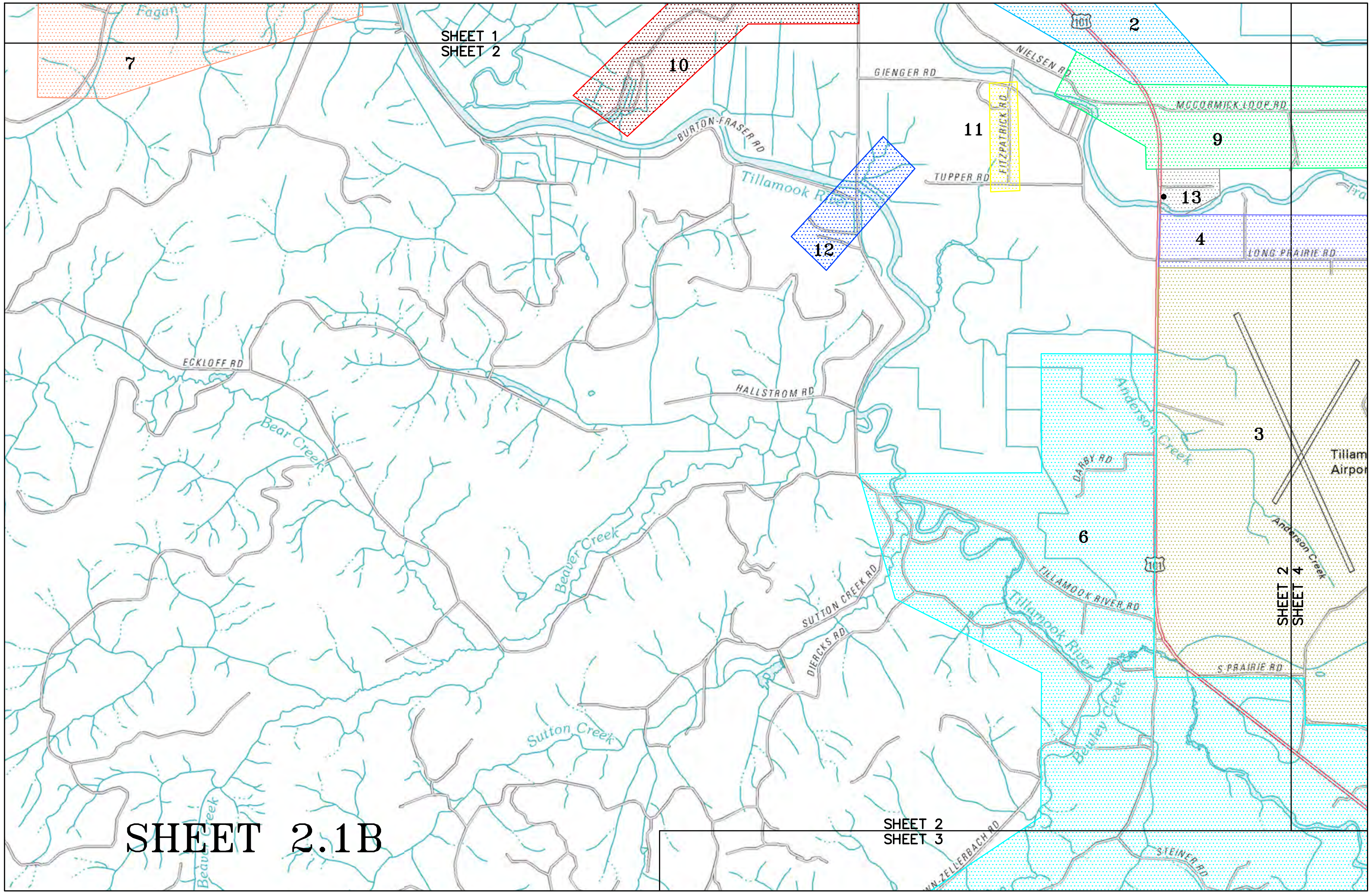
(IN FEET)
1 inch = 2000ft.

BOATWRIGHT ENGINEERING, INC.

Map Source: USGS

Water System Master Plan
City of Tillamook, Oregon

FIGURE 2.1A



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GRAPHIC SCALE

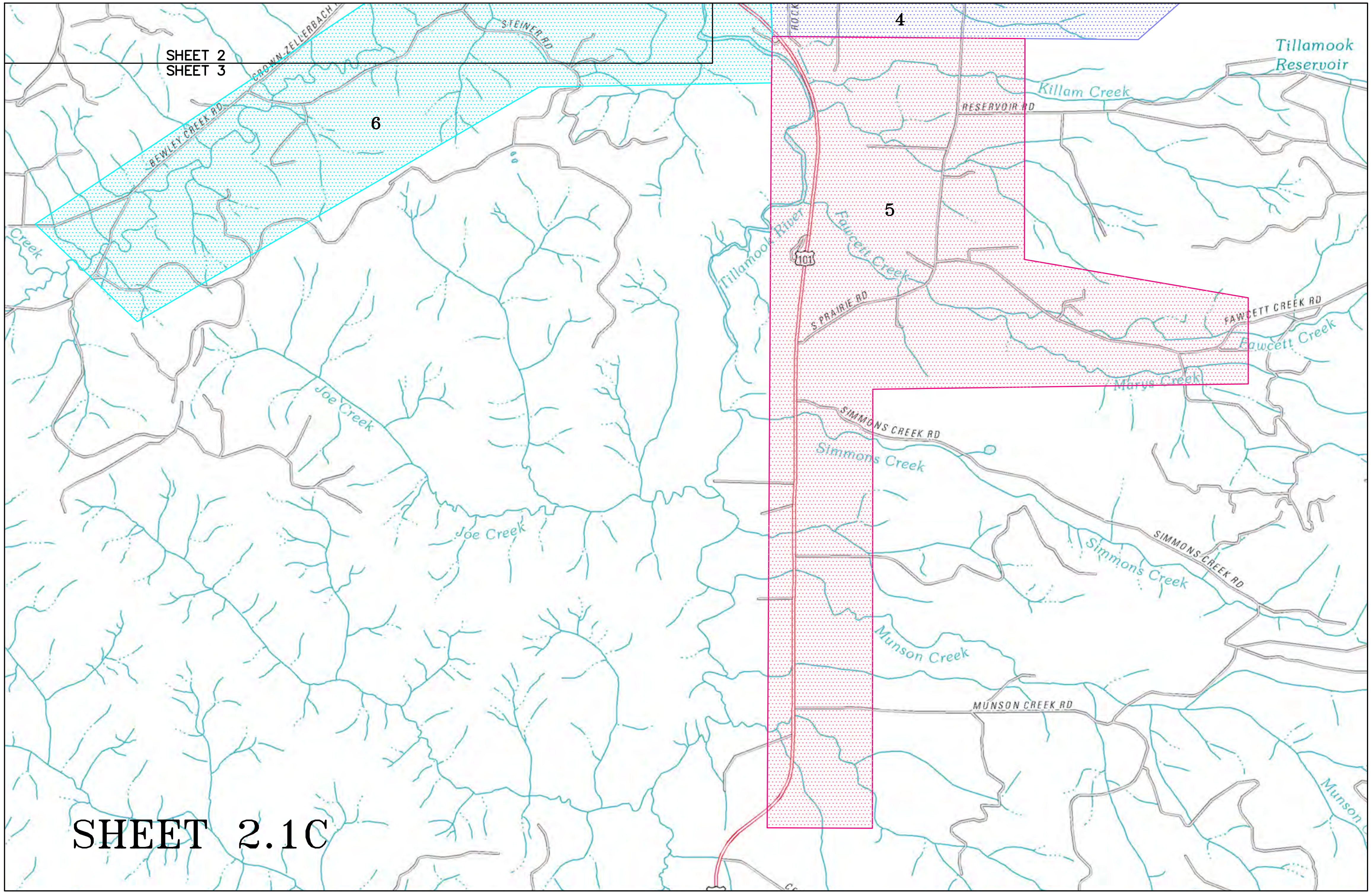
0 2000 4000

(IN FEET)
1 inch = 2000ft.

Map Source: USGS

Water System Master Plan
City of Tillamook, Oregon

FIGURE 2.1B



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NORTH

GRAPHIC SCALE

0 2000 4000

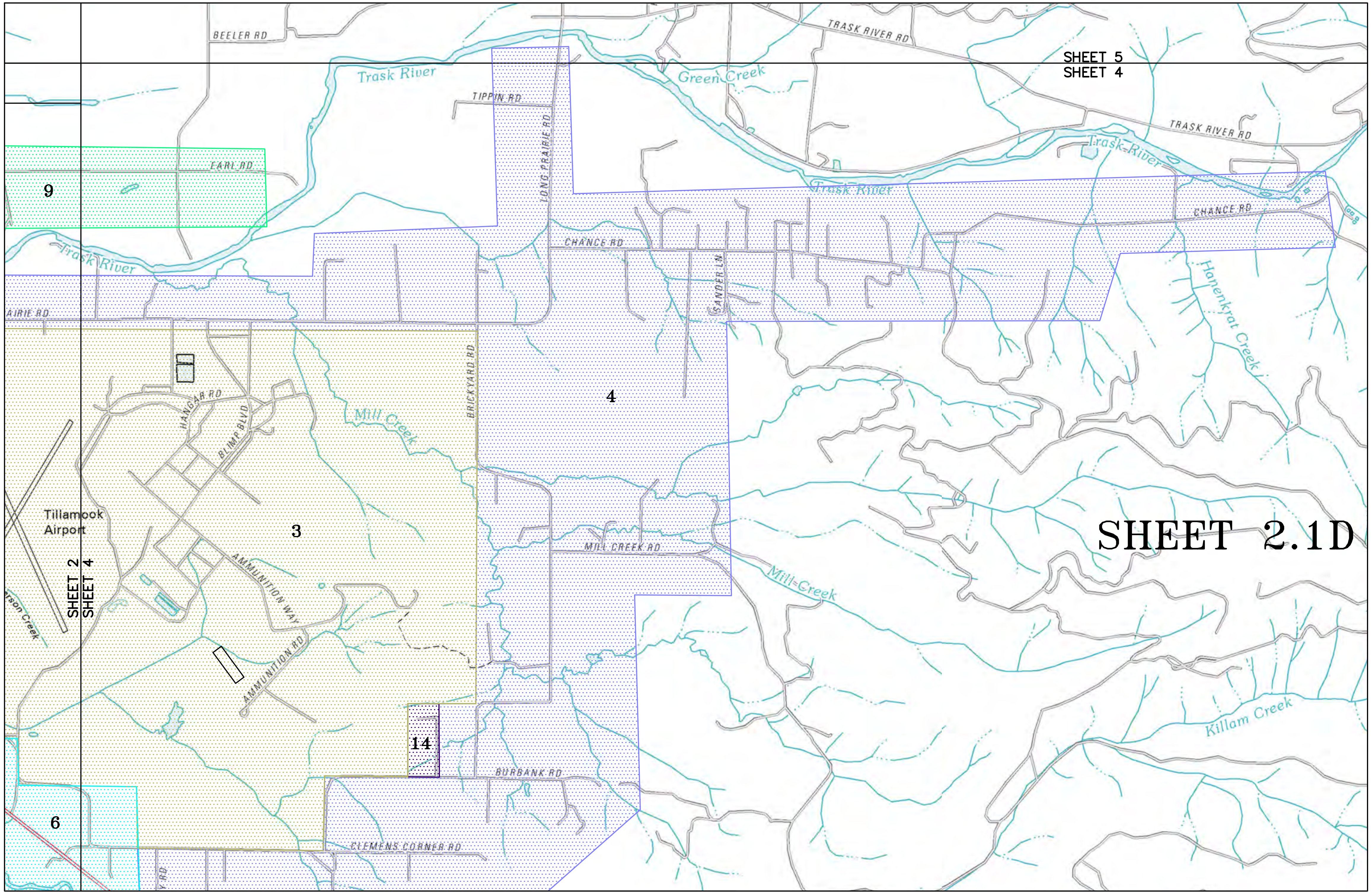
(IN FEET)
1 inch = 2000ft.

BOATWRIGHT ENGINEERING, INC.

Map Source: USGS

Water System Master Plan
City of Tillamook, Oregon

FIGURE 2.1C



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NORTH

GRAPHIC SCALE

0 2000 4000

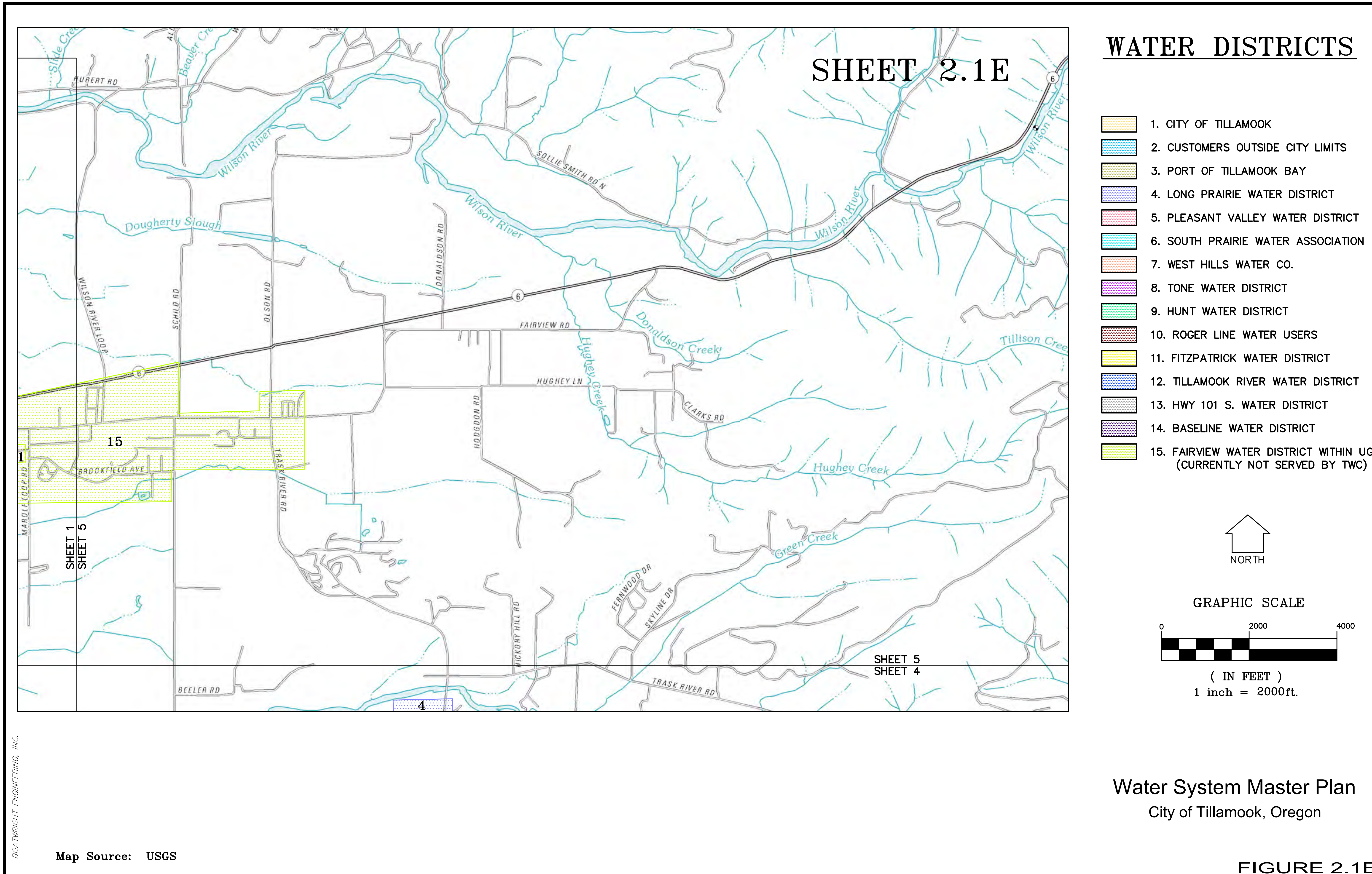
(IN FEET)
1 inch = 2000ft.

BOATWRIGHT ENGINEERING, INC.

Map Source: USGS

Water System Master Plan
City of Tillamook, Oregon

FIGURE 2.1D



BOATWRIGHT ENGINEERING, INC.

Map Source: USGS

Water System Master Plan

City of Tillamook, Oregon

FIGURE 2.1E

districts have 836 services. **Figures 2.1-2.1A-E** illustrate the entire service area that receives, or has the immediate potential to receive, City of Tillamook water.

2.2.2 Future Service Area

Future service areas will occur, primarily, within the City Limits and the Tillamook Urban Growth Boundary. Given the ever increasing environmental restrictions in the valley, the most likely growth of the City will be to the east, into the current Fairview Water District Area, or southeast along Highway 101 and to the Port of Tillamook Bay area. No new areas beyond the 11 rural water districts that are currently being served are anticipated to be added to the service area. Additionally, the City is considering laying the groundwork for future plans to work closely with these customers to develop a more streamlined and cost efficient delivery of the water supply.

2.2.3 Geography of the Area

The City of Tillamook, in the northwest corner of Oregon, lies along the mid-coastal area of Tillamook County at the southeast end of Tillamook Bay. It is about 9.4 miles south-southeast from the mouth of the bay and it is separated from the Pacific Ocean, which lies approximately 6 miles due west, at the Meares headland. The headland reaches an elevation of 1420 feet (NAVD 1929)

.

The area served by the water system of the City and the surrounding districts is located mostly on the broad flat plain that drains to Tillamook Bay. The area is bisected by three rivers: the Wilson, the Trask, and the Tillamook. Between the rivers there are sloughs and many small creek tributaries. Elevations range from less than 10 feet (NAVD 1929) above mean sea level at the northwestern fringe to about 170 feet (NAVD 1929) at the south reaches of the Pleasant Valley Water Company.

The watersheds of Killam Creek and Fawcett Creek extend into the Coast Range and to Edwards Butte at elevation 3168 (NAVD 1929). The City's storage reservoir, Skookum Lake, is located in the Fawcett Creek Basin at elevation 1311 (NAVD 1929). The watersheds are owned in part by the City of Tillamook and also be private forest resource companies that manage their properties for timber sale. Portions of the watersheds are also in the Tillamook State Forest.

The climate in the Tillamook area is generally mild year-round. Rainfall averages 90-inches per year. November through March is wet; accumulating about 70% of the total precipitation. Summers are fairly dry. Precipitation in the Skookum Lake drainage basin averages between 140 and 150 inches per year.

2.2.4 Land Use in the Area

The City of Tillamook is the county seat of Tillamook County and serves as the commercial and governmental hub for the area. A central commercial district runs parallel with Highway 101 as it bisects town and extends for several blocks to each side. Many of these lots, zoned for commercial use, are currently occupied by single family housing, especially to the west and south of downtown. Given the concentration and vibrancy of this housing, it is not anticipated to be replaced with commercial uses during the lifespan of this master plan.

A highway commercial area runs along Highway 101 north of town for about 1.3 miles to the Wilson River. However, future development or redevelopment of approximately 65% of this area, stretching from Hoquarten Slough to Goodspeed Road, is severely impacted by its identification as being within the floodway of the Wilson River on the Wetlands and Floodway map included as Map 4 in the *2012 Tillamook Comprehensive Plan*. **See Appendix A**. The Wilson River overflows northeast of town, just east of Wilson River Loop, then makes its way across the broad flat valley to Hall, Dougherty and Hoquarten sloughs as if flows towards Tillamook Bay. This flooding greatly impacts commerce in the region, and travel along Highway 101, on a fairly regular basis and oftentimes to a very severe degree.

A mixture of commercial, industrial and residential zones border the Wilson River Highway (OR Hwy 6) as it extends east out of downtown. This area transitions in and out of the city limits. There are a scattering of vacant parcels or tracts with potential for redevelopment to a higher concentration of use. This area is largely unaffected by wetlands, though there are small areas adjacent to Schild Road and Trask River Road.

Much of the land on both the east and west sides of the downtown district is zoned for varying levels of residential development. There are a smattering of vacant lots that could be built upon, though many appear to be expanded yards for adjacent homes.

Large blocks of general industrial land are located on the east side of town, adjacent to the railroad line that bisects the city. The majority of this area is occupied by Hampton Lumber Mill. The longevity of its occupation may be tenuous because of the declines in the timber industry and the expense of bringing the product to market.

East of Marolf Loop there are three tracts of light industrial land that are currently vacant or underdeveloped. Two of these are impacted by wetland designations. The most northeast one, north of 3rd Street and adjacent to Schild Road is heavily impacted with nearly 50% of the property so designated. The southeast parcel is less impacted in total area but wetlands cut off access to the northwest quarter so that it may be unable to be developed, especially since the adjacent land to the north is primarily residential.

Interspersed around town are various open space and public designations that are comprised of city, county, state and federal offices, parks, schools, churches, the county fairgrounds, and natural areas that are too wet or too ecologically valuable to be developed.

The area to the east of Tillamook currently receives water from the Fairview Water District, which holds its own water rights. At this point it is not anticipated to be absorbed into the City of Tillamook, though the city already has taken over some of its more westerly services. Therefore, the area within Fairview Water District, but outside the Tillamook Urban Growth Boundary is not included in this report.

Growth within the City of Tillamook is anticipated to occur through infill on small vacant properties within already built areas, redevelopment of currently occupied parcels to higher and more concentrated uses, and larger empty tracts both within the City limits and in the area between the current City limits and the current urban growth boundary. The bulk of these latter areas fringe the city limits to the east of Evergreen Drive and extend farther east to just past Trask River Road.

Future development will be impacted by the need to abide by laws regulating construction and changes within identified floodways and wetlands and the City's planned protection of these natural areas. Property owners may be able to develop their property if they are able to purchase credits in a local wetlands mitigation bank.

Map 3 in the *2012 Tillamook Comprehensive Plan* identifies land within the city limits and within the urban growth boundary that are vacant or are potential redevelopment sites. **Table 2-2** summarizes the areas and the potential for additional household connections. Lands with other zones are not considered as they require households to support their employment numbers and, for the most part, are not significant water users.

TABLE 2-2				
Vacant & Redevelopable Lands*				
Tillamook City Limits				
Zone	**Vacant Acres**	**Redevelopable Acres**	**Total Acres**	**Potential Households**
Multiple Residential (RO)	4.64	26.38	31.02	248-930†
Single Family & Duplex Residential (R-5.0)	0	0.23	0.23	1•
Single Family Residential (R-7.5)	0.13	0	0.13	2^
Tillamook Urban Growth Boundary				
Zone	**Vacant Acres**	**Redevelopable Acres**	**Total Acres**	**Potential Households**
Multiple Residential (RO)	22.66	28.79	51.45	412-1544†
Single Family & Duplex Residential (R-5.0)	0	0	0	0
Single Family Residential (R-7.5)	0	0	0	0

* Tillamook Comprehensive Plan, 2012
† Calculated based on 8-30 Units allowed per acre
• Calculated based on 5000 SF lots
^ Calculated based on 7500 SF lots

Beyond the city's Urban Growth Boundary, land use is under the jurisdiction of Tillamook County for the eleven service districts to which the city provides water. These areas are dominated by a handful of land use zones, those being: Forest (F), Farm (F-1), Small Farm & Woodlot (SFW-20 and SFW-10), and Rural Residential (RR), with the Forest and Farm zones predominating. The rural residential zone requires lots to be a minimum of 2.0 acres if they were created prior to October 4, 2000. Lots created after that date must be 10.0 acres in size. A review of existing aerial photography, zoning and assessment records indicates that there are approximately 100-125 properties which are currently vacant and available for development as new home sites within all of these service districts.

2.3 Population

2.3.1 Historic Population Growth

Chapter 9 of the *2012 Tillamook Comprehensive Plan* discusses the population history of Tillamook County and the City of Tillamook. In the past, Tillamook has seen both great population increases and population decreases. The growths have been the result of annexations to the city and the rise of the timber industry. Likewise, the declines can also be tied to the timber industry and the closing of several major mills. According to the plan, the City of Tillamook is on a slow growth curve; averaging about a 1% increase in population over the past thirty years. Larger jumps in the population witnessed in certain years can be attributed to specific annexations.

Table 2-3, copied directly from Table 9-3 of the *2012 Tillamook Comprehensive Plan,* illustrates the Historic growth in Tillamook over the years from 1980 through 2010. The numbers are city estimates, not actual counts. The Federal Census estimates are shown for 1980, 1990, 2000 and 2010. The data is from the Center for Population Research and Census (CPRC), which is the State of Oregon agency responsible for maintaining official population estimates for cities and counties.

TABLE 2-3

City of Tillamook

Estimated Population 1980 - 2010

	Year	Population		Population Change			Year	Population		Population Change	
•	1980	3981	US Census				1996	4275		+	30
	1981	3983		+	2		1997	4340		+	65
•	1982	3986		+	3		1998	4310		-	30
•	1983	3988		+	2		1999	4270		-	40
	1984	3991		+	3		2000	4352	US Census	+	82
	1985	3993		+	2		2001	4340		-	12
	1986	3996		+	3		2002	4340			0
	1987	3998		+	2		2003	4350		+	10
•	1988	4001		+	3		2004	4350			0
	1989	4003		+	2		2005	4300		-	50
•	1990	4006	US Census	+	3	•	2006	4675		+	375
	1991	4068		+	62		2007	4690		+	15
	1992	4129		+	61		2008	4700		+	10
	1993	4190		+	61		2009	4710		+	10
	1994	4190			0	•	2010	4920	US Census	+	210
•	1995	4245		+	55						

• Annexation of land to City

2.3.2 Projected Population Growth

Chapter 9 of the *2012 Tillamook Comprehensive Plan* evaluates the many projections that have been made over the past several decades regarding the growth rates that will predict the future population of Tillamook. It considers past trends, building permits, and demographics.

The conclusion reached in the Comprehensive Plan is that a modest growth, which has been reflected more closely by the recent past, will continue over the coming decades. **Table 2-4**, below, is directly copied from Table 9-7 of the Plan, and is the basis the City is using to guide decisions regarding levels of service, including utilities. The partial information shown in the last column of the table, which extends the data out for 4 years to reach the end of this Master Plan period, has been extrapolated based on the rates for 2030.

TABLE 2-4								
CITY OF TILLAMOOK								
Future Population Growth								
	2000	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2034**
Total Population Projection	**4,352**	**4,689**	**4,940**	**5,207**	**5,490**	**5,760**	**6,038**	***6208***
Average Annual Growth Rate	0.5% (from 1995)	1.5%	1.1%	1.1%	1.0%	0.7%	0.7%	*0.7%*
5-year Population Increase	107 (from 1995)	337	251	267	283	270	278	
5-year Percentage Increase	2.5% (from 1995)	7.7%	5.3%	5.4%	5.4%	4.9%	4.8%	
Tillamook as percent of County	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.1%	
Tillamook County	24,262	26,143	27,538	29,030	30,604	32,114	33,663	

Table 2-5 illustrates the current (2006) population projections included in the Tillamook County Comprehensive Plan through the year 2035. This growth is slower than within the city, proper. **Table 2-6** uses these growth projections to calculate the rate of growth for the Districts that the City serves which are outside the City limits and within the County's jurisdiction. Interestingly, the number of future services in the next 20 years, calculated by the growth rate, is 126 while, as discussed in section 2.2.4 above, there are currently about 100-125 properties within the Districts' service areas that are available for development. Therefore, it appears that the available home sites are sufficient to provide for the projected need.

TABLE 2-5						
Tillamook County						
Future Population Growth						
	2010	**2015**	**2020**	**2025**	**2030**	**2035**
Total Population Projection	**26,589**	**27,897**	**29,097**	**30,094**	**30,887**	**31,538**
Population Increase/5 years		1308	1200	997	793	651
Population Increase/year		261.6	240	199.4	158.6	130.2
% Population Growth/yr		0.98%	0.86%	0.69%	0.53%	0.42%

TABLE 2-6						
Water District Connections						
Future Water Connection Growth						
	2013	**2015**	**2020**	**2025**	**2030**	**2035**
Water Connections	**836**	**852**	**887**	**917**	**942**	**962**
Connection Increase/year	8	5	6	5	4	
% Population Growth/yr	0.98%	0.86%	0.69%	0.53%	0.42%	

Chapter 3
Water Requirements

Chapter THREE: **Water Requirements**

3.1 Introduction

To determine the adequacy of the City of Tillamook's existing water supply, distribution, transmission, and storage facilities, the trends in water supply, consumption and loss must be evaluated. Population projections must be used in conjunction with water production and consumption data to determine future water demand within the City of Tillamook and the eleven service districts which are served by the City through 2034.

City staff has maintained records of production from the wells and surface water sources. Consumption is monitored through monthly meter reading of all individual services and the master meters at the service district connections.

A comparison of the consumption records with the production records yields trends of use and monitors water losses.

3.2 Analysis of Water Services

The City meters 2005 services, including 102 that are located outside the city limits. these services consumed 182,769,000 gallons in 2013, or 60.9% of the total water accounted for. In addition to the billed accounts, there are seven public facilities in the city which receive free water: City Hall, the Fire Station, the Sewage Treatment Plant, the City Shops, Carnaham Park, Goodspeed Park and Sue H. Elmore Park, all of which are metered. The largest of these users is the Sewage Treatment Plant which consumed 3,101,000 gallons in 2013. Altogether, the unbilled accounts used 3,961,000 gallons in 2013, or 1.3% of the total water accounted for.

The City also provides water to eleven rural water districts which used 89,514,000 gallons in 2013, or 29.8% of the accounted for water; and, the Port of Tillamook Bay which used 23,647,000 gallons in 2013, or 8.0% of the accounted for water. The Port water is used for commercial and industrial operations while most of the water use by the Districts is for residences and a few farms.

The City has an unknown number of unmetered connections which were granted free water in exchange for pipeline easements, primarily in the early 1900's. The actual number of these services is believed to be small. The city is launching a program to identify the locations of these services and to investigate the whether or not the current property owners are still eligible for a free connection, based on the language and conditions stated in the original granting documents.

Table 3-1 shows the average daily use in gallons per day (gpd) per service for City meters and for meters in the water districts. The quantity of water included in the calculations for the Districts is from the master meters at the point of delivery by the City.

TABLE 3-1 CONSUMPTION & PRODUCTION COMPARISON					
		Water Consumption Jan-Dec 2013			
	Total Meters	1000 gal/yr	gal/day	% of Total Consumption	gpd/service
CITY					
City Meters (billed)	2005	182,769	500,737	60.95	250
In-City Meters (un-billed)					
Carnahan Park	1	26	71	0.01	71
Goodspeed Park	1	115	315	0.04	315
Sue H. Elmore Park	1	79	216	0.03	216
City Hall	1	170	466	0.06	466
Tillamook Fire District	1	204	559	0.07	559
Sanitary Sewer Lift Station	1	266	729	0.09	729
Sewage Treatment Plant	1	3,101	8,496	1.03	8,496
TOTAL CITY METERS	**2012**	**186,730**	**511,589**	**62.27%**	**254**
RURAL WATER DISTRICTS					
Baseline Water Cooperative	6	239	655	0.08	109
Fitzpatrick Water Association	20	793	2,173	0.26	109
Highway 101 South Water District	4	164	449	0.05	112
Hunt Water District	22	7,889	21,614	2.63	982
Long Prairie Water District	268	26,890	73,671	8.97	275
Pleasant Valley Water Company	245	22,740	62,301	7.58	254
Port of Tillamook Bay	53	23,647	64,786	7.89	1,222
Rogers Waterline Users Association	13	1,711	4,688	0.57	361
South Prairie Water Association	122	10,950	30,000	3.65	246
Tillamook River Water District	8	921	2,523	0.31	315
Tone Water District	28	6,290	17,233	2.10	615
West Hills Water Company, Inc.	100	10,927	29,937	3.64	299
TOTAL DISTRICT METERS	**889**	**113,161**	**310,030**	**37.73%**	**349**
TOTAL	**2901**	**299,891**	**821,619**	**100%**	**283**

The usage rate per service in the Water Districts varies quite a lot, from a low of 109 gpd per service to a high of 982 gpd per service. Other than the Port, which has no residential use, the districts are primarily residential services. The Districts average 349 gpd which could reflect not only the large rural lot sizes, but also the distribution losses of the individual water districts. The Districts with the higher use rates should probably conduct leak studies to determine if the high rates indicate a significant loss of water.

Within the City, the consumption of approximately 250 gpd per service is on the high side but reflects the mix of residential, industrial and commercial users. The seven consistently high volume residential users represented in **Table 3-2** average approximately 139 gallons per day per residential unit. Use by this group of users would be expected to be lower than the City's average residential use because they represent residential units with little, or no, yard or garden. They are also more likely to be occupied by singles or couples, rather than larger families.

TABLE 3-2

CITY OF TILLAMOOK HIGH VOLUME SERVICES

			Water Consumption Jan-Dec 2013		
	Large Industrial/Commercial Users		**1000 gal/year**	**% of City Metered Water**	**gpd/svc**
1	Tillamook Lumber Co.		23,184	12.7	63,518
2	Hogan Dairy		9,038	4.9	24,762
3	Shilo Inn		5,025	2.8	13,767
4	Tillamook County Hospital		4,257	2.3	11,633
5	Jenck Dairy		4,087	2.2	11,197
6	Wastewater Treatment Plant		3,101	1.7	8,496
7	Fred Meyer		2,850	1.6	7,808
8	Werner Gourmet Meat Snacks		2,090	1.1	5,726
9	Shilo Restaurant		1,960	1.1	5,370
10	Ashley Inn		1,575	0.9	4,315
11	Atlas Tillamook LLC 101 (101 retail mall)		1,508	0.8	4,132
12	Safeway		1,495	0.8	4,096
13	Darrel Maas		1,409	0.8	3,860
	TOTAL		**61,579**	**33.7**	**168,680**
	AVERAGE/Service				**12,975**
	Large Residential Users	**Units**	**1000 gal/year**	**% of City Metered Water**	**gpd/svc**
1	Vreeland Manufactured Home Park	50	2,664	1.5	7,299
2	Five Rivers Assisted Living	88	2,410	1.3	6,603
3	Laurelwood Mobile Home Park	25	1,970	1.1	5,397
4	Tillamook Apartments	32	1,481	0.8	4,058
5	Golden Eagle Apartments	17	1,440	0.8	3,945
6	6th Street Apartments	20	1,355	0.7	3,712
7	Sandpiper Apartments	16	1,293	0.7	3,542
	TOTAL	**248**	**12,613**	**6.9**	**34,556**
	AVERAGE/ Residential Unit				**139**

The top 13 industrial and commercial users represented in Table 3-2 are the services that most greatly influence the skew towards higher average gallons per day per service within the City. Together, these services use 33.7% of all metered water delivered through City meters. The 13 services average 12,975 gallons per day per service, but even that is distorted by the Tillamook Lumber Company which uses 63,518 gallons per day for its operations.

System wide use for 2013 was 283 gpd/service.

3.3 Analysis of Production, Consumption & Loss

Table 3-3 provides a graphic representation of the City's water production over the past five years.

TABLE 3-3

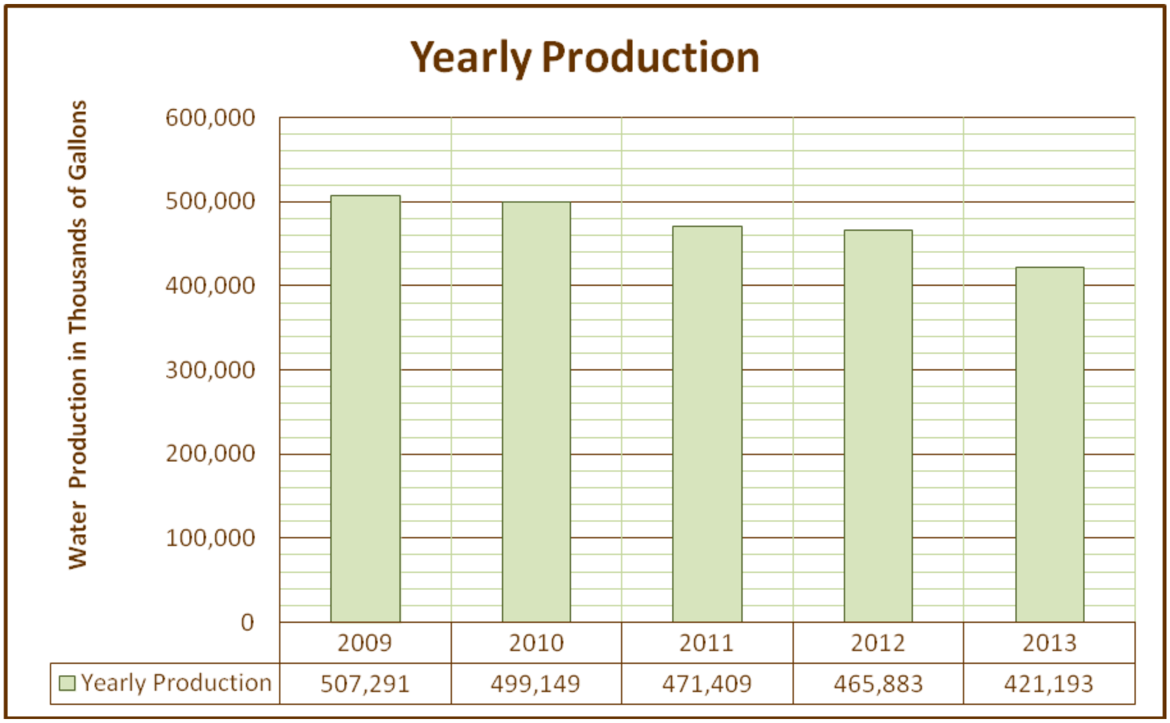


Table 3-4 compares the total production of the City's wells and surface water supplies to the metered consumption throughout the service area. An attempt was made to provide this data for the years from from 2009 through 2013. However, the city does not have a complete data record for 2009 and 2011 which needs to include the amount of intake form the surface water sources.

Table 3-4 also shows that subtracting metered consumption from production volumes yields unaccounted-for water. Unaccounted-for water results from unmetered connections, inaccurate or improperly sized meters, leaks, fire hydrant use, pipeline flushing, treatment plant flushing, and reservoir overflow.

Table 3-4								
Consumption & Production Comparison								
Year	Production 1000's gal	Metered Consumption 1000's gal	Unaccounted Water (loss) 1000's gal	Loss as a % of Production	ADD gallons Production	ADD gallons Consumption	PDD gallons 1000's gal	Peaking Factor
2009	507,291	365,790	141,501	27.9	1,389,838	1,002,164	2195.9	1.58
2010	499,149	319,639	179,510	36.0	1,367,532	875,723	2201.7	1.61
2011 M	471,409	300,685	170,724	36.2	1,291,532	855,260	1756.5	1.36
2012 M	465,883	306,813	159,070	34.1	1,276,392	867,329	1799.7	1.41
2013	421,193	295,549	125,644	29.8	1,153,953	821,619	1627.1	1.41

ADD - Average Daily Demand
PDD - Peak Daily Demand (ADD Production x Peaking Factor)
Peaking Factor - Calculated using the average of the top 3 days per month divided by the ADD for the month, for each month of the year, discard the highest and lowest and divide by 10. For years with incomplete monthly data reports, the same formula is used with the last divisor being the total number of months reported minus two.
M - Missing or Incomplete Data

The normal Peaking Factor range is 1.2 to 1.8 times the Average Daily Demand of consumption use

In the last full year of the previous Master Plan, 1995, water loss fell to 62,198,000 gallons. The previous year, 1994, the loss was 109,050,000 gallons. This represented a drop in the loss percentage from 19.17% to 13.14% and extended a near continual drop in losses from a high of 27.23% in 1990. The projected loss for 1996 was 12.45%, another reduction of losses.*

The amount of unaccounted-for water has rebounded to a 2013 rate of 27.4%. The Oregon Water Resources Department recommends a goal of 10-15% for water loss. Clearly, a better system is needed for the City to determine if losses are actually this high, or if water is being lost or used in more unmetered ways than they are aware of.

The International Water Association (IWA) and the American Water Works Association (AWWA) has established a Water Audit Method that can be performed using data collected in a one-year time frame. (A brief Summary is included in **Appendix B**) Financial accounts are checked for accuracy and the water flow is traced from the intake, through treatment, into the transmission and distribution system, and to the customer. A spreadsheet or worksheet is used to collect the details and results in an illustration of the water balance.

* *Table 3.2 of the 1997 Water Master Plan is in error. Column 5 of the table indicates that the percentages shown are the relationship of loss to production. In fact, the percentages shown represent loss in relationship to metered consumption. Based on the data in the table, the percentages of loss relative to production should be: 1990 - 27.23%; 1991 - 20.08%; 1992 - 22.25%; 1993 - 18.48%; 1994 - 19.17%; 1995 - 13.14%; 1996 - 12.45%.*

Theoretically, all of the water that enters the system would be accounted for as delivered to the customers. The audit will reveal the quantity of water that is lost.
These can be apparent losses, such as unauthorized consumption and inaccurate customer meters, or they can be real losses that result from pipeline leakage, reservoir leaks and overflows, and service line leaks.

Over the past 20 years the City has continued to repair its pipe system and replaced lines that have reached the end of their design life. However, one area that could be the source of the unaccounted for water loss are the transmission mains, from the tank reservoirs between Fawcett and Killam creeks. The stretch of pipes that traverse the Port of Tillamook Bay property at the old Naval Air Base should be checked first. These pipes are 76 and 71 years old, having been installed in 1937 and 1942. They are made of steel so that even a small scratch inflicted during construction could now be cause for failure. Additionally, these pipes are surrounded in places by freshwater forested/shrub wetlands so that they are not visited regularly. If either, or both, are leaking the problem may be virtually undetectable since the flow would be shrouded by the wetlands and the pressure is high enough in these transmissions lines to not register a severe enough drop in the downstream portions of the system. If no leaks are found in this area, further investigations of all of the old steel pipe should be conducted.

2013 production costs for water are $0.23 per 1000 gallons and water sales are, on average, $5.07 per 1000 gallons. Unaccounted-for water in the current range of 113,351,000 gallons per year represent an expenditure of $26,070 and a loss in sales of $574,690, for a total revenue loss of $600,760 per year.

If, in 2013, the City had produced enough water to meet the metered demand for both billed services and un-billed services and suffered a 10% loss of water, the quantity would have been 333,212,000 gallons. At the production cost of $0.23 per 1000 gallons, expenses would have been $76,639; for a savings of $17,789.
To further reduce unaccounted-for water the following steps should be considered:

1. Perform an AWWA water audit.

2. Consider purchasing a leak noise correlator system. This equipment detects the presence of leaks using two acoustical sensors that are in contact with the pipe. The sensors record the time it takes for the hissing sound of a leak to reach each sensor. This can be converted to a distance and the leak location can be pinpointed.

3. All "free" connections should be metered and the consumption entered into the monthly totals in order to provide an accurate unaccounted-for water volume.

4. The old steel transmission lines should be prioritized for replacement or lining.

5. Meters larger than ¾-inch should be tested on a revolving 2-3 year cycle in order to eliminate the possibility of non-registering or under-registering meters.

6. The City should continue an annual minimum budgetary expenditure of $40,000 to $50,000 to upgrade the distribution system by replacing undersized and leaking waterlines.

7. The City should begin, or continue, an education program for users of fire hydrants showing the importance of notifying the City of specific fire hydrants used and the duration of use. This is especially important for non-emergency users such as construction and clean-up crews and fire fighter training.

Table 3-4 also shows the daily demand and peak demand over the past 5 years, 2009-2013. The table shows that peak demand is decreasing and is, on average, 1.53 times the average daily demand.

3.4 Projection of Future Water Demand

The projection of future water demand in the study area from 2013 to 2033 will need to take into account past trends and future growth in population, employment and water consumption patterns within the City, the Urban Growth Boundary, and the service districts that the City supplies water

Table 3-5 shows the projected average daily demand and the peak daily demand throughout the study period assuming an annual growth rate in population as determined for the City's Comprehensive Plan and as shown in **Table 2-3** in Chapter 2.

For purposes of this study we will use a rather high peaking factor of 1.8. This is used due to the uncertainty of the source of the lost and unaccounted-for water and seeks to err on the side of providing an adequate supply. 2013 represents a year with a reliable production rate since the source of all water was from metered Wells 2 and 3, with no surface water withdrawn. Even so, the peaking factor for that year is 2.09, which is based on the single peak day to yearly average daily use, falls outside the norm.

Historical cycles of use may not be as reliable as they once were, given the dramatic changes in the economy and the direct affect of increased environmental standards and practices in the resource industries that Tillamook has always relied on for its economic base. Farming and the timber industry have been especially restricted from what were once "usual" activities and the result is a loss of both high paying jobs, and families, in the area.

TABLE 3-5				
PROJECTED AVERAGE DAILY DEMAND at 160 gallons per day per person				
Year	Population	Average Daily Demand	Peak Daily Demand	% Unaccounted-for Water
2014	5,153	1,177,829	2,120,091	30%
2015	5,207	1,041,400	1,874,520	20%
2016	5,264	990,871	1,783,567	15%
2017	5,320	978,391	1,761,103	13%
2018	5,377	977,636	1,759,745	12%
2019	5,433	976,719	1,758,094	11%
2020	5,490	976,000	1,756,800	10%
2021	5,544	985,600	1,774,080	10%
2022	5,598	995,200	1,791,360	10%
2023	5,652	1,004,800	1,808,640	10%
2024	5,706	1,014,400	1,825,920	10%
2025	5,760	1,024,000	1,843,200	10%
2026	5,816	1,033,956	1,861,120	10%
2027	5,871	1,043,733	1,878,720	10%
2028	5,927	1,053,689	1,896,640	10%
2029	5,982	1,063,467	1,914,240	10%
2030	6,038	1,073,422	1,932,160	10%
2031	6,080	1,080,889	1,945,600	10%
2032	6,122	1,088,356	1,959,040	10%
2033	6,165	1,096,000	1,972,800	10%
2034	6,208	1,103,644	1,986,560	10%

Assuming leaks are reduced, and kept, to 10% through the end of the study period, the peak daily production required in 2034 will be 1.986 MGD and the average daily production will be 1.103 MGD.

3.5 Fire Protection Requirements

Fire protection for areas within the City of Tillamook service area is provided by the Tillamook Fire District which was created in 1993 through a consolidation of the City's services and the Tillamook Rural Fire District.

Insurances Services Office, Inc. prepared the City's current Public Protection Classification Summary Report dated March 2014. (**See Appendix C**) This report evaluates the community's fire suppression capabilities and assigns a rating known as a Public Protection Classification (PPC). A rating of "Class 1 represents and exemplary fire suppression program, and Class 10 indicates that the area's fire suppression program does not meet ISO's minimum criteria." (*page 1, Tillamook FD Public Protection Classification Summary Report*) The rating is the major criteria used in setting fire insurance premiums for individual buildings.

Tillamook's current rating in the 2013 report is Class 3; placing it within the top 6.6% of communities evaluated nationwide. This is a move up from that reported in the 1996 Master Plan where the rating was a Class 5.

The amount of water used for firefighting in comparison to total yearly water consumption is negligible, but high flow rates required for fighting potential major fires greatly influences the design of distribution systems and storage reservoirs. Some Insurance Services Offices recommended fire flows and the duration of time for which they must be provided are listed in **Table 3-6**.

TABLE 3-6

FIRE FLOWS

(JUNE 25, 2013)

Building Type	Location	Required Fire Flow @ 20 psi (gpm)	Duration (hours)
Commercial	Hwy 101 & Wilson River Loop	5500	4
Commercial	Main Ave & Front Street	6000	4
Commercial	3rd Street & Cedar Avenue	1750	4
Commercial	7th Street & Stillwell Avenue	4500	4
Commercial	5th Street & Miller Avenue	3500	4
Commercial	12th Street & Miller Avenue	7000	4
Commercial	Alder Lane & Spruce Avenue	5000	4
Commercial	3rd Street & Meadow Avenue	7000	4

Chapter 4
Supply System

Chapter FOUR: **Supply System**

4.1 Water Rights

The development and use of water in the State of Oregon is controlled by the Oregon Water Resources Department (WRD). Surface water sources required the acquisition of permits after February 24, 1909. Groundwater permits for wells were required beginning in 1955.

The City of Tillamook's sources of supply are drawn from live flow surface water, surface water storage reservoirs, and groundwater sources. (See **Appendix D** for **Water Right Documents** and **Appendix E** for **Well Logs**)

Surface water rights are held on Killam, Fawcett and Simmons Creeks. Stored water is used from a very small equalization reservoir and Skookum Lake Reservoir, located in the upper reaches of the Fawcett Creek basin. Groundwater is available from four wells. These rights are shown in **Table 4-1**

All of the rights are classified for municipal use. Five of the rights have been perfected to Certificates. One right, for Well 3, has a Claim of Beneficial Use filed, but lacks a proper pump test to move the claim forward to Certificate. Among the others, some have current Time Extensions, others are in need of them. Any water rights which have not been perfected to the Certificate stage will need to be consistently monitored to keep in compliance with Oregon Water Resources Department (WRD) requirements for Time Extensions so that the rights are not cancelled. Once cancelled, it is costly to revive them, and not entirely assured that they will be reinstated.

With ever increasing pressures to maintain surface water flows for wildlife and habitat, the City's water rights become more valuable and their preservation should be the City's top priority. New surface water rights for live flow use in the summertime months are not available from the main stems or tributaries of the Wilson, Trask, or Tillamook river systems. Rights to store wintertime flows of water in reservoirs are still available and encouraged by the WRD, but environmental concerns and considerations can draw out the timeline between application and issuance of a permit, if one is ever acquired, and add a myriad of expenses to the process.

Due to the serious defects discovered in the Skookum Lake Reservoir dam and discussed in Section 4.6, below, it is recommended that the City prepare to cancel water rights permits R-4532 and S-30192.

Also, given that the City has no intent or ability to develop the rights on Simmons Creek, it is recommended that the City prepare to cancel water right permit S-41438.

TABLE 4-1

EXISTING WATER RIGHTS

	Application	Permit	Transfer	Certificate	Priority	Source	Rate	Use	Comment
1	S-698	S-439	-----	2388	May 22, 1910	Killam Creek	6.0 cfs	MU	Perfected
2	S-9415	S-6673	T-11197 Permit Amend	-----	Mar 13, 1924	Fawcett Creek	20.0 cfs	MU	Moved POD Time Extension to 2020 **Progress Report due 10-1-2018**
3	R-11037	R-661	-----	49474	Aug 20, 1926	Fawcett Creek	0.666 AF	MU	Perfected
4	S-14810	S-10790	-----	33251	Nov 23, 1932	Intake Res Fawcett Creek	0.666 AF 6.0 cfs	MU	Perfected **Needs Transfer for POD**
5	G-990	G-842	-----	32234	Jun 01, 1958	Well 1 TILL 654 Trask River Basin Hwy 101	1.56 cfs	MU	Perfected
6	G-1807	G-1652	-----	35782	Jul 25, 1960	Well 2 (old) TILL 530 Trask River Basin Gienger Road	1.03 cfs	MU	Perfected
7	R-40641	R-4532	-----	-----	Aug 25, 1965	Fawcett Creek	700 AF	MU	No Time Extension Needed. Waiting for Secondary to be Completely Used OR **Cancellation**
8	S-40642	S-30192	-----	-----	Aug 25, 1965	Skookum Lake Res	700 AF	MU	**Needs Time Extension** (last to 2000) OR **Cancellation**
9	S-53575	S-41438	-----	-----	Aug 22, 1975	Simmons Creek	2.0 cfs	MU	**Needs Time Extension** (last to 2000) OR **Cancellation**
10	G-10574	G-9829	-----	-----	Jul 14, 1982	Well 2 TILL 073 East Elem School	2.7 cfs	MU	Time Extension filed in 2011 to 2040 - pending
11	G-12443	G-11784	-----	-----	Aug 04, 1991 Jul 15, 1992	Well 3 TILL 013 Trask River Basin Alder Ln -Jr Hi Sch	2.0 cfs 0.23 cfs	MU	CBU filed 1997 **Needs Pump Test**

4.2 History

Stream water was diverted by a private water company to supply the community prior to the establishment of the Tillamook City charter in 1891. In 1895 the City took over the job and in 1905 the Tillamook Water Commission was chartered. The Commission governed the city's supply and system developments until its dissolution in 1999. At that time, control was returned to the City of Tillamook and its Public Works Department.

Killam Creek and Fawcett Creek provided the City's early supplies. Requests for water right permits were filed with the State of Oregon for 6.0 cfs from Killam Creek in 1910 and for 20.0 cfs from Fawcett Creek in 1924.

The 1926 right for the small, 0.66 acre-foot (200,000 gal), open concrete reservoir provided what was termed a "balance" reservoir to equalize the pressure head from the two creek intakes. The Killam Creek intake is at elevation 246 (NAVD 1929), while the Fawcett Creek intake is 86 feet higher, at elevation 332 (NAVD 1929). It also served as additional storage.

700 acre-feet of additional storage was added in 1965 with the construction of Skookum Lake Reservoir. The dam is 37 feet high, earth filled, with a concrete spillway at elevation 1,193 (NAVD 1929). The small drainage basin supplying the reservoir encompasses just 2.2 square miles, or about 1,308 acres. With the abundance of wintertime rainfall, it is able to replenish each winter and releases flow into Fawcett Creek in the drier months from June through October.

In 1958, the City began to acquire water rights for wells located closer to, or in, town in order to supplement the surface water sources, especially during periods of excess turbidity or low stream flows. Well 1 (Well Log TILL 654), is located along the east side of Highway 101, just north of the Trask River crossing. High iron content has relegated this well to emergency use only.

In 1960 a second well (Well Log TILL 530) was drilled alongside Gienger Road about 1.5 miles south of town. Like Well 1, this well is high in iron content and is not currently in service.

In 1981 well drilling began on the east side of town in an effort to find a better supply and improved water quality; wells that did not have the high iron content found in the earlier wells. Existing, private wells supported the possibility of finding wells with proven quality and quantity. Well 2 (TILL 073) was drilled on the grounds of East Elementary School, east of the intersection of Williams Avenue and Maple Street.

Encouraged by the success of Well 2, another well was installed at the southern end of Williams Avenue in 1986. The water turned out to have high levels of sand, turbidity, iron, and manganese and was eventually abandoned.

As a result of this experience, Lee Engineering conducted a groundwater supply study in October of 1986 which inventoried existing wells within the city limits between Highway 101 on the west and the Wilson River on the north. As stated in the 1997 water Master Plan, the study concluded that *". . . good quality groundwater can most likely be found in wells drilled over 120 feet deep and located north of a line formed by 9th and Walnut Streets."*

After drilling several wells that did not provide sufficient quality or flow, Well 3 (TILL 013) was installed at the southwest corner of the Tillamook Junior High School campus, along Alder Lane.

4.3 Existing Supply System

A portion of Killam Creek encounters a low concrete diversion dam with wood stop logs which directs a portion of the stream flow into a 200,000 gallon impoundment and settling basin. From there the water enters a screened concrete intake and flows by gravity in a 16-inch diameter steel pipe to the water treatment plant

Like Killam Creek, a portion of Fawcett Creek also encounters a low diversion dam which directs a portion of the stream flow into a 200,000 gallon impoundment and settling basin. During low flow summer months, the water acquired from Fawcett Creek is stored water released from Skookum Lake. From the impoundment, the water enters a screened concrete intake and flows by gravity in an 18-inch diameter steel pipe to the balance reservoir at elevation 246 (NAVD 1929), which is located about 1000 feet southeast of the water treatment plant.

The 2.0 million gallon per day (mgd) package filtration plant was constructed in 1994. It allows surface waters from Killam and Fawcett Creeks to be treated for turbidity and then disinfected. The head works allow for flow from either source individually, or a combination of both sources. Adequate chlorine contact is provided by the 3.0 million gallons of onsite storage.

Water leaves the treatment plant and travels approximately 6 miles by gravity to the City of Tillamook via parallel 12-inch to 24-inch diameter steel transmission lines. A 24-inch diameter main, installed in 1994, traverses the route from the treatment plant to South Prairie Road, at the southeast corner of the Port of Tillamook Bay Naval Air Station. From there north, the rest of the pipes were installed between 1937 and 1960 and replaced earlier wood staved pipes. Two of the mains enter town on the south end in the vicinity of Highway 101. One 10-inch steel main leaves Highway 101 and crosses farm fields to the west side of Tillamook High School and 12th Street and Miller Avenue.

Well No. 1 is adjacent to the 18-inch transmission line along Highway 101 and hooks directly into the pipeline at the well site. It is only operated during emergency situations when water from the other sources is not sufficient to meet the needs of the city.

Old Well No. 2 (Gienger Rd) is located adjacent to the south right of way line of Geinger Road, within a farmed field, just east of the intersection with Fitzpatrick Road and along the 14-inch steel transmission line installed in 1949.

Well No. 2 is on a City owned parcel, tucked into the southwest corner of the East Elementary School campus. It is connected to the system with a 10-inch pipe that extends west and then a 12-inch pipe that extends north to the Alder Lane right-of-way and the 12-inch line located therein.

Well No. 3. is located adjacent to the north right-of-way line of Alder Lane and connects directly into the 12-inch line that runs along the right-of-ways south edge.

The City of Tillamook has an 8-inch to 10-inch emergency intertie with Bay City at the north end of the city's system on Highway 101 between Makinster Road and the Wilson River Bridge. The Bay City Juno Hill and Alderbrook reservoirs are at elevations of approximately 212 (NAVD 1929) to 213 (NAVD 1929) and are capable of providing sufficient pressure to the Tillamook system. The intertie was tested in July of 2014 and worked according to plans. The intertie, in conjunction with Tillamook's two main wells (No.'s 2 and 3), was able to maintain the water supply to the City of Tillamook during a 20 day interruption to the City's 24-inch and 16-inch transmission lines through the Port of Tillamook Bay property. Breaks in the two pipelines eliminated Tillamook's access to its storage tanks and any surface water sources. The intertie can provide 500-600 gpm. There is a sample station on the Bay City side of the intertie and a meter. The Cities have agreed to just exchange water unless there is a long term need for one to supply the other. Currently the line is flushed from time to time. Bay City has matched its chlorine concentration to that of Tillamook. However, the City of Tillamook maintains a higher pressure on its side of the interconnection.

4.4 Groundwater Supply

4.4.1 Quantity

Wells 2 and 3 are the only wells currently being used on a regular basis. The well log for Well 2 indicates a capacity of up to 1,100 gallon per minute (gpm). The well log for Well 3 indicates a capacity of up to 935 gpm. The water rights allow for 1,212 gpm from Well 2 and 1,000 gpm from Well 3. Well 2 is currently operated at 550 gpm which is down from its maximum rate of 650 to 750 gpm. The pump has worn impellors which need to be replaced. Well 3 is operated at 820 gpm for energy efficiency, though its maximum capability is 1000 gpm. The combined capacity of the 2 wells is currently 1370 gpm. See **Table 4-2.**

A series of 10-inch and 12-inch diameter transmission mains moves the water west, from Wells 2 and 3, to the core of downtown at Ivy Street.

Wells 1 and Old Well 2 (Gienger Road) are only used for emergencies. The well log for Well 1 indicates a capacity of 1160 to 1320 gpm. The well log for Old Well 2 shows a capacity of 450 to 540 gpm. The quality of water in these two wells limit their use and is discussed in 4.4.2, below.

TABLE 4-2

WELL DATA

Well	Well Log	Well Tag ID	Year Drilled	Depth Completed	Diameter	Casing Depth	Perforations /Screens	Perforations /Screen Depth	Current Capacity gpm	Current Use Rate gpm	Use Priority
1	TILL 654	No Tag	1958	147'	16"	146.5'	Perforations	88'-93' 135'-140'	1320	0	Emergency
2 (Old)	TILL 530	No Tag	1960	107.5'	16"	107.5'	Perforations	87'-92'	540	0	Emergency
2	TILL 073	No Tag	1981	125'	14" & 12"	102'	Screens	95'-122'	750	550	Primary
3	TILL 013	No Tag	1990	201'	26" & 24"	201'	Perforations	154'-194'	1000	820	Primary

4.4.2 Quality

Wells 2 and 3 are the only wells currently being used on a regular basis, as they are the only sources of good quality groundwater.

Well 1 and old Well 2 (Gienger Rd) both have quality issues because of high iron content and are not used except in emergencies. If the City is able to construct additional wells within the basin which produce good quality water, the water rights from these two wells should be transferred under the process provided by the Oregon Water Resources Department. If new wells produce more water than the capacity of these two rights, only then should new permits be sought.

To gain the quality of water that the City is currently deriving from Wells 2 and 3, the location of any new wells will most likely be located in the same east and northeast sections of the City. Over the years, test wells farther west and south have not produced quality water.

The locations of wells 2 and 3 are also good from the standpoint of well head protection, even though they are located within the City and all of its mixed land uses. Located on School District property and City property that is surrounded by School District property, they are somewhat isolated from surrounding points of potential contamination and should remain so since the school property is not likely to be redeveloped into more concentrated, or deleterious, activity. The School District has worked well with the City to curb or eliminate the use of chemicals for the upkeep of the school grounds. If agreeable with the School District, the City may choose to pursue additional wells on these sites.

The Oregon Department of Environmental Quality (DEQ) and the Oregon Health Authority (OHA) have partnered to set up the Water Quality Drinking Water Protection Program. The purpose of the program is to provide information to communities on how to evaluate and protect their water resources through preventative management and to encourage community-based strategies.

Identifying potential risks allows communities to address and then reduce or prevent contamination of their water supply. Protection plans offer the opportunity to assess potential risks to the drinking water system and to explore means and methods to alleviate those threats. The collateral benefit of such plans are the potential to reduce or eliminate treatment costs, reduce health threats to the community, remove the need for replacement of the supply and, possibly, decrease State monitoring requirements. A protected and reliable drinking water supply also contributes to the economic viability and attractiveness of the service area.

DEQ and OHA have set up a database that identifies the City's supply areas for groundwater and identifies potential contamination sources that could enter through Wells 2 and 3. A copy of the May 2005 Source Water Assessment Report for the City of Tillamook is included in **Appendix F**

All groundwater is treated with chlorine at the individual well sites. The City is in compliance with the Oregon Health Authority for all required coliform and chemical testing.

4.5 Surface Water Supply

The existing surface water supply must be evaluated in terms of available quantity to meet present and future demands. It must address water quality, watershed control and treatment methods to meet the regulations of the Enhanced Surface Water Treatment Rules (ESWTR) resulting from the 1996 Safe Drinking Water Act (SDWA) amendments.

4.5.1 Quantity

The City has multiple surface water rights, those being: a water right certificate to divert 6.0 cfs (2,693 gpm or 3,877,900 gpd) from Killam Creek; a water right permit to divert 20.0 cfs (8,966 gpm or 12,911,000 gpd) from Fawcett Creek; a water right certificate to divert an additional 6.0 cfs (2,693 gpm or 3,877,900 gpd) from Fawcett Creek; and, a water right permit to divert 2.0 cfs (898 gpm or 1,292,630 gpd) from Simmons Creek as shown above in **Table 4-1**.

The right from Simmons Creek has not been developed. Environmental and flow considerations indicate that it may never be able to be used. The creek is a known fish habitat and summertime flows, when the city would be most in need of additional supply, runs very low. If it is ever to be used the only option may be to construct a storage reservoir that would be able to withdraw wintertime flows and release the water during the summertime. It is recommended that the City consider cancelling this right.

The combined rights from Fawcett and Killam Creeks total 32 cfs, or 20.67 million gallons per day. The actual quantity of water available fluctuates seasonally. While the winter flows greatly exceed the allowed diversion rate, summertime flows can be well under. The available flow data for the two creeks, which is extremely limited and 30 years old, is shown in **Table 4-3**.

Minimum stream flow for Killam Creek is protected under Certificate of Water Right 73005. Minimum stream flow for Fawcett Creek is protected under Certificate of Water Right 72532. Minimum stream flow for Simmons Creek is protected under Certificate of Water Right 72513

These certificates, issued in 1996 with a February 13, 1991 priority date, preclude any additional permits from being issued on these sources for live summertime flow. They also affect the City's existing permits in that they have priority over any use other than human consumption and livestock consumption.

The total amount that can be withdrawn from Fawcett and Killam creeks drops to approximately 3.34 cfs (1,500 gpm and 2.1 mgd) during late summer and early fall.

1,500 gpm is slightly more than the current capacity of the water treatment plant. The ideal rate for the treatment plant is 1350 gpd with a maximum of 1400 gpd. However, it is under the 1627 gpm of present peak demand. Therefore, the demand is augmented by the production of groundwater.

TABLE 4-3 STREAMFLOW RECORDS				
Killam Creek				
INFORMATION SOURCE: OWRD Hydrographics Database, Mean Daily Flows, OWRD Daily Values Table - Water Year, *http://apps.wrd.state.or.us/apps/sw/hydro_report/gage_data_request.aspx?station_nbr=14302600* (from continuous reading gauge located above diversion dam)				
Water Year	**Mean cfs**	**Max cfs**	**Min cfs**	**Annual Acre Feet**
1976	37.0	507	1.7	26,860
1977	15.1	103	1.2	10,950
1978	41.1	782	2.3	29,770
1979	24.1	280	2.0	17,470
1980	24.8	265	2.0	17,990
1981	29.0	308	2.3	20,990
1982	35.3	296	2.5	25,560
1983	38.9	343	4.2	28,200
1984	33.0	241	3.7	23,880
Fawcett Creek				
INFORMATION SOURCE: Tillamook Water Commission (Monthly Measurements at Diversion Dam)				
Year	**Max cfs**	**Date**	**Min cfs**	**Date**
1975	70.20	12-30-75	2.35	6-26-75
1976	155.00	3-25-76	2.95	8-30-76
1977	84.60	11-28-77	3.87	7-26-77
1978	77.70	12-05-78	4.76	10-26-78
1979	115.00	2-26-79	2.77	8-01-79
1980	44.40	2-26-80	2.39	10-30-80
1981	50.30	11-20-81	6.3	7-29-81
1982	15.40	4-07-82	3.99	9-01-82
Simmons Creek				
No Flow Data Available				

4.5.2 Quality

The water supply must meet the regulations of the Enhanced Surface Water Treatment Rules (ESWTR) resulting from the 1996 Safe Drinking Water Act (SDWA) amendments.

The combined flows from Fawcett and Killam creeks, along with any water released from Skookum Lake, are treated by rapid sand filtration and chlorine disinfection at the 2.0 mgd water treatment facility located south of Reservoir Road and east of its intersection with South Prairie Road. With the completion of the treatment plant in 1994, the City's water quality has met all Federal and State guidelines. The City is in compliance with the Oregon Health Authority for all required coliform and chemical testing.

Like the report for groundwater, The Oregon Department of Environmental Quality (DEQ) and the Oregon Health Authority (OHA) have also partnered to review potential surface water contaminants..

DEQ and OHA have set up a database that identifies the City's supply areas for surface water and identifies potential contamination sources that could enter upstream of the diversion points. A copy of the January 14, 2003 Source Water Assessment Summary Brochure for the Tillamook Water Commission [sic] (City of Tillamook) is included in **Appendix G**. The watersheds for Killam and Fawcett Creeks contain potential pollution sources as shown in **Table 4-4**.

TABLE 4-4

2003 Source Water Assessment Results (Surface Water)

Basin	Potential Contaminant Source	Risk Level in Sensitive Area	Potential Impacts
Fawcett & Killam	Managed Forest Land Clear Cut Harvest (<35 years)	Higher	Increased erosion causing turbidity and chemical changes to water. Over-application of pesticides or fertilizers may impact water
Fawcett & Killam	Landslides	Moderate	
Fawcett & Killam	Transmission Lines	Higher	Construction & Maintenance may contribute to increased erosion & turbidity. Over-application or improper handling of pesticides or fertilizers may impact water
Fawcett	Coyote Point Rock Quarry	Moderate	Spills, leaks or improper handling of chemicals & wastes from mining or equipment operation may impact water
Fawcett	Upstream Dam Skookum Lake	Moderate	During major storms, may contribute to prolonged turbidity. Construction, fluctuating water levels, heavy waterside use can increase erosion & turbidity.

In the spring and fall of 2013, the Tillamook Estuary Partnership and the Oregon Department of Environmental Quality procured and analyzed water samples collected upstream of the City of Tillamook's drinking water intakes. Results indicate three pesticides were present in the sources. Glyphosate (developed by

Monsanto as *Roundup*) and aminomethylphosphonic acid (AMPA), (the primary degradation product of Glyphosate) were detected at levels close to the laboratory instrument detection limits in Fawcett Creek. The concentrations were thousands of times lower than the primary maximum contaminant level (MCL) allowed. The allowed limit is 700,000ng/L where 70.6 and 92.2 ng/L were measured. Sulfometuron-methyl (the active ingredient in *Oust),* a broad spectrum grass and broadleaf herbicide, was detected in Killam Creek; also at levels close to the laboratory instrument detection limits. The allowed limit is 2,000,000 ng/L where the estimated detection was 1.63 ng/L. A copy of the June 3, 2014 letter from the Oregon Health Authority regarding the City's drinking water source sampling and Oregon State University Extension Service Pesticide Fact Sheets is included in **Appendix H**.

Removal of Glyphosate from drinking water supplies is by granular carbon filter. No removal guidelines were found for Sulfometuron-methyl.

4.6 Skookum Lake

In the past, and when needed, Skookum Lake augmented the flow of Fawcett Creek in the low flow summer months; providing water to the City of Tillamook and improving wildlife habitat. The capacity of Skookum Lake is unknown at the present time. In the nearly 50 years, since its construction in 1965, the lake has never been drained completely nor has the amount of silt inflow been determined. It would be expected to have experienced some diminishment of capacity, though the extent is unknown. Aerial photographs show what appears to be a large amount of silt at three drainage entrances into the lake. The recent acquisition of the original 1965 construction plans from the design engineer, CH_2M-Hill, shows that these silt flows had already begun as early as 1972. They are sketched on the plans and are significant.

With the acquisition of the CH_2M-Hill plans and the recent access to LIDAR (light detection and ranging) images from the Oregon Department of Geology and Mineral Industries, it has become apparent that the Skookum Lake dam was constructed utilizing an old landslide. See **Figure 4.1**, **Figure 4.2**, **Figure 4.3** and **Figure 4.4** The plans indicate that soil sample test pits, no more than 8.5 feet deep were excavated at the time of design. These show a mixture of soil types and materials and variable plasticity limits, confirming the presence of the slide.

The construction plans indicate the dam is 41 feet high at the centerline of Fawcett Creek and spans 630 feet across the valley. The slide material incorporated into the dam stretches across the entire draw and was eroded by Fawcett Creek as it flowed out of the natural Skookum Lake, located approximately 900 feet to the southeast of

Landslide Hazard

Landslide

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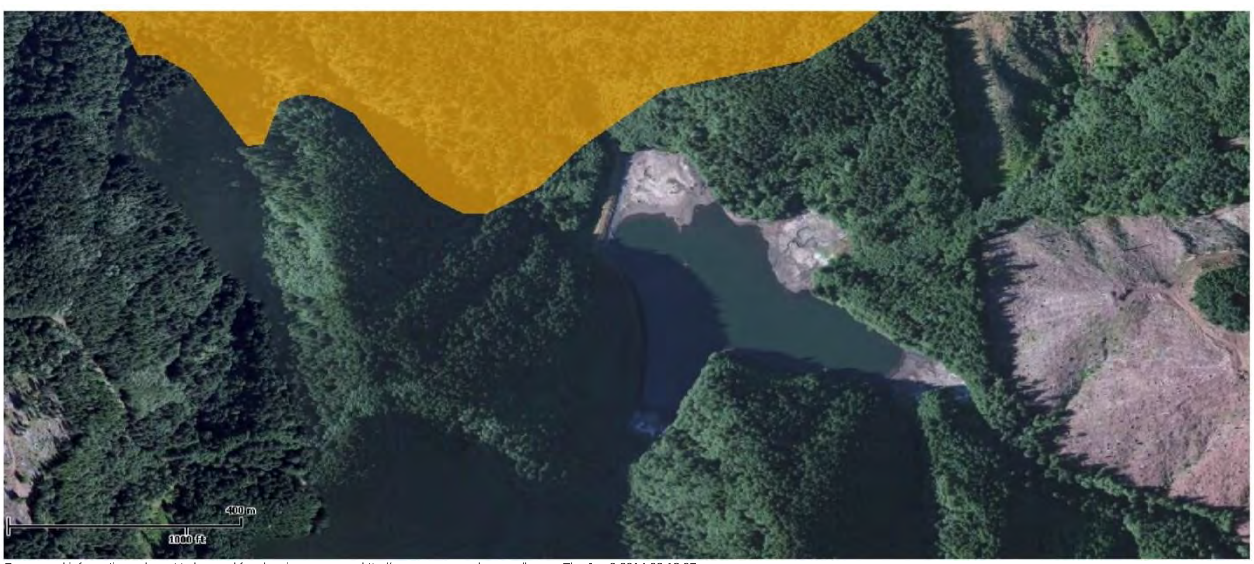
Earthquake Soft Soil Hazard

Moderate



For general information only, not to be used for planning purposes. http://www.oregongeology.org/hazvu Thu Jan 9 2014 03:13:07

Figure 4-1

Cascadia Earthquake Expected Shaking

Shookum Lake Reservoir

For general information only; not to be used for planning purposes. http://www.oregongeology.org/hazvu Mon Feb 24 2014 08:51:06 AM.

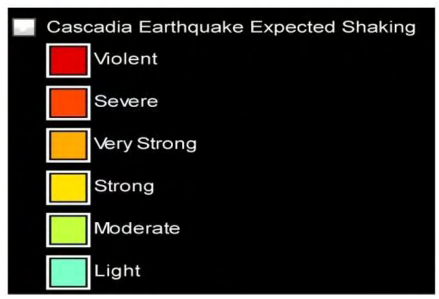


Figure 4-2

SKOOKUM LAKE

Old Side Area

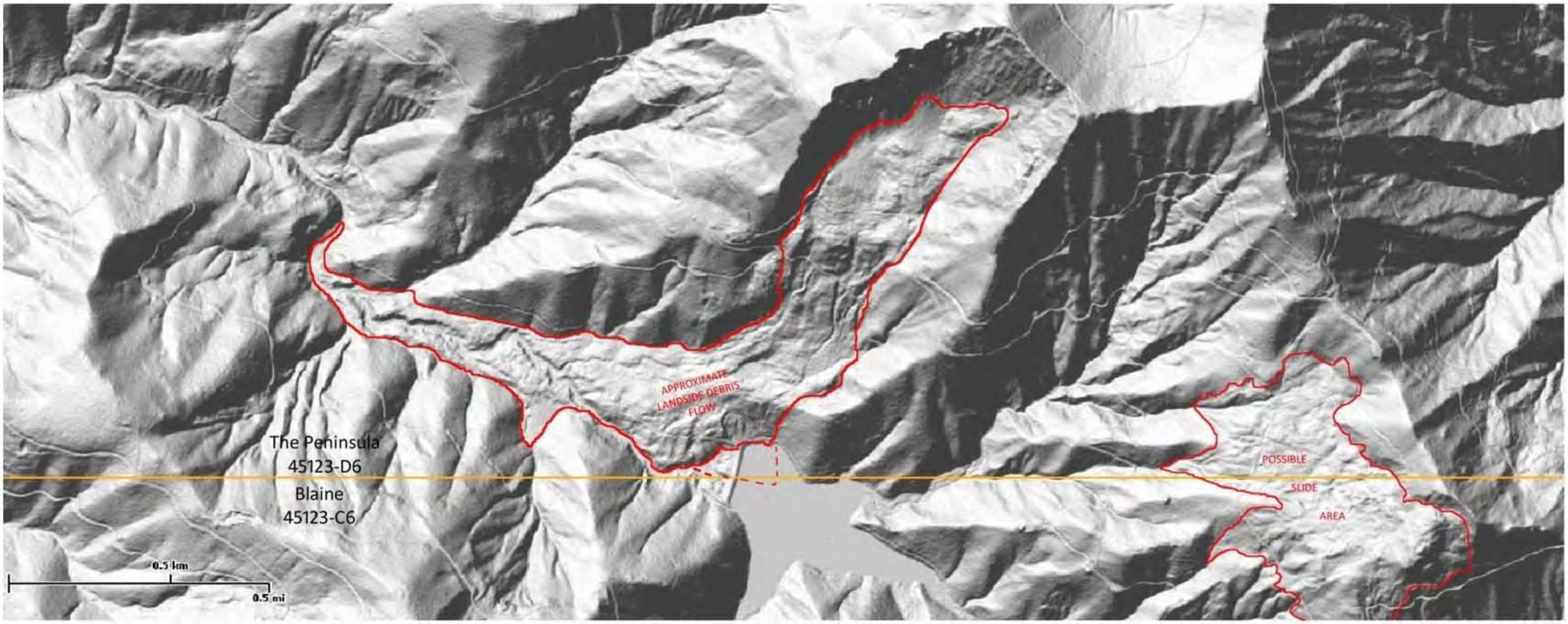
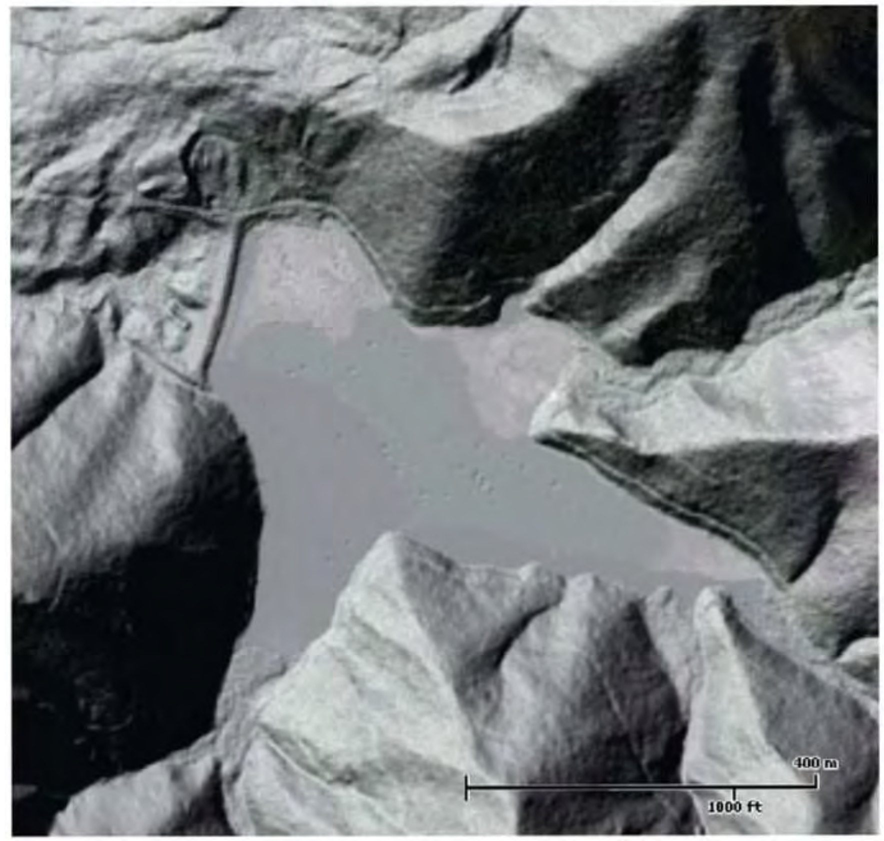


Figure 4-3

Tillamook

Skookum Lake Reservoir

Photo Image



Lidar Image

http://www.oregongeology.org/dogamilidarviewer/

Figure 4-4

the existing dam and having been incorporated into the reservoir pool. The slide material originates from the mountainside to the north-northwest of the dam.

The site of the landslide was neither fully investigated, nor excavated and re-compacted, at the time it was incorporated into the dam in 1965. Consultation with the Oregon Department of Water Resources Dam Safety Engineer, has confirmed the potential catastrophic consequences of this construction. Also of concern is the potential for future slides in the area which could cause even more problems with the dam or could slide into the reservoir, displacing the stored water and overtopping the dam.

The hazard rating for the dam, which indicates the potential for an accidental dam breach that could damage property or result in loss of life, has recently been raised from low to high by the Oregon Department of Water Resources as a result of the discovery of the landslide materials in the dam.

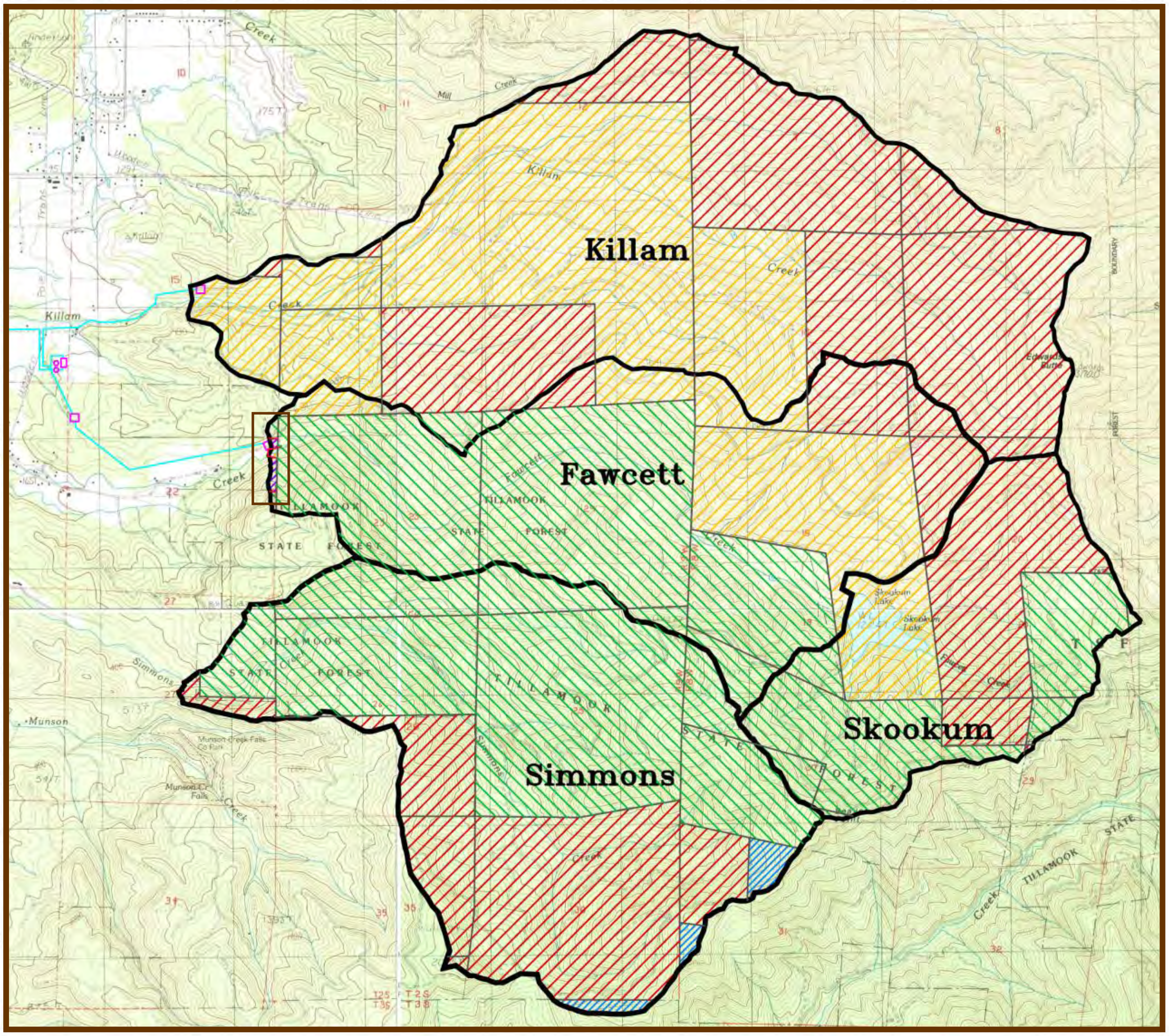
The dam has not been a source of municipal water supply for many years and, due to the discovery of its uncertain stability, it is recommended that the City breach the dam. A request to cancel the storage and secondary municipal use water rights should be made to the Oregon Water Resources Department, only after the breach work has been completed.

4.7 Watershed Control

The watersheds for the City's surface water sources are under a mix of ownerships. The watershed ownerships are shown in **Table 4-5** and on **Figure 4-5**. The City does not have current formal drinking water protection plans for these watersheds.

The City has verbal agreements with both private and public landowners and the City is notified when activities, such as herbicide applications or timber harvests, are set to occur. The City restricts the water intake from the affected area, shutting it off during and after the activity and increasing water quality testing. Water acquisition is resumed once testing determines that all threats have passed. All access roads into the watersheds are gated and remain locked except for harvesting activities and access by authorized personnel.

The City wishes to obtain a partnership arrangement with the various landowners to formalize the current management practices which have been very successful, but which offer no guarantee of continuance. The basis for this document and agreement is to provide for drinking water protection as required under the 1996 Safe Drinking Water Act and as recommended under the State of Oregon's Water Quality Drinking Water Protection Program.



Watershed Ownerships

Detail

Figure 4-5

If the City of Tillamook breaches Skookum Lake dam and relinquishes its water rights, it will need to contemplate what it will do with the remaining forest acreage. Considering that this land is in the Fawcett Creek drainage basin that will continue to supply the City's drinking water, the City may choose to hold onto the land so that it controls, to a certain degree, how it is managed in general. Day to day management and harvest practices could be negotiated with an adjacent timberland owner and may generate income for the City. A second option would be to sell the property with conditions regarding management practices as they would affect the City's drinking water quality and supply.

TABLE 4-5

Watershed Ownerships

Killam Creek		
3096 acres		
Owner	**Acreage**	**% of Watershed**
Stimson Lumber Company	1591	51%
City of Tillamook	1473	48%
State of Oregon	32	1%
Fawcett Creek *(without Skookum Reservoir basin)*		
2030 acres		
Owner	**Acreage**	**% of Watershed**
State of Oregon	1230	61%
City of Tillamook	502	25%
Stimson Lumber Company	293	14%
George Hurliman & Rose Hurliman Living Trusts	5	0%
Skookum Reservoir		
1114 acres		
Owner	**Acreage**	**% of Watershed**
State of Oregon	504	45%
Stimson Lumber Company	444	40%
City of Tillamook	166	15%
Simmons Creek		
2302 acres		
Owner	**Acreage**	**% of Watershed**
State of Oregon	1370	60%
Stimson Lumber Company	878	38%
United State of America, Forest Service	166	2%

4.8 Water Treatment System

4.8.1 Surface Water

Two 1 million gallon per day (MGD) automatic package treatment units and related appurtenances are installed in the water treatment plant building, located southeast of Tillamook. The two units are controlled by a single plant controller, with the chemical feed system for both units automatically controlled by a single coagulant controller.

The following items are included in the water treatment system:

a. Factory built steel modular tanks, each designed using an upflow adsorption clarifies followed by a downflow gravity filter with mixed media directly retained by the underdrain system.

b. A complete treatment system including chemical injection equipment, adsorption clarification, filtration, automatic process valves, controllers, adsorption clarifier media, mixed media, direct retention underdrains, and microprocessor based plant control and coagulant control systems.

c. An air scouring system including air blowers and automatic valves for the operation of this system to flush the adsorption clarifies and to aid in the filter backwash.

d. Filters with mixed media and direct retention underdrain system. The underdrain system provides media support and effective air/water backwashing without the use of support gravel. The underdrain system is capable of simultaneous air/water washing. This system provides more effective cleaning at reduced backwash water volumes that the conventional water/water backwash system and eliminates the potential for filter bed upsets.

e. The package water treatment system is provided with an alum tank, propeller flow meters, a backwash water pump, backwash water pond decant pump system, telemetry system, and controls to form a complete and operational water treatment system.

4.8.1.1 Design and Operating Criteria

The package water treatment plant (PWTP) units, the plant control system and the coagulant control system are designed to perform according to the following design and operating criteria:

a. Raw Water

Raw water is provided from two sources: Fawcett and Killam Creeks and from Skookum Lake via the Fawcett Creek intake structure. Turbidity, or the cloudiness of water caused by suspended solids, is measured in nephelometric turbidity units (NTU) where the higher the number, the greater the turbidity. All of these sources have raw water quality typical of that for small Pacific Northwest coastal streams. Turbidities normally range from 1 to 3 NTU with spikes of up to 40 NTU in Killam Creek and 70 NTU in Fawcett Creek which last less than 24 hours. Fawcett Creek has a higher clay content in its turbidity due to the greater unstable soil conditions in its watershed. In addition, during the warmer months of July through November, small amounts of stringy brown algae appear in Fawcett Creek and small round clumps of green algae appear in Killam Creek. However, the manually cleaned screens at the intakes for both diversions are effective in removing the algae.

b. Recycled Water

A fourth source of influent flow is recycled water pumped from the backwash water ponds by the decant pumps. However, this source should only be used on an emergency basis. It should not be used when adequate raw water is available.

c. Influent Head

Because of the fixed available head form the Killam and Fawcett Creek gravity sources, the water treatment facilities are operated by gravity. Therefore, at a design flow of 1400 gpm, only 14 feet of head (measured from the top of the water treatment plant base) is available at the point where the influent plant piping splits from one common 16-inch diameter line into two 8-inch diameter pipes entering each of the two PWTP units. This head is sufficient to operate the treatment units entirely by gravity flow without pumping except for the effluent turbidimeter sample pumps, backwashing, and in-plant use.

d. Raw Water Source Control

Each day while checking the water treatment plant, the operator selects the desired combination of raw water sources and manually adjusts influent flows to obtain a total flow of up to 1.400 gpm, which is the plant capacity. At the telemetry panel in the water treatment plant building he observes the flow rates from Killam and Fawcett Creek supplies as registered by the remote flow meters in the each of the headwork's vaults. By operating the remote electric butterfly valve actuators on the two supply lines in the headwork's vaults, the desired flow rates from each creek supply are obtained.

e. Chemical Feed System

The chemicals to be used in the treatment process are undiluted liquid alum (5.25 lbs.; of dry alum per gallon) for coagulation; soda ash for pH adjustment at an average ratio of 1 ppm per 2ppm of alum; polymer as a filter conditioner; and, chlorine gas for both pre- and post-disinfection.

f. Performance Criteria

The package water treatment system is capable of reliably producing finished water quality that meets the criteria established by the Environmental Protection Agency (EPA) in the National Primary Drinking Water Regulations (NPDWR) for Filtration, Disinfection, Turbidity, Giardia lamblia, Viruses, Legionella, and Heteratrophic Bacteria; Final Rule. This rule is more commonly called the Surface Water Treatment Rule (SWTR), promulgated on June 29, 1989. Specifically, the finished water turbidity shall be less than 0.5 NTU 95% of the time, less that 5 NTU at all times, and less than 0.2 NTU when raw water NTU is 1.0 or less. In addition, the EPA must be satisfied that contaminant removal efficiencies for the upflow clarification/filtration process only are as follows:

Contaminant	Log Removals
Giardia Lamblia cysts	2.5
Viruses	2
Total and fecal coliform	>3

Removal of between 75% and 95% of turbidity and Giardia Lamblia shall be done by the upflow clarifier only.

The disinfection process following filtration will provide at least 0.5 log inactivation of Giardia Lamblia cysts, and 2,0 inactivation of viruses.

4.8.2 Groundwater

The wells can be operated at the same time as the water treatment plant. Because the groundwater and surface water may be mixed, each well is equipped and operated with a chlorinator to provide residual disinfection.

Chapter 5
Transmission & Distribution System

Chapter FIVE: **Transmission & Distribution System**

5.1 Description And Evaluation of Existing System

5.1.1 Transmission System

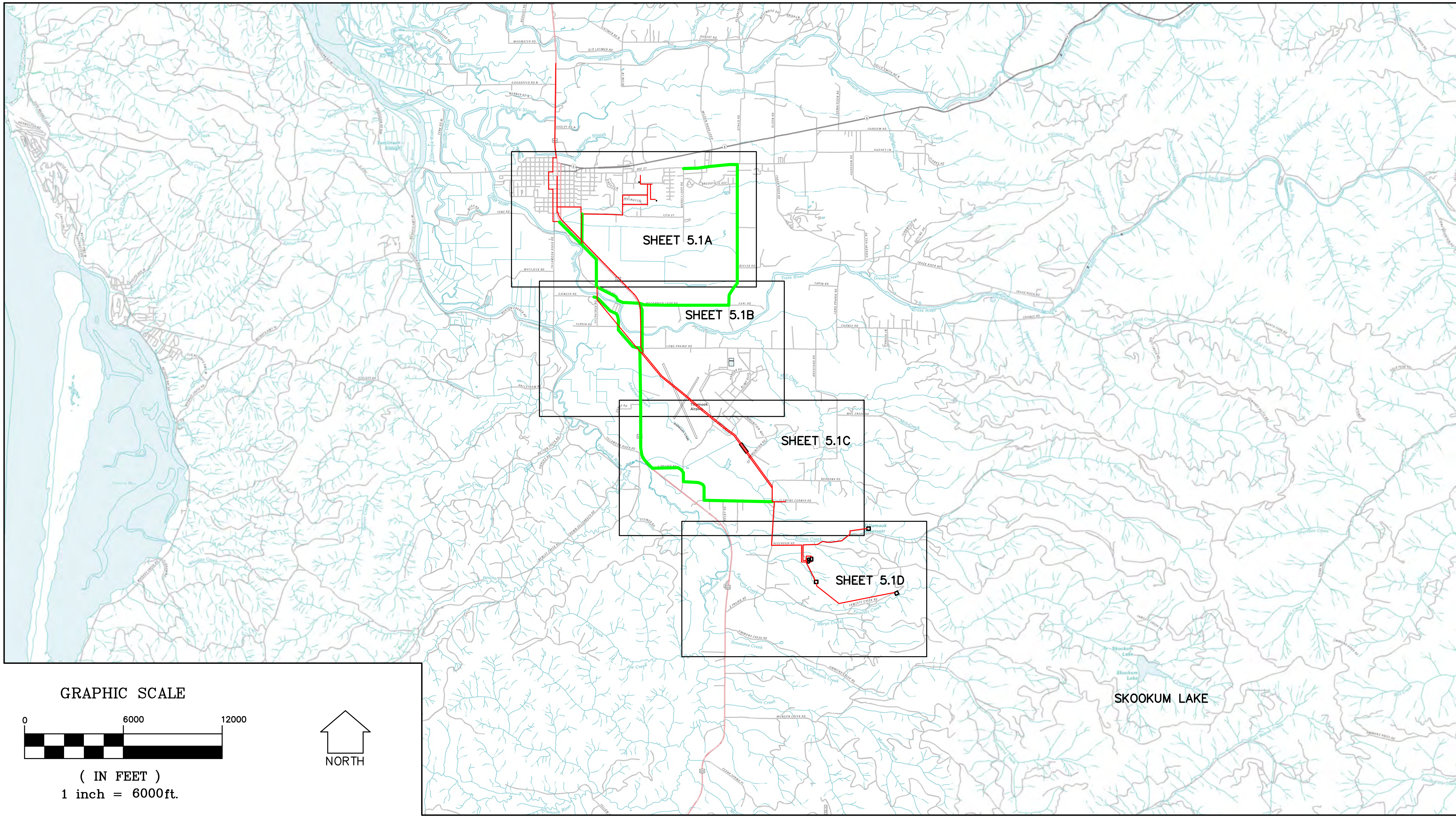
Raw water is transported from the Fawcett Creek intake, westerly, to the Fawcett Creek Balance Reservoir, via 10,500 feet of 18-inch PVC waterline being constructed in 2013-2014. From there it continues north, through 1,400 feet of 18-inch PVC waterline being constructed in 2013-2014 to the water treatment plant. Raw water from Killam Creek travels from the Killam Creek Balance Reservoir, located just past the creek intake structure, to the water treatment plant through 5,300 feet of 16-inch PVC waterline constructed in 1994.

From the reservoirs at the treatment plant facility the treated water flows by gravity to the Tillamook city limits through approximately six miles of parallel steel transmission mains ranging in size from 12-inches to 24-inches in diameter and varying in age from 60 to 76 years. **Figure 5.1**, **Figure 5.1A**, **Figure 5.1B**, **Figure 5.1C** and **Figure 5.1D** show the location, size and date of installation of the various rural transmission main segments.

Within the city limits the transmission system consists of mains running north-south through the center of town and farther north, along Highway 101, to the Wilson River and an emergency intertie with the Bay City waterline. Another main runs east, along the southern city limits, and then northeasterly to Wells No. 2 and 3 at the Tillamook Junior High School and East Elementary School. In 2012, a new 12-inch transmission pipeline was constructed in Third Avenue from Evergreen Drive to Marolf Loop Road to reinforce the water supply to the northeast portion of town.

The transmission mains within the City are shown on **Figure 5.2**.

On July 9, 2014, the City experienced a break in the 16-inch transmission line passing through the Port of Tillamook Bay property. In the process of exposing the 16-inch line, the closely located 24-inch transmission line also ruptured, creating a catastrophic situation for the City. Personnel work maximum hours to get the lines shut down and exposed to determine the extent of repairs needed. During this shut down, Wells 2 and 3 were in continual service and the intertie with Bay City was opened to provide backup supply and storage. It took the City nearly 20 days to assemble the parts and materials to make the repairs and get the two lines back in service.



EXISTING TRANSMISSION MAINS

EXISTING TRANSMISSION MAINS TO BE ABANDONED WITH NEW CONSTRUCTION

PROPOSED TRANSMISSION MAINS

RURAL TRANSMISSION LINES

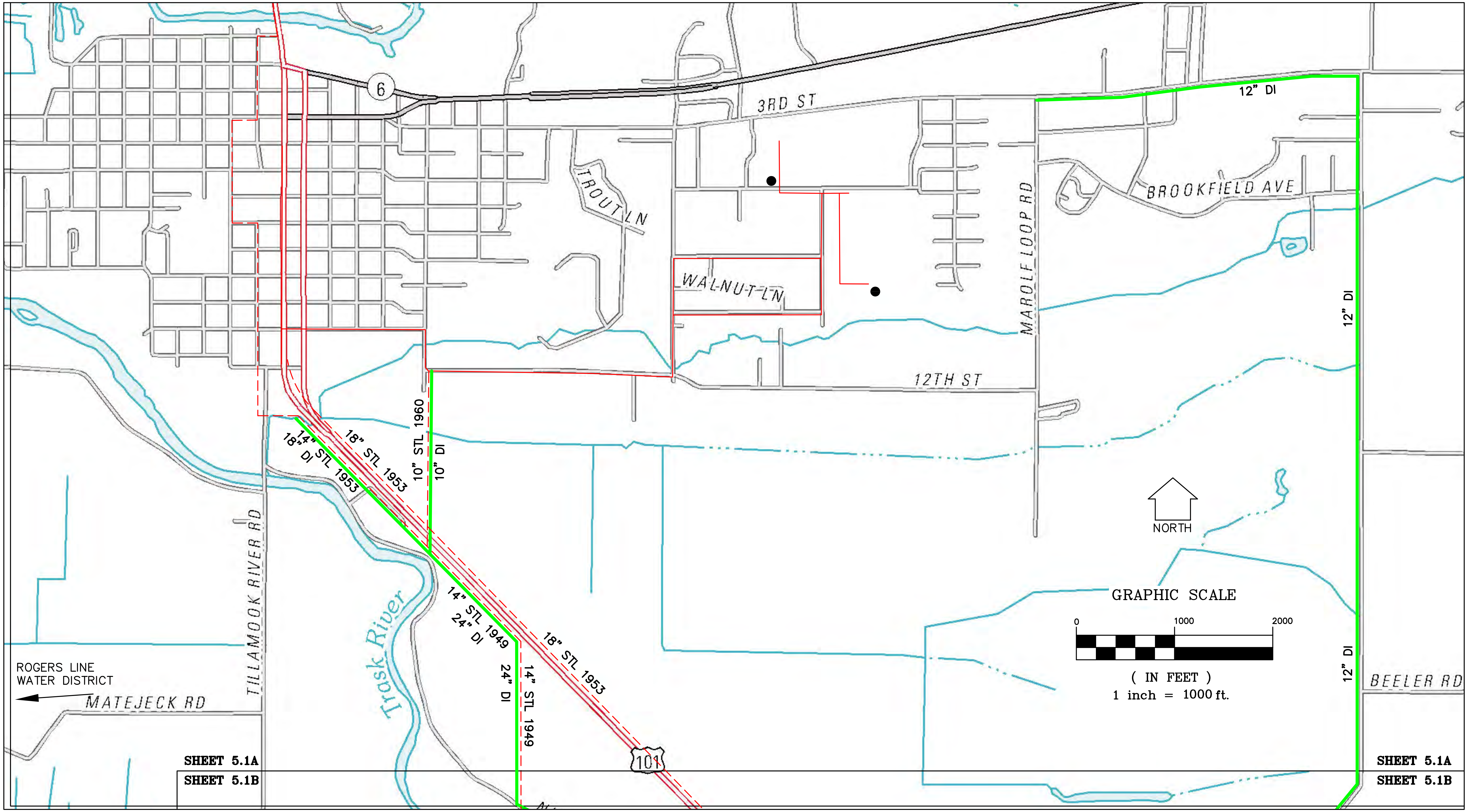
Water System Master Plan

City of Tillamook, Oregon

Map Source: USGS

FIGURE 5.1

BOATWRIGHT ENGINEERING, INC.



EXISTING TRANSMISSION MAINS

EXISTING TRANSMISSION MAINS TO BE ABANDONED WITH NEW CONSTRUCTION

PROPOSED TRANSMISSION MAINS

RURAL TRANSMISSION LINES

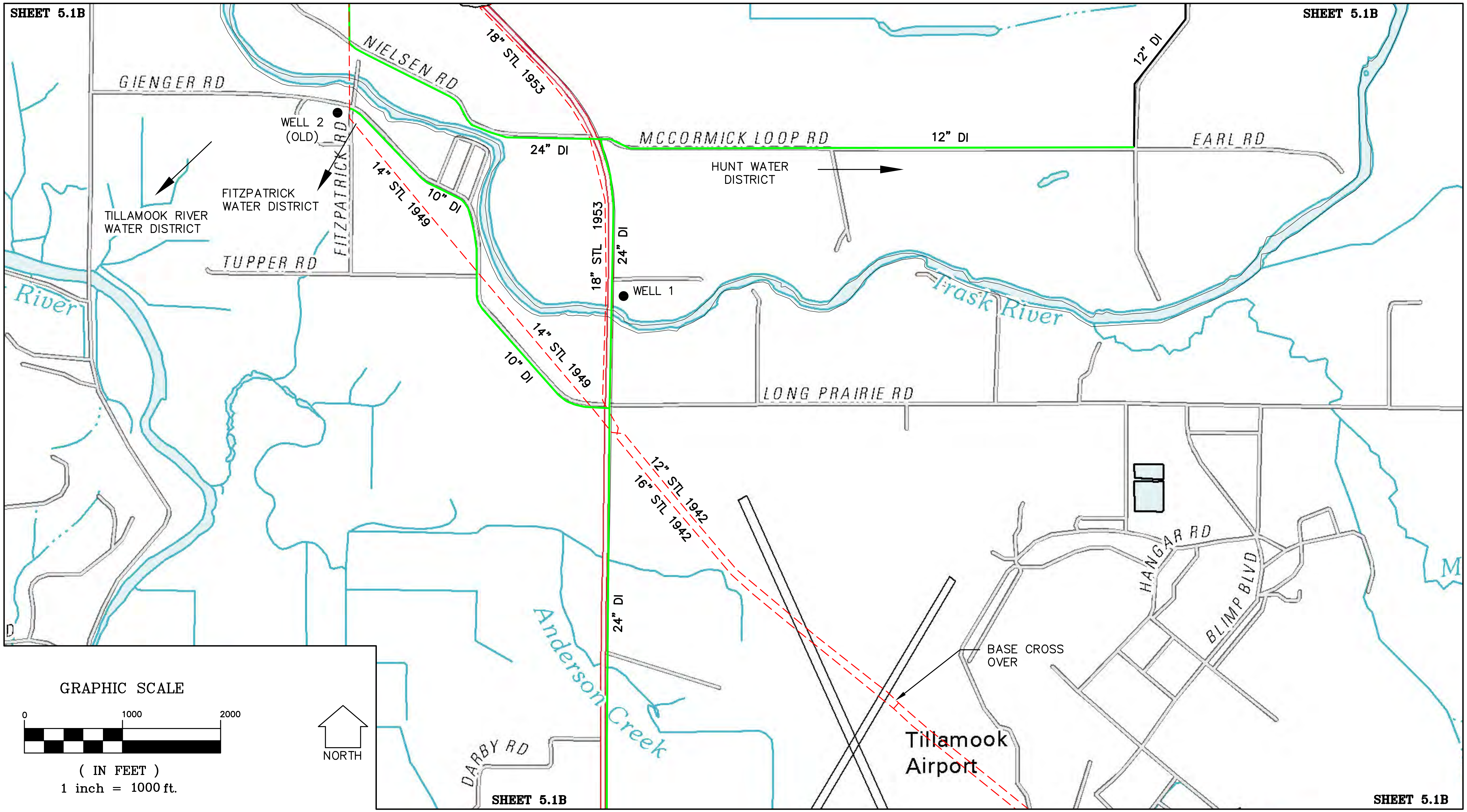
Water System Master Plan
City of Tillamook, Oregon
Map Source: USGS

FIGURE 5.1A

BOATWRIGHT ENGINEERING, INC.

SHEET 5.1A
SHEET 5.1B

SHEET 5.1A
SHEET 5.1B



SHEET 5.1B
SHEET 5.1C

SHEET 5.1B
SHEET 5.1C

12" STL 1942
16" STL 1942

EXISTING TRANSMISSION MAINS

EXISTING TRANSMISSION MAINS TO BE ABANDONED WITH NEW CONSTRUCTION

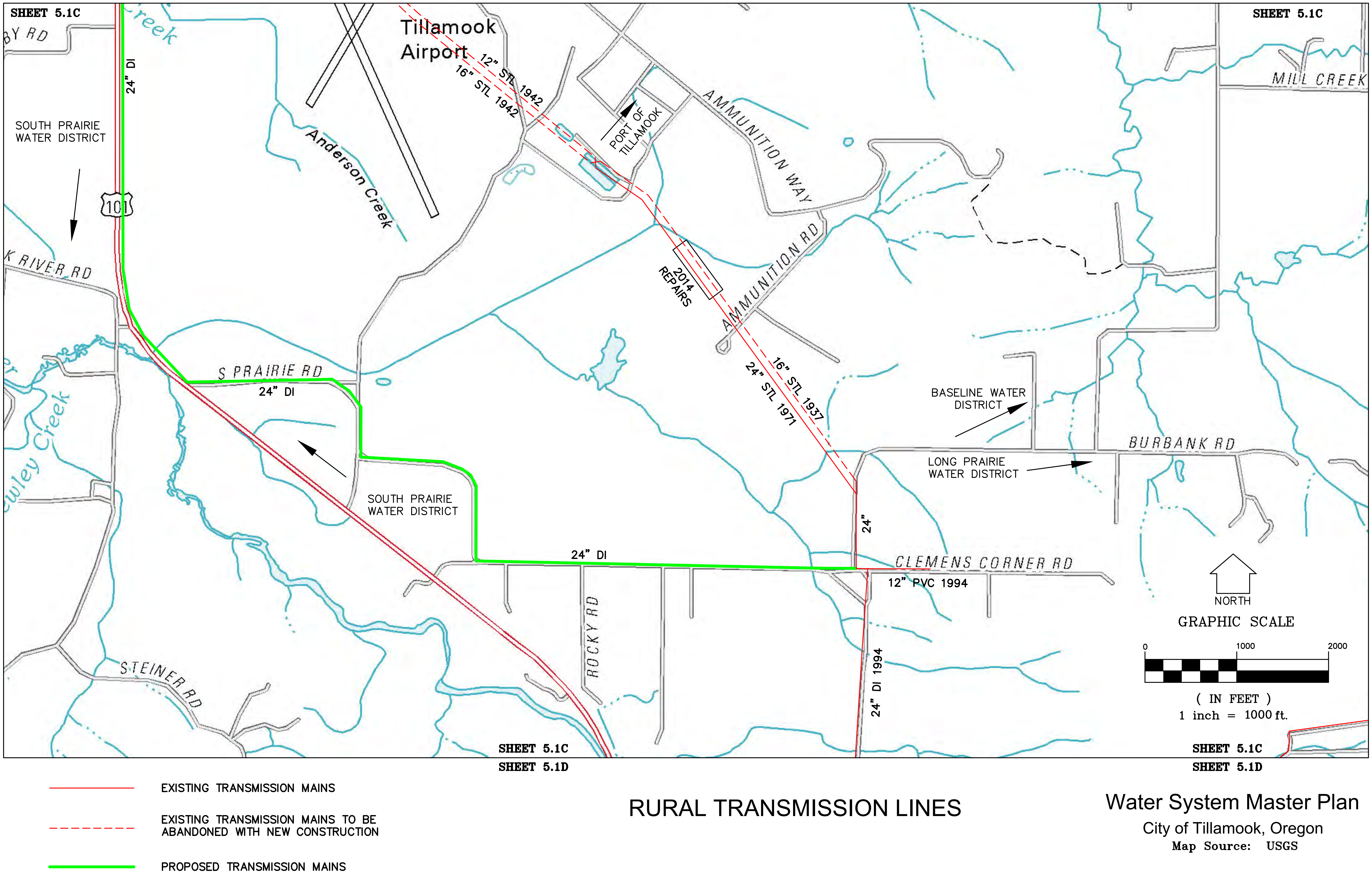
PROPOSED TRANSMISSION MAINS

RURAL TRANSMISSION LINES

Water System Master Plan
City of Tillamook, Oregon
Map Source: USGS

FIGURE 5.1B

BOATWRIGHT ENGINEERING, INC.



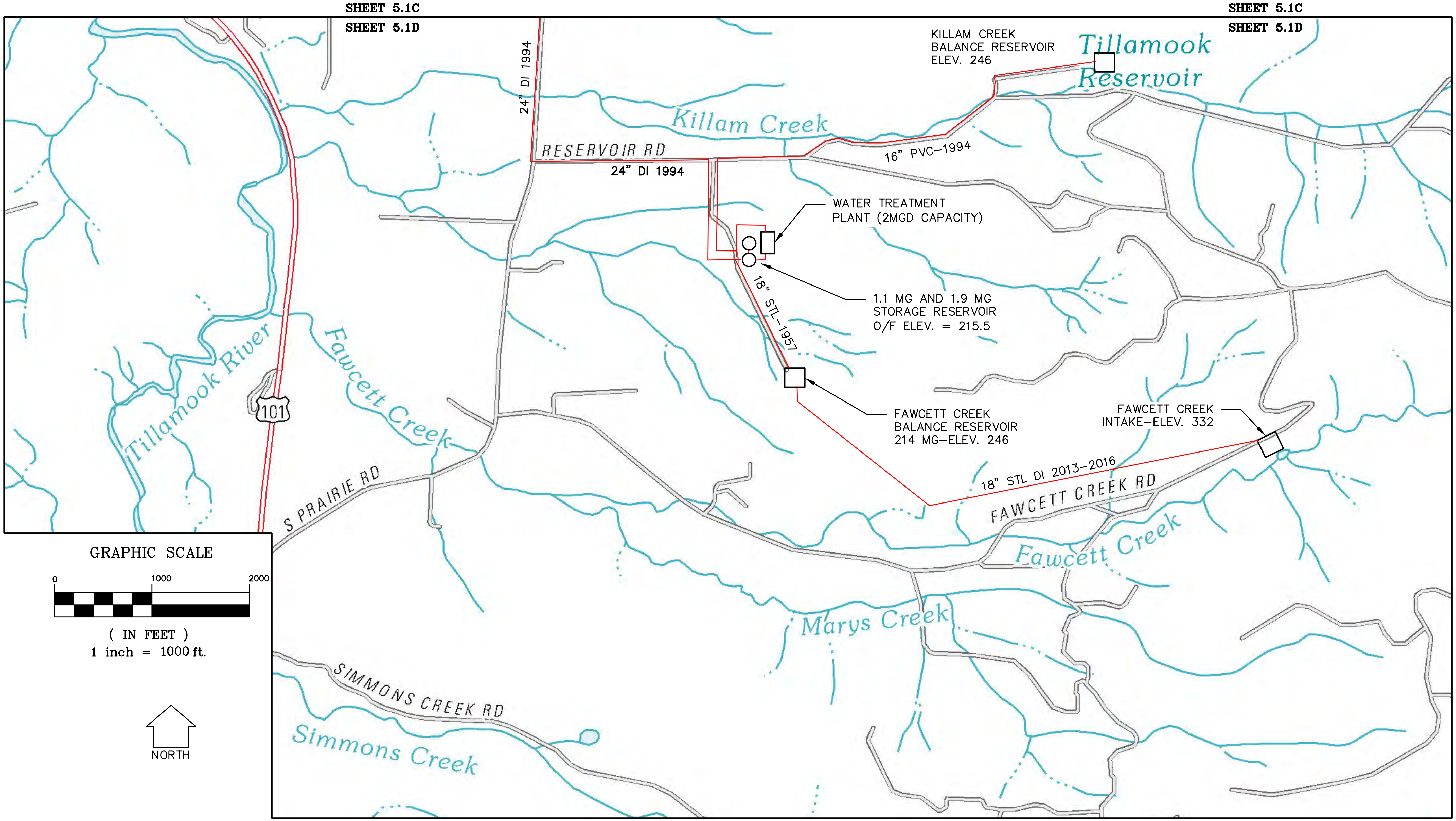
RURAL TRANSMISSION LINES

Water System Master Plan

City of Tillamook, Oregon

Map Source: USGS

FIGURE 5.1C



BOATWRIGHT ENGINEERING, INC.

EXISTING TRANSMISSION MAINS

EXISTING TRANSMISSION MAINS TO BE ABANDONED WITH NEW CONSTRUCTION

PROPOSED TRANSMISSION MAINS

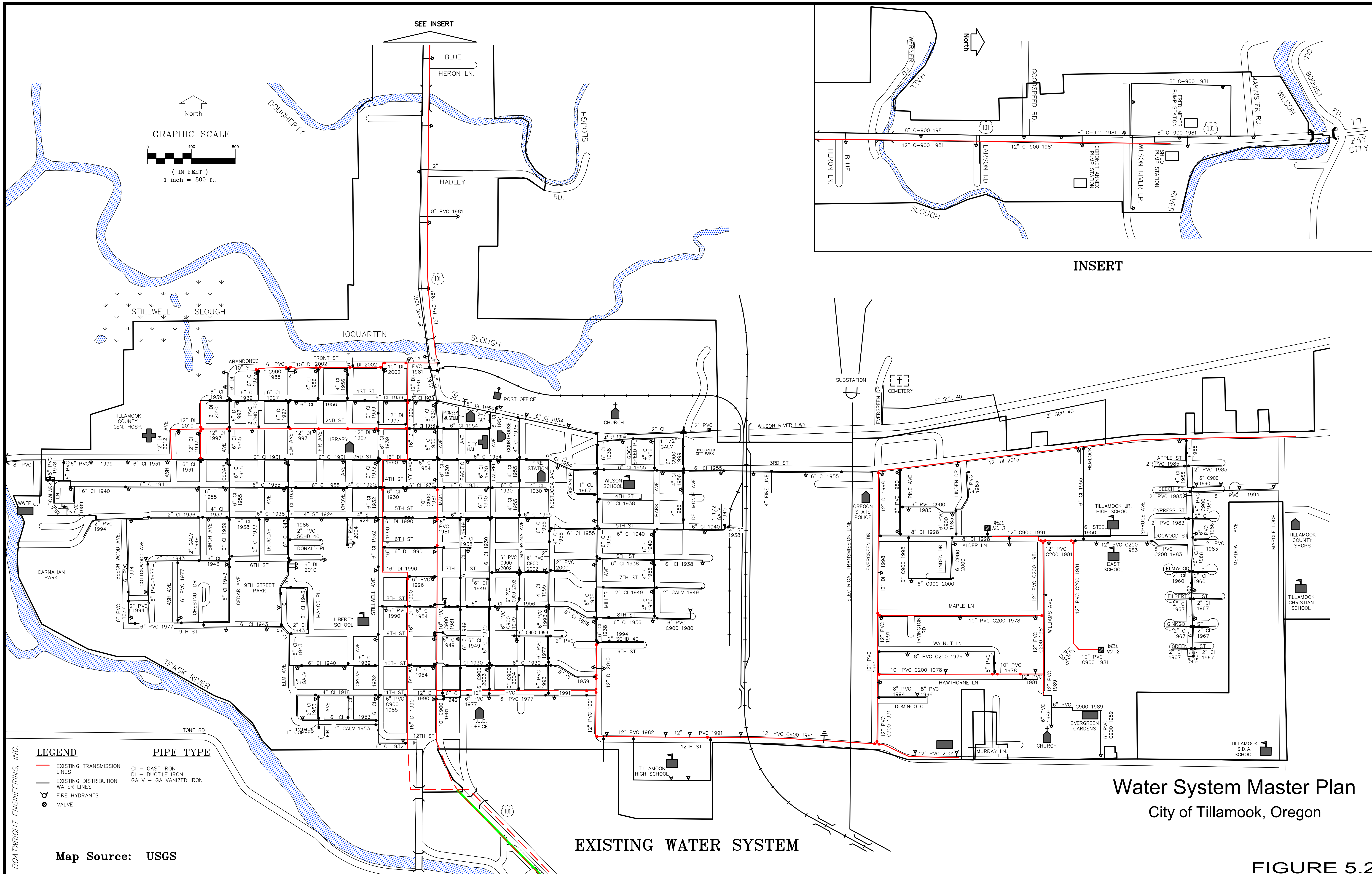
RURAL TRANSMISSION LINES

Water System Master Plan

City of Tillamook, Oregon

Map Source: USGS

FIGURE 5.1D



Water System Master Plan
City of Tillamook, Oregon
EXISTING WATER SYSTEM
INSERT
SEE INSERT
North
GRAPHIC SCALE
(IN FEET)
1 inch = 800 ft.
LEGEND
EXISTING TRANSMISSION LINES
EXISTING DISTRIBUTION WATER LINES
FIRE HYDRANTS
VALVE
PIPE TYPE
CI – CAST IRON
DI – DUCTILE IRON
GALV – GALVANIZED IRON
Map Source: USGS
BOATWRIGHT ENGINEERING, INC.
HOQUARTEN SLOUGH
STILLWELL SLOUGH
DOUGHERTY SLOUGH
TRASK RIVER
WILSON RIVER
WILSON RIVER HWY
TILLAMOOK COUNTY GEN. HOSP.
CARNAHAN PARK
LIBERTY SCHOOL
WILSON SCHOOL
TILLAMOOK HIGH SCHOOL
TILLAMOOK JR. HIGH SCHOOL
EAST SCHOOL
OREGON STATE POLICE
CITY HALL
POST OFFICE
LIBRARY
FIRE STATION
P.U.D. OFFICE
PIONEER MUSEUM
COURTHOUSE
CEMETERY
SUBSTATION
EVERGREEN GARDENS
TILLAMOOK COUNTY SHOPS
TILLAMOOK CHRISTIAN SCHOOL
TILLAMOOK S.D.A. SCHOOL
WELL NO. 2
WELL NO. 3
FRED MEYER PUMP STATION
CORONET ANNEX PUMP STATION
SHILO PUMP STATION
TO BAY CITY

FIGURE 5.2

5.1.2 Distribution System

The distribution system within the City is reasonably laid out, and for the most part was constructed of long lasting, appropriately sized pipe for providing adequate looping and fire flow. **Figure 5.2** also shows the location, size and date of installation of the various system components. The majority of the central city system is 6-inch cast iron installed from the 1920's through the 1950's. The rest of the system is a mix of, mostly, Ductile Iron and PVC of varying strengths (including Schedule 40, Class 200, and Class C-900) with smaller portions of Galvanized Iron and other materials.

Leaking, undersized, and out-of-date piping has been identified in previous reports, with most of the leaking pipes repaired, replaced or taken out of service. However, undersized pipe, pipe which had a shorter life span, such as galvanized iron, is still in place and should be replaced to improve quality, reliability, looping, and fire flow capability. These pipes will be identified in the Capital Improvements Plan as needing to be replaced. An inventory of the existing pipe system is contained in **Appendix I** and listed in chronological order, by construction date. This document also identifies those pipes which have outlived their life expectancy, along with those that reach the end of life within the first ten years of this master plan and those that reach the end of life within the last ten years of this 20-year master plan.

5.1 Surges

Surges are phenomena within hydraulic systems which tend to suddenly increase pressures when the velocity in a pipeline changes rapidly. For example, if a fire hydrant is opened and flowing at 1,000 gpm and is then quickly shut off, surges may be added to the system which will significantly raise the pressure. These surges can double, or triple, the normal pressure. The surges can be of such an extent that they break pipes or sever joints.

Other sources of surges are improperly operating regulating or relief valves and/or pumps. Since there are no regulating or relief valves in the system, the main sources of surges will be the opening and closing of fire hydrants and isolating valves, and the operation of the pumps associated with the wells. A pressure surge will result any time a sudden change is made in the velocity of the fluid column. It may be the result of stopping or slowing down a moving water column, or accelerating a stationary water column, such as a pump cycling off and on. For every foot per second sudden change in the fluid's velocity, a pressure surge of approximately 50 to 60 psi can result. For example, suddenly stopping a water column moving at 5 feet per second could result in a pressure surge of approximately 250 to 300 psi, depending on the pipe material and wall thickness. Different materials have different wave speeds and rigidity, which ultimately affect the magnitude of the surge. To minimize surges, all flow stoppages should be made in a time period greater than one surge period, and usually over several surge periods. The "surge period" or "critical period" of the pipe is the length of time it takes for the surge wave to travel from one end of the pipe to the other and back again (one round trip). A very simplifies example would be a 10,000 foot long PVC pipe with a wave velocity of 1,000 ft/sec. The surge period would be 2x10,000/1,000 = 20 seconds.

In the case of a pump shutting down immediately or tripping out, the initial surge at that location is a down surge due to the momentum change at the pump. The surge then travels up the pipe at its surge wave velocity to the end of the pipe, then returns to the beginning point a surge of the opposite magnitude.

The key is to minimize surges by gradual changes in flow, thereby eliminating problems before they begin. This can be accomplished through the use of pump control valves or power operated check valves which gradually open and close, allowing for smooth startups and shutdowns. As a backup against sudden failures, a number of methods can be used to deal with the resulting high pressure such as surge tanks, surge relief valves, and surge anticipator valves. The City's wells currently are operated with pump control valves to deal with this issue.

5.3 Cross Connections

A cross-connection is defined by Chapter 333 of the Oregon Administrative Rules (OAR) as *". . . any actual or potential unprotected connection or structural arrangement between the public or user's potable water system and any other source or system through which it is possible to introduce into any part of the potable system any used water, industrial fluid, gas, or substances other than the intended potable water with which the system is supplied. Bypass arrangements, jumper connections, removable sections, swivel, or change-over devices, and other temporary or permanent devices through which, or because of which, backflow can occur are considered to be cross connections."*

Effectively, this measure means anyone who has a well plumbed to their house or is connected to an irrigation system as well as any commercial/industrial type service with any type of process water or fire system must have an approved backflow prevention device to protect the City's potable water system from contamination of any type.

OAR Chapter 333-061-0070 requires that the water supplier identify and evaluate all potential cross-connections and deny or discontinue service to those premises where the potential cross-connection exists until an appropriate backflow prevention device is installed or until the cause of the hazard is eliminated. Also, since the City has more than 300 services, at least one person on the staff is to be certified in cross-connection control inspection.

The City of Tillamook has taken the steps necessary toward compliance with this regulation and has a cross-connection program in place. A copy of the City ordinance (13.04.140), a list of premises requiring cross connection protection devices within the City of Tillamook, a list of the types of premises requiring cross-connection controls under OAR 333-061-0070, and a list of acceptable methods, under OAR 333-061-0070, are all included in **Appendix J**

5.4 Hydraulic Analysis of the Distribution System

Computer Model

In order to analyze the capacity of the existing system and project the future needs of the system, a computer model was developed. The hydraulic analysis was performed using Haestad Methods' WaterCad water distribution modeling software.

A modeled water system is based on a skeleton system consisting of nodes connected to pipe sections. Pipe sections are constant diameter pipes which can contain fittings such as bends, valves, pumps, fire hydrants, and other systems. The end points of the pipe sections are called nodes, which act as places in the network where flow may either enter or leave the distribution system. There are two types of nodes modeled in the program. A junction node is a point where two, or more, pipes meet. Most commonly, it serves as a location where customers take water at a given rate. The computer program calculates the resulting pressure based on the specified elevation and demand at the node. A source node is a point in the system where both pressure and elevation are specified and the computer program calculates the resulting flow in or out of the system. Examples of source nodes are reservoirs and master meters connected to large pipelines. A source node can also be used at a point where the available fire flow is to be calculated at a standard residual pressure of 20 psi.

All nodes and pipe sections are linked together by a set of equations which obey the following physical rules:

1. The sum of all flows into and out of a junction node is zero.
2. The sum of a pressure drops around any closed loop in the network must be zero.

Pipe sections are modeled using the Hazen-Williams equation which relates flow to pressure drop thorough a length of pipe. The diameter, length, and friction factor for each pipe section must be input in the model. For a pressure reducing valve, the computer program compares the upstream pressure, the downstream pressure and the valve pressure setting. If the upstream pressure is greater than the valve setting, the pressure out of the valve is reduced to the setpoint. If the downstream pressure is greater than the valve setpoint, there is not flow through the valve. If the upstream pressure is greater than the downstream pressure but less than the setpoint, the valve opens all the way and acts like a pipe.

The output from each computer run is a listing of flow, velocity, and pressure loss through each pipe section and the elevation, pressure and flow into or out of each node. Input data and output results for the existing pipes, junctions, reservoirs and pumps during average daily use in 2013, are shown in **Appendix K**

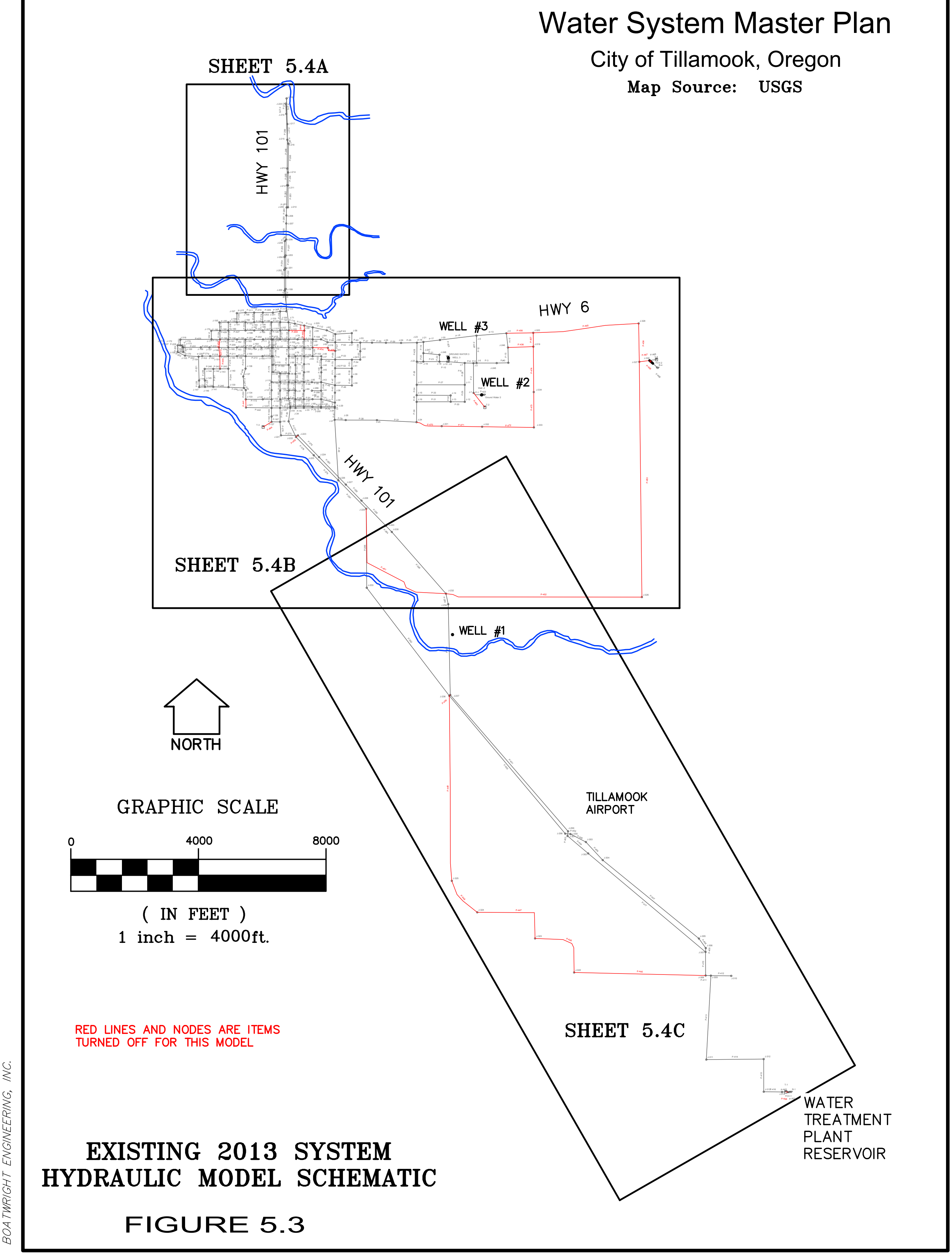
The Waterworks program also generates a plot file which is converted into a pipe network CADD (Computer Aided Drafting and Design) file. When plotted, the file graphically displays the flows and pressures at selected points in the piping system. The program was used to create a network schematic of the water system pipes modeled in this hydraulic analysis. **Figure 5.3**, **Figure 5.3A**, **Figure 5.3B** and **Figure 5.3C** show the schematic for the existing system model.

When constructing a hydraulic model of a water system, much information is required. One must know the configuration of the system; the size, length, and hydraulic condition (or smoothness) of each pipe modeled; the elevation of each node; the characteristics of the water sources; and the demand patterns of the customers. The following narrative discusses the sources of information and the assumptions made to construct the computer morel.

The distribution system configuration was obtained from the 1997 Water System Master Plan prepared for the Tillamook Water Commission, updated as of September 2013 by the City of Tillamook Public Works staff. The system was modeled by selecting the most important pipes so that the computer program was reasonably uncomplicated, yet sufficiently accurate in predicting system performance. Pipes smaller than 6-inches were assumed to make no meaningful contribution toward moving water through the system and to function only as local distribution laterals. Therefore, 4-inch and smaller mains were eliminated unless they completed an important loop or otherwise were significant due to their location.
The resulting model consists of 252 junction nodes, 3 source nodes, and 325 pipes.

Figure 5.4, **Figure 5.4A**, **Figure 5.4B** and **Figure 5.4C** show a schematic of the proposed system modeled for the Capital Improvement Plan (CIP). Elevations for the junction and source nodes are on the NAVD88 datum.

In addition to system configurations, the model requires input data for each line consisting of length, diameter, and friction factor. The individual line lengths were scaled from the City's master map which also shows line size and material. The larger pipes are PVC, ductile iron, steel, or asbestos cement. Most have been



EXISTING 2013 SYSTEM HYDRAULIC MODEL SCHEMATIC

FIGURE 5.3

Water System Master Plan

City of Tillamook, Oregon

Map Source: USGS

EXISTING 2013 SYSTEM HYDRAULIC MODEL SCHEMATIC

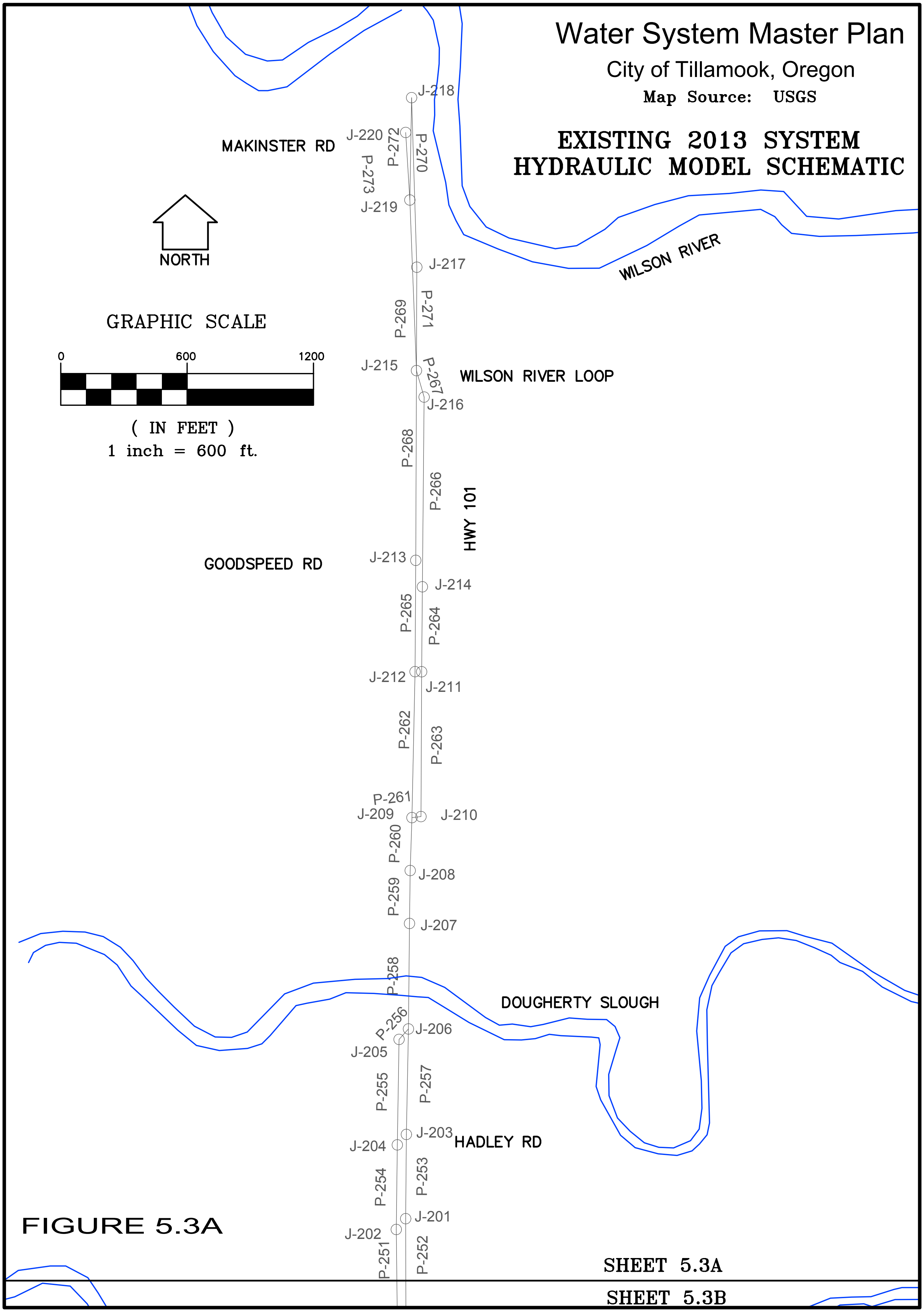
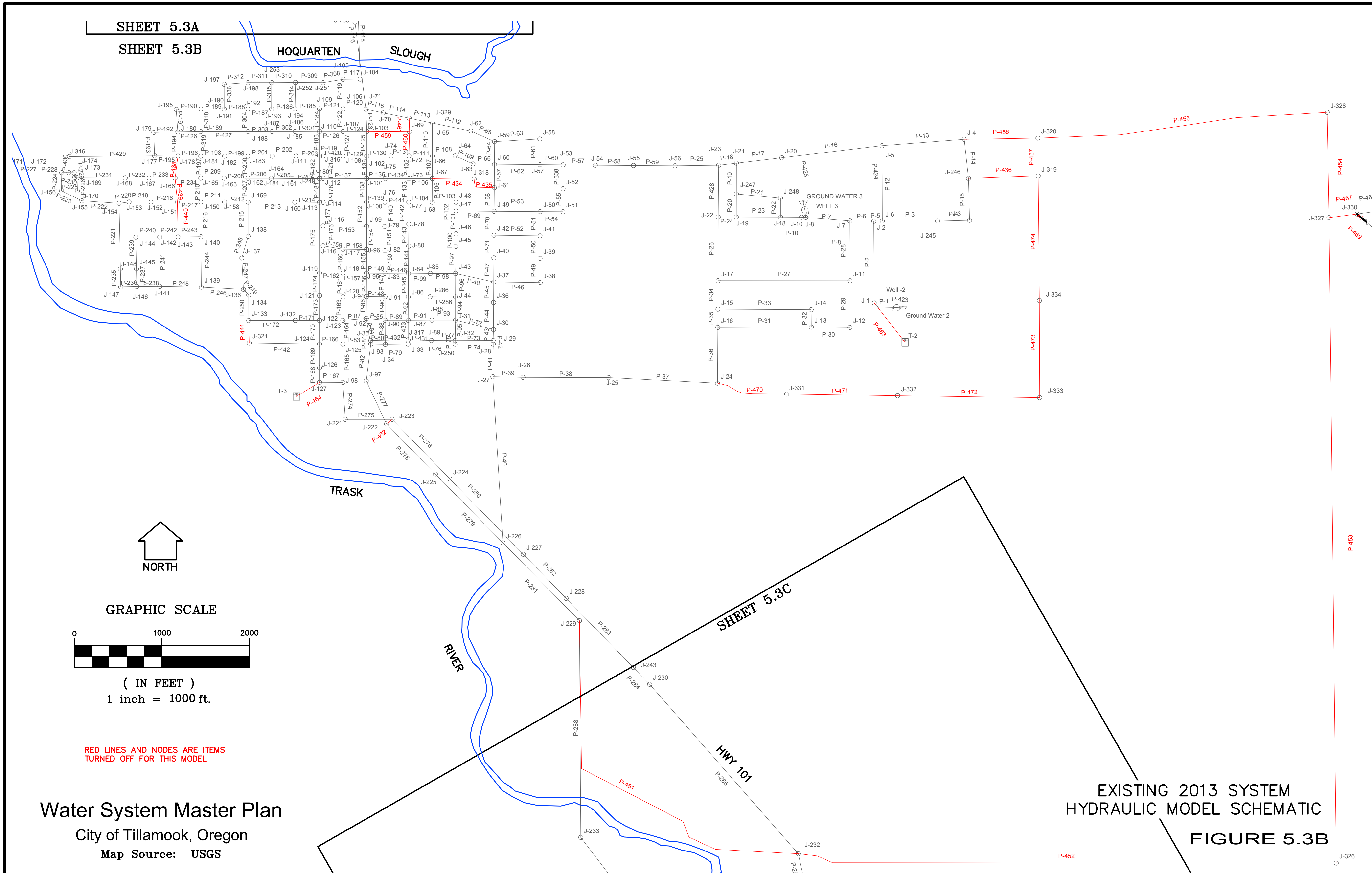


FIGURE 5.3A

BOATWRIGHT ENGINEERING, INC.



EXISTING 2013 SYSTEM
HYDRAULIC MODEL SCHEMATIC

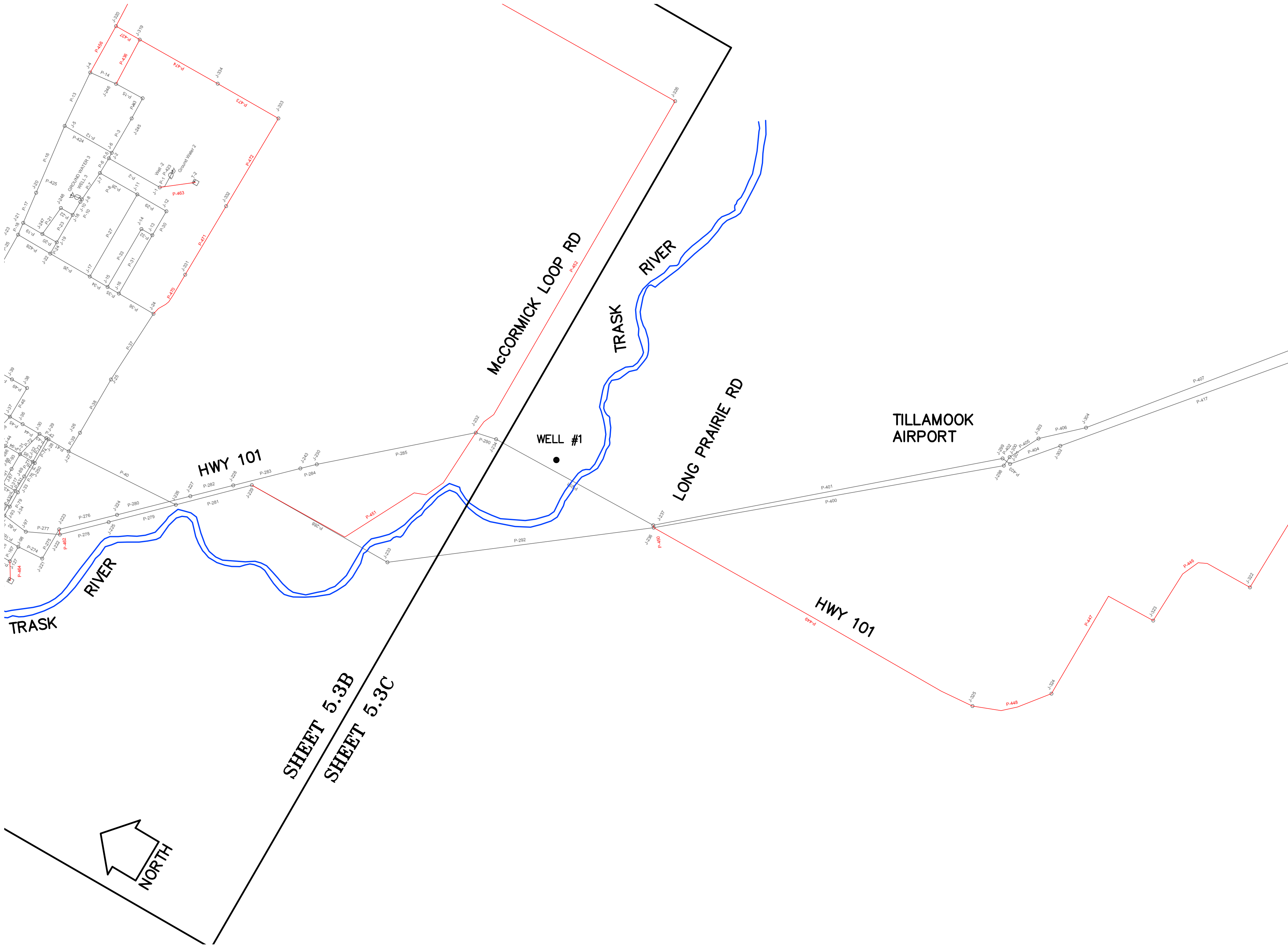
FIGURE 5.3B

Water System Master Plan

City of Tillamook, Oregon

Map Source: USGS

BOATWRIGHT ENGINEERING, INC.



Water System Master Plan

City of Tillamook, Oregon

Map Source: USGS

EXISTING 2013 SYSTEM HYDRAULIC MODEL SCHEMATIC

RED LINES AND NODES ARE ITEMS TURNED OFF FOR THIS MODEL

GRAPHIC SCALE

0 2000 4000

(IN FEET)

1 inch = 2000ft.

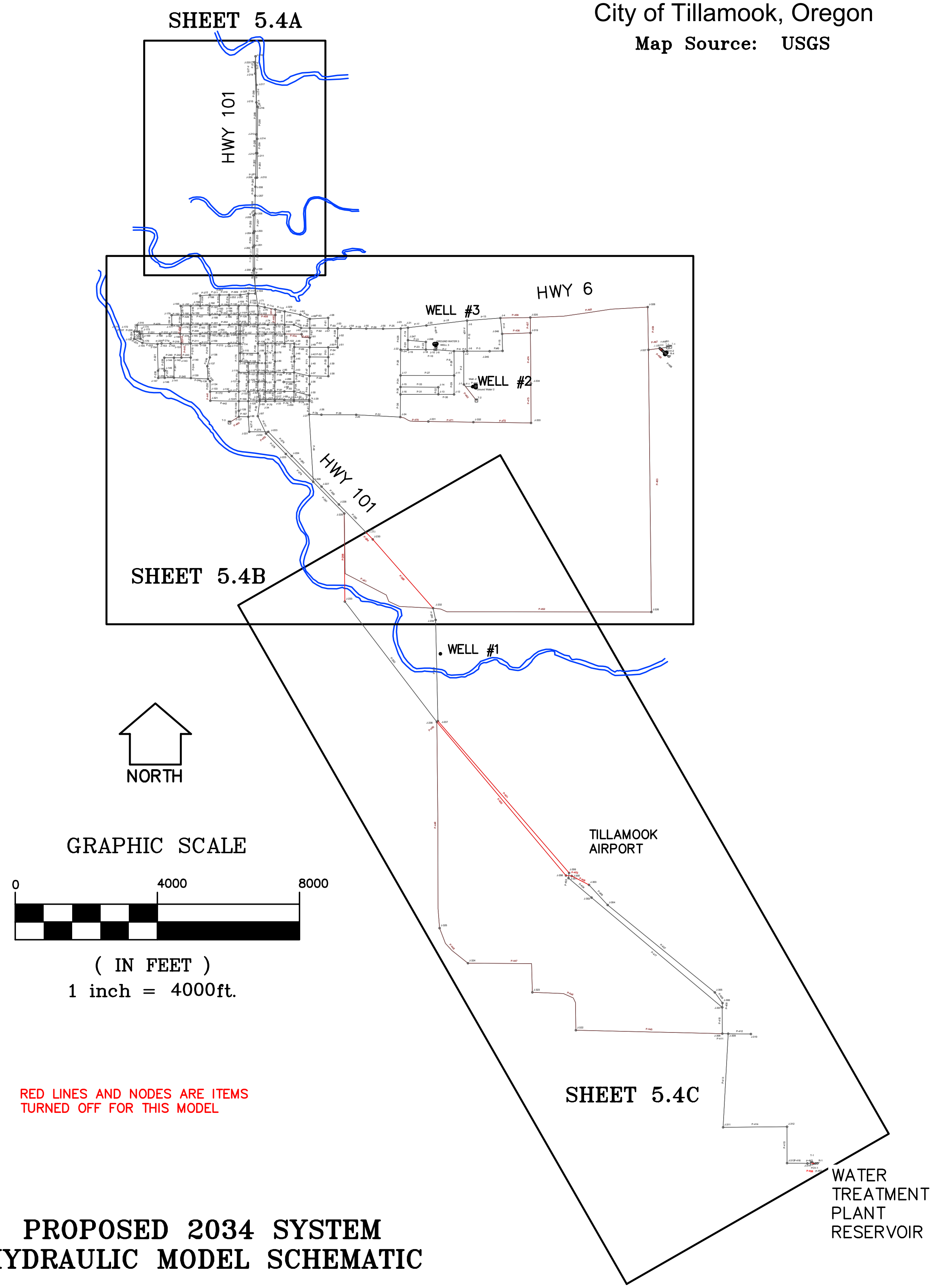
FIGURE 5.3C

BOATWRIGHT ENGINEERING, INC.

Water System Master Plan

City of Tillamook, Oregon

Map Source: USGS



PROPOSED 2034 SYSTEM HYDRAULIC MODEL SCHEMATIC

FIGURE 5.4

BOATWRIGHT ENGINEERING, INC.

Water System Master Plan

City of Tillamook, Oregon

Map Source: USGS

PROPOSED 2034 SYSTEM HYDRAULIC MODEL SCHEMATIC

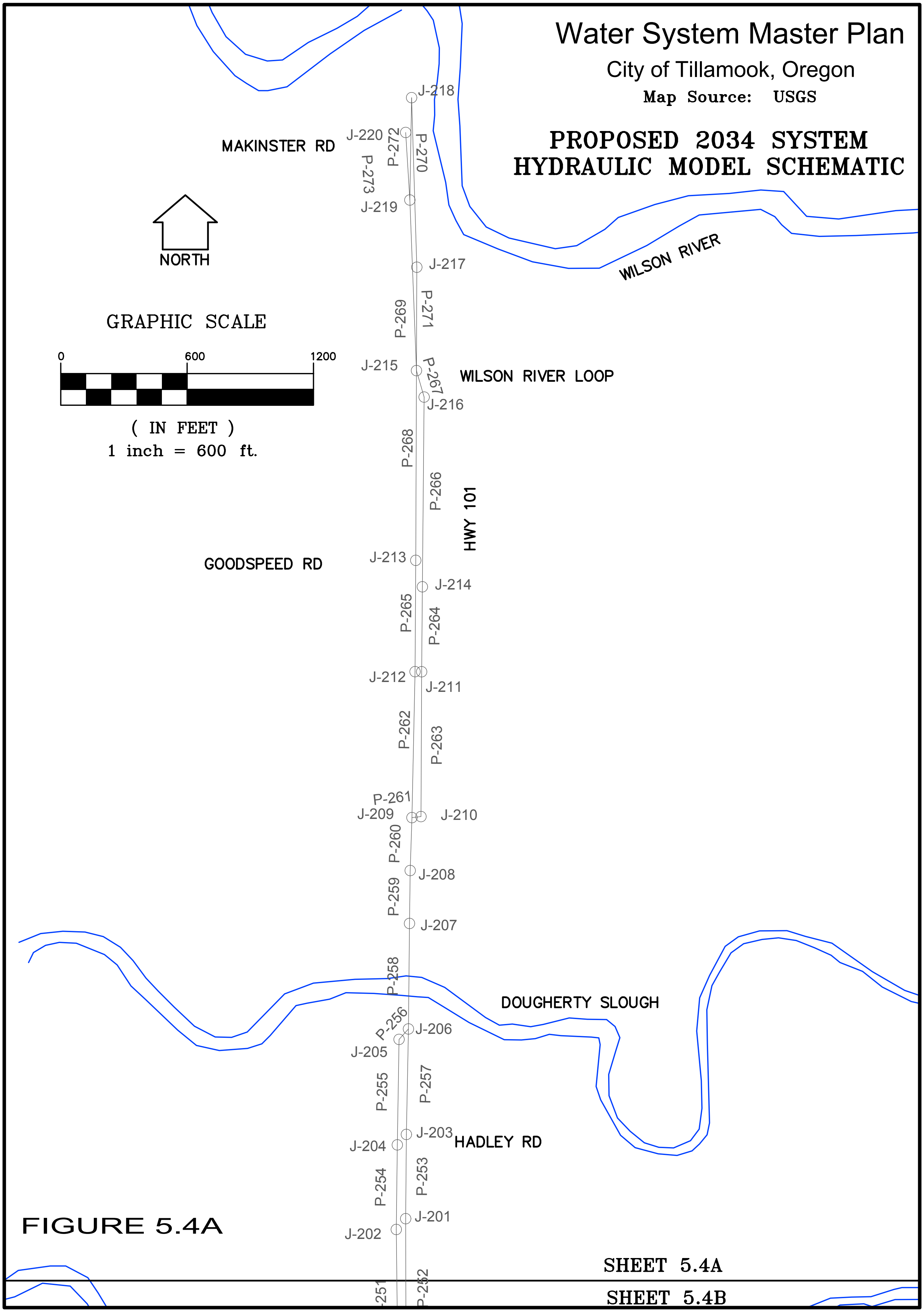
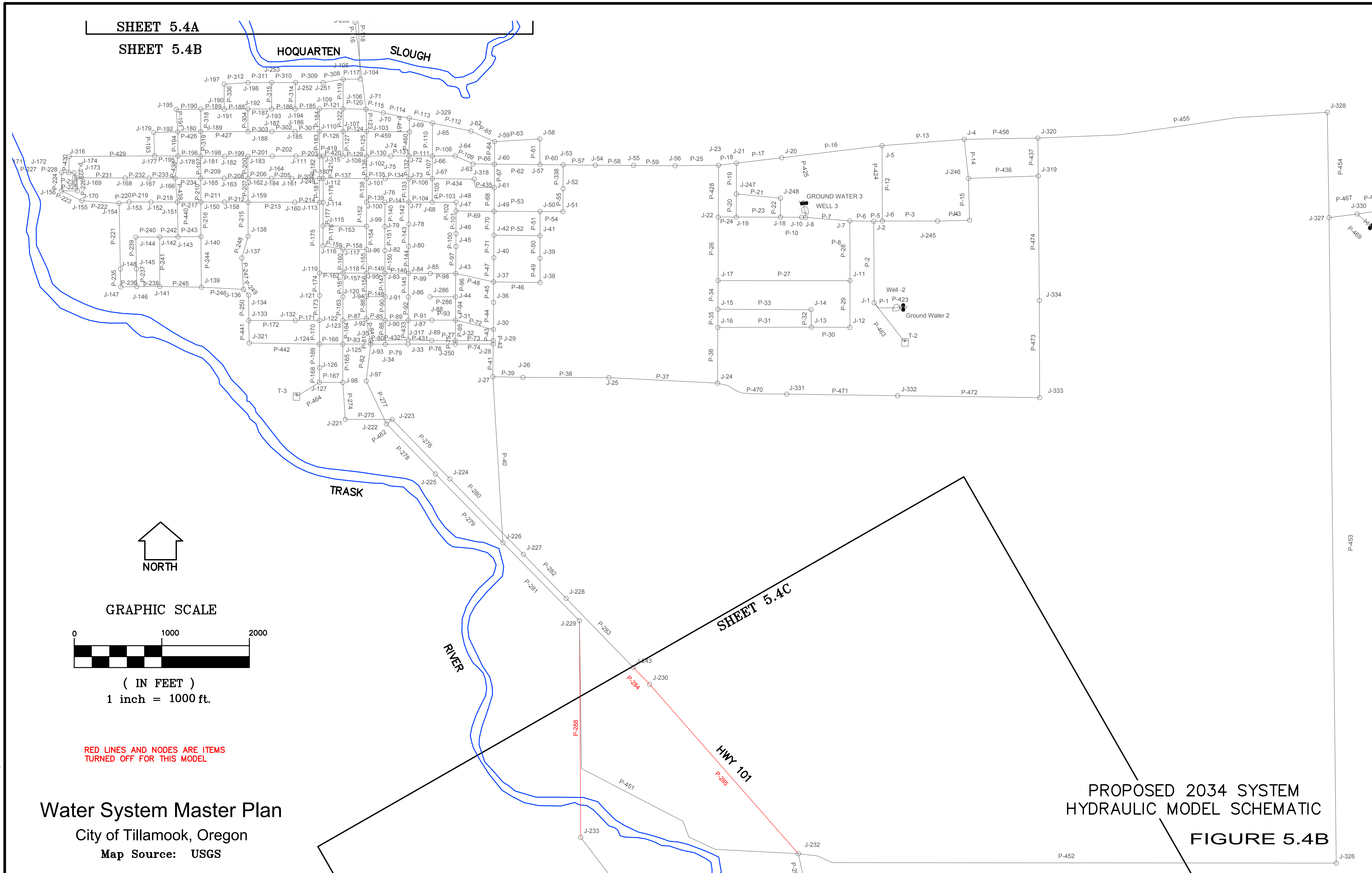


FIGURE 5.4A

BOATWRIGHT ENGINEERING, INC.



Water System Master Plan

City of Tillamook, Oregon

Map Source: USGS

PROPOSED 2034 SYSTEM HYDRAULIC MODEL SCHEMATIC

FIGURE 5.4B

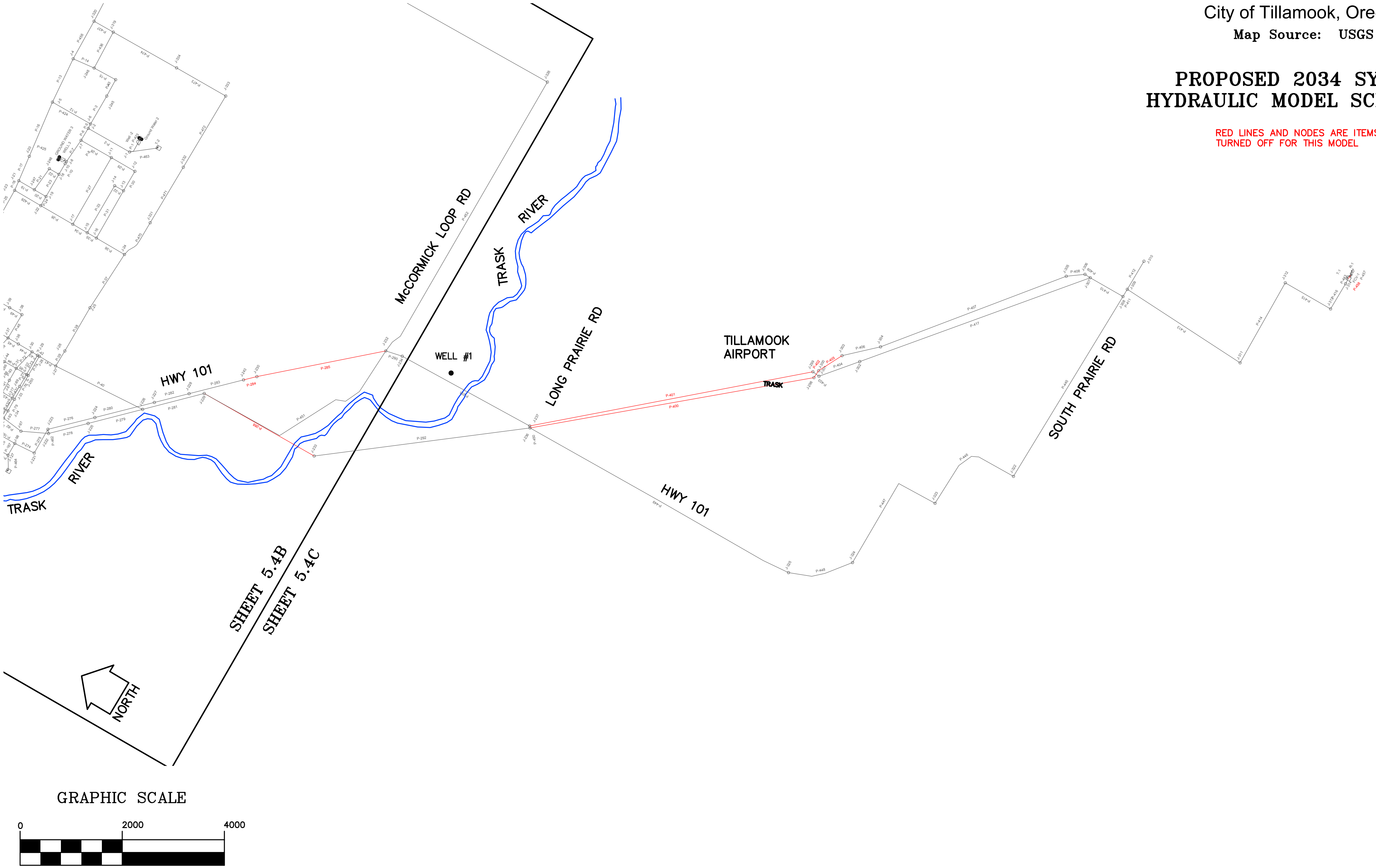
Water System Master Plan

City of Tillamook, Oregon

Map Source: USGS

PROPOSED 2034 SYSTEM HYDRAULIC MODEL SCHEMATIC

RED LINES AND NODES ARE ITEMS TURNED OFF FOR THIS MODEL



BOATWRIGHT ENGINEERING, INC.

FIGURE 5.4C

installed within the last 50 years. The roughness coefficient, or Hazen-Williams "C" factor for each pipe was set as follows:

PVC	C = 150
Asbestos Cement	C = 140
New Piping & Ductile Iron	C = 135
Steel	C = 90
Unlined Cast Iron	C = 90

Water demand was estimated from the City's metered production records. The peak day demand was assumed to be 2340 gpm, which is 1.8 times the average day demand of approximately 1300 gpm. Fire flow demands were obtained from the Tillamook Fire District.

According to accepted engineering practice and Oregon Health Authority requirements, a distribution system must be able to supply peak day demand plus fire flow while maintaining a minimum 20 psi pressure throughout the system. Thus, for purposes of this study, the supply sources and transmission system must be able to meet that criteria. The City attempts to maintain a 250 foot spacing between fire hydrants. **Figure 5.5** shows the existing fire hydrant spacing.

After all network elements and node demands were defined and input into the computer, the model was verified against actual field test records provided by the Tillamook Fire District from tests run on June 25, 2013 by the ISO.

Table 5-1 describes the current data for the fire hydrant locations shown on **Figure 5.5**. Pipe sizes and ages were also discussed with City of Tillamook staff and it is believed the model closely represents actual field conditions. This verified model is then used for modeling any capital improvement projects or changes in conditions. **Table 5-2** shows the modeled results for the same fire hydrants after the proposed Capital Improvements are made.

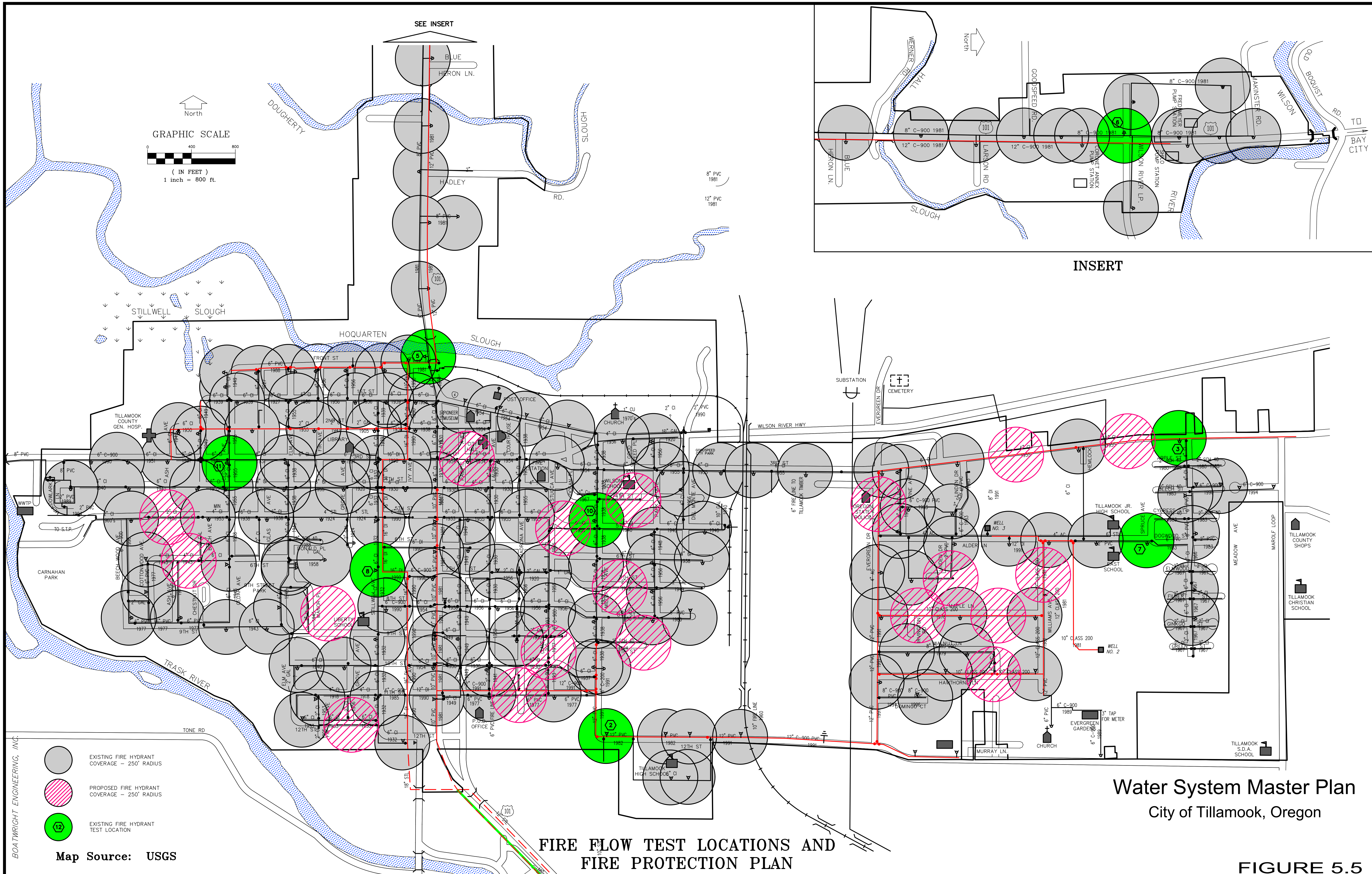
Input data and output results for the proposed pipes, junctions, reservoirs and pumps during peak use in 2034, are shown in **Appendix L**

TABLE 5-1

2013 Measured Fire Flows

ISO Field Test June 25, 2013

No.	Location	Vicinity	Flow (gpm)	Static	Res. psi	Needed	Available
1	Wilson River Loop & Hwy 101	Fred Meyer	890	85	59	5500	2200
2	Front & Main	Park	1160	85	65	6000	2500
3	3rd & Cedar	1 block east of Hospital	1050	87	72	1750	2400
4	7th & Stillwell	Liberty School & MCA	1060	89	75	4500	2500
5	5th & Miller	Sacred Heart Church	1160	80	65	3500	2000
6	12th & Miller	High School	890	85	59	7000	1500
7	Spruce & Alder	Junior High & East School	1030	80	66	5000	2300
8	3rd & Meadow	Residential	1210	108	72	5000	2000



FIRE FLOW TEST LOCATIONS AND FIRE PROTECTION PLAN

Water System Master Plan

City of Tillamook, Oregon

FIGURE 5.5

TABLE 5-2

Modeled Fire Flows

Model - Base with Fire Flow - model of existing system as of 2013												
				Static Pressure @ Demand		2013 ADD+Fire		Res. Pressure given 2013 PDD + Fire Flow of					
No	Junct. Node	Location	Vicinity	ADD 2013	PDD 2034	Flow gpm	Res psi	2000 gpm	3000 gpm	4000 gpm	5000 gpm	Needed Flow	Max @ 20	
1	J-216	Wilson River Lp & Hwy 101	Fred Meyer	84	83	1064	76	62	37	---	---	5500	3550	
2	J-104	Front & Main	Park	81	80	1161	78	73	64	51	34	6000	5760	
3	J-181	3rd & Cedar	1 block east of Hospital	82	81	1053	77	66	48	24	---	1750	4150	
4	J-119	7th & Stillwell	Liberty School & MCA	81	80	1064	76	65	46	20	---	4500	4000	
5	J-49	5th & Miller	Sacred Heart Church	77	76	1054	72	61	42	---	---	3500	3870	
6	J-27	12th & Miller	High School	82	81	892	80	77	70	61	50	7000	7050	
7	J-245	Spruce & Alder	Junior High & East School	83	81	1031	76	70	59	43	22	5000	5090	
8	J-4	3rd & Meadow	Residential	75	74	1217	67	60	44	22	---	7000	4090	
Model - Base with Fire Flow - model of proposed system in 2034												
				Static Pressure @ Demand		2013 ADD+Fire		Res. Pressure given 2034 PDD + Fire Flow of					
No	Junct. Node	Location	Vicinity	ADD 2013	PDD 2034	Flow gpm	Res psi	2000 gpm	3000 gpm	4000 gpm	5000 gpm	Needed Flow	Max @ 20	Max @ 20 †
1	J-216	Wilson River Lp & Hwy 101	Fred Meyer	82	82	1064	77	65	46	22	---	5500	4070	4070
2	J-104	Front & Main	Park	80	80	1161	78	77	73	70	65	6000	10650	10530
3	J-181	3rd & Cedar	1 block east of Hospital	81	81	1053	80	78	75	71	66	1750	10770	10650
4	J-119	7th & Stillwell	Liberty School & YMCA	80	80	1064	76	68	55	38	---	4500	4850	
	J-116*						79*	79*	77*	76*	74*	4500	18720*	18130*
5	J-49	5th & Miller	Sacred Heart Church	75	75	1054	75	74	72	70	67	3500	13650	13310
6	J-27	12th & Miller	High School	80	80	892	79	79	78	76	74	7000	17790	17050
7	J-245	Spruce & Alder	Junior High & East School	77	77	1031	75	74	71	68	63	5000	10310	9580
8	J-4	3rd & Meadow	Residential	70	70	1217	69	67	64	60	55	7000	9460	8550

*FH at No. 4 is currently connected to the 6" line in Stillwell Avenue. * Numbers represent changing the FH connection to the 16" line in Stillwell Avenue.*
† 2034 CIP less the 0.5 million gallon reservoir in Fairview Area

Notes:

Modeled using: Haestad Methods' WaterCad v6.5	*ADD: Average Daily Demand*	*PDD: Peak Daily Demand*	*Peaking Factor: 2013=1.4; 2034=1.8*	
	ADD= 801.4 for 2013 (851.1 model for 2013)	*PDD= 1379.6 for 2034 (1380.1 for model for 2034)*	*All Locations: Commercial (per ISO)*	*Reservoirs: Full*

Chapter 6
Water Storage

Chapter SIX: **Water Storage**

6.1 Storage Requirements

6.1.1 Existing Storage

The City of Tillamook currently has 3.0 million gallons (MG) of reservoir storage located at the water treatments plant site, consisting of a 1.1 MG ground level steel tank baffled for disinfection contact time followed by a 1.9 MG ground level steel tank. The overflow elevation at the existing reservoirs is 215 (NGVD 1929 datum)(*per 1997 Water Master Plan - field verify*). A typical standard in engineering practice is to provide storage equal to three times the average daily demand, plus fire reserve equal to the largest fire flow for its recommended duration. Based on the City's average daily demand for 2013 of approximately 1.15 MG and a fire flow of 7,000 gpm for a duration of 4.0 hours to meet the Uniform Fire Code requirements, the recommended storage capacity is 5.14 MG. See **Table 6-1**. This is higher than what the City currently has available, but there are circumstances where this is acceptable. In the City of Tillamook's case, there are multiple sources of supply. In addition to water flowing from the reservoirs, the wells can be activated, providing additional flow during a fire. The City Public Works staff maintains contact with the Tillamook Fire District and is notified whenever an emergency response is activated. Through remote electronic communication with the two wells, the City is able to turn them on and maintain pumping through a fire emergency. Also, in the worst case scenario, of a power failure during a fire, the water treatment plant is equipped with an emergency generator which will allow the reservoirs to be filling at the same time as they are emptying. For these reasons, 3.0 MG of storage may be acceptable for the existing conditions. It is advisable to have further reservoir capacity closer to town and on another side of the system. As previously stated, all existing storage is located on the extreme south end of the system. Future reservoir capacity should be constructed to the north, east, or west of the system to provide backup storage with an alternate route to the system in case of a transmission main failure.

6.1.2 Future Storage

Based on the formula for recommended storage capacity described previously and the year 2033 projected average daily demand of 1.096 MG, required storage at the end of the 20-year study period, as shown in **Table 6-2**, is 5.0 MG. It is also proposed that an additional 2.0 MG of storage be provided either to the north, east, or west of the City by the end of the study period.

TABLE 6-1

RECOMMENDED RESERVOIR CAPACITY - 2013

Avg Q (gpm)	Avg Q (MGD)	3xAvg (MGD)	Peak Q (MGD)	Fire Q (gpm)	Fire Reserve (MG)	Reserve Capacity Required		Additional Storage Required (MG)
						Minimum Storage * (MG)	Recommended Storage † (MG)	
801	1,154	3.462	2.308	500	0.06	2.368	3.522	0.52
				1,000	0.12	2.428	3.582	0.58
				1,500	0.18	2.488	3.642	0.64
				2,000	0.24	2.548	3.702	0.70
				2,500	0.30	2.608	3.762	0.76
				3,000	0.54	2.848	4.002	1.00
				3,500	0.63	2.938	4.092	1.09
				4,000	0.96	3.268	4.422	1.42
				4,500	1.08	3.388	4.542	1.54
				5,000	1.20	3.508	4.662	1.66
				5,500	1.32	3.628	4.782	1.78
				6,000	1.44	3.748	4.902	1.90
				6,500	1.56	3.868	5.022	2.02
				7,000	1.68	3.988	5.142	2.14

** Minimum storage = peak day demand + required fire flow (Q for 2-4 hours, see below)*
† Recommended storage = 3 x average daily demand + required fire flow (Q for 2-4 hours, see below)

Peaking Factor = 2.00
Existing storage = 3,000,000 gallons = 3.0 MG
This chart is for existing conditions only

Fire flows < 3000 gpm need only a 2 hr duration
Fire flows from 3000-4000 gpm need a 3 hr duration
Fire flows > 4000 gpm need a 4 hr duration

TABLE 6-2

RECOMMENDED RESERVOIR CAPACITY - 2034

Avg Q (gpm)	Avg Q (MGD)	3xAvg (MGD)	Peak Q (MGD)	Fire Q (gpm)	Fire Reserve (MG)	Reserve Capacity Required		Additional Storage Required (MG)
						Minimum Storage * (MG)	Recommended Storage † (MG)	
766	1.103	3.309	2.207	500	0.06	2.267	3.369	0.37
				1,000	0.12	2.327	3.429	0.43
				1,500	0.18	2.387	3.489	0.49
				2,000	0.24	2.447	3.549	0.55
				2,500	0.30	2.507	3.609	0.61
				3,000	0.54	2.747	3.849	0.85
				3,500	0.63	2.837	3.939	0.94
				4,000	0.96	3.167	4.269	1.27
				4,500	1.08	3.287	4.389	1.39
				5,000	1.20	3.407	4.509	1.51
				5,500	1.32	3.527	4.629	1.63
				6,000	1.44	3.647	4.749	1.75
				6,500	1.56	3.767	4.869	1.87
				7,000	1.68	3.887	4.989	1.99

** Minimum storage = peak day demand + required fire flow (Q for 2-4 hours, see below)*
† Recommended storage = 3 x average daily demand + required fire flow (Q for 2-4 hours, see below)

Peaking Factor = 2.00
Existing storage = 3,000,000 gallons = 3.0 MG
This chart is for existing conditions only

Fire flows < 3000 gpm need only a 2 hr duration
Fire flows from 3000-4000 gpm need a 3 hr duration
Fire flows > 4000 gpm need a 4 hr duration

6.2 Alternatives for Meeting Storage Requirements

Alternatives for increasing storage capacity include additional ground level tanks or elevated tanks. Since the terrain within the City's Urban Growth Boundary is quite level and at low elevation, a ground level tank would be functional with the addition of a pump station downstream of the reservoir to achieve and maintain adequate pressure. Within most of the developed portions of the City, this alternate would be preferable to an elevated tank so as not to affect the aesthetics and livability of the neighborhood.

The following alternatives have been reviewed:

1. Ground level tank east of Fairview

2. Ground level tank north of Tillamook

3. Ground level tank in northwest Tillamook

4. Ground level tank in east Tillamook

5. Ground level tank in southwest Tillamook

Alternative 1: Involves constructing a ground level reservoir tank with an overflow elevation at 215[1] feet southeast of the Fairview area and east of Trask River Road. Candidate sites at the appropriate elevation are east of the Sunset Heights Memorial Gardens off of Azalea Lane or Greentree Ridge Road, west of Balmer Hill. A minimum parcel of about one-half acre would be required to be purchased, along with access, as needed. Approximately 11,150 feet of 12-inch transmission pipeline would be required to connect to the existing 12-inch main at 3rd street and Marolf Loop Road.

Site considerations include the Oregon Department of Geology and Mineral Industries' preliminary identification of this area as being in a landslide hazard area, a moderate earthquake soft soil hazard area, and, an area with a severe-to-violent level of expected earthquake shaking

Alternative 2: Involves constructing a ground level reservoir tank with an overflow elevation at 215[1] feet north of Tillamook and east of the Tillamook County Creamery Association's Cheese Factory on north Highway 101. Candidate sites at the appropriate elevation are east on Latimer Road, about 0.60 of a mile from its intersection with Highway 101 and then up a logging access road about 0.50 mile in

[1] NGVD 1929 datum, *per 1997 Water Master Plan - field verify*

the Tillamook State Forest. A minimum parcel of about one-half acre would be required to be purchased, along with access, as needed. Approximately 8,300 feet of 12-inch transmission line would be required to connect to the northern terminus of the existing 12-inch main in Highway 101, including a bridge crossing or a under river boring of the Wilson River.

Site considerations include the Oregon Department of Geology and Mineral Industries preliminary identification of this area as being located within about 800-900 feet of an identified historic fault line, and in a landslide hazard area, a moderate earthquake soft soil hazard, and, an area with a violent level of expected earthquake shaking.

Additionally, the required crossing of the Wilson River places the pipeline within the Cascadia Earthquake and Tsunami Hazard - Statutory (ORS 445.446 and 445.447) Tsunami Inundation Boundary. This is an area that regulates essential structures including:

> *(1)(a)(C) Tanks or other structures containing, housing or supporting water or fire-suppression materials or equipment required for the protection of essential or hazardous facilities or special occupancy structures.*

While the pipeline may not be classified as a "structure" it must be recognized that the reservoir proposed would be more useful if the pipeline connecting it to the system withstood the forces of the earthquake and any accompanying tsunami.

Alternative 3: Involves constructing a ground level reservoir tank with a downstream pump station to achieve and maintain adequate pressure, west of the Tillamook County General Hospital in the 900 block of 3rd Street, west of Ash Avenue and east of the Trask River Bridge. A minimum parcel of about one-half acre would be required to be purchased, along with access, as needed. Approximately 2,900 feet of 12-inch transmission line would be required to connect to the existing 16-inch diameter main at 3rd Street and Stillwell Avenue.

Site considerations include the Oregon Department of Geology and Mineral Industries' preliminary identification of this area as a high earthquake soft soil hazard area, and, an area with a severe level of expected earthquake shaking.

A ground level tank will likely require some fill to remove the entire site from the 100-year flood plain of the Trask River.

Alternative 4: Involves constructing two ground level reservoir tanks, with a downstream pump station to achieve and maintain adequate pressure, adjacent to the Well No. 2 site on the City's property and on a portion of School District 9 property. The City's ownership, consisting of about 1 acre, is surrounded by School

District property on the north, east and west. The District property includes the improved grounds of East Elementary School on Alder Lane and undeveloped land, of the same width, that extends south approximately 575 feet to the south line of the Haynes Donation Land Claim No. 43, which also coincides with the alignment of the south terminus of Williams Street. Approximately 1,700 feet of 12-inch or 16-inch transmission line would be required to connect to the existing 12-inch diameter main in Alder Lane and to Well No. 3.

Site considerations include the Oregon Department of Geology and Mineral Industries' preliminary identification of this area as a low earthquake soft soil hazard area, and an area with a severe level of expected earthquake shaking.

The City's property is outside of the 100-year floodplain. It is sheltered on the south by an identified Freshwater Forested/Shrub Wetland on the School District's land which extends approximately 575 feet south of the well house. It sets back about 800 feet from Alder Lane and is blocked from street view by East Elementary School and various structures on the school site. It would be approximately 165 feet east from the back property line of residences fronting on Williams Avenue to the west, which have 205 foot deep lots. It is about 550 feet from the back lot lines of residences to the east

In order to accommodate two shorter reservoirs which would be less imposing, the City may need to obtain an easement upon, or ownership of, a small area of School District land to the east of the City's current ownership. About one third of an acre would be needed.

Alternative 5: Involves constructing a ground level reservoir tank with a downstream pump station to achieve and maintain adequate pressure, in the vicinity of south 12th Street between Ivy Pacific. There are several options in this area, including the wide meridian between Main and Pacific Avenues at the entrance to the City, or closer to Stillwell behind the Tillamook Association for the Performing Arts building. If located in the meridian between Pacific and Main streets, the reservoir could be wider and shorter, to resemble a wheel of cheese, and could be colored and embellished with the City's logo. If located farther to the west, in the edges of the farm property, it could be effectively screened from the residential area to the north of 12th Street with trees.

Site considerations include the Oregon Department of Geology and Mineral Industries' preliminary identification of this area as a high earthquake soft soil hazard area, and, an area with a severe level of expected earthquake shaking.

[1] NGVD 1929 datum, *per 1997 Water Master Plan - field verify*

Earthquake Hazard

Active Faults & Earthquake Epicenter (1971-2008)

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Flood Hazard

Statutory Tsunami Inundation Line & FEMA 100 yr Flood

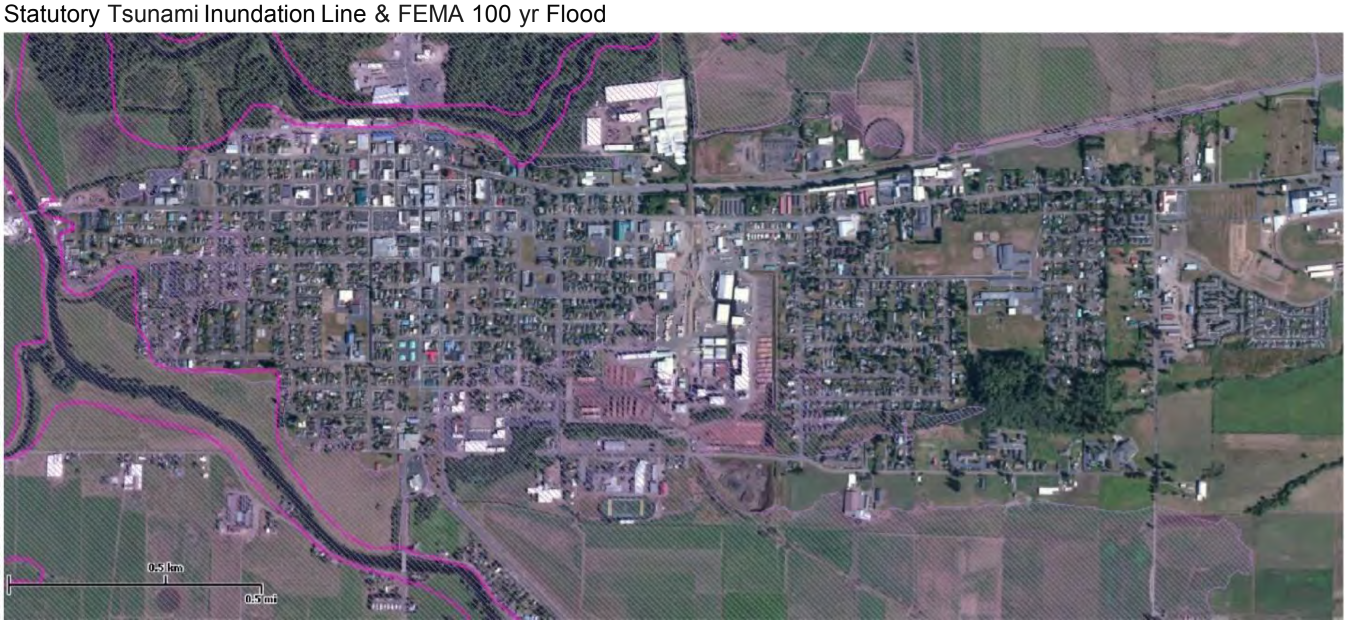

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Figure 6.1

Cascadia Earthquake Expected Shaking

Severe

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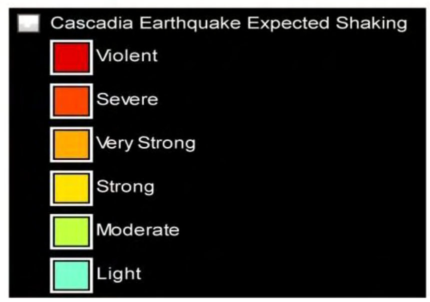

Cascadia Earthquake soft Soil Hazard

High to Low

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Figure 6.2

Both potential sites are out of the Tsunami Hazard zone. Some fill may need to be placed to elevate the reservoir above the flood plain of the Trask River.

Both sites are close to the large transmission lines that enter the City from the south along Tillamook River Road or Highway 101.

Table 6-3 provides a comparison of the five sites.
Figure 6.1 illustrates the Earthquake and Tsunami Hazards in the Tillamook area.
Figure 6.2 illustrates DOGAMI's Earthquake Shaking and Soft Soil Hazards in the Tillamook area.

Initially, Alternative 4 appears to be the most suitable site, even though it involves constructing 2 tanks to meet storage capacity while keeping them at a low profile. Each site will require some land acquisition, but Alternative 4 involves slightly less than the other three and already has access. Visibility of the tank is most intrusive at Alternative 3, near the city center. Alternatives 1 and 2 are in remote locations; with no structures around Alternative 2 and two houses in the vicinity of Alternative 1. Alternative 4 is mostly screened from view by the existing school and the forested wetlands. Visibility from residential backyards is minimal with the homes between 250 and 700 feet distant. Alternative 4 also has the least amount of transmission line construction to reach the nearest 12-inch diameter transmission main.

TABLE 6-3

ALTERNATIVE RESERVOIR SITES

Alternative	Location	Land Acquisition	Tank Location Visibility	Connecting Pipeline Construction (LF)	DOGAMI Geo-Hazards*				
					Fault Area	Landslide Area	Soft Soil	Shaking	Tsunami Inundation Boundary
1	E of City Trask River Rd	½-acre	Remote	11,500	No	Yes	Moderate	Severe-to-Violent	No
2	N of City Latimer Rd	½-acre	Remote	8,300	Near (800')	Yes	Moderate	Violent	Yes (pipe)
3	Hospital	½-acre	High	2,900	No	No	High	Severe	No
4	East Elem School	⅓-acre	Screened	1,700	No	No	Low	Severe	No
5	12th & Ivy	⅓-acre	High	125	No	No	High	Severe	No
	Hwy 101 meridian	-----	High	100	No	No	High	Severe	No

** All DOGAMI geo-hazard determinations are informational only. Each site requires specific geological evaluation.*
DOGAMI maps viewable at: www.oregongeology.org/hazvu

Each site is located within a severe or violent earthquake shaking zone. However, there are no locations within Tillamook County with a lower rating than severe. Alternatives 4 has the lowest level of soft soil and both 3 and 4 are away from landslide hazard areas. Alternative 2 is very near a mapped historic fault line. Finally, Alternative 2 requires the connecting transmission main to cross a mapped Tsunami Inundation Boundary which raises additional considerations.

Chapter 7
Recommended Capital Improvements

Chapter SEVEN: **Recommended Capital Improvements**

7.1 General

Based on the evaluation of the water supply, treatment, transmission and distribution and storage facilities contained in Chapters 4, 5 and 6, a Capital Improvement Program is recommended as outlined in **Table 7.1**, **Table 7.2, Table 7.3** and **Table 7.4** and shown on **Figure 7-1**. This chapter will summarize the recommended improvements, set priorities, and give an approximate timeline for implementation.

Cost estimates given herein are of a very preliminary nature. No attempt was made to develop projects to a level of preliminary engineering. Rather, standard cost guidelines were used when they were appropriate, and are intended to be conservative. In other cases, information was taken from similar projects in the Pacific Northwest and costs were adjusted to take into account the location at Tillamook.

The Engineer has no control over the costs of labor, materials, equipment or services furnished by others; the Contractor's methods of determining prices; and competitive bidding or market conditions; consequently, the Engineer's opinions of probable costs provided are made on the basis of the Engineer's experience and qualifications and represent the Engineer's best judgment as an experienced and qualified professional engineer familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual project costs or construction costs will not vary from the opinions of probable costs prepared.

There are three stages of cost estimates made during a project. The Master Plan estimate is done first when the requirements of the project are outlined. This cost estimate is a general overview and may be plus or minus 20% on equipment. The preliminary design phase is next, where it is determined how the work is actually to be done. A preliminary estimate is plus or minus 10% in accuracy. The last cost estimate is done after the project is designed and before it goes to construction. At that point, the cost estimate should be plus or minus 5% in accuracy since all the equipment and materials have been identified.

7.2 Unaccounted-for Water

The City's continued large discrepancies between the amount of water produced and the amount metered and delivered are a cause of concern. The percentage of unaccounted-for water varies month to month and averages 30-35%. This needs to be addressed and investigated until the basis of the losses are found and remedied.

The implementation of an AWWA Water Audit is recommended.

The City should also consider the purchase of a Leak Noise Correlator system to assist with finding failed pipes. There are a number of places where City pipelines cross beneath rivers and wetlands which hamper the visual detection of leaks that might be apparent in dry areas. The correlator system can also detect smaller leaks, or clusters of leaks, that may be draining through the bedding gravels and either entering the storm drain system or flowing to surface drainage undetected.

The unmeasured overflow at the City's tank reservoirs at the Treatment Plant may be another source of water loss. Currently there is no mechanism for detecting the quantity or frequency of the overflow. See 7.4 below for further discussion.

Any service, whether it is billed, or not, should have a meter in place that is read monthly. This includes all public facilities such as parks and municipal offices, along with those private residences that have a "free" service as payment for waterline easements granted in the early to mid-1900's. The City should explore methods for purchasing these "free" services and returning them to paying accounts.

7.3 Source Improvements

The City's population is not growing at a very fast rate, and some years it is declining. With that scenario predicted to last through the life of this study, the water right permits and certificates provide ample water for current and future use. However, the City should understand that the permits appear to allow for more water than is likely ever to be available from the surface water sources.

The storage in Skookum Lake has not been needed for several years. Since the discovery that the dam structure was built on a landslide, the reservoir has been drawn down to the natural lake level, with no storage behind the dam. To eliminate liability for dam failure, the City will be breeching the dam in the near future. Water right permits for the storage and use of the stored water will be cancelled once the deconstruction work is completed.

The water supplies on Killam and Fawcett creeks are limited due to turbidity during the stormy, rainy parts of the year when turbidity is an issue. Killam Creek is also affected by low flow and fish habitat protection during the warm summer and fall months. With the decommissioning of Skookum Lake Reservoir, summer and autumn stream flows in Fawcett Creek will no longer be augmented with released stored water and it will also be further constrained by habitat protection requirements.

It would be beneficial to mount USGS porcelain staff gages on the current concrete intake structures that are upstream of the footbridges and weirs at the Killam and Fawcett creek diversions. These gages would be within about 10-20 feet of the weirs and could be set so zero corresponds to the bottom level of the weirs. This would allow City staff to measure the water depth relative to the weir and be able to calculate and record the stream flow each time the sites are visited with a very fractional investment of time. There has been no stream flow data collected on Fawcett Creek or Killam Creek since the early 1980's. The proposed installations would be a minor expense for materials and installation and would provide valuable information for the use of these rights along with flow trends for future planning.

Simmons Creek has not been developed and is unlikely to be of any use to the City. Its flow is extremely low during the summer months, when the City would be most in need of additional water, and it will be impacted by fish habitat protection requirements if development is proposed. This creek will also be difficult to pipe to the water treatment plant given the logistics of two waterway crossings, including Fawcett Creek, and either a shorter route across two hills or a longer route along the existing roadways. Its value may be in releasing the water rights as a mitigation for another project. The City should explore cancelling this water right.

Wells 2 and 3 are supplying the City with all of its water at this time. This reliability has allowed the City to make decisions about the use of its surface water sources, which are less reliable and more expensive to operate.

To provide future water demands and reduce the need for surface water, the City could construct additional wells in the northeast portion of town where both water production and quality have been found to be higher. Potential locations should be carefully evaluated to minimize potential groundwater pollution affecting the wells. Each existing, or new, well should have a minimum well head protection easement encompassing a 100-foot radius from the well head.

If additional wells are developed, the City should transfer the water rights from Well 1, located along Highway 101 south of town, and Well 2 (old), located along Gienger Road, which are only used for emergency needs due to their water quality. The transfers should be for additional points of diversion. This would provide the City with good, new wells with 1958 and 1960 water right priority dates.

The well meters on Wells 2 and 3, along with any future wells, should be periodically evaluated to determine that they are recording accurate information. This will assist the City in determining unaccounted-for water volumes.

7.4 Treatment System Improvements

The water treatment plant is 20 years old but is not required to process as much water since the City has reduced its use of surface water. However, the plant does need to be evaluated for seismic stability given that the potential for geologic hazards has been updated, and greatly increased, since its construction in 1994.

As discussed above in 7.2 above, the City should consider installing meters or sensors at all of its overflows and by-passes in order to keep better track of the water it is collecting and treating, but which does not enter the delivery system. This would help to monitor unaccounted-for water.

Annual inspections of the existing buildings should be made by city staff. The roofing, siding and support structure of the treatment plant building should be checked, both inside and out, for any signs of rust or other deterioration. Any deficiencies that are found should be scheduled for repair or replacement.

The 1.9 mg reservoir was drained and cleaned in 2013. The City procured a tank inspection by LiquiVision Technology in December of 2014. The inspection yielded no serious issues. Inspections should be scheduled about every 5 years and as conditions worsen, or new issues arise, repairs or coatings should be scheduled.

The overflow ponds, which are lined with asphalt, should be scheduled to be rebuilt and the lining changed to a neutral material.

The City has a certain amount of materials, such as water treatment filter media, which it has collected for future use. While the opportunity to acquire these at a bargain price can help the City financially, they need to be stored in a safe and protected place and these materials should be kept in an interior location.

7.5 Transmission System Improvements

7.5.1 Raw Water Transmission Mains

The Killam Creek raw water intake pipeline was replaced in 1994 and should still be functional with approximately 30 years of life remaining. The Fawcett Creek raw water intake pipeline is currently being replaced and, when completed, should have a 100-year life expectancy. Barring unforeseen damage, both of these lines are expected to be functional through the duration of this study period.

7.5.2 Rural Transmission Mains

If the well meters are found to be operating reasonably efficiently and accurately, the first priority for the improvement of the transmission system is to determine if the oldest mains, southeast of town, are the source(s) of the excessive amounts of the City's unaccounted for water. If they are, they should be repaired or replaced directly. If replacement is not an immediate option, budgeting for the construction of new lines should be put in place as early as possible. Delay only costs the City more money in increased production costs and reduced revenue, or the City incurs added expenses having to deal with emergency blow-out conditions rather that planned and controlled construction conditions.

With the major transmission breaks on the 16-inch and 24-inch lines in the summer of 2014, City staff realized that the transmission mains lack enough valves to be able to shut the system down quickly and efficiently. Valves should be installed at no greater than approximately half mile intervals. New valves in remote areas should have bollards placed about them for easier and quicker locating in times of emergencies and for protection from damage by vehicles and equipment. Cross interties between the parallel transmission mains should also be installed with multiple valves to isolate sections needing repair. This will allow the City to bypass the repair and continue to flow water through the transmission lines, both upstream and downstream of the repair.

The 1996 proposal to route a 24-inch line along Gienger Road, replacing the 14-inch steel line constructed in 1949 and which traverses cross-country, is still recommended. The replacement line, if located within road rights-of-way, could eliminate old easements from the early 1900's, and the free water services that paid for many of their acquisitions. Locating within the road rights-of-way will also provide better access for repairs and maintenance and monitoring for leaks and breaks.

A second alignment of a transmission pipeline should be considered into the easterly side of town. This would reinforce the system's flow and provide a higher level of fire protection and reliability of service in the event of a problem with a main in the downtown section of the City. A suggested route for a 12 inch pipeline would be to extend east along McCormick Loop from its intersection with Highway 101, just over 1 mile, to the northerly extension of McCormick Loop and then following it north, approximately 8800 feet to 3rd Street. The 12 inch pipeline would then extend west on 3rd Street, approximately 3500 feet to the existing 12 inch line at Marolf Loop. This alignment provides easy access to the pipeline by following the existing road system, eliminates the need for cross country easements, minimizes waterway crossings, and prepares the system for future growth in the east portion of town, which is less impacted by floodplains, tsunami zones and wetlands.

7.5.3 City Transmission Mains

It is recommended that the transmission system be reinforced and looped within the City. This will allow water from all existing and proposed sources and storage facilities access to the main distribution system as well as provide the needed redundancy in case of an emergency.

A reinforcement transmission line along the western portion of town would be beneficial. The proposal would construct a 12-inch line from the existing 12-inch ductile iron pipeline at the intersection of 3rd and Birch and then extend south, along Birch to 6th, jog east on 6th to Cedar, go south on Cedar to 9th, follow 9th to Elm, proceed south on Elm to 11th and head east on 11th to tie into the existing 16-inch ductile iron pipe in Ivy. This proposal slightly realigns the layout included in the 1996 Master Plan.

With the 2013 completion of the 12-inch pipeline along Third Avenue from Evergreen to Marolf, two more links to this section should be planned. The first is extending the west end of this line back to Miller to connect to the proposed 12-inch distribution line in Miller between 3rd and 9th. This would also feed and support the 12-inch distribution line to be constructed in 4th between Miller and Laurel and extended north on Laurel to 3rd. The second section is a 12-inch line which should be constructed south on Marolf to 12th and then extended west to the end of the existing 12-inch line in 12th located at the east edge of Five Rivers Retirement Community property (3500 12th Street).

7.6 Distribution System Improvements

Table 7-1 lists the needed distribution system improvements, many of which were identified in the prior Water Master Plan. Although the main distribution system is solid and well looped, smaller diameter, aged, and leaking pipes should continually be upgraded and replaced. This improvement list is lengthy with pipes that have already outlived their life expectancy with an estimated replacement cost in 2014 dollars of nearly $6.2 million. In the first ten years of this plan, 2014 through 2024, the list of additional lines diminishes considerably, dropping to an estimated replacement cost in 2014 dollars of a little over $60,000. Fortunately, this will provide a cushion for addressing the already out of life pipes in preparation for facing the next wave of replacements. In the second ten years of the plan, years 2024 to 2034 the list balloons again to an estimated replacement cost in 2014 dollars of nearly $2.8 million.

It is recommended that the City evaluate these water lines, along with the condition and age of its sanitary sewer lines, storm drain lines, and the condition of its street surfaces in order to develop a program for addressing those areas where poor infrastructure coincides and a construction project can address multiple needs while minimizing costs.

7.7 Storage Improvements

The existing two reservoirs at the Water Treatment Plant site have some seismic securing features. However, they should be re-evaluated for seismic stability given that the potential for geologic hazards has been updated, and greatly increased, since its construction in 1994. See **Figure 7.2** Cascadia Earthquake Expected Shaking and Earthquake Soft Soil Hazard and **Figure 7.3** Landslide Hazard

The City staff is required by the Oregon Health Authority to inspect the tops of the reservoirs on a monthly basis. Given the frequency of the examinations, the City may consider constructing a steel stairway and platform access located in between the two reservoirs in order to facilitate the inspections and to also reduce the potential for bodily injury resulting from using the current ladder and harness system,

As discussed in Chapter 6, additional storage of 2.0 to 3.0 million gallons should be provided. This would protect the system from potential disruption problems between the water treatment plant and current reservoir tank site and town. The chart below compares the rough estimate of the costs associated with these improvements for either glass or concrete construction. This is the cost of the reservoir materials and construction only. It does not include land purchase or waterline installation to connect to the existing system which would need to be developed for the project.

Reservoir Cost		
Reservoir Capacity MG	**Glass Tank* †**	**Concrete Tank* †**
0.5	$420,000	$465,000
1.0	$550,000	$690,000
2.0	$960,000	$990,000
3.0	$1,451,000	$1,300,000

** Does not include cost of land*
† 2014 dollars

Future reservoirs can be constructed of concrete or glass. However, in the coastal environment, glass will be more resistant to deterioration and require less maintenance.

The construction of multiple smaller reservoirs is more advantageous than constructing a single large reservoir. The sloshing height on a cylindrical reservoir due to seismic forces is directly related to the diameter. This means that larger reservoirs have to be constructed with more height that cannot be utilized for storage, creating additional costs per gallon stored. Multiple smaller diameter reservoirs would also allow maintenance on reservoirs to be accomplished while taking a smaller portion of the storage capacity off line. The City can prepare a site to accommodate two 0.5 million gallon reservoirs and then construct them

Cascadia Earthquake Expected Shaking

Severe

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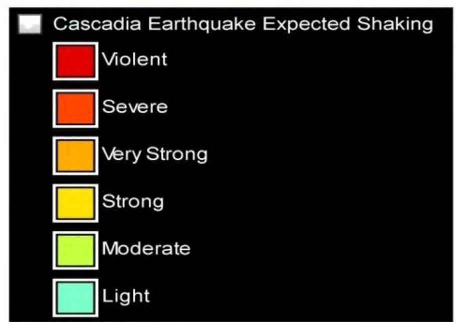

Earthquake Soft Soil Hazard

Moderate

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Figure 7.2

Landslide Hazard

Landslide

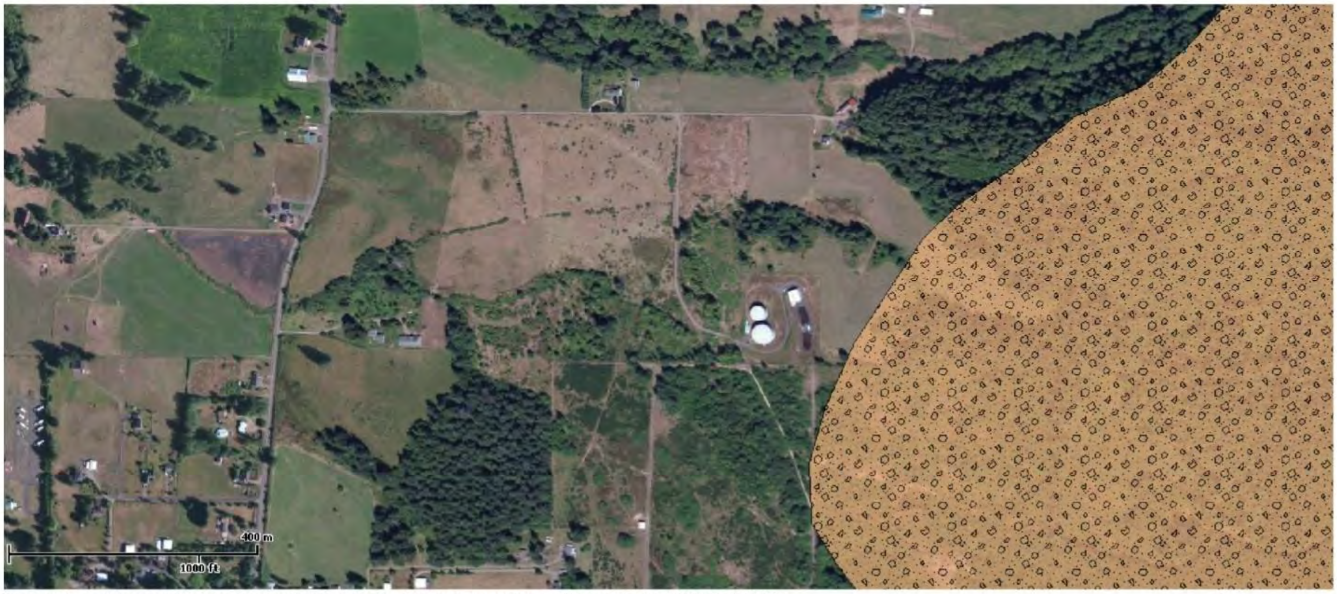

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Figure 7.3

sequentially as funding allows. The City can evaluate placing the reservoirs in different locations around town so that emergency needs can be met.

Sites in town would be more beneficial to the community in several ways:

a. The pipeline connection to the existing system is shorter;
b. Some City owned land is already available, and a small easement, or land trade, could be acquired from the School District or other public or private entity;
c. The reservoir(s) would be accessible to the community in the event of a natural disaster, such as the Cascadia Subduction Zone Earthquake, that could destroy the current reservoirs and/or sever the pipelines from them;
d. If placed near East Elementary School, it would be close to a potential evacuation site/staging area at the East Elementary School-Tillamook Junior High School complex. Other potential locations would be near Tillamook County Fairgrounds, another potential gathering site, or near the Hospital.

7.8 Funding

As part of the Tillamook Master Water Plan, a Cost Service Rate Report has been prepared by the Oregon Association of Water Utilities. This separate report utilizes data collected for the Master Plan to assist the City of Tillamook in setting Cost of Service Rates for the years 2014 through 2019.

Outside funding sources that the City could pursue, include several opportunities through the Business Oregon Infrastructure Finance Authority, including the Water/Wastewater Financing Program, the Special Public Works Fund, the Safe Drinking Water Revolving Loan Fund, and the Drinking Water Source Protection Fund. Additionally, the City may be able to participate in the US Department of Agriculture Rural Development Water and Waste Disposal Loan and Grant Program.

TABLE 7-1

Capital Improvement Plan

Priority	CIP No	Location	Justification	Length (feet)	OLD dia (inches)	OLD Pipe material	NEW Dia (inches)	Estimated Cost† Construction	Estimated Cost† Engineering, Administration, Contingencies	Estimated Cost† Total	Length to Cplt. Loop
DISTRIBUTION SYSTEM											
1	1	4th St, Laurel to Ocean to Miller	MR	1,100	6 & 1	CI & Cu	12	$143,000	$42,900	$185,900	300'
	2	Laurel Ave, 3rd to 4th	MR	260	6	CI	12	$33,800	$10,140	$43,940	0
2	3	4th St, Miller to Del Monte	EH	800	2	CI	6	$54,400	$16,300	$70,700	650'
		Del Monte 3rd to 5th	EH	530	4	CI	6	$36,050	$10,800	$46,850	0
3	4	3rd St, Miller to Evergreen	EH	2520	6	CI	12	$327,600	$98,300	$425,900	0
4	5	Miller Ave, 4th to 9th	EH	1305	6	CI	12	$169,650	$50,900	$220,550	0
	6	9th St, Miller east	EH	470	2	PVC	6	$32,000	$9,600	$41,600	0
5	7	5th St, Cedar to STP to 3rd	MR/EH	2485	2 & 4	PVC-CI	6	$169,000	$50,700	$219,700	610'
6	8	Cedar Ave, 2nd to 3rd	MR	275	2	CI	6	$18,700	$5,600	$24,300	0
7	9	Manor Pl loop, Elm to 9th & 9th to Elm	EH	900	2	CI	6	$61,200	$18,400	$79,600	0
8	10	7th St, Miller to east terminus	MR/EH	975	2	CI-GI	6	$66,300	$19,900	$86,200	0
9	11	Douglas St, 5th to 6th	EH	400	2	CI	6	$27,200	$8,200	$35,400	0
10	12	Elm, 11th to 12th	EH	290	2	GI	6	$19,750	$5,900	$25,750	80'
11	13	Alder Ln, Williams to Schools	MR/EH	800	6	PVC	6	$54,400	$16,300	$239,150	0
12	14	5th St, Elm to Stillwell	MR/EH	810	4	Stl	6	$55,400	$9,750	$70,700	0
0 yrs life	15	6th St - Main to Pacific	MR	50	8	Stl	8	$3,800	$1,150	$4,950	0
	16	Birch Ave - 5th to 6th	MR	430	2	GI	6	$29,250	$8.800	$38,050	180'
	17	5th St, terminus to railroad	MR	315	4	Stl	6	$21,450	$6,450	$27,900	0
	18	5th St - terminus north	MR	300	1½	Gal	2	$12,800	$3,840	$16,380	0
< 10 yrs life	19	4th St, Grove to Stillwell	MR/EH	300	4	CI	6	$20,400	$6,150	$26,550	0

EH - Existing Hydraulic Deficiency FH - Future Hydraulic Deficiency FF - Fire Flow Deficiency MR - Material Replacement † *2014 dollars*

TABLE 7-1

Capital Improvement Plan

Priority	CIP No	Location	Justification	Length (feet)	OLD dia (inches)	OLD Pipe material	NEW Dia (inches)	Estimated Cost† Construction	Estimated Cost† Engineering, Administration, Contingencies	Estimated Cost† Total	Length to Cplt. Loop
DISTRIBUTION SYSTEM											
< 20 yrs life	20	1st St, Douglas to Elm	MR	265	6	CI	6	$18,150	$5,450	$23,600	0
	21	Douglas Ave, Front to 1st	MR	265	6	CI	6	$18,150	$5,450	$23,600	0
	22	4th St, Stillwell to Laurel	MR	1,055	6	CI	6	$72,300	$21,700	$94,000	0
	23	10th St, Main to Nestucca	MR	960	6	CI	6	$65,300	$19,600	$84,900	0
	24	Laurel Ave, 4th to 10th	MR	1605	6	CI	6	$109,150	$32,750	$141,900	0
	25	Main Ave, Front to 4th	MR	1140	6	CI	6	$86,650	$26,000	$112,650	0
	26	3rd St, west of Ash to Stillwell	MR	1480	6	CI	6	$100,650	$30,200	$130,850	0
	27	Stillwell, 7th to 12th	MR	1550	6	CI	6	$105,400	$31,650	$137,050	0
	28	12th, Stillwell to Ivy	MR	280	6	CI	6	$19,050	$5,700	$24,750	0
	29	1st St, Stillwell to Ivy	MR	270	6	CI	6	$18,400	$5,500	$23,900	0
	30	11th St, Pacific to Miller	MR	1230	6	PVC	6	$83,650	$25,100	$108,750	0
	31	9th St, Elm to Cedar	MR	960	6	PVC	6	$65,300	$19,600	$84,900	0
	32	Ash Ave, 6th to 9th	MR	600	6	PVC	6	$40,800	$12,250	$53,050	0
	33	Beachwood Ave, 7th to 9th	MR	220	6	PVC	6	$15,000	$4,500	$19,500	0
	34	Cottonwood Ave, 6th to 9th	MR	600	6	PVC	6	$40,800	$12,250	$53,050	0
	35	Nestucca Ave, 9th to 10th	MR	200	6	PVC	6	$13,600	$4,100	$17,700	0
	36	Maple Ln, Evergreen to Williams	MR	1500	10	PVC	10	$150,000	$45,000	$195,000	0
	37	Hawthorne Ave, Evergreen to Williams	MR	1320	10	PVC	10	$132,000	$39,600	$171,600	0
	38	Walnut Ave, Evergreen to Hawthorne	MR	275	6	PVC	6	$18,700	$5,600	$24,300	0
	39	Madrona Ave 8th to 9th	MR	275	6	PVC	6	$18,700	$5,600	$24,300	0
	40	8th Street, Park east	MR	400	6	PVC	6	$27,200	$8,200	$35,400	0

EH - Existing Hydraulic Deficiency   FH - Future Hydraulic Deficiency   FF - Fire Flow Deficiency   MR - Material Replacement   † *2014 dollars*

TABLE 7-1

Capital Improvement Plan

Priority	CIP No	Location	Justification	Length (feet)	OLD dia (inches)	OLD Pipe material	NEW Dia (inches)	Estimated Cost† Construction	Estimated Cost† Engineering, Administration, Contingencies	Estimated Cost† Total	Length to Cplt. Loop
DISTRIBUTION SYSTEM											
< 20 yrs life	41	Pine Ave, 3rd to Alder	MR	620	6	PVC	6	$42,150	$12,650	$54,900	0
	42	Alder Ave, School Dist. easmt to Williams	MR	40	10	PVC	10	$4,000	$1,200	$5,200	0
	43	Front St, Ivy to Hwy. 101	MR	200	12	PVC	12	$26,000	$7,800	$33,800	0
	44	Hadley Rd, east	MR	600	2	PVC	6	$40,800	$12,250	$53,050	0
	44	Hadley Rd, east	MR	600	2	PVC	6	$40,800	$12,250	$53,050	0
	45	Hawthorne Ave, Williams west	MR	250	12	PVC	12	$32,500	$9,750	$42,250	0
	46	Hwy 101, line east, south of Hadley	MR	400	8	PVC	8	$30,400	$9,150	$39, 550	0
	47	Hwy 101, east side, Hadley north	MR	4100	12	PVC	12	$533,000	$159,900	$692,900	0
	48	Hwy. 101, west side, Hadley north	MR	200	8	PVC	8	$15,200	$4,600	$19,800	0
	49	Hwy. 101, west side, Hadley south	MR	1100	8	PVC	8	$83,600	$25,100	$108,700	0
	50	Hwy. 101, Werner north	MR	3200	8	PVC	8	$243,200	$73,000	$316,200	0
	51	Hwy. 101, east side, Hoquarton Sl. to Hadley	MR	1525	12	PVC	12	$198,250	$59,500	$257,750	0
	52	Larson Road, east	MR	350	2	PVC	6	$23,800	$7,150	$30,950	0
	53	Main Avenue, 4th to 12th	MR	2500	10	PVC	10	$250,000	$75,000	$325,000	0
	54	Main Avenue, 12th south	MR	300	10	PVC	10	$30,000	$9,000	$39,00	0
	55	Well #2, to Alder	MR	700	12	PVC	12	$91,000	$27,300	$118,300	0
	56	Williams Avenue, Alder to Maple	MR	670	12	PVC	12	$87,100	$26,150	$113,250	0
	57	Williams Avenue, Maple to Hawthorne	MR	575	12	PVC	12	$74,750	$22,450	$97,200	0
	58	12th Street, Miller to High School	MR	975	12	PVC	12	$126,750	$38,050	$164,800	0
	59	Alder Lane, Well No. 2 line to Dogwood	MR	800	12	PVC	12	$104,000	$31,200	$135,200	0
	60	Cypress Street, east	MR	450	2	PVC	2	$7,500	$2,250	$9,750	0
	61	Cypress Street, west, Spruce to Alder	MR	450	2	PVC	6	$30,600	$9,200	$39,800	0

EH - Existing Hydraulic Deficiency FH - Future Hydraulic Deficiency FF - Fire Flow Deficiency MR - Material Replacement † *2014 dollars*

TABLE 7-1											
Capital Improvement Plan											
Priority	CIP No	Location	Justification	Length (feet)	OLD dia (inches)	OLD Pipe material	NEW Dia (inches)	Estimated Cost†			Length to Cplt. Loop
								Construction	Engineering, Administration, Contingencies	Total	
DISTRIBUTION SYSTEM											
	62	Dogwood Street, east	MR	200	2	PVC	6	$13,600	$4,100	$17,700	0
	63	Dogwood Street, west	MR	400	6	PVC	6	$27,200	$8,200	$35,400	0
< 20 yrs life	64	Linden Avenue, Alder to Pine Ave. Apts.	MR	260	6	PVC	6	$17,700	$5,300	$23,000	0
	65	Linden Avenue, Pine Ave. Apts, north	MR/FF/EH	290	2	PVC	6	$19,750	$5,900	$25,750	0
	66	Pine Avenue Apts., Pine to Linden	MR	520	6	PVC	6	$35,400	$10,600	$46,000	0

EH - Existing Hydraulic Deficiency FH - Future Hydraulic Deficiency FF - Fire Flow Deficiency MR - Material Replacement † *2014 dollars*

TABLE 7-2
Capital Improvement Plan

Priority	CIP No	Location	Justification	Length (feet)	OLD dia (inches)	OLD Pipe material	NEW Dia (inches)	Estimated Cost†			Length to Cplt. Loop (feet)
								Construction	Engineering, Administration, Contingencies	Total	
CITY TRANSMISSION MAINS											
1	1A	West Side Transmission: Birch Ave, 3rd-6th; 6th St, Birch to Cedar; Cedar Ave, 6th to 9th; 9th St, Cedar to Elm; Elm Ave, 8th to 11th; 11th St, Elm to Ivy	MR/FH	4000	2 & 6	GI & CI	12	$520,000	$156,000	$676,000	700
4	2A	Southeast Transmission 12th St - 300' east of Evergreen to Marolf Marolf Lp, 12th to 3rd	FH	6000	---	---	12	$780,000	$234,000	$1,014,000	6000
2	3A	South Transmision Ivy & 12th to south city limits & Hwy 101	MR	1000	18	Stl	18	$150,000	$45,000	$195,000	0
3	4A	South Transmission Miller & 12th to Hwy 101	MR	1670	18	Stl	18	$250,500	$75,150	$325,650	0
RURAL TRANSMISSION MAINS											
1	1B	So Prairie - Clemens Cor. to Hwy 101 Hwy 101 So Prairie to Long Prairie	MR	16,450	12-16-24	Stl	24	$2,961,000	$888,300	$3,849,300	0
2	2B	Hwy 101 - So Prairie to Nielsen; Nielsen to exist line; N. to 101; 101 to City Limits	MR	10,500	14	Stl	24	$1,890,000	$567,000	$2,457,000	0
3	3B	Gienger Rd - Hwy 101to Fitzpatrick Rd	MR	4,700	14	Stl	10	$376,000	$112,800	$488,800	0
4	4B	McCormack Lp - Hwy 101 to 3rd St	FH	14,300	---	---	12	$1,430,000	$429,000	$1,859,000	14,300
5	5B	3rd St - McCormick to Marolf Lp	FH	3,350	---	---	12	$435,500	$130,650	$566,150	3,350

EH - Existing Hydraulic Deficiency FH - Future Hydraulic Deficiency FF - Fire Flow Deficiency MR - Material Replacement † *2014 dollars*

TABLE 7-3						
Capital Improvement Plan						
Priority	CIP No	Item	Justification	Estimated Cost†		
				Construction	Engineering, Administration, Contingencies	Total
FIRE HYDRANTS						
1	1D	7th Street & Stillwell Ave, transfer to 16" line	FF	$5,000	$1,500	$6,500
As funds are available or to coincide with other construction projects	2D	Sub-surface Fire Hydrant 3rd & Pacific	Reduce Downtown Repairs	$8,000	$2,400	$10,400
	3D	Sub-surface Fire Hydrant	Reduce Downtown Repairs	$8,000	$2,400	$10,400
	4D	3rd Street - East of Linden Drive	FF	$4,400	$1,320	$5,720
	5D	3rd Street - West of Meadow Avenue	FF	$4,400	$1,320	$5,720
	6D	4th Street - @ Wilson School	FF	$4,400	$1,320	$5,720
	7D	5th Street - West of Birch Avenue	FF	$4,400	$1,320	$5,720
	8D	5th Street & Nestucca Avenue	FF	$4,400	$1,320	$5,720
	9D	6th Street & Ash Avenue	FF	$4,400	$1,320	$5,720
	10D	7th Street & Miller Avenue	FF	$4,400	$1,320	$5,720
	11D	9th Street - between Grove Ave & Manor Pl	FF	$4,400	$1,320	$5,720
	12D	9th Street - east terminus, east of Miller Ave	FF	$4,400	$1,320	$5,720
	13D	12th Street & Grove Avenue	FF	$4,400	$1,320	$5,720
	14D	12th Street & Madrona Avenue	FF	$4,400	$1,320	$5,720
	15D	Nestucca Avenue between 9th & 10th Sts	FF	$4,400	$1,320	$5,720
	16D	Evergreen Avenue - north of Alder Lane	FF	$4,400	$1,320	$5,720
	17D	Linden Drive - south of Alder Lane	FF	$4,400	$1,320	$5,720
	18D	Williams Avenue - south of Alder Lane	FF	$4,400	$1,320	$5,720
	19D	Maple Lane - east of Evergreen Drive	FF	$4,400	$1,320	$5,720
	20D	Maple Lane - west of Williams Avenue	FF	$4,400	$1,320	$5,720
	21D	Hawthorne Lane & Walnut Drive	FF	$4,400	$1,320	$5,720

FF - Fire Flow Deficiency   † *2014 dollars*

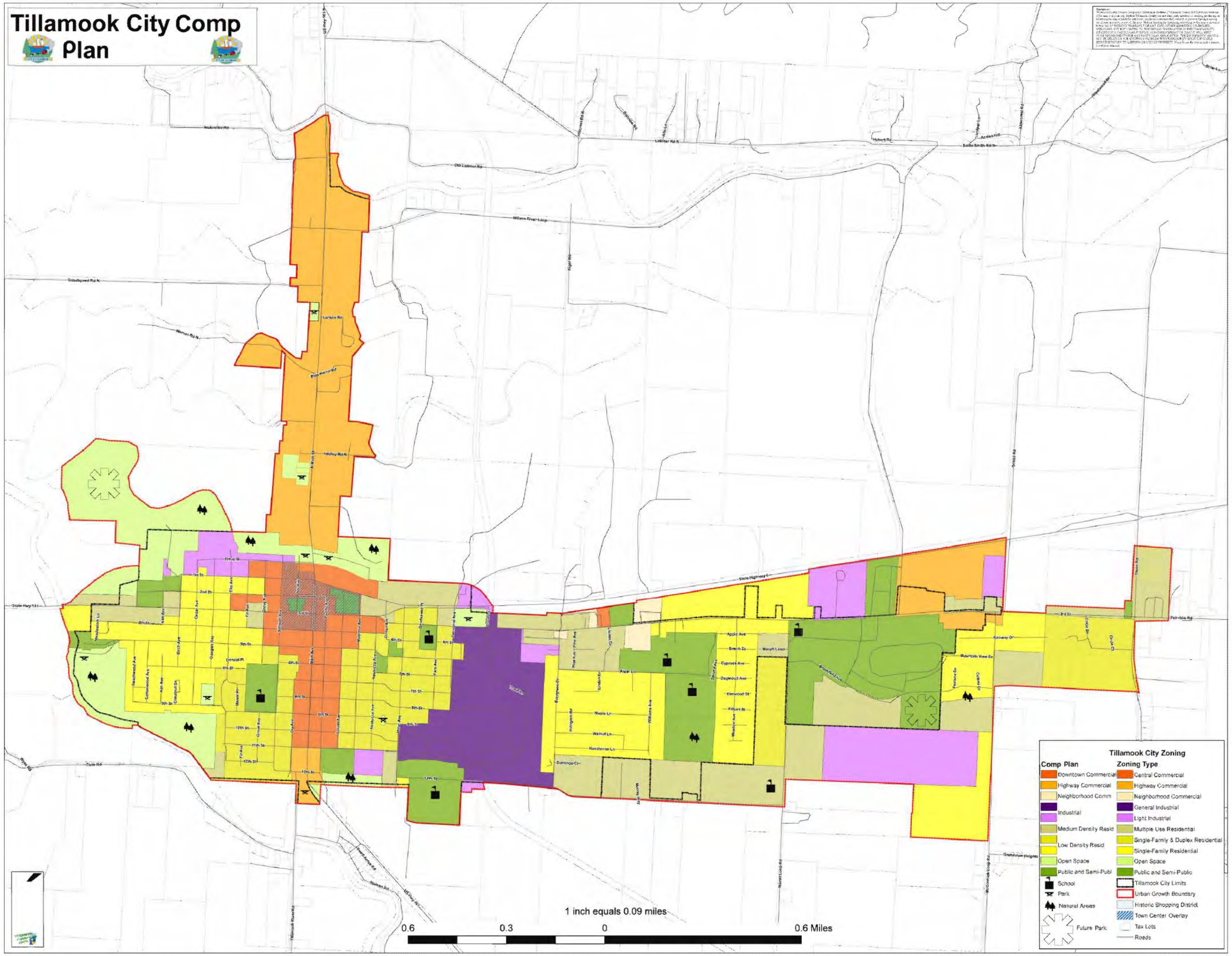
Table 7-4

Capital Improvement Plan

Priority	CIP No	Item	Justification	Estimated Cost† Construction	Estimated Cost† Engineering, Administration, Contingencies	Estimated Cost† Total
RESERVOIRS						
1	1E	0.5 M Gal Reservoir (Glass) [1]	3-day Storage Reserve/Fire Flows, current need; Disaster Preparedness	$700,000	$210,000	$910,000
4	2E	0.5 M Gal Reservoir (Glass) [2]	3-day Storage Reserve/Fire Flows, current need; Disaster Preparedness	$420,000	$126,000	$546,000
2	3E	0.5 M Gal Reservoir (Glass) [3]	3-day Storage Reserve/Fire Flows, current need; Disaster Preparedness	$560,000	$168,000	$728,000
5	4E	0.5 M Gal Reservoir (Glass) [3]	3-day Storage Reserve/Fire Flows, current need; Disaster Preparedness	$560,000	$168,000	$728,000
3	5E	Seismic Evaluation Exist. 1.1 & 1.9 MG Reservoirs & WTP	Disaster Preparedness	$30,000	$9,000	$39,000
SUPPLY						
1	1F	Well No. 4	Maintain Water Right Volume	$60,000	$18,000	$78,000
1a	2F	Water Right Transfer Well No. 1	Preserve Priority Date	-----	$4,800	$4,800
	3F	Evaluate Well No. 1 (Hwy 101)	Eliminate Liability	$5,000	$1,500	$6,500
2	4F	Well No. 5	Maintain Water Right Volume	$60,000	$18,000	$78,000
2a	5F	Water Right Transfer Old Well No.2	Preserve Priority Date	-----	$4,800	$4,800
	6F	Evaluate Old Well No. 2 (Gienger Rd)	Eliminate Liability	$5,000	$1,500	$6,500
MISCELLANEOUS						
1	1G	Leak Noise Correlator System	Reduce Unaccounted for Water	-----	-----	$30,000
2	2G	AWWA Water System Audit	Reduce Unaccounted for Water	In	House	-----
4	3G	SCADA System	Monitor Water Production/Use	$100,000	$30,000	$130,000
6	4G	Meters/sensors at overflows	Reduce Unaccounted for Water	$1500	-----	variable
7	5G	Meters on all uses (services)	Reduce Unaccounted for Water	$1000	-----	variable
8	6G	Staff Gages Fawcett & Killam Creeks	Monitor Water Levels/Volume	$1200	$350	$1,550
5	7G	Water Conservation & Management Plan due by Nov. 14, 2017	Required by Water Resources Well 2 Time Extension Order	-----	$50,000	$50,000
3	8G	Skookum Lake Decommissioning	Remove Liability/Hazard	$200,000	$60,000	$260,000
9	9G	Stairway & Platform Access WTP Res	Reduce Hazard	$55,000	$16,500	$71,500

† *2014 dollars*
[1] *Reservoir includes, booster pump w/ building, site grading for 2 reservoirs*
[2] *Reservoir construction only on prepared site*
[3] *Reservoir includes, booster pump w/ building, site grading for 1 reservoir*

Appendix A



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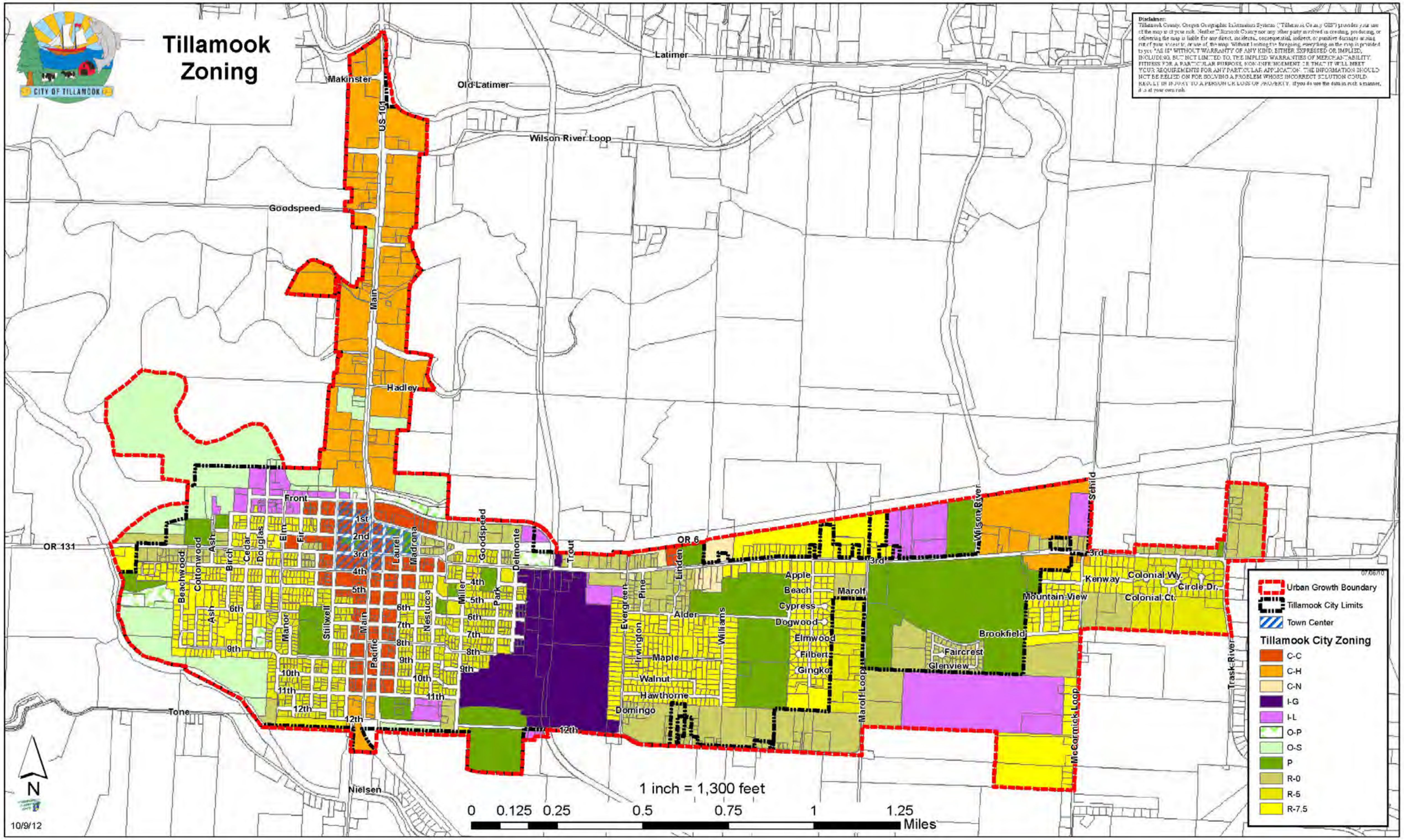
Tillamook City Zoning

Comp Plan	Zoning Type
Downtown Commercial	Central Commercial
Highway Commercial	Highway Commercial
Neighborhood Comm	Neighborhood Commercial
Industrial	General Industrial
	Light Industrial
Medium Density Resid	Multiple Use Residential
Low Density Resid	Single-Family & Duplex Residential
	Single-Family Residential
Open Space	Open Space
Public and Semi-Publ	Public and Semi-Public
School	Tillamook City Limits
Park	Urban Growth Boundary
Natural Areas	Historic Shopping District
	Town Center Overlay
Future Park	Tax Lots
	Roads



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Urban Growth Boundary
Tillamook City Limits
Town Center

Tillamook City Zoning

- C-C
- C-H
- C-N
- I-G
- I-L
- O-P
- O-S
- P
- R-0
- R-5
- R-7.5

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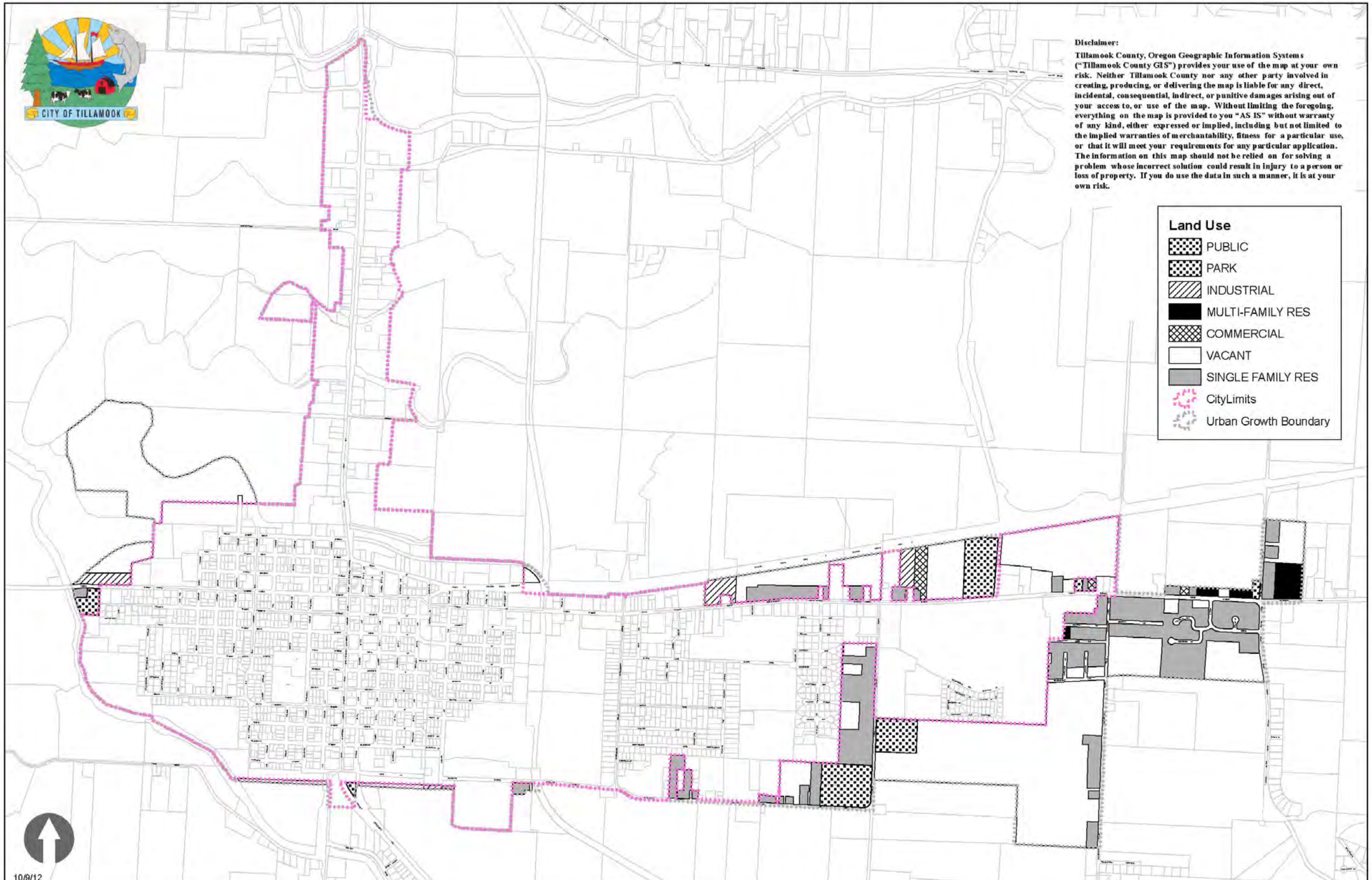

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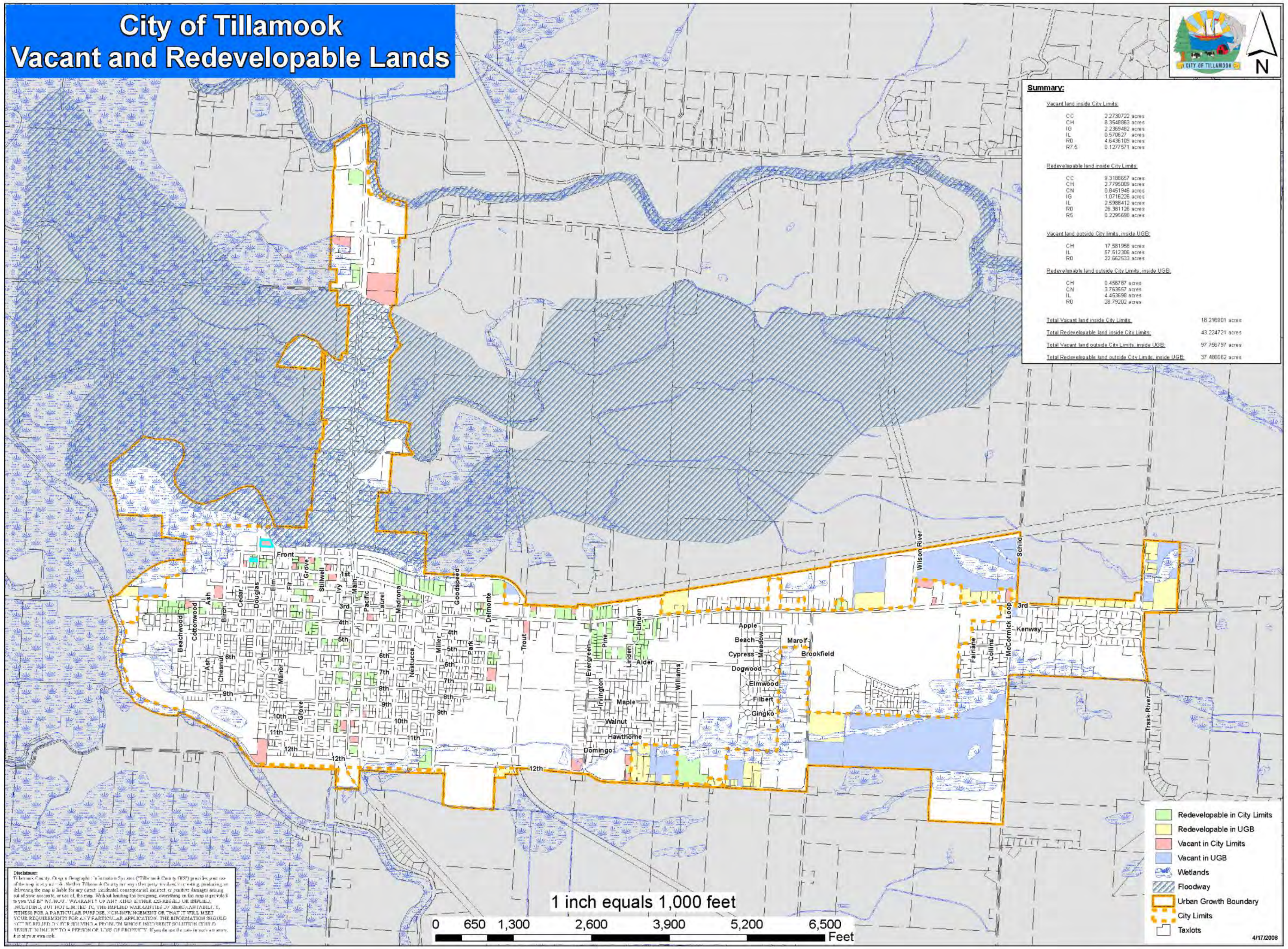

Summary:

Vacant land inside City Limits:

CC	2.2730722 acres
CH	8.3548863 acres
IG	2.2369482 acres
IL	0.570627 acres
R0	4.6436109 acres
R7.5	0.1277571 acres

Redevelopable land inside City Limits:

CC	9.3188657 acres
CH	2.7795009 acres
CN	0.8451946 acres
IG	1.0716226 acres
IL	2.5988412 acres
R0	26.381126 acres
R5	0.2295698 acres

Vacant land outside City limits, inside UGB:

CH	17.581958 acres
IL	57.512306 acres
R0	22.662533 acres

Redevelopable land outside City Limits, inside UGB:

CH	0.456787 acres
CN	3.763557 acres
IL	4.453698 acres
R0	28.79202 acres

Total Vacant land inside City Limits:	18.216901 acres
Total Redevelopable land inside City Limits:	43.224721 acres
Total Vacant land outside City Limits, inside UGB:	97.756797 acres
Total Redevelopable land outside City Limits, inside UGB:	37.466062 acres

Redevelopable in City Limits
Redevelopable in UGB
Vacant in City Limits
Vacant in UGB
Wetlands
Floodway
Urban Growth Boundary
City Limits
Taxlots

4/17/2008

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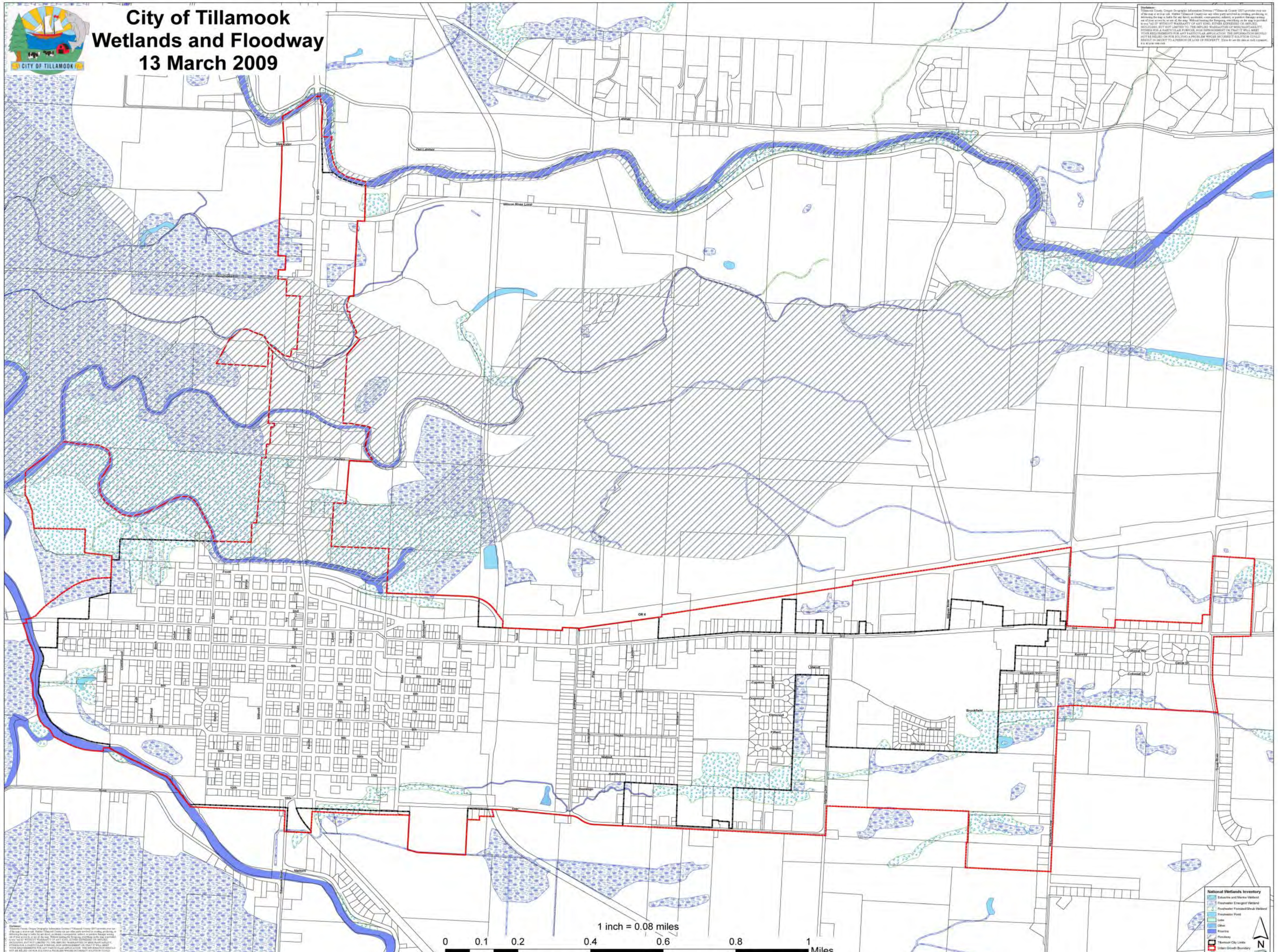

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National Wetlands Inventory

- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine
- Floodway
- Tillamook City Limits
- Urban Growth Boundary
- Taxlots

N

Tillamook County GIS

Appendix B

IWA/AWWA Water Audit Method

What is a Water Audit?

An audit has been defined as an examination of records or financial accounts to check their accuracy. The *water audit* typically traces the flow of water from the site of water withdrawal or treatment, through the water distribution system, and into customer properties. The water audit usually exists in the form of a worksheet or spreadsheet that details the variety of consumption and losses that exist in a community water system.

The *water balance* summarizes the components and provides accountability, as all of the water placed into a distribution system should – in theory – equal all of the water taken out of the distribution system.

Photo courtesy of Hughes Supply - Utilities Services Group.

The IWA/AWWA Water Audit Method

AWWA participated in a five-country task force formed by the International Water Association (IWA) to develop a best practice water audit structure for drinking water utilities. The Task Force published its results in the 2000 IWA publication *Performance Indicators for Water Supply Services*.

AWWA's Water Loss Control Committee advocated use of the IWA/AWWA Water Audit Method in its 2003 Committee Report "Applying Worldwide Best Management Practices in Water Loss Control", published in the *Journal AWWA*.

How does the IWA/AWWA Water Audit Method work?

The IWA/AWWA Water Audit Method is effective because it features sound, consistent definitions for the major forms of water consumption and water loss encountered in drinking water utilities. It also features a set of rational performance indicators that evaluate utilities on system-specific attributes such as the average pressure in the distribution system and total length of water mains. The format of the water balance of this method is given in **Table 1** with definitions for the terms included in **Table 2**.

The performance indicators, shown in **Table 3**, allow water utilities to make a meaningful assessment of their water loss standing, benchmark themselves with other water utilities and set performance targets. The water audit tells us how much of each type of loss occurs and how much it is costing the water utility. The key concept around this method is that all water is quantified – via measurement or estimate – as either a form of beneficial consumption or as wasteful loss. A cost is placed on each volume component in order to assess its financial impact to the water utility.

Table 1. IWA/AWWA Water Balance (All data in volume for the period of reference, typically one year)

<table>
<tr><td rowspan="10">System Input Volume (corrected for known errors)</td><td rowspan="4">Authorized Consumption</td><td rowspan="2">Billed Authorized Consumption</td><td>Billed Metered Consumption (including water exported)</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="8">Non-Revenue Water (NRW)</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="6">Water Losses</td><td rowspan="3">Apparent Losses</td><td>Unauthorized Consumption</td></tr>
<tr><td>Customer Metering Inaccuracies</td></tr>
<tr><td>Systematic Data Handling Errors</td></tr>
<tr><td rowspan="3">Real Losses</td><td>Leakage on Transmission and Distribution Mains</td></tr>
<tr><td>Leakage and Overflows at Utility's Storage Tanks</td></tr>
<tr><td>Leakage on Service Connections up to point of Customer metering</td></tr>
</table>

Table 2. Components and Definitions of the IWA/AWWA Water Balance

Water Balance Component	Definition
System Input Volume	The annual volume input to the water supply system
Authorized Consumption	The annual volume of metered and/or unmetered water taken by registered customers, the water supplier and others who are authorized to do so
Water Losses	The difference between System Input Volume and Authorized Consumption, consisting of Apparent Losses plus Real Losses
Apparent Losses	Unauthorized Consumption, all types of metering inaccuracies and systematic data handling errors
Real Losses	The annual volumes lost through all types of leaks, breaks and overflows on mains, service reservoirs and service connections, up to the point of customer metering.
Revenue Water	Those components of System Input Volume which are billed and produce revenue
Non-Revenue Water (NRW)	The difference between System Input Volume and Billed Authorized Consumption

Table 3. Performance Indicators for Non-revenue Water and Water Losses

Performance Indicator	Function	Comments
Volume of Non-revenue water as a percentage of system input volume	Financial - Non-revenue water by volume	Can be calculated from a simple water balance; good only as a general financial indicator
Volume of Non-revenue water as a percentage of the annual cost of running the water system	Financial - Non-revenue water by cost	Allows different unit costs for Non-revenue water components
Volume of Apparent Losses per service connection per day	Operational - Apparent Losses	Basic but meaningful indicator once the volume of apparent losses has been calculated or estimated
Real Losses as a percentage of system input volume	Inefficiency of use of water resources	Unsuitable for assessing efficiency of management of distribution systems
Normalized Real Losses - Gallons/service connection/day when the system is pressurized	Operational: Real Losses	Good operational performance indicator for target-setting for real loss reduction
Unavoidable Annual Real Losses (UARL)	UARL (gallons/day) = (5.41Lm + 0.15Nc + 7.5Lp) x P where Lm = length of water mains, miles Nc = number of service connections Lp = total length of private pipe, miles = Nc x average distance from curbstop to customer meter P = average pressure in the system, psi	A theoretical reference value representing the technical low limit of leakage that could be achieved if all of today's best technology could be successfully applied. A key variable in the calculation of the Infrastructure Leakage Index (ILI) It is not necessary that systems set this level as a target unless water is unusually expensive, scarce or both
Infrastructure Leakage Index (ILI)	Operational: Real Losses	Ratio of Current Annual Real Losses (CARL) to Unavoidable Annual Real Losses (UARL); good for operational benchmarking for real loss control.

Appendix C

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March 31, 2014

Mr. Paul Wintergreen, Manager
Tillamook
210 Laurel Ave
Tillamook, OR 97141

RE: Tillamook FD, Tillamook County, OR
Public Protection Classification: 3/3Y
Effective Date: July 1, 2014

Dear Mr. Wintergreen:

We wish to thank you, Fire Chief Rick Adams and others for your cooperation during our recent Public Protection Classification (PPC) survey. ISO has completed its analysis of the structural fire suppression delivery system provided in your community. The resulting classification is indicated above.

Enclosed is a summary of the ISO analysis of your fire suppression services. If you would like to know more about your community's PPC classification, or if you would like to learn about the potential effect of proposed changes to your fire suppression delivery system, please call us at the phone number listed below.

ISO's Public Protection Classification Program (PPC) plays an important role in the underwriting process at insurance companies. In fact, most U.S. insurers – including the largest ones – use PPC information as part of their decision- making when deciding what business to write, coverage's to offer or prices to charge for personal or commercial property insurance.

Each insurance company independently determines the premiums it charges its policyholders. The way an insurer uses ISO's information on public fire protection may depend on several things – the company's fire-loss experience, ratemaking methodology, underwriting guidelines, and its marketing strategy.

Through ongoing research and loss experience analysis, we identified additional differentiation in fire loss experience within our PPC program, which resulted in the revised classifications. We based the differing fire loss experience on the fire suppression capabilities of each community. The new classifications will improve the predictive value for insurers while benefiting both commercial and residential property owners. We've published the new classifications as "X" and "Y" — formerly the "9" and "8B" portion of the split classification, respectively. For example:

- A community currently graded as a split 6/9 classification will now be a split 6/6X classification; with the "6X" denoting what was formerly classified as "9."
- Similarly, a community currently graded as a split 6/8B classification will now be a split 6/6Y classification, the "6Y" denoting what was formerly classified as "8B."
- Communities graded with single "9" or "8B" classifications will remain intact.

PPC is important to communities and fire departments as well. Communities whose PPC improves may get lower insurance prices. PPC also provides fire departments with a valuable benchmark, and is used by many departments as a valuable tool when planning, budgeting and justifying fire protection improvements.

ISO appreciates the high level of cooperation extended by local officials during the entire PPC survey process. The community protection baseline information gathered by ISO is an essential foundation upon which determination of the relative level of fire protection is made using the Fire Suppression Rating Schedule.

The classification is a direct result of the information gathered, and is dependent on the resource levels devoted to fire protection in existence at the time of survey. Material changes in those resources that occur after the survey is completed may affect the classification. Although ISO maintains a pro-active process to keep baseline information as current as possible, in the event of changes please call us at 1-800-444-4554, option 2 to expedite the update activity.

ISO is the leading supplier of data and analytics for the property/casualty insurance industry. Most insurers use PPC classifications for underwriting and calculating premiums for residential, commercial and industrial properties. The PPC program is not intended to analyze all aspects of a comprehensive structural fire suppression delivery system program. It is not for purposes of determining compliance with any state or local law, nor is it for making loss prevention or life safety recommendations.

If you have any questions about your classification, please let us know.

Sincerely,

Dominic Santanna

Dominic Santanna
(800) 444-4554 Option 2

jj

Encl.

cc: Fire Chief Rick Adams, Tillamook Fire Department
Mr. Ed Donaue, Superintendent, Fairview Water District
Mr. Tim Lyda, Superintendent, Tillamook Water Department
Mr. Alan Tuckey, Superintendent, Oceanside Water District
Mr. Doug Kettner, Manager, Tillamook County Emergency Communications District
Ms. Debra Reeve, Chairman, Board of Tillamook

Public Protection Classification

Summary Report

Tillamook FD

OREGON

Prepared by

Insurance Services Office, Inc.
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Marlton, New Jersey 08053-3112
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March 2014

Background Information

Introduction

ISO collects and evaluates information from communities in the United States on their structure fire suppression capabilities. The data is analyzed using our Fire Suppression Rating Schedule (FSRS™) and then a Public Protection Classification (PPC™) number is assigned to the community. The surveys are conducted whenever it appears that there is a possibility of a classification change. As such, the PPC program provides important, up-to-date information about fire protection services throughout the country.

The Fire Suppression Rating Schedule (FSRS) recognizes fire protection features only as they relate to suppression of first alarm structure fires. In many communities, fire suppression may be only a small part of the fire department's overall responsibility. ISO recognizes the dynamic and comprehensive duties of a community's fire service, and understands the complex decisions a community must make in planning and delivering emergency services. However, in developing a community's Public Protection Classification, only features related to reducing property losses from structural fires are evaluated. Multiple alarms, simultaneous incidents and life safety are not considered in this evaluation. The PPC program evaluates the fire protection for small to average size buildings. Specific properties with a Needed Fire Flow in excess of 3,500 gpm are evaluated separately and assigned an individual classification.

A community's investment in fire mitigation is a proven and reliable predictor of future fire losses. Statistical data on insurance losses bears out the relationship between excellent fire protection – as measured by the PPC program – and low fire losses. So, insurance companies use PPC information for marketing, underwriting, and to help establish fair premiums for homeowners and commercial fire insurance. In general, the price of fire insurance in a community with a good PPC is substantially lower than in a community with a poor PPC, assuming all other factors are equal.

ISO is an independent company that serves insurance companies, communities, fire departments, insurance regulators, and others by providing information about risk. ISO's expert staff collects information about municipal fire suppression efforts in communities throughout the United States. In each of those communities, ISO analyzes the relevant data and assigns a Public Protection Classification – a number from 1 to 10. Class 1 represents an exemplary fire suppression program, and Class 10 indicates that the area's fire suppression program does not meet ISO's minimum criteria.

ISO's PPC program evaluates communities according to a uniform set of criteria, incorporating nationally recognized standards developed by the National Fire Protection Association and the American Water Works Association. A community's PPC depends on:

- **Needed Fire Flows**, which are representative building locations used to determine the theoretical amount of water necessary for fire suppression purposes.
- **Emergency Communications**, including emergency reporting, telecommunicators, and dispatching systems.
- **Fire Department**, including equipment, staffing, training, geographic distribution of fire companies, operational considerations, and community risk reduction.
- **Water Supply**, including inspection and flow testing of hydrants, alternative water supply operations, and a careful evaluation of the amount of available water compared with the amount needed to suppress fires up to 3,500 gpm.

Data Collection and Analysis

ISO has evaluated and classified over 48,000 fire protection areas across the United States using its Fire Suppression Rating Schedule (FSRS). A combination of meetings between trained ISO field representatives and the dispatch center coordinator, community fire official, and water superintendent is used in conjunction with a comprehensive questionnaire to collect the data necessary to determine the PPC number. In order for a community to obtain a classification better then a Class 9, three elements of fire suppression features are reviewed. These three elements are Emergency Communications, Fire Department, and Water Supply.

A review of the **Emergency Communications** accounts for 10% of the total classification. This section is weighted at **10 points,** as follows:

- Emergency Reporting 3 points
- Telecommunicators 4 points
- Dispatch Circuits 3 points

A review of the **Fire Department** accounts for 50% of the total classification. ISO focuses on a fire department's first alarm response and initial attack to minimize potential loss. The fire department section is weighted at **50 points,** as follows:

- Engine Companies 6 points
- Reserve Pumpers 0.5 points
- Pump Capacity 3 points
- Ladder/Service Companies 4 points
- Reserve Ladder/Service Trucks 0.5 points
- Deployment Analysis 10 points
- Company Personnel 15 points
- Training 9 points
- Operational considerations 2 points
- Community Risk Reduction 5.5 points (in addition to the 50 points above)

A review of the **Water Supply** system accounts for 40% of the total classification. ISO reviews the water supply a community uses to determine the adequacy for fire suppression purposes. The water supply system is weighted at **40 points,** as follows:

- Credit for Supply System 30 points
- Hydrant Size, Type & Installation 3 points
- Inspection & Flow Testing of Hydrants 7 points

There is one additional factor considered in calculating the final score – **Divergence**.

Even the best fire department will be less than fully effective if it has an inadequate water supply. Similarly, even a superior water supply will be less than fully effective if the fire department lacks the equipment or personnel to use the water. The FSRS score is subject to modification by a divergence factor, which recognizes disparity between the effectiveness of the fire department and the water supply.

The Divergence factor mathematically reduces the score based upon the relative difference between the fire department and water supply scores. The factor is introduced in the final equation.

Public Protection Classification Number

The PPC number assigned to the community will depend on the community's score on a 100-point scale:

PPC	Points
1	90.00 or more
2	80.00 to 89.99
3	70.00 to 79.99
4	60.00 to 69.99
5	50.00 to 59.99
6	40.00 to 49.99
7	30.00 to 39.99
8	20.00 to 29.99
9	10.00 to 19.99
10	0.00 to 9.99

The classification numbers are interpreted as follows:

- Class 1 through (and including) Class 8 represents a fire suppression system that includes an FSRS creditable dispatch center, fire department, and water supply.
- Class 8B is a special classification that recognizes a superior level of fire protection in otherwise Class 9 areas. It is designed to represent a fire protection delivery system that is superior except for a lack of a water supply system capable of the minimum FSRS fire flow criteria of 250 gpm for 2 hours.
- Class 9 is a fire suppression system that includes a creditable dispatch center, fire department but no FSRS creditable water supply.
- Class 10 does not meet minimum FSRS criteria for recognition, including areas that are beyond five road miles of a recognized fire station.

New Public Protection Classifications effective July 1, 2014

We're revising our Public Protection Classifications (PPC™) to capture the effects of enhanced fire protection capabilities that reduce fire loss and fire severity in Split Class 9 and Split Class 8B areas (as outlined below). This new structure benefits the fire service, community, and property owner.

New classifications
Through ongoing research and loss experience analysis, we identified additional differentiation in fire loss experience within our PPC program, which resulted in the revised classifications. We based the differing fire loss experience on the fire suppression capabilities of each community. The new classifications will improve the predictive value for insurers while benefiting both commercial and residential property owners. Here are the new classifications and what they mean.

Split classifications
When we develop a split classification for a community — for example 5/9 — the first number is the class that applies to properties within 5 road miles of the responding fire station and 1,000 feet of a creditable water supply, such as a fire hydrant, suction point, or dry hydrant. The second number is the class that applies to properties within 5 road miles of a fire station but beyond 1,000 feet of a creditable water supply. We have revised the classification to reflect more precisely the risk of loss in a community, replacing Class 9 and 8B in the second part of a split classification with revised designations.

What's changed with the new classifications?
We've published the new classifications as "X" and "Y" — formerly the "9" and "8B" portion of the split classification, respectively. For example:

- A community currently displayed as a split 6/9 classification will now be a split 6/6X classification; with the "6X" denoting what was formerly classified as "9".
- Similarly, a community currently graded as a split 6/8B classification will now be a split 6/6Y classification, the "6Y" denoting what was formerly classified as "8B".
- Communities graded with single "9" or "8B" classifications will remain intact.

Prior Classification	New Classification
1/9	1/1X
2/9	2/2X
3/9	3/3X
4/9	4/4X
5/9	5/5X
6/9	6/6X
7/9	7/7X
8/9	8/8X
9	9

Prior Classification	New Classification
1/8B	1/1Y
2/8B	2/2Y
3/8B	3/3Y
4/8B	4/4Y
5/8B	5/5Y
6/8B	6/6Y
7/8B	7/7Y
8/8B	8/8Y
8B	8B

What's changed?
As you can see, we're still maintaining split classes, but it's how we represent them to insurers that's changed. The new designations reflect a reduction in fire severity and loss and have the potential to reduce property insurance premiums.

Benefits of the revised split class designations

- To the fire service, the revised designations identify enhanced fire suppression capabilities used throughout the fire protection area
- To the community, the new classes reward a community's fire suppression efforts by showing a more reflective designation
- To the individual property owner, the revisions offer the potential for decreased property insurance premiums

New water class
Our data also shows that risks located more than 5 but less than 7 road miles from a responding fire station with a creditable water source within 1,000 feet had better loss experience than those farther than 5 road miles from a responding fire station with no creditable water source. We've introduced a new classification —10W — to recognize the reduced loss potential of such properties.

What's changed with Class 10W?
Class 10W is property-specific. Not all properties in the 5-to-7-mile area around the responding fire station will qualify. The difference between Class 10 and 10W is that the 10W-graded risk or property is within 1,000 feet of a creditable water supply. Creditable water supplies include fire protection systems using hauled water in any of the split classification areas.

What's the benefit of Class 10W?
10W gives credit to risks within 5 to 7 road miles of the responding fire station and within 1,000 feet of a creditable water supply. That's reflective of the potential for reduced property insurance premiums.

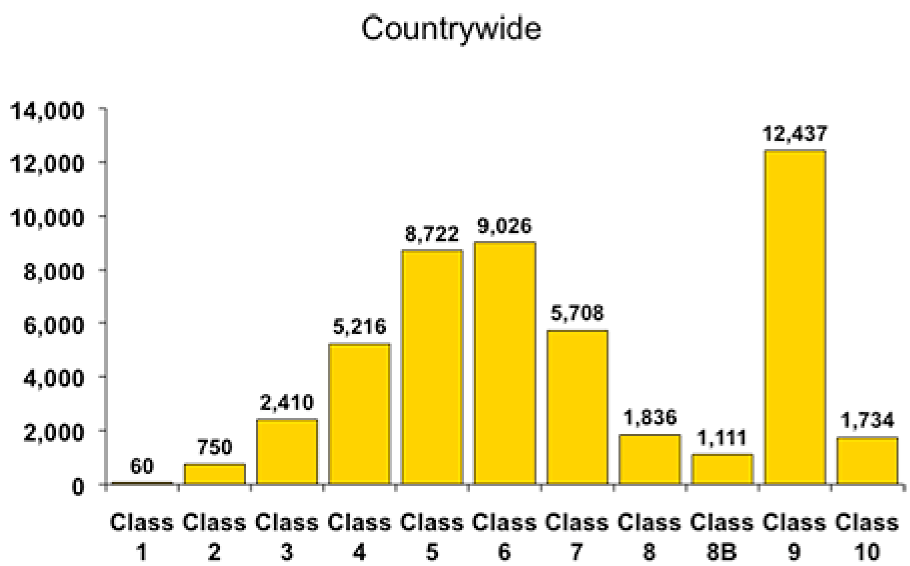
What does the fire chief have to do?
Fire chiefs don't have to do anything at all. The revised classifications will change automatically effective July 1, 2014*.

What if I have additional questions?
Feel free to contact ISO at 800.444.4554 or email us at PPC-Cust-Serv@iso.com.

*The new classifications do not apply in Texas.

Distribution of Public Protection Classification Numbers

The 2014 published countrywide distribution of communities by the Public Protection Classification number is as follows:



Assistance

The PPC program offers help to communities, fire departments and other public officials as they plan for, budget, and justify improvements. ISO is also available to assist in the understanding of the details of this evaluation.

ISO Public Protection representatives can be reached by telephone at (800) 444-4554. The technical specialists at this telephone number have access to the details of this evaluation and can effectively speak with you about your PPC questions. What's more, we can be reached via the internet at www.isomitigation.com/talk/.

We also have a website dedicated to our Community Hazard Mitigation Classification programs at www.isomitigation.com. Here, fire chiefs, building code officials, community leaders and other interested citizens can access a wealth of data describing the criteria used in evaluating how cities and towns are protecting residents from fire and other natural hazards. This website will allow you to learn more about ISO's Public Protection Classification program. The website provides important background information, insights about the PPC grading processes and technical documents. ISO is also pleased to offer Fire Chiefs Online — a special secured website with information and features that can help improve your ISO Public Protection Classification, including a list of the Needed Fire Flows for all the commercial occupancies ISO has on file for your community. Visitors to the site can download information, see statistical results and also contact ISO for assistance.

In addition, on-line access to the Fire Suppression Rating Schedule and its commentaries is available to registered customers for a fee. However, fire chiefs and community chief administrative officials are given access privileges to this information without charge.

To become a registered fire chief or community chief administrative official, register at www.isomitigation.com.

Public Protection Classification

ISO concluded its review of the fire suppression features being provided for Tillamook FD. The resulting community classification is **Class 03/3Y**.

If the classification is a single class, the classification applies to properties with a Needed Fire Flow of 3,500 gpm or less in the community. If the classification is a split class (e.g., 6/XX), the following applies:

- The first class (e.g., “6” in a 6/XX) applies to properties within 5 road miles of a recognized fire station and within 1,000 feet of a fire hydrant or alternate water supply.
- The second class (XX or XY) applies to properties beyond 1,000 feet of a fire hydrant but within 5 road miles of a recognized fire station.
- Alternative Water Supply: The first class (e.g., “6” in a 6/10) applies to properties within 5 road miles of a recognized fire station with no hydrant distance requirement.
- Class 10 applies to properties over 5 road miles of a recognized fire station.
- Specific properties with a Needed Fire Flow in excess of 3,500 gpm are evaluated separately and assigned an individual classification.

Summary Evaluation Analysis

FSRS Feature	Earned Credit	Credit Available
Emergency Communications		
414. Credit for Emergency Reporting	**2.40**	3
422. Credit for Telecommunicators	**3.99**	4
432. Credit for Dispatch Circuits	**2.25**	3
440. Credit for Receiving and Handling Fire Alarms	**8.64**	**10**
Fire Department		
513. Credit for Engine Companies	**5.84**	6
523. Credit for Reserve Pumpers	**0.00**	0.50
532. Credit for Pump Capacity	**3.00**	3
549. Credit for Ladder Service	**3.98**	4
553. Credit for Reserve Ladder and Service Trucks	**0.00**	0.50
561. Credit for Deployment Analysis	**7.05**	10
571. Credit for Company Personnel	**5.26**	15
581. Credit for Training	**6.61**	9
730. Credit for Operational Considerations	**2.00**	2
590. Credit for Fire Department	**33.74**	**50**
Water Supply		
616. Credit for Supply System	**21.12**	30
621. Credit for Hydrants	**2.99**	3
631. Credit for Inspection and Flow Testing	**2.20**	7
640. Credit for Water Supply	**26.31**	**40**
Divergence	**-0.34**	--
1050. Community Risk Reduction	**4.36**	**5.50**
Total Credit	**72.71**	**105.50**

Emergency Communications

Ten percent of a community's overall score is based on how well the communications center receives and dispatches fire alarms. Our field representative evaluated:

• Communications facilities provided for the general public to report structure fires

• Enhanced 9-1-1 Telephone Service including wireless

• Computer-aided dispatch (CAD) facilities

• Alarm receipt and processing at the communication center

• Training and certification of telecommunicators

• Facilities used to dispatch fire department companies to reported structure fires

	Earned Credit	Credit Available
414. Credit Emergency Reporting	**2.40**	3
422. Credit for Telecommunicators	**3.99**	4
432. Credit for Dispatch Circuits	**2.25**	3
Item 440. Credit for Emergency Communications:	**8.64**	**10**

Item 414 - Credit for Emergency Reporting (3 points)

The first item reviewed is Item 414 "Credit for Emergency Reporting (CER)". This item reviews the emergency communication center facilities provided for the public to report fires including 911 systems (Basic or Enhanced), Wireless Phase I and Phase II, Voice over Internet Protocol, Computer Aided Dispatch and Geographic Information Systems for automatic vehicle location. ISO uses National Fire Protection Association (NFPA) 1221, *Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems* as the reference for this section.

Item 410. Emergency Reporting (CER)	Earned Credit	Credit Available
A./B. Basic 9-1-1, Enhanced 9-1-1 or No 9-1-1 For maximum credit, there should be an Enhanced 9-1-1 system, Basic 9-1-1 and No 9-1-1 will receive partial credit.	**20.00**	**20**
1. E9-1-1 Wireless Wireless Phase I using Static ALI (automatic location identification) Functionality (10 points); Wireless Phase II using Dynamic ALI Functionality (15 points); Both available will be 25 points	**25.00**	**25**
2. E9-1-1 Voice over Internet Protocol (VoIP) Static VoIP using Static ALI Functionality (10 points); Nomadic VoIP using Dynamic ALI Functionality (15 points); Both available will be 25 points	**10.00**	**25**
3. Computer Aided Dispatch Basic CAD (5 points); CAD with Management Information System (5 points); CAD with Interoperability (5 points)	**10.00**	**15**
4. Geographic Information System (GIS/AVL) The PSAP uses a fully integrated CAD/GIS management system with automatic vehicle location (AVL) integrated with a CAD system providing dispatch assignments.	**15.00**	**15**
Review of Emergency Reporting total:	**80.00**	**100**

Item 422- Credit for Telecommunicators (4 points)

The second item reviewed is Item 422 “Credit for Telecommunicators (TC)”. This item reviews the number of Telecommunicators on duty at the center to handle fire calls and other emergencies. All emergency calls including those calls that do not require fire department action are reviewed to determine the proper staffing to answer emergency calls and dispatch the appropriate emergency response. NFPA 1221, *Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems,* recommends that ninety-five percent of emergency calls shall be answered within 15 seconds and ninety-nine percent of emergency calls shall be answered within 40 seconds. In addition, NFPA recommends that ninety percent of emergency alarm processing shall be completed within 60 seconds and ninety-nine percent of alarm processing shall be completed within 90 seconds of answering the call.

To receive full credit for operators on duty, ISO must review documentation to show that the communication center meets NFPA 1221 call answering and dispatch time performance measurement standards. This documentation may be in the form of performance statistics or other performance measurements compiled by the 9-1-1 software or other software programs that are currently in use such as Computer Aided Dispatch (CAD) or Management Information System (MIS).

Item 420. Telecommunicators (CTC)	**Earned Credit**	**Credit Available**
A1. Alarm Receipt (AR) Receipt of alarms shall meet the requirements in accordance with the criteria of NFPA 1221	**19.79**	**20**
A2. Alarm Processing (AP) Processing of alarms shall meet the requirements in accordance with the criteria of NFPA 1221	**20.00**	**20**
B. Emergency Dispatch Protocols (EDP) Telecommunicators have emergency dispatch protocols (EDP) containing questions and a decision-support process to facilitate correct call categorization and prioritization.	**20.00**	**20**
C. Telecommunicator Training and Certification (TTC) Telecommunicators meet the qualification requirements referenced in NFPA 1061, *Standard for Professional Qualifications for Public Safety Telecommunicator,* and/or the Association of Public-Safety Communications Officials - International (APCO) *Project 33.* Telecommunicators are certified in the knowledge, skills, and abilities corresponding to their job functions.	**20.00**	**20**
D. Telecommunicator Continuing Education and Quality Assurance (TQA) Telecommunicators participate in continuing education and/or in-service training and quality-assurance programs as appropriate for their positions	**20.00**	**20**
Review of Telecommunicators total:	**99.79**	**100**

Item 432 - Credit for Dispatch Circuits (3 points)

The third item reviewed is Item 432 “Credit for Dispatch Circuits (CDC)”. This item reviews the dispatch circuit facilities used to transmit alarms to fire department members. A “Dispatch Circuit” is defined in NFPA 1221 as “A circuit over which an alarm is transmitted from the communications center to an emergency response facility (ERF) or emergency response units (ERUs) to notify ERUs to respond to an emergency”. All fire departments (except single fire station departments with full-time firefighter personnel receiving alarms directly at the fire station) need adequate means of notifying all firefighter personnel of the location of reported structure fires. The dispatch circuit facilities should be in accordance with the general criteria of NFPA 1221. “Alarms” are defined in this Standard as “A signal or message from a person or device indicating the existence of an emergency or other situation that requires action by an emergency response agency”.

There are two different levels of dispatch circuit facilities provided for in the Standard – a primary dispatch circuit and a secondary dispatch circuit. In jurisdictions that receive 730 alarms or more per year (average of two alarms per 24-hour period), two separate and dedicated dispatch circuits, a primary and a secondary, are needed. In jurisdictions receiving fewer than 730 alarms per year, a second dedicated dispatch circuit is not needed. Dispatch circuit facilities installed but not used or tested (in accordance with the NFPA Standard) receive no credit.

The score for Credit for Dispatch Circuits (CDC) is influenced by monitoring for integrity of the primary dispatch circuit. There are up to 0.90 points available for this Item. Monitoring for integrity involves installing automatic systems that will detect faults and failures and send visual and audible indications to appropriate communications center (or dispatch center) personnel. ISO uses NFPA 1221 to guide the evaluation of this item. ISO's evaluation also includes a review of the communication system's emergency power supplies.

Item 432 “Credit for Dispatch Circuits (CDC)” = 2.25 points

Fire Department

Fifty percent of a community's overall score is based upon the fire department's structure fire suppression system. ISO's field representative evaluated:

- Engine and ladder/service vehicles including reserve apparatus
- Equipment carried
- Response to reported structure fires
- Deployment analysis of companies
- Available and/or responding firefighters
- Training

	Earned Credit	Credit Available
513. Credit for Engine Companies	**5.84**	6
523. Credit for Reserve Pumpers	**0.00**	0.5
532. Credit for Pumper Capacity	**3.00**	3
549. Credit for Ladder Service	**3.98**	4
553. Credit for Reserve Ladder and Service Trucks	**0.00**	0.5
561. Credit for Deployment Analysis	**7.05**	10
571. Credit for Company Personnel	**5.26**	15
581. Credit for Training	**6.61**	9
581. Credit for Operational Considerations	**2.00**	2
Item 590. Credit for Fire Department:	**33.74**	**50**

Basic Fire Flow

The Basic Fire Flow for the community is determined by the review of the Needed Fire Flows for selected buildings in the community. The fifth largest Needed Fire Flow is determined to be the Basic Fire Flow. The Basic Fire Flow has been determined to be 3500 gpm.

Item 513 - Credit for Engine Companies (6 points)

The first item reviewed is Item 513 "Credit for Engine Companies (CEC)". This item reviews the number of engine companies, their pump capacity, hose testing, pump testing and the equipment carried on the in-service pumpers. To be recognized, pumper apparatus must meet the general criteria of NFPA 1901, *Standard for Automotive Fire Apparatus* which include a minimum 250 gpm pump, an emergency warning system, a 300 gallon water tank, and hose. At least 1 apparatus must have a permanently mounted pump rated at 750 gpm or more at 150 psi.
The review of the number of needed pumpers considers the response distance to built-upon areas; the Basic Fire Flow; and the method of operation. Multiple alarms, simultaneous incidents, and life safety are not considered.

The greatest value of A, B, or C below is needed in the fire district to suppress fires in structures with a Needed Fire Flow of 3,500 gpm or less: **3 engine companies**

a) **0 engine companies** to provide fire suppression services to areas to meet NFPA 1710 criteria or within 1½ miles.

b) **3 engine companies** to support a Basic Fire Flow of 3500 gpm.

c) **2 engine companies** based upon the fire department's method of operation to provide a minimum two engine response to all first alarm structure fires.

The FSRS recognizes that there are **3 engine companies** in service.

The FSRS also reviews Automatic Aid. Automatic Aid is considered in the review as assistance dispatched automatically by contractual agreement between two communities or fire districts. That differs from mutual aid or assistance arranged case by case. ISO will recognize an Automatic Aid plan under the following conditions:

- It must be prearranged for first alarm response according to a definite plan. It is preferable to have a written agreement, but ISO may recognize demonstrated performance.
- The aid must be dispatched to all reported structure fires on the initial alarm.
- The aid must be provided 24 hours a day, 365 days a year.

FSRS Item 512.D "Automatic Aid Engine Companies" responding on first alarm and meeting the needs of the city for basic fire flow and/or distribution of companies are factored based upon the value of the Automatic Aid plan (up to 1.00 can be used as the factor). The Automatic Aid factor is determined by a review of the Automatic Aid provider's communication facilities, how they receive alarms from the graded area, inter-department training between fire departments, and the fire ground communications capability between departments.

For each engine company, the credited Pump Capacity (PC), the Hose Carried (HC), the Equipment Carried (EC) all contribute to the calculation for the percent of credit the FSRS provides to that engine company.

Item 513 "Credit for Engine Companies (CEC)" = 5.84 points

Item 523 - Credit for Reserve Pumpers (0.50 points)

The item is Item 523 "Credit for Reserve Pumpers (CRP)". This item reviews the number and adequacy of the pumpers and their equipment. The number of needed reserve pumpers is 1 for each 8 needed engine companies determined in Item 513, or any fraction thereof.

Item 523 "Credit for Reserve Pumpers (CRP)" = 0.00 points

Item 532 – Credit for Pumper Capacity (3 points)

The next item reviewed is Item 532 "Credit for Pumper Capacity (CPC)". The total pump capacity available should be sufficient for the Basic Fire Flow of 3500 gpm. The maximum needed pump capacity credited is the Basic Fire Flow of the community.

Item 532 "Credit for Pumper Capacity (CPC)" = 3.00 points

Item 549 – Credit for Ladder Service (4 points)

The next item reviewed is Item 549 "Credit for Ladder Service (CLS)". This item reviews the number of response areas within the city with 5 buildings that are 3 or more stories or 35 feet or more in height, or with 5 buildings that have a Needed Fire Flow greater than 3,500 gpm, or any combination of these criteria. The height of all buildings in the city, including those protected by automatic sprinklers, is considered when determining the number of needed ladder companies. Response areas not needing a ladder company should have a service company. Ladders, tools and equipment normally carried on ladder trucks are needed not only for ladder operations but also for forcible entry, ventilation, salvage, overhaul, lighting and utility control.

The number of ladder or service companies, the height of the aerial ladder, aerial ladder testing and the equipment carried on the in-service ladder trucks and service trucks is compared with the number of needed ladder trucks and service trucks and an FSRS equipment list. Ladder trucks must meet the general criteria of NFPA 1901, *Standard for Automotive Fire Apparatus* to be recognized.

The number of needed ladder-service trucks is dependent upon the number of buildings 3 stories or 35 feet or more in height, buildings with a Needed Fire Flow greater than 3,500 gpm, and the method of operation.

The FSRS recognizes that there are **1 ladder companies** in service. These companies are needed to provide fire suppression services to areas to meet NFPA 1710 criteria or within 2½ miles and the number of buildings with a Needed Fire Flow over 3,500 gpm or 3 stories or more in height, or the method of operation.

The FSRS recognizes that there are **0 service companies** in service.

Item 549 "Credit for Ladder Service (CLS)" = 3.98 points

Item 553 – Credit for Reserve Ladder and Service Trucks (0.50 points)

The next item reviewed is Item 553 "Credit for Reserve Ladder and Service Trucks (CRLS)". This item considers the adequacy of ladder and service apparatus when one (or more in larger communities) of these apparatus are out of service. The number of needed reserve ladder and service trucks is 1 for each 8 needed ladder and service companies that were determined to be needed in Item 540, or any fraction thereof.

Item 553 "Credit for Reserve Ladder and Service Trucks (CRLS)" = 0.00 points

Item 561 – Deployment Analysis (10 points)

Next, Item 561 "Deployment Analysis (DA)" is reviewed. This Item examines the number and adequacy of existing engine and ladder-service companies to cover built-upon areas of the city.

To determine the Credit for Distribution, first the Existing Engine Company (EC) points and the Existing Engine Companies (EE) determined in Item 513 are considered along with Ladder Company Equipment (LCE) points, Service Company Equipment (SCE) points, Engine-Ladder Company Equipment (ELCE) points, and Engine-Service Company Equipment (ESCE) points determined in Item 549.

Secondly, as an alternative to determining the number of needed engine and ladder/service companies through the road-mile analysis, a fire protection area may use the results of a systematic performance evaluation. This type of evaluation analyzes computer-aided dispatch (CAD) history to demonstrate that, with its current deployment of companies, the fire department meets the time constraints for initial arriving engine and initial full alarm assignment in accordance with the general criteria of in NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments.*

A determination is made of the percentage of built upon area within 1½ miles of a first-due engine company and within 2½ miles of a first-due ladder-service company.

Item 561 "Credit Deployment Analysis (DA)" = 7.05 points

Item 571 – Credit for Company Personnel (15 points)

Item 571 “Credit for Company Personnel (CCP)” reviews the average number of existing firefighters and company officers available to respond to reported first alarm structure fires in the city.

The on-duty strength is determined by the yearly average of total firefighters and company officers on-duty considering vacations, sick leave, holidays, “Kelley” days and other absences. When a fire department operates under a minimum staffing policy, this may be used in lieu of determining the yearly average of on-duty company personnel.

Firefighters on apparatus not credited under Items 513 and 549 that regularly respond to reported first alarms to aid engine, ladder, and service companies are included in this item as increasing the total company strength.

Firefighters staffing ambulances or other units serving the general public are credited if they participate in fire-fighting operations, the number depending upon the extent to which they are available and are used for response to first alarms of fire.

On-Call members are credited on the basis of the average number staffing apparatus on first alarms. Off-shift career firefighters and company officers responding on first alarms are considered on the same basis as on-call personnel. For personnel not normally at the fire station, the number of responding firefighters and company officers is divided by 3 to reflect the time needed to assemble at the fire scene and the reduced ability to act as a team due to the various arrival times at the fire location when compared to the personnel on-duty at the fire station during the receipt of an alarm.

The number of Public Safety Officers who are positioned in emergency vehicles within the jurisdiction boundaries may be credited based on availability to respond to first alarm structure fires. In recognition of this increased response capability the number of responding Public Safety Officers is divided by 2.

The average number of firefighters and company officers responding with those companies credited as Automatic Aid under Items 513 and 549 are considered for either on-duty or on-call company personnel as is appropriate. The actual number is calculated as the average number of company personnel responding multiplied by the value of AA Plan determined in Item 512.D.

The maximum creditable response of on-duty and on-call firefighters is 12, including company officers, for each existing engine and ladder company and 6 for each existing service company.

Chief Officers are not creditable except when more than one chief officer responds to alarms; then extra chief officers may be credited as firefighters if they perform company duties.

The FSRS recognizes **1.93 on-duty personnel** and an average of **17.05 on-call personnel** responding on first alarm structure fires.

Item 571 “Credit for Company Personnel (CCP)” = 5.26 points

Item 581 – Credit for Training (9 points)

Training	Earned Credit	Credit Available
A. Facilities, and Use For maximum credit, each firefighter should receive 18 hours per month in structure fire related subjects as outlined in NFPA 1001.	25.0(	35
B. Company Training For maximum credit, each firefighter should receive 16 hours per month in structure fire related subjects as outlined in NFPA 1001.	12.66	25
C. Classes for Officers For maximum credit, each officer should be certified in accordance with the general criteria of NFPA 1021. Additionally, each officer should receive 12 hours of continuing education on or off site.	6.00	12
D. New Driver and Operator Training For maximum credit, each new driver and operator should receive 60 hours of driver/operator training per year in accordance with NFPA 1002 and NFPA 1451.	3.08	5
E. Existing Driver and Operator Training For maximum credit, each existing driver and operator should receive 12 hours of driver/operator training per year in accordance with NFPA 1002 and NFPA 1451.	5.00	5
F. Training on Hazardous Materials For maximum credit, each firefighter should receive 6 hours of training for incidents involving hazardous materials in accordance with NFPA 472.	0.50	1
G. Recruit Training For maximum credit, each firefighter should receive 240 hours of structure fire related training in accordance with NFPA 1001 within the first year of employment or tenure.	3.23	5
H. Pre-Fire Planning Inspections For maximum credit, pre-fire planning inspections of each commercial, industrial, institutional, and other similar type building (all buildings except 1-4 family dwellings) should be made annually by company members. Records of inspections should include up-to date notes and sketches.	12.0(	12

Item 580 "Credit for Training (CT)" = 6.61 points

Item 730 – Operational Considerations (2 points)

Item 730 "Credit for Operational Considerations (COC)" evaluates fire department standard operating procedures and incident management systems for emergency operations involving structure fires.

Operational Considerations	Earned Credit	Credit Available
Standard Operating Procedures The department should have established SOPs for fire department general emergency operations	**50**	**50**
Incident Management Systems The department should use an established incident management system (IMS)	**50**	**50**
Operational Considerations total:	**100**	**100**

Item 730 "Credit for Operational Considerations (COC)" = 2.00 points

Water Supply

Forty percent of a community's overall score is based on the adequacy of the water supply system. The ISO field representative evaluated:

- the capability of the water distribution system to meet the Needed Fire Flows at selected locations up to 3,500 gpm.
- size, type and installation of fire hydrants.
- inspection and flow testing of fire hydrants.

	Earned Credit	Credit Available
616. Credit for Supply System	**21.12**	30
621. Credit for Hydrants	**2.99**	3
631. Credit for Inspection and Flow Testing	**2.20**	7
Item 640. Credit for Water Supply:	**26.31**	**40**

Item 616 – Credit for Supply System (30 points)

The first item reviewed is Item 616 “Credit for Supply System (CSS)”. This item reviews the rate of flow that can be credited at each of the Needed Fire Flow test locations considering the supply works capacity, the main capacity and the hydrant distribution. The lowest flow rate of these items is credited for each representative location. A water system capable of delivering 250 gpm or more for a period of two hours plus consumption at the maximum daily rate at the fire location is considered minimum in the ISO review.

Where there are 2 or more systems or services distributing water at the same location, credit is given on the basis of the joint protection provided by all systems and services available.

The supply works capacity is calculated for each representative Needed Fire Flow test location, considering a variety of water supply sources. These include public water supplies, emergency supplies (usually accessed from neighboring water systems), suction supplies (usually evidenced by dry hydrant installations near a river, lake or other body of water), and supplies developed by a fire department using large diameter hose or vehicles to shuttle water from a source of supply to a fire site. The result is expressed in gallons per minute (gpm).

The normal ability of the distribution system to deliver Needed Fire Flows at the selected building locations is reviewed. The results of a flow test at a representative test location will indicate the ability of the water mains (or fire department in the case of fire department supplies) to carry water to that location.

The hydrant distribution is reviewed within 1,000 feet of representative test locations measured as hose can be laid by apparatus.

For maximum credit, the Needed Fire Flows should be available at each location in the district. Needed Fire Flows of 2,500 gpm or less should be available for 2 hours; and Needed Fire Flows of 3,000 and 3,500 gpm should be obtainable for 3 hours.

Item 616 “Credit for Supply System (CSS)” = 21.12 points

Item 621 – Credit for Hydrants (3 points)

The second item reviewed is Item 621 “Credit for Hydrants (CH)”. This item reviews the number of fire hydrants of each type compared with the total number of hydrants.

There are a total of 436 hydrants in the graded area.

620. Hydrants, - Size, Type and Installation	Number of Hydrants
A. With a 6 -inch or larger branch and a pumper outlet with or without 2½ -inch outlets	432
B. With a 6 -inch or larger branch and no pumper outlet but two or more 2½ -inch outlets, or with a small foot valve, or with a small barrel	4
C./D. With only a 2½ -inch outlet or with less than a 6 -inch branch	0
E./F. Flush Type, Cistern, or Suction Point	0

Item 621 “Credit for Hydrants (CH)” = 2.99 points

Item 630 – Credit for Inspection and Flow Testing (7 points)

The third item reviewed is Item 630 “Credit for Inspection and Flow Testing (CIT)”. This item reviews the fire hydrant inspection frequency, and the completeness of the inspections. Inspection of hydrants should be in accordance with AWWA M-17, *Installation, Field Testing and Maintenance of Fire Hydrants.*

Frequency of Inspection (FI): Average interval between the 3 most recent inspections.

Frequency	Points
1 year	30
2 years	20
3 years	10
4 years	5
5 years or more	No Credit

Note: The points for inspection frequency are reduced by 10 points if the inspections are incomplete or do not include a flushing program. An additional reduction of 10 points are made if hydrants are not subjected to full system pressure during inspections. If the inspection of cisterns or suction points does not include actual drafting with a pumper, or back-flushing for dry hydrants, 20 points are deducted.

Total points for Inspections = 0.55 points

Frequency of Fire Flow Testing (FF): Average interval between the 3 most recent inspections.

Frequency	Points
5 years	40
6 years	30
7 years	20
8 years	10
9 years	5
10 years or more	No Credit

Total points for Fire Flow Testing = 1.65 points

Item 631 "Credit for Inspection and Fire Flow Testing (CIT)" = 2.20 points

Divergence = -0.34

The Divergence factor mathematically reduces the score based upon the relative difference between the fire department and water supply scores. The factor is introduced in the final equation.

Community Risk Reduction

	Earned Credit	Credit Available
1025. Credit for Fire Prevention and Code Enforcement (CPCE)	**1.97**	2.2
1033. Credit for Public Fire Safety Education (CFSE)	**1.49**	2.2
1044. Credit for Fire Investigation Programs (CIP)	**0.90**	1.1
Item 1050. Credit for Community Risk Reduction	**4.36**	**5.50**

Item 1025 – Credit for Fire Prevention Code and Enforcement (2.2 points)	Earned Credit	Credit Available
Fire Prevention Code Regulations (PCR) Evaluation of fire prevention code regulations in effect.	10.00	10
Fire Prevention Staffing (PS) Evaluation of staffing for fire prevention activities.	8.00	8
Fire Prevention Certification and Training (PCT) Evaluation of the certification and training of fire prevention code enforcement personnel.	2.63	6
Fire Prevention Programs (PCP) Evaluation of fire prevention programs.	15.25	2
Review of Fire Prevention Code and Enforcement (CPCE) total:	35.88	40

Item 1033 – Credit for Public Fire Safety Education (2.2 points)	Earned Credit	Credit Available
Public Fire Safety Educators Qualifications and Training (FSQT) Evaluation of public fire safety education personnel training and qualification as specified by the authority having jurisdiction.	10.00	10
Public Fire Safety Education Programs (FSP) Evaluation of programs for public fire safety education.	17.00	30
Review of Public Safety Education Programs (CFSE) total:	27.00	40

Item 1044 – Credit for Fire Investigation Programs (1.1 points)	Earned Credit	Credit Available
Fire Investigation Organization and Staffing (IOS) Evaluation of organization and staffing for fire investigations.	8.00	8
Fire Investigator Certification and Training (IQT) Evaluation of fire investigator certification and training.	2.40	6
Use of National Fire Incident Reporting System (IRS) Evaluation of the use of the National Fire Incident Reporting System (NFIRS) for the 3 years before the evaluation.	6.00	6
Review of Fire Prevention Code and Enforcement (CPCE) total:	16.4	20

Summary of Public Protection Classification Review

Completed by ISO

for

Tillamook FD

FSRS Item	Earned Credit	Credit Available
Emergency Reporting		
414. Credit for Emergency Reporting	**2.40**	3
422. Credit for Telecommunicators	**3.99**	4
432. Credit for Dispatch Circuits	**2.25**	3
440. Credit for Receiving and Handling Fire Alarms	**8.64**	**10**
Fire Department		
513. Credit for Engine Companies	**5.84**	6
523. Credit for Reserve Pumpers	**0.00**	0.5
532. Credit for Pumper Capacity	**3.00**	3
549. Credit for Ladder Service	**3.98**	4
553. Credit for Reserve Ladder and Service Trucks	**0.00**	0.5
561. Credit for Deployment Analysis	**7.05**	10
571. Credit for Company Personnel	**5.26**	15
581. Credit for Training	**6.61**	9
730. Credit for Operational Considerations	**2.00**	2
590. Credit for Fire Department	**33.74**	**50**
Water Supply		
616. Credit for Supply System	**21.12**	30
621. Credit for Hydrants	**2.99**	3
631. Credit for Inspection and Flow Testing	**2.20**	7
640. Credit for Water Supply	**26.31**	**40**
Divergence	**-0.34**	--
1050. Community Risk Reduction	**4.36**	**5.50**
Total Credit	**72.71**	**105.5**

Final Community Classification = 03/3Y

INSURANCE SERVICES OFFICE, INC.

HYDRANT FLOW DATA SUMMARY

City: Tillamook FD
County: Tillamook   State: Oregon   Witnessed by: Insurance Services Office, Inc   Date: June 25, 2013

TEST NO.	TYPE DIST.*	TEST LOCATION	SERVICE	FLOW - GPM $Q=(29.83(C(d^2)p^{0.5}))$ INDIVIDUAL HYDRANTS			TOTAL	PRESSURE PSI STATIC	RESID.	FLOW - AT 20 PSI NEEDED **	AVAIL.	REMARKS***
1	Comm	Rte 101 & LATIMER RD	KILCHIS REGIONAL WATER DISTRICT, MAIN	1300	0	0	1300	130	105	7500	2900	(D)-(4781 gpm)
2	Comm	12 Street & MILLER	TILLAMOOK WATER DEPARTMENT, MAIN	890	0	0	890	85	59	7000	1500	
3	Comm	3 Street & MEADOW	FAIRVIEW WATER DISTRICT, MAIN	1210	0	0	1210	108	72	7000	2000	(D)-(2485 gpm)
4	Comm	HANGAR Road & 4TH STREET	TILLAMOOK WATER DEPARTMENT, MAIN	890	0	0	890	70	55	7000	1700	
5	Comm	Main Avenue & FRONT ST	TILLAMOOK WATER DEPARTMENT, MAIN	1160	0	0	1160	80	65	6000	2500	
6	Comm	Main Avenue & WILSON RIVER LOOP	TILLAMOOK WATER DEPARTMENT, MAIN	1060	0	0	1060	90	72	5500	2200	
7	Comm	Alder Lane & SPRUCE	TILLAMOOK WATER DEPARTMENT, MAIN	1030	0	0	1030	80	66	5000	2300	
7.1	Comm	Alder Lane & SPRUCE	TILLAMOOK WATER DEPARTMENT, MAIN	1030	0	0	1030	80	66	5000	2300	
4.1	Comm	D Street & HANGAR	TILLAMOOK WATER DEPARTMENT, MAIN	890	0	0	890	70	55	5000	1700	
3.1	Comm	3 Street & MEADOW	FAIRVIEW WATER DISTRICT, MAIN	1210	0	0	1210	108	72	5000	2000	(D)-(2485 gpm)
3.2	Comm	3 Street & MEADOW	FAIRVIEW WATER DISTRICT, MAIN	1210	0	0	1210	108	72	5000	2000	(D)-(2485 gpm)
8	Comm	Stillwell Avenue & 7TH STREET	TILLAMOOK WATER DEPARTMENT, MAIN	1060	0	0	1060	89	75	4500	2500	
4.2	Comm	D Street & HANGAR	TILLAMOOK WATER DEPARTMENT, MAIN	890	0	0	890	70	55	4500	1700	
9	Comm	South Prairie Road & HWY 101	TILLAMOOK WATER DEPARTMENT, MAIN	750	0	0	750	84	58	4500	1200	
1.1	Comm	Rte 101n & LATIMER RD	KILCHIS REGIONAL WATER DISTRICT, MAIN	1300	0	0	1300	130	105	4000	2900	
10	Comm	5 Street & MILLER	TILLAMOOK WATER DEPARTMENT, MAIN	1050	0	0	1050	77	59	3500	2000	

THE ABOVE LISTED NEEDED FIRE FLOWS ARE FOR PROPERTY INSURANCE PREMIUM CALCULATIONS ONLY AND ARE *NOT* INTENDED TO PREDICT THE MAXIMUM AMOUNT OF WATER REQUIRED FOR A LARGE SCALE FIRE CONDITION.

THE AVAILABLE FLOWS ONLY INDICATE THE CONDITIONS THAT EXISTED AT THE TIME AND AT THE LOCATION WHERE TESTS WERE WITNESSED.

*Comm = Commercial; Res = Residential.

**Needed is the rate of flow for a specific duration for a full credit condition. Needed Fire Flows greater than 3,500 gpm are not considered in determining the classification of the city when using the Fire Suppression Rating Schedule.

*** (A)-Limited by available hydrants to gpm shown. Available facilities limit flow to gpm shown plus consumption for the needed duration of (B)-2 hours, (C)-3 hours or (D)-4 hours.

INSURANCE SERVICES OFFICE, INC.

HYDRANT FLOW DATA SUMMARY

City Tillamook FD

County Tillamook State Oregon Witnessed by: Insurance Services Office, Inc. Date: June 25, 2013

TEST NO.	TYPE DIST.*	TEST LOCATION	SERVICE	FLOW - GPM $Q=(29.83(C(d^2)p^{0.5}))$				PRESSURE PSI		FLOW - AT 20 PSI		REMARKS***
				INDIVIDUAL HYDRANTS			TOTAL	STATIC	RESID.	NEEDED **	AVAIL.	
2a	Comm	12 Street & MILLER	TILLAMOOK WATER DEPARTMENT, MAIN	890	0	0	890	85	59	3500	1500	
1a	Comm	Rte 101n & LATIMER RD	KILCHIS REGIONAL WATER DISTRICT, MAIN	1300	0	0	1300	130	105	3000	2900	
4a	Comm	Hangar A Road & D STREET	TILLAMOOK WATER DEPARTMENT, MAIN	890	0	0	890	70	55	3000	1700	
5a	Comm	1 Street & FRONT ST	TILLAMOOK WATER DEPARTMENT, MAIN	1160	0	0	1160	80	65	2500	2500	
8a	Comm	6 Street & STILLWELL	TILLAMOOK WATER DEPARTMENT, MAIN	1060	0	0	1060	89	75	2500	2500	
9a	Comm	South Prairie Road & HWY 101	TILLAMOOK WATER DEPARTMENT, MAIN	750	0	0	750	84	58	2000	1200	
11	Comm	3 Street & CEDAR	TILLAMOOK WATER DEPARTMENT, MAIN	1050	0	0	1050	87	72	1750	2400	
3a	Comm	3 Street & MEADOW	FAIRVIEW WATER DISTRICT, MAIN	1210	0	0	1210	108	72	1750	2000	
6a	Comm	North Main Avenue & WILSON RIVER LOOP	TILLAMOOK WATER DEPARTMENT, MAIN	1060	0	0	1060	90	72	1500	2200	
12	Comm	South Prairie Road & HWY 101	OCEANSIDE WATER DISTRICT, MAIN	920	0	0	920	84	58	1000	1500	(B)-(776 gpm)
7A	Res	Alder Lane & SPRUCE	TILLAMOOK WATER DEPARTMENT, MAIN	1030	0	0	1030	80	66	750	2300	

THE ABOVE LISTED NEEDED FIRE FLOWS ARE FOR PROPERTY INSURANCE PREMIUM CALCULATIONS ONLY AND ARE *NOT* INTENDED TO PREDICT THE MAXIMUM AMOUNT OF WATER REQUIRED FOR A LARGE SCALE FIRE CONDITION.

THE AVAILABLE FLOWS ONLY INDICATE THE CONDITIONS THAT EXISTED AT THE TIME AND AT THE LOCATION WHERE TESTS WERE WITNESSED.

*Comm = Commercial; Res = Residential.

**Needed is the rate of flow for a specific duration for a full credit condition. Needed Fire Flows greater than 3,500 gpm are not considered in determining the classification of the city when using the Fire Suppression Rating Schedule.

*** (A)-Limited by available hydrants to gpm shown. Available facilities limit flow to gpm shown plus consumption for the needed duration of (B)-2 hours, (C)-3 hours or (D)-4 hours.

Appendix D

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STATE OF OREGON

WATER DIVISION NO. 1 COUNTY OF TILLAMOOK

CERTIFICATE OF WATER RIGHT

(For rights perfected under original, enlargement or secondary permits)

This is to Certify, *That* TILLAMOOK CITY

of Tillamook *, State of* Oregon *, has made proof to the satisfaction of the STATE WATER BOARD of Oregon, of a right to the use of the waters of* Killam Creek *, a tributary of* Trask River and Tillamook River *, for the purpose of* Municipal supplies

under *Permit No.* 439 *of the State Engineer, and that said right to the use of said waters has been perfected in accordance with the laws of Oregon and duly confirmed by order of the STATE WATER BOARD of Oregon, made and entered of record in the Record of Proceedings of said Board, at Salem, in Volume* 1 *, at page* 329 *, on the* 28th *day of* July, 1919 *; that the priority of the right hereby confirmed dates from* May 22, 1910 *; that the amount of water to which such right is entitled and hereby confirmed, for the purposes aforesaid, is limited to an amount actually beneficially used for said purposes, and shall not exceed* 6.00 *cubic feet per second.*

A description of the lands under such right, and to which the water hereby confirmed is appurtenant, or, if for other purposes, the place where such water is put to beneficial use, is as follows: Tillamook City, in Tillamook County, Oregon.

~~The right to the use of the water aforesaid hereby confirmed is restricted to the lands or place of use herein described.~~

Rights to the use of water for power purposes are limited to a period of forty years from the date of priority of the right, as herein set forth, subject to a preference right of renewal under the laws existing at the date of the expiration of the right for power purposes, as hereby confirmed and limited.

Witness *the seal and signature of the STATE WATER BOARD affixed this* 1st *day of* August *, 191*9.

STATE WATER BOARD

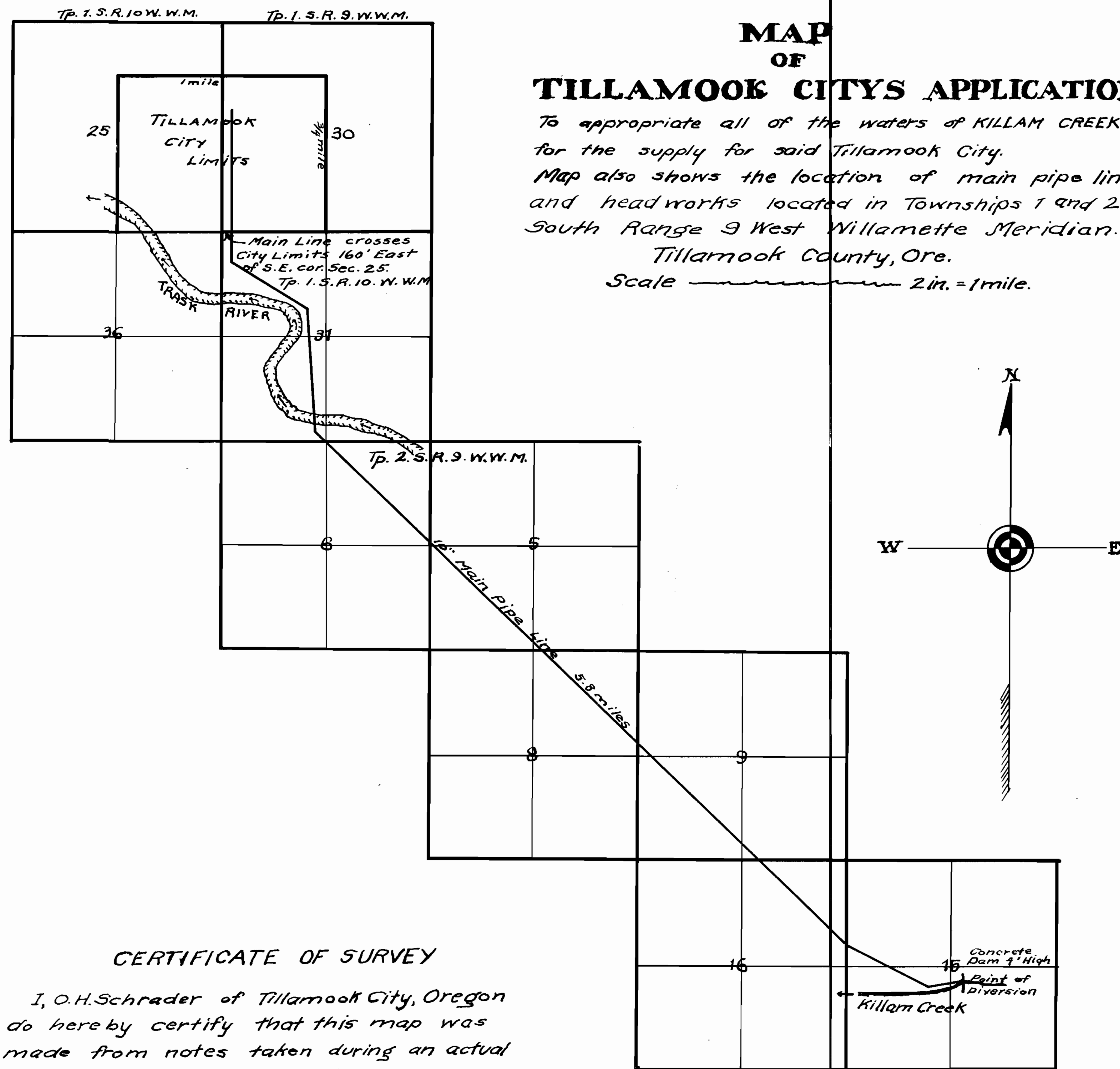
(SEAL OF STATE WATER BOARD) *By* PERCY A. CUPPER
State Engineer, President

Attest: R. W. POTTER
Secretary

Recorded in State Record of Water Right Certificates, Volume 3 *, Page* 2388

MAP
OF
TILLAMOOK CITYS APPLICATION

To appropriate all of the waters of KILLAM CREEK for the supply for said Tillamook City.
Map also shows the location of main pipe line and head works located in Townships 1 and 2 South Range 9 West Willamette Meridian.
Tillamook County, Ore.
Scale 2 in. = 1 mile.



CERTIFICATE OF SURVEY

I, O.H. Schrader of Tillamook City, Oregon do hereby certify that this map was made from notes taken during an actual survey made by W.B. Chase in Dec. 1904. and that it correctly represents the works described.

O.H. Schrader
Surveyor

NOTE:— Point of Diversion is 463 ft. South and 3090 ft. East of the 1/4 Sec. cor. between Secs. 15 and 16, Tp. 2, S. R. 9. W. W. M.

Application No. 698
Permit No. 439

PWJ

*Permit No. 6673

APPLICATION FOR A PERMIT

To Appropriate the Public Waters of the State of Oregon

I, Tillamook City
(Name of Applicant)

of Tillamook, Ore. (Postoffice), *County of* Tillamook,

State of Oregon, *do hereby make application for a permit to appropriate the following described public waters of the State of Oregon subject to existing rights:*

If the applicant is a corporation, give date and place of incorporation

1. *The source of the proposed appropriation is* Fawcett Crk. (Name of stream)

tributary of Tillamook River

2. *The amount of water which the applicant intends to apply to beneficial use is* 20 *cubic feet per second.*

3. *The use to which the water is to be applied is* (Irrigation, power, mining, manufacturing, domestic supplies, etc.) Municipal supplies

4. *The point of diversion is located* (Give distance and bearing to section corner)

Project #2 also SE¼ of SE¼ 19 2 South

being within the #1 Lot 1(NW¼ NW¼) (Give smallest legal subdivision) *of Sec.* 23, *Tp.* 2 South (No. N. or S.)

R. 8 West 9 West (No. E. or W.), *W. M., in the county of* Tillamook

5. *The* Pipe line & Flume (Main ditch, canal or pipe line) *to be* # 2 9 miles (5 miles built) # 1 6 miles (4 " built) *miles*

in length, terminating in the SW¼ (Smallest legal subdivision) *of Sec.* 25, *Tp.* 1 South (No. N. or S.)

R. 10 West (No. E. or W.), *W. M., the proposed location being shown throughout on the accompanying map.*

6. *The name of the ditch, canal or other works is* Tillamook City Water Supply

DESCRIPTION OF WORKS

DIVERSION WORKS—

7. (a) *Height of dam* 13 *feet, length on top* 60 *feet, length at bottom .... feet; material to be used and character of construction* Concrete (Loose rock, concrete, masonry, rock and brush, timber crib, etc., wasteway over or around dam)

(b) *Description of headgate* 1-24" concrete. (Timber, concrete, etc., number and size of openings)

Hydraulic Gradient - 5 ft. per thousand.

* A different form of application is provided where storage works are contemplated. These forms can be secured without charge, together with instructions, by addressing the State Engineer, Salem, Oregon.

CANAL SYSTEM—

8. (a) *Give dimensions at each point of canal where materially changed in size, stating miles from headgate. At headgate: Width on top (at water line) .... feet; width on bottom .... feet; depth of water .... feet; grade .... feet fall per one thousand feet.*

(b) *At .... miles from headgate. Width on top (at water line) .... feet; width on bottom .... feet; depth of water .... feet; grade .... feet fall per one thousand feet.*

....

....

....

FILL IN THE FOLLOWING INFORMATION WHERE THE WATER IS USED FOR:

IRRIGATION—

9. *The land to be irrigated has a total area of .... acres, located in each smallest legal subdivision, as follows:* ....
(Give area of land in each smallest legal subdivision which you intend to irrigate)

....

....

....

....

....

....

....

....

....

....
(If more space required, attach separate sheet)

POWER, MINING, MANUFACTURING, OR TRANSPORTATION PURPOSES—

10. (a) *Total amount of power to be developed* .... *theoretical horsepower.*

(b) *Total fall to be utilized* .... *feet.*
(Head)

(c) *The nature of the works by means of which the power is to be developed* ....

....

(d) *Such works to be located in* .... *of Sec*.................................,
(Legal subdivision)

Tp................................., *R*................................., *W. M.*
(No. N. or S.) (No. E. or W.)

(e) *Is water to be returned to any stream?* ....
(Yes or No)

(f) *If so, name stream and locate point of return* ....

................................., *Sec*................................., *Tp*................................., *R*................................., *W. M.*
(No. N. or S.) (No. E. or W.)

(g) *The use to which power is to be applied is* ....

....

(h) *The nature of the mines to be served* ....

....

MUNICIPAL SUPPLY—

11. *To supply the city of* Tillamook, Ore.

Tillamook (Name of) *County, having a present population of* 5000,

and an estimated population of 8000 *in 19*30.

(Answer questions 12, 13, 14 and 15 in all cases)

12. *Estimated cost of proposed works, $* 50 000.00

13. *Construction work will begin on or before*

14. *Construction work will be completed on or before*

15. *The water will be completely applied to the proposed use on or before*

Duplicate maps of the proposed ditch or other works, prepared in accordance with the rules of the State Water Board, accompany this application.

TILLAMOOK CITY, OREGON.
(Name of applicant)

(CORPORATE SEAL)

J. Merrel Smith, Mayor,

Ira W. White, Recorder,

Signed in the presence of us as witnesses:

(1) A. A. Hall, (Name) — Tillamook, Ore. (Address of Witness)

(2) E. D. Hoag (Name) — " " (Address of Witness)

Remarks:

STATE OF OREGON,
County of Marion, } *ss.*

This is to certify that I have examined the foregoing application, together with the accompanying maps and data, and return the same for correction or completion, as follows:

In order to retain its priority, this application must be returned to the State Engineer, with corrections, on or before

WITNESS my hand this .... *day of* ....

State Engineer.

6673(c)

1

Application No. 9415

Permit No. 6673

PERMIT

TO APPROPRIATE THE PUBLIC WATERS OF THE STATE OF OREGON

District No.

This instrument was first received in the office of the State Engineer at

Salem, Oregon, on the 13 *day*

of March, 1924

at 1:30 *o'clock* P.*M.*

Returned to applicant for correction

Corrected application received

Approved:

February 28, 1925

Recorded in Book No. 23 *of*

Permits, on Page 6673

RHEA LUPER

State Engineer.

1 map ER

$8.00

STATE OF OREGON,
County of Marion, } *ss.*

This is to certify that I have examined the foregoing application and do hereby grant the same, subject to the following limitations and conditions: If for irrigation, this appropriation shall be limited to one-eightieth of one cubic foot per second, or its equivalent, for each acre irrigated, and shall be subject to such reasonable rotation system as may be ordered by the proper state officer.

The right herein granted is limited to the appropriation of water from Fawcett Creek for municipal purposes.

The amount of water appropriated shall be limited to the amount which can be applied to beneficial use and not to exceed 20.0 *cubic feet per second, or its equivalent in case of rotation. The priority date of this permit is* March 13, 1924.

Actual construction work shall begin on or before February 28, 1930 *and shall thereafter be prosecuted with reasonable diligence and be completed on or before* February 28, 1930.

Extended to Oct. 1, 1941 Extended to Oct. 1, 1947 Extended to Oct. 1, 1959 Extended to October 1, 1988
Extended to Oct. 1, 1950 Extended to Oct. 1, 1953

Complete application of the water to the proposed use shall be made on or before February 28, 1931.

Extended to Oct. 1, 1941 Extended to Oct. 1, 1947 Extended to Oct. 1, 1959 Extended to October 1, 1988
Extended to Oct. 1, 1950 Extended to Oct. 1, 1953

WITNESS my hand this 28th *day of* February, 1925

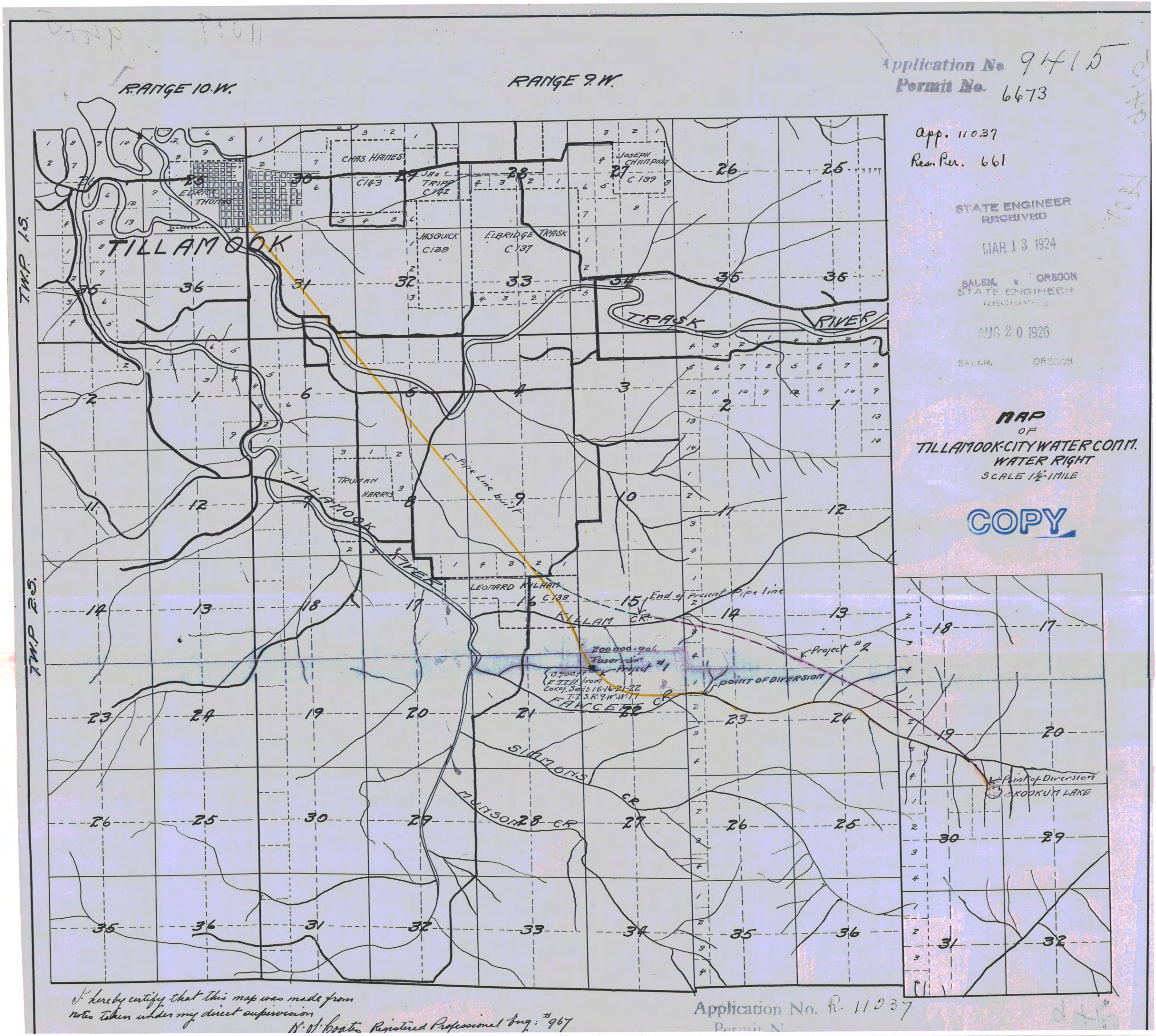
Rhea Luper,

State Engineer.

Permits for power development are subject to the limitation of franchise as provided in Section 5728, Oregon Laws, and the payment of annual fees as provided in Section 5803, Oregon Laws.

This form approved by the State Water Board, March 11, 1909.

Extended to October 1, 1993 ,10-1-98 BC ext. 10-1-20



Application No. 9415
Permit No. 6673
app. 11037
Res. Per. 661
STATE ENGINEER
RECEIVED
MAR 13 1924
SALEM, OREGON
STATE ENGINEER
AUG 20 1926
SALEM, OREGON
MAP
OF
TILLAMOOK-CITY WATER COMM.
WATER RIGHT
SCALE 1/2"=1 MILE
COPY
RANGE 10.W.
RANGE 9.W.
TWP 1S.
TWP 2S.
TILLAMOOK
EDGAR THOMAS
CHAS. HAINES
C143
Jas. TRIPP
C142
JOSEPH CHAMPION
C139
JASQUICK
C138
ELBRIDGE TRASK
C137
TRASK RIVER
TILLAMOOK RIVER
TRUMAN HARRIS
Pipe Line built
LEONARD KILHAM
C138
End of present Pipe line
KILLAM CR.
200,000 gal.
Reservoir
Project #1
3900 ft
E 77 ft from
Cor. of Secs 15-16-21-22
T. 2 S. R. 9 W. W. M.
FAWCETT CR.
POINT OF DIVERSION
Project #2
SIMMONS CR.
MUNSON CR.
Point of Diversion
SKOOKUM LAKE
I hereby certify that this map was made from
notes taken under my direct supervision
N. J. Coats Registered Professional Eng: #967
Application No. R. 11037
Permit N

Oregon Water Resources Department
Water Rights Division

Water Rights Application
Number 9415

Final Order
Extension of Time for Permit Number 6673

Appeal Rights
This is a final order in other than contested case. Pursuant to ORS 536.075 and OAR 137-004-080 and OAR 690-01-005, you may either petition the Director for reconsideration of this order or petition for judicial review of this order. As provided in ORS 536.075, this order is subject to judicial review under ORS 183.484. Any petition for judicial review of the order must be filed within the 60 day time period specified by ORS 183.484(2).

Application History
On NOVEMBER 3, 1998, TILLAMOOK CITY submitted an application to the Department for an extension of time for permit number 6673. The Department issued Permit number 6673 on FEBRUARY 28, 1925. The permit called for completion of construction of the water development project by FEBRUARY 28, 1930 and complete application of water to the full beneficial use by FEBRUARY 28, 1931. In accordance with OAR 690-320-0010(8), on NOVEMBER 2, 1999, the Department issued a Proposed Final Order proposing to extend the time to complete development of the water development project to October 1, 2020, and/or the time to fully apply water to beneficial use to October 1, 2020. The protest period closed DECEMBER 17, 1999. No protest was filed.

The applicant has demonstrated good cause for the permit extension pursuant to ORS 537.230, 537.248, 537.630 and 539.010(5) (as appropriate).

The Proposed Final Order imposed the following conditions for the Extension Request:

1-The permittee shall install, maintain, and operate fish screening to prevent fish from entering the proposed diversion. The permittee shall also install a fishway at the obstruction that will provide adequate upstream and downstream passage for fish. The permittee may submit evidence that the Oregon Department of Fish and Wildlife (ODFW) has determined screens and/or fishways are not necessary.

2-The permittee must submit a written progress report to the Department by October 1, of the years 2003, 2008, 2013, and 2018. The report must be received by the Department not sooner than 90 days prior to the due date. The permittee's report must describe in detail the work done each year since the last extension was granted or the last progress report submitted. The report shall include:a) The amount of construction completed;

b) The amount of beneficial use of water being made, including the total volume of water used, water used relative to the specific authorizations (types of use, acres irrigated, etc.) contained in the permit, and the percent of the total allowable water use that this represents;

c) A review of the permittee's compliance with terms and conditions of the permit and/or previous extension; and

d) Financial investments made toward developing the beneficial water use.

The Department will review the progress report to determine whether the permittee is exercising diligence towards completion of the project and complying with the terms and conditions of the permit and extension.

Failure to submit a progress report by the due date above will result in cancellation of the undeveloped portion of the permit by the Department pursuant to ORS 537.260 or 537.410 to 537.450. Within one year after cancellation, the permittee must submit a final proof survey pursuant to ORS 537.230 and 537.250.

If the Department finds that diligence is questionable, the Department may:

a) request the permittee to submit additional information with which to evaluate diligence;

b) apply additional conditions and performance criteria for perfection of the right; or

c) cancel the undeveloped portion of the permit pursuant to ORS 537.260 or 537.410 to 537.450. The Department will grant the permittee a hearing on the cancellation, if one is requested.

In determining whether the permittee has been diligent, the Department will consider information submitted to the Department by the permittee and any information submitted during the 30-day public comment period following public notice of submittal of the progress report.

If information is received through the public notice process indicating that the applicant has not been diligent toward completing the project, and if the director determines there are significant disputes related to the use of water, the Department will conduct a hearing.

Order

The extension of time for Application 9415, Permit Number 6673, therefore, is approved with the conditions set forth in the Proposed Final Order. The deadline for completing construction is extended to October 1, 2020. The deadline for applying water to full beneficial use is extended to October 1, 2020.

DATED April 18**, 2000**

Dwight French for

Martha O. Pagel, Director

This document was prepared by Anita Huffman. If you have any questions about any of the statements contained in this document I am the most likely the best person to answer your questions. You can reach me toll free within Oregon at 1-800-624-3199 extension 229. Outside of Oregon you can dial 1-503-378-8455.

If you have questions about how to file a protest or if you have previously filed a protest and want to know the status, please contact Adam Sussman. His extension number is 262.

If you have other questions about the Department or any of its programs please contact our Water Rights Information Group at extension 201. Address all other correspondence to: Water Rights Section, Oregon Water Resources Department, 158 12th ST. NE Salem, OR 97301-4172, Fax: (503)378-2496

BEFORE THE WATER RESOURCES DEPARTMENT
OF THE
STATE OF OREGON

In the Matter of Permit Amendment	)	**FINAL ORDER**
T-11197, Tillamook County	)	APPROVING A CHANGE IN POINT OF
	)	DIVERSION

Authority

ORS 537.211 establishes the process in which a water right permit holder may submit a request to change the point of diversion and/or place of use authorized under an existing water right permit.

Applicant

CITY OF TILLAMOOK
210 LAUREL AVENUE
TILLAMOOK, OR 97141

Findings of Fact

Background

1. On February 10, 2011, CITY OF TILLAMOOK filed an application to change the point of diversion under Permit S-6673. The Department assigned the application number T-11197.

2. The permit to be amended is as follows:

Permit: S-6673 in the name of CITY OF TILLAMOOK
Use: MUNICIPAL PURPOSES
Priority Date: MARCH 13, 1924
Quantity: 20.0 CUBIC FEET PER SECOND
Source: FAWCETT CREEK, a tributary to the TILLAMOOK RIVER

Authorized Points of Appropriation:

Twp	Rng	Mer	Sec	Q-Q	GLot	Measured Distances
2 S	9 W	WM	23	NW NW	1	NONE GIVEN
2 S	8 W	WM	19	SE SE		NONE GIVEN

Authorized Place of Use:

Within the City of Tillamook

This is a final order in other than contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review must be filed within the 60 day time period specified by ORS 183.484(2). Pursuant to ORS 536.075 and OAR 137-004-080 and OAR 690-01-005 you may either petition for judicial review or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied.

3. The applicant supplied information that better describes the authorized point of diversion as follows:

Twp	Rng	Mer	Sec	Q-Q	GLot	Measured Distances
2 S	9 W	WM	22	NE NE	1	1760 FEET SOUTH AND 20 FEET WEST FROM THE NE CORNER OF SECTION 22

4. Permit Amendment Application T-11197 proposes to move the authorized point of diversion approximately 25 feet from the existing point of diversion to:

Twp	Rng	Mer	Sec	Q-Q	GLot	Measured Distances
2 S	9 W	WM	23	NW NW	1	600 FEET SOUTH AND 5 FEET EAST FROM THE NW CORNER OF SECTION 23

5. Notice of the application for the permit amendment was published in the Department's weekly notice on February 22, 2011 pursuant to ORS 540.520(5). No comments were filed in response to the notice.

6. The Oregon Department of Fish and Wildlife (ODFW) has determined that a fish screening and/or by-pass device is necessary at the new point of diversion to prevent fish from entering the diversion and/or safely transport fish back to the body of water from which the fish were diverted and that the diversion is not currently equipped with an appropriate fish screening and/or by-pass device. This diversion may be eligible for screening cost share funds.

7. ORS 537.211(4)(e) states that a permit holder may change the point of appropriation if: "The holder of the permit provides written notice to the department at least 60 days before making any changes to the lands, point of diversion or point of appropriation described in the permit." The applicant provided the required notice to the department on February 10, 2011.

Permit Amendment Review Criteria

8. The change would not result in injury to other water rights.

9. The change does not enlarge the permit.

10. The change does not alter any other terms of the permit.

Conclusions of Law

The change in point of diversion proposed by Permit Amendment Application T-11197 is consistent with the requirements of ORS 537.211.

Now, therefore, it is ORDERED:

The change and subsequent use of water shall be subject to the following conditions:

1. Pursuant to ORS 537.211(4)(e), the use of water under the permit from the proposed point of diversion shall not occur until after April 11, 2011.

2. The quantity of water diverted at the new point of diversion shall not exceed the quantity of water lawfully available at the original point of diversion.

3. Water shall be acquired from the same surface water source as the original point of diversion.

4. Prior to diverting water, the water user shall install a fish screening and/or by-pass device, as appropriate, at the new point of diversion consistent with the Oregon Department of Fish and Wildlife's (ODFW) design and construction standards. Prior to installation, the water user shall obtain written approval from ODFW that the required screen and/or by-pass device meets ODFW's criteria. Prior to submitting a Claim of Beneficial Use, the water user must obtain written approval from ODFW that the required screening and/or by-pass device was installed to the state's criteria. The water user shall maintain and operate the fish screen and/or by-pass device, as appropriate, at the point of diversion consistent with ODFW's operational and maintenance standards.

5. The water user shall maintain and operate the existing measurement device and shall make such improvements as may be required by the Department.

6. All other terms and conditions of Permit S-6673 remain the same.

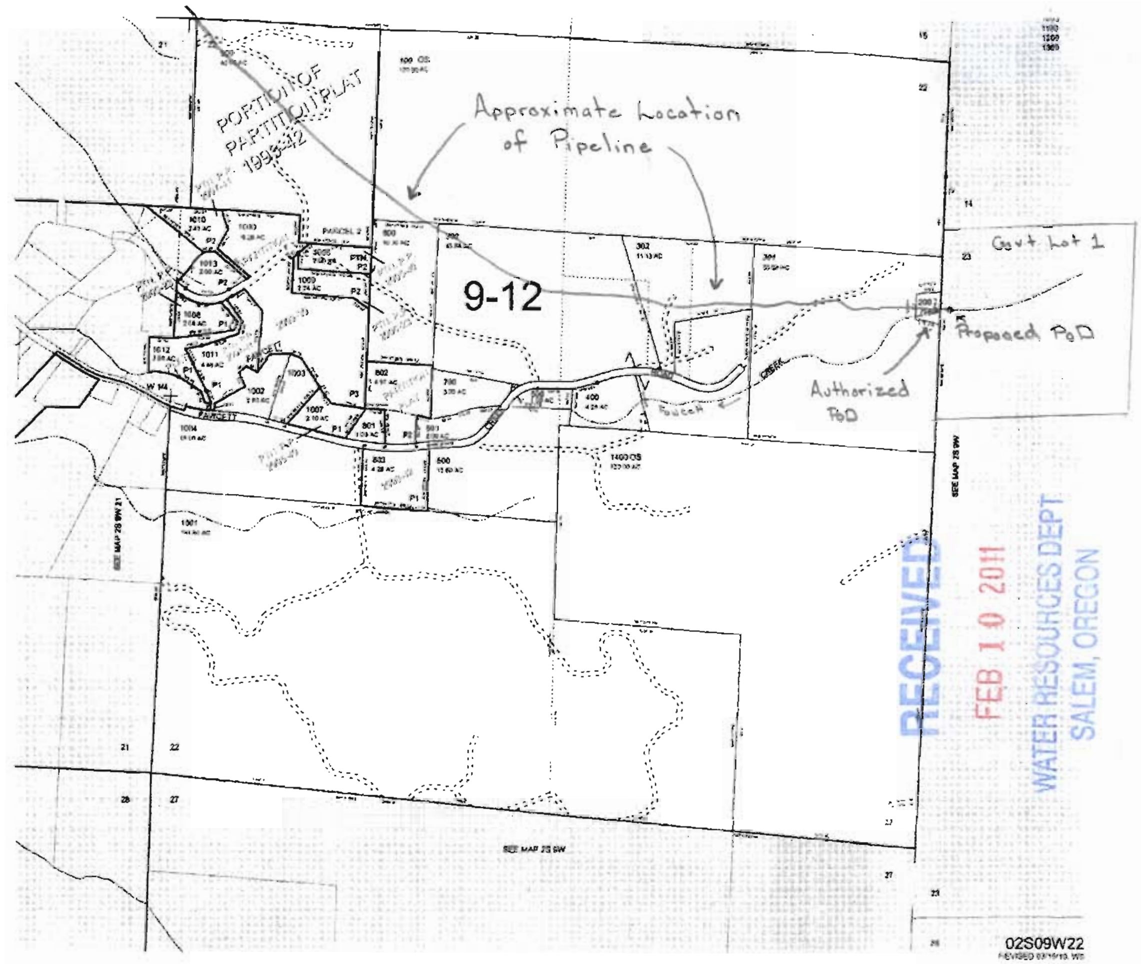
7. Permit S-6673, in the name of CITY OF TILLAMOOK, is amended as described herein.

Dated at Salem, Oregon this 29 day of March, 2011.

Dwight French for
PHILLIP C. WARD, DIRECTOR

Mailing Date: APR 01 2011

Township 2S Range 9W



Authorized POD
1760 ft South
20 ft West
of NE Corner of
2S 9W Section 22

Proposed POD
600 ft South
5 ft East
of NW Corner
of 2S 9W
Section 23

↑ N

Scale
1 inch = 1320 ft

Oregon
Theodore R. Kulongoski, Governor

Department of Fish and Wildlife
Fish Division
3406 Cherry Avenue NE
Salem, OR 97303
503-947-6228
Fax: 503-947-6202
TTY: 503-947-6339
greg.d.apke@state.or.us

COPY

December 10, 2010

Mr. Mark Wharry, P.E.
Winzler and Kelly Associates, Inc.
15575 SW Sequoia Parkway, Suite 140
Portland, Oregon 97224

RECEIVED
JAN 07 2011
By________

Arley Sullivan
City of Tillamook
Public Works Director
116 Birch Ave
Tillamook, Oregon 97141

Re: Fish Passage Approval at the Fawcett Creek Fish Passage and Screening Improvement Project (PA-01-0024)

Mr. Sullivan,

The Oregon Department of Fish and Wildlife (ODFW) approves (PA-01-0024) the fish passage design for the Fawcett Creek Fish Passage and Screening Improvement Project, where you plan to install a new fishway, fish screen and water diversion structure at the City of Tillamook's (City) municipal water supply facility. This facility is located on Fawcett Creek, a tributary of the Tillamook River, a tributary of the Tillamook Bay in Tillamook County, Oregon. The new fishway, owned and managed by the City, is comprised of a pool and weir configuration with a maximum change in water surface elevation of six-inches into, through and exiting the engineered fish passage facility. ODFW Fish Passage program staff have reviewed the fishway design and we have determined the design meets Oregon Fish Passage design criteria (OAR 635-412-0035 (1, 2 and 10)). Please pass this information contained within this fish passage permit to the appropriate City staff and others as appropriate and necessary.

This fish passage approval at this location is contingent on specific operational items which include:

1. Demolition of the existing structures and installation of the new fishway, fish screen and water diversion structures shall occur during the appropriate ODFW recommended in-water work window, or as negotiated with ODFW.

2. The City shall contact and coordinate with ODFW at least two-weeks prior to any in-water work activities.
3. Fish salvage and rescue shall be performed prior to commencement of any in-water work, including work area isolation and temporary water management.
4. Temporary water management and work area isolation measures shall provide downstream fish passage during construction.
5. The outfall of the temporary water management diversion pipe shall outfall and or be situated such that any fish migrating downstream will outfall into water with adequate depth and pool volume to promote safe re-entry of fish back into Fawcett Creek (as defined in OAR 635-412-0035 (10).
6. It is the City's responsibility to maintain fish passage at this location as approved. The City shall be responsible for all maintenance required such that the fish ladder provides adequate passage for native migratory fish. If monitoring by the City or Department indicates that fish passage is not being provided, the City in consultation with the Department shall determine the cause and, during a work period approved by the Department, shall modify the fish ladder to rectify problems as necessary. Failure to maintain fish passage for the duration of this approval shall constitute a violation of this approval and applicable fish passage laws (ORS 509.610).
7. The Department shall be allowed to inspect the fish ladder at reasonable times for the duration of this approval. Unless prompted by emergency or other exigent circumstances, inspection shall be limited to regular and usual business hours, including weekends.
8. At any point along, into or through the fishway structure and fish screen, where fish may be exposed to materials necessary to construct the fishway (steel, cable, wood, etc.), all potential sharp or abrasive edges and surfaces shall be made smooth as to preclude harm or physical injury to fish.
9. All weir structures within the fishway shall consist of fabricated bulkheads with rounded edges with smooth transitions to promote adult lamprey migration.
10. The applicant shall monitor and report the effectiveness of fish passage during, throughout and after completion of this project. This shall entail monitoring of the new fishway after construction and project completion. Monitoring will be performed by a qualified fisheries biologist to determine whether or not the project is functioning as it was designed to function for fish passage.
11. Fish passage monitoring reports shall report on the effectiveness of fish passage of native migratory fish at a variety of passage flows when fish are migrating through the project area. Monitoring and reporting shall coincide with the time of the year when native migratory fish species are migrating in Fawcett Creek and through the project area. Monitoring and reporting shall consist of a summary of the fish passage conditions and fish passage performance with particular emphasis on flow velocities,

water depths and the volitional unimpeded passage of native migratory fish during the appropriate fish passage design flows. Monitoring and reporting shall be based on visual observations, established photo points, flow velocity characteristics of the fishway, or other means; particularly with regards to fish passage conditions and fish passage performance through the project area during and after the completion of the project.

12. Monitoring reports shall be completed and submitted to the ODFW Fish Passage Program Coordinator and the District Fish Biologist annually for a period of 3-years after the completion of the project. Monitoring reports shall be submitted by March 31 of each year for the previous years reporting period.
13. If flood water overtops the distilling basin all practical efforts shall be made to salvage and rescue entrained fish as soon as practical after the flooding event(s). Fish salvage and rescue shall be coordinated with ODFW District staff. Salvaged fish shall be released back into Fawcett Creek.
14. This approval, as required by ORS 509.585, only provides approval authority administered by ODFW. It is the responsibility of the City to comply with all necessary and required local, county, state, and federal approvals and permits.

Please retain this email correspondence for your records, as this documents ODFW's approval of fish passage at this site. Again, please note that it is your responsibility to maintain the fishway as approved (ORS 509.610).

Thank you for cooperation as we worked through the fish passage issues at this site. If you have any questions, please contact me.

Sincerely,

Gregory D. Apke

Greg Apke
ODFW - Statewide Fish Passage Program Coordinator

c.c. Alan Ritchey, ODFW Passage & Screening Program Manager
Joel Watts, ODFW Fish Passage Engineer
Chris Knutsen, ODFW North Coast District Fish Biologist
Dave Stewart, ODFW North Coast Assistant District Fish Biologist
Denise Loffman, Tillamook Bay Watershed Council
Amy Horstman, USFWS
Project File (PA-01-0024)

[redacted]

Permit No.

County Tillamook

SPECIAL USE PERMIT

STATE OF OREGON - BOARD OF FORESTRY

The State of Oregon, acting by and through the Board of Forestry on behalf of the Oregon Department of Forestry (the "State") hereby grants a special use permit (a "Permit") to the individual or group designated below (the "Permittee") for the location and purposes listed below and subject to the conditions hereinafter stated:

Permittee:	City of Tillamook Water Department 210 Laurel Avenue Tillamook, OR 97141
Location ("Permit Area"):	Portion of NW¼, NW¼, Section 22, T2S, R9W, W.M. as shown on Exhibit "A".
Purposes ("Permitted Uses"):	To construct access road, diversion structure, fish screen and fish ladder along Fawcett Creek.

This Permit is subject to the conditions listed below and any violation of such conditions will be grounds for revoking the Permit. Unless revoked, the Permit shall terminate on 12/31/12 or upon such date as the purposes or activities described above are fulfilled or completed, whichever occurs first. The exercise of any of the privileges granted in this Permit constitutes acceptance of all conditions of the Permit.

Sec. 1. Permittee shall undertake no construction, reconstruction, alteration or improvements within the Permit Area (individually an "Improvement") without first obtaining the written approval of the State. All Improvements shall be undertaken only in accordance with the specifications and standards approved by the State. All Improvements shall become the property of the State of Oregon upon the termination or revocation of this Permit.

Sec. 2. Permittee may remove or destroy forest products from the Permit Area only after receiving prior written approval and designation by the State. Permittee shall pay $N/A for all merchantable timber sold under separate timber sale contract No. N/A, and $N/A for other forest values destroyed.

Sec. 3. Reference to Permittee herein shall include contractors, officers, employees and agents of Permittee. Permittee acknowledges and agrees that the State may act by and through its designated and authorized representatives, including employees of the Department of Forestry and other agencies of the State. In exercising the privileges granted by this Permit, Permittee shall comply with all laws of the State of Oregon, including all lawful regulations issued thereunder.

Sec. 4. Permittee shall exercise diligence in protecting the Permit Area from damage and, promptly upon presentment of invoice from the State and shall reimburse the State for any damage to the Permit Area resulting from negligence or violation of any condition of this permit by Permittee. Permittee shall repair all damage caused by Permittee's use of roads under this Permit; provided however, that when Permittee and other authorized parties jointly use such roads, then each party shall be responsible for a proportionate part of the entire maintenance, which proportion shall be determined in the sole discretion of the State.

Sec. 5. Permittee shall secure at Permittee's expense, and shall keep in effect during the term of this Permit, the following insurance coverages, in a policy or policies issued by an insurance company or companies authorized to do business in the State of Oregon. The issuing company or companies shall indicate on the insurance certificate(s) required by this section that the State will be given not less than 30 days notice of any cancellation, material change, or intent not to renew such policy. The coverage shall be as follows:

[redacted]

(a) Commercial General Liability insurance covering personal injury and property damage in an amount not less than **$N/A** combined single limit per occurrence, with a contractual liability to include all contracts involving the work to be performed under this permit.

(b) Automobile Liability insurance in an amount not less than **$N/A** combined single limit per occurrence. This coverage can be provided by combining the Automobile Liability protection with the Commercial General Liability policy.

(c) Loggers Broad Form coverage, in an amount not less than **$N/A** for costs of fire control, losses or damage from fire, and other causes arising or resulting from activities of Permittee, employees, contractors and others working or acting for Permittee.

As evidence of the insurance coverages required by this Permit, Permittee shall furnish to the State a certificate or certificates of insurance verifying all of the foregoing coverages, and naming the State as an additional insured..

Sec. 6. Permittee shall provide a bond in the amount of **$N/A** issued by a company licensed to act as a surety in the State of Oregon. The bond required by this section, if any, shall be in favor of the State of Oregon, and shall guarantee the full and faithful performance of the terms and conditions of this permit by Permittee.

Sec. 7. The required payment, bond and insurance shall be submitted to the State within N/A days of the date of issuance of the Permit. Permittee shall not exercise any of the Permitted Uses until the bond and insurance have been accepted in writing by the State.

Sec. 8. This Permit is nontransferable and nonexclusive; it is subject to all valid claims. The State reserves the right to use the Permit Area or adjacent State lands for purposes not inconsistent with the Permitted Uses and to authorize others to use the Permit Area and/or adjacent State lands at any and all times. Permittee's use of the Permit Area shall not unreasonably interfere with the use of the Permit Area and adjacent State land by other authorized users.

Sec. 9. The State makes no representation or warranty regarding the present or future condition of the Permit Area or any other State land. Permittee assumes all risks in connection with use of the Permit.

Sec. 10. Permittee shall not use, store or bring onto the Permit Area any hazardous materials or substances, as defined under federal or state law or regulation.

Sec. 11. Permittee shall immediately suspend all operations upon notice by State. This permit may be terminated at the discretion of the State at any time for public safety or other reasons or for failure of Permittee to comply with the terms and conditions of the permit.

Sec. 12. Permittee shall defend and hold harmless the State of Oregon, the Oregon Board of Forestry, the State Forester, the State Land Board, the Department of State Lands, their officers, agents, employees, and members, from all claims, suits, or actions of any nature resulting from or arising out of the activities of Permittee or its subcontractors, agents, or employees under this permit.

Sec. 13. Failure of the State to enforce any provision of this Permit shall not constitute a waiver or relinquishment by the State of the right to require Permittee's performance in the future, nor of the right to enforce any other provision of this Permit.

Sec. 14. In the event a law suit of any kind is instituted on behalf of State to collect any payment due or to obtain performance of any kind under this permit, Permittee shall pay such additional sums as the court may adjudge for reasonable attorneys' fees plus all costs and disbursements at trial and on any appeal.

Sec. 15. This permit includes special conditions. The special conditions (if any) incorporated in this Permit are attached hereto as Exhibit "B".

Issued this ________ day of ________________, ________.

The STATE of OREGON, acting by and through the Board of Forestry on behalf of the Oregon Department of Forestry

By: ____

As: ________________________, Oregon Dept of Forestry
Title

Attachments: Exhibit A (Map of Permit Area)
Exhibit B (Special Conditions)

09SUP.doc

[redacted]

EXHIBIT "A"

Map of Permit Area
Special Use Permit No.

STATE OF OREGON

COUNTY OF TILLAMOOK

CERTIFICATE OF WATER RIGHT

This Is to Certify, *That* TILLAMOOK CITY WATER COMMISSION

of Tillamook *, State of* Oregon 97141 *, has made*

proof to the satisfaction of the Water Resources Director, of a right to store the waters of Fawcett Creek, tributary of Tillamook River, appropriated under Permit No. 10790

for the purposes of municipal

under Reservoir Permit No. R-661 *, and that said right to store said waters has been perfected in accordance with the laws of Oregon; that the priority of the right hereby confirmed dates from* August 20, 1926

that the amount of water entitled to be stored each year under such right, for the purposes aforesaid, shall not exceed 2/3 acre foot

The reservoir is located in

NW¼ NW¼
Section 22
T. 2 S., R. 9 W., W. M.

Fawcett Creek Diversion - SE¼ NE¼, Section 22, T. 2 S., R. 9 W., W. M.

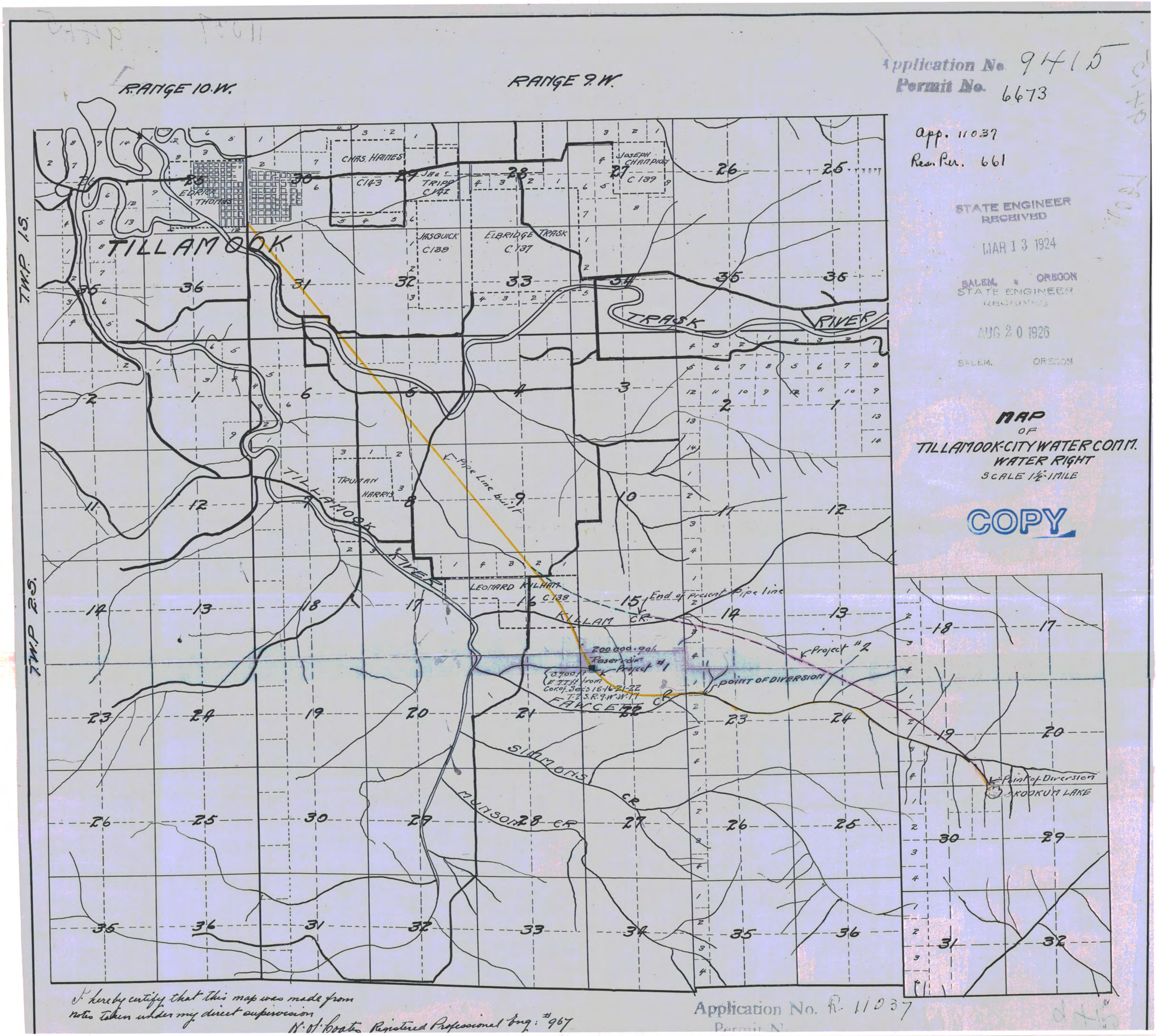
This certificate is issued to supersede certificate of water right recorded at page 10144, Volume 9, State Record of Water Right Certificates, so as to correctly describe the location of the reservoir.

The issuance of this superseding certificate does not confirm the status of the water right in reference to ORS 540.610.

WITNESS the signature of the Water Resources Director, affixed this date. September 4, 1980

James E. Sexson
Water Resources Director

Recorded in State Record of Water Right Certificates, Volume 43 *, page* 49474


Application No. 9415
Permit No. 6673
App. 11037
Res. Per. 661
STATE ENGINEER RECEIVED
MAR 13 1924
SALEM, OREGON
STATE ENGINEER RECEIVED
AUG 20 1926
SALEM, OREGON
MAP OF TILLAMOOK-CITY WATER COMM. WATER RIGHT
SCALE 1/2"=1 MILE
COPY
RANGE 10.W.
RANGE 9.W.
TWP 1S.
TWP 2S.
TILLAMOOK
EDGAR THOMAS
CHAS. HAINES C143
JAS. TRIPP C142
JOSEPH CHAMPION C139
JAS. QUICK C138
ELBRIDGE TRASK C137
TRASK RIVER
TILLAMOOK RIVER
TRUMAN HARRIS
LEONARD KILHAM C138
Pipe Line built
End of present Pipe line
KILLAM CR.
200,000 Gal. Reservoir Project #1
Project #2
POINT OF DIVERSION
FAWCETT CR.
SIMMONS CR.
MUNSON CR.
Point of Diversion
SKOOKUM LAKE
I hereby certify that this map was made from notes taken under my direct supervision
W. W. Coats Registered Professional Eng. #967
Application No. R. 11037
Permit No.

Permit A—4M—5-64 SP*12907-119

STATE OF OREGON

COUNTY OF TILLAMOOK

CERTIFICATE OF WATER RIGHT

This Is to Certify, *That* TILLAMOOK CITY WATER COMMISSION

of Tillamook *, State of* Oregon *, has made proof to the satisfaction of the STATE ENGINEER of Oregon, of a right to the use of the waters of* Fawcett Creek and water stored in reservoir constructed under Application No. 11037, Permit No. R-661

a tributary of Tillamook River *for the purpose of* municipal

under Permit No. 10790 *of the State Engineer, and that said right to the use of said waters has been perfected in accordance with the laws of Oregon; that the priority of the right hereby confirmed dates from* November 23, 1932;

that the amount of water to which such right is entitled and hereby confirmed, for the purposes aforesaid, is limited to an amount actually beneficially used for said purposes, and shall not exceed 6.0 cubic feet per second

or its equivalent in case of rotation, measured at the point of diversion from the stream. The point of diversion is located in the $NW\frac{1}{4}$ $NW\frac{1}{4}$, Section 22, T. 2 S., R. 9 W., W. M.

The amount of water used for irrigation, together with the amount secured under any other right existing for the same lands, shall be limited to - - - - - - - - - *of one cubic foot per second per acre,*

and shall conform to such reasonable rotation system as may be ordered by the proper state officer.

A description of the place of use under the right hereby confirmed, and to which such right is appurtenant, is as follows:

$W\frac{1}{2}$
Section 30
T. 1 S., R. 9 W., W. M.

$E\frac{1}{2}$
Section 25
T. 1 S., R. 10 W., W. M.

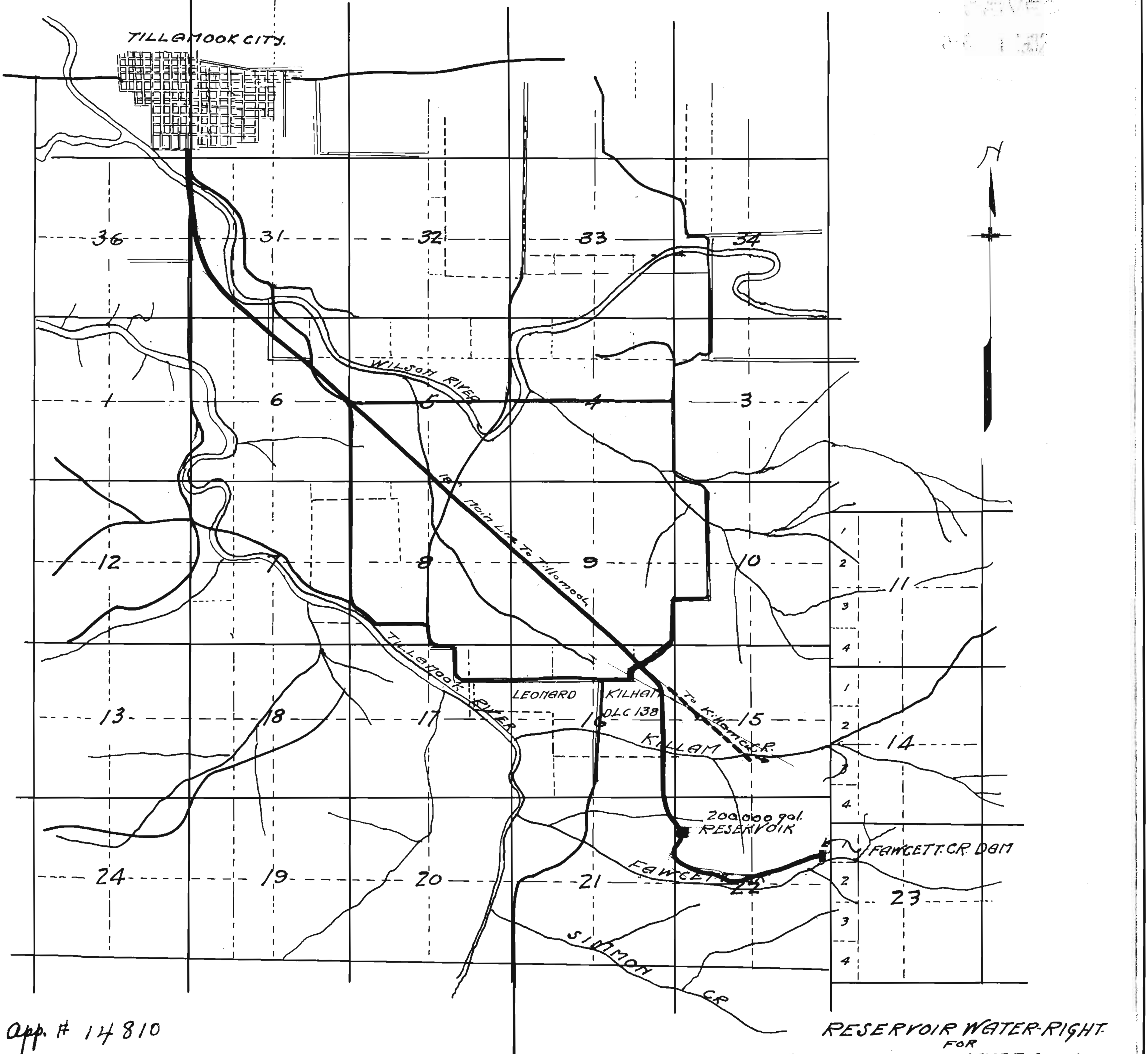
NOTE: Certificate of water right issued to Tillamook City Water Commission and recorded at page 10198, Volume 9, State Record of Water Right Certificates, confirms a right to the use of 11.8 cubic feet per second of water for municipal use. Subsequently, the right to the use of 5.8 cubic feet per second of water was canceled by order of the State Engineer entered March 29, 1966. This certificate is issued to confirm the remaining right to the use of water for municipal and supersedes the certificate heretofore issued to Tillamook City Water Commission.

The right to the use of the water for the purposes aforesaid is restricted to the lands or place of use herein described.

WITNESS the signature of the State Engineer, affixed this date. July 19, 1966

CHRIS L. WHEELER
State Engineer

Recorded in State Record of Water Right Certificates, Volume 25 *, page* 33251



App. # 14810
Per. 10790

RESERVOIR WATER-RIGHT
FOR
TILLAMOOK CITY WATER COMMISSION
SECTION 22. T. 2 S. R. 9. W. W. M.
Scale 1½" = 1 MILE
Traced by W. E. Anderson County Surv.

BEFORE THE STATE ENGINEER OF OREGON

County of Tillamook

IN THE MATTER OF)
THE CANCELATION)
OF A WATER RIGHT)

O R D E R

The Tillamook City Water Commission acted at a special meeting on May 24, 1965, to authorize reduction of the water right for appropriation of not to exceed 11.8 cubic feet per second of water from Fawcett Creek and stored water from the reservoir constructed under Permit No. R-661, at a point of diversion located within the NW¼ NW¼ of Section 22, Township 2 South, Range 9 West, Willamette Meridian, with the priority date of November 23, 1932, for municipal use within the W½ of Section 30, Township 1 South, Range 9 West, Willamette Meridian, and the E½ of Section 25, Township 1 South, Range 10 West, Willamette Meridian, as evidenced by the certificate recorded at Volume 9, page 10198, State Record of Water Right Certificates, from the amount of water of 11.8 cubic feet per second to the amount of water of 6.0 cubic feet per second.

ORS 540.621 provides: "Whenever the owner of a perfected and developed water right certifies under oath to the State Engineer that the water right has been abandoned by him and that he desires cancelation thereof, the State Engineer shall enter an order canceling the water right."

It is ORDERED that the right to appropriate 5.8 cubic feet per second of water from Fawcett Creek and stored water from the reservoir constructed under Permit No. R-661 to be diverted at a point located within the NW¼ NW¼ of Section 22, Township 2 South, Range 9 West, Willamette Meridian, with the date of priority of November 23, 1932, for municipal use as evidenced by the certificate recorded at Volume 9, page 10198, State Record of Water Right Certificates, in the name of Tillamook City Water Commission be, and the same hereby is, canceled.

It is FURTHER ORDERED that the certificate recorded at Volume 9, page 10198, be canceled and that a new certificate be issued in the name of Tillamook Water Commission in evidence of the remaining right for the appropriation of not to exceed 6.0 cubic feet per second from Fawcett Creek (a tributary of Tillamook River) and the stored water from the reservoir constructed under Permit No. R-661, at a point of diversion located in the NW$\frac{1}{4}$ NW$\frac{1}{4}$ of Section 22, Township 2 South, Range 9 West, Willamette Meridian, with the priority date of November 23, 1932, for municipal use within the W$\frac{1}{2}$ of Section 30, Township 1 South, Range 9 West, Willamette Meridian, and the E$\frac{1}{2}$ of Section 25, Township 1 South, Range 10 West, Willamette Meridian, as established under Permit No. 10790.

Dated at Salem, Oregon, this 29th day of March, 1966.

Chris L. Wheeler

CHRIS L. WHEELER
State Engineer

STATE OF OREGON

COUNTY OF TILLAMOOK

CERTIFICATE OF WATER RIGHT

This Is to Certify, *That* TILLAMOOK CITY WATER COMMISSION

of Tillamook *, State of* Oregon *, has made proof to the satisfaction of the STATE ENGINEER of Oregon, of a right to the use of the waters of* a well

a tributary of Trask River *for the purpose of* municipal

under Permit No. G-842 *of the State Engineer, and that said right to the use of said waters has been perfected in accordance with the laws of Oregon; that the priority of the right hereby confirmed dates from* June 4, 1958

that the amount of water to which such right is entitled and hereby confirmed, for the purposes aforesaid, is limited to an amount actually beneficially used for said purposes, and shall not exceed 1.56 cubic foot per second

or its equivalent in case of rotation, measured at the point of diversion from the stream. The point of diversion is located in the SW$\frac{1}{4}$ NW$\frac{1}{4}$, Section 5, T. 2 S., R. 9 W., W. M.
Well located 1410.54 feet S. and 53.62 feet E. from NW corner of Section 5.

The amount of water used for irrigation, together with the amount secured under any other right existing for the same lands, shall be limited to - - - - - - - - *of one cubic foot per second per acre,*

and shall conform to such reasonable rotation system as may be ordered by the proper state officer.

A description of the place of use under the right hereby confirmed, and to which such right is appurtenant, is as follows:

S$\frac{1}{2}$ NW$\frac{1}{4}$
SW$\frac{1}{4}$
Section 29
S$\frac{1}{2}$ NW$\frac{1}{4}$
S$\frac{1}{2}$
Section 30
S$\frac{1}{2}$
Section 31
S$\frac{1}{2}$ SW$\frac{1}{4}$
S$\frac{1}{2}$ SE$\frac{1}{4}$
Section 32
T. 1 S., R. 9 W., W. M.

S$\frac{1}{2}$ NE$\frac{1}{4}$
S$\frac{1}{2}$ NW$\frac{1}{4}$
SW$\frac{1}{4}$
N$\frac{1}{2}$ SE$\frac{1}{4}$
Section 26
S$\frac{1}{2}$
Section 34
all
Section 35
all
Section 36
T. 1 S., R. 10 W., W. M.

N$\frac{1}{2}$
E$\frac{1}{2}$ SE$\frac{1}{4}$
Section 6
all
Section 7
all
Section 8
all
Section 9
N$\frac{1}{2}$ NW$\frac{1}{4}$
Section 16
T. 2 S., R. 9 W., W. M.

S$\frac{1}{2}$ NE$\frac{1}{4}$
S$\frac{1}{2}$ NW$\frac{1}{4}$
S$\frac{1}{2}$
Section 25

S$\frac{1}{2}$
Section 4
S$\frac{1}{2}$
Section 5

The right to the use of the water for the purposes aforesaid is restricted to the lands or place of use herein described.

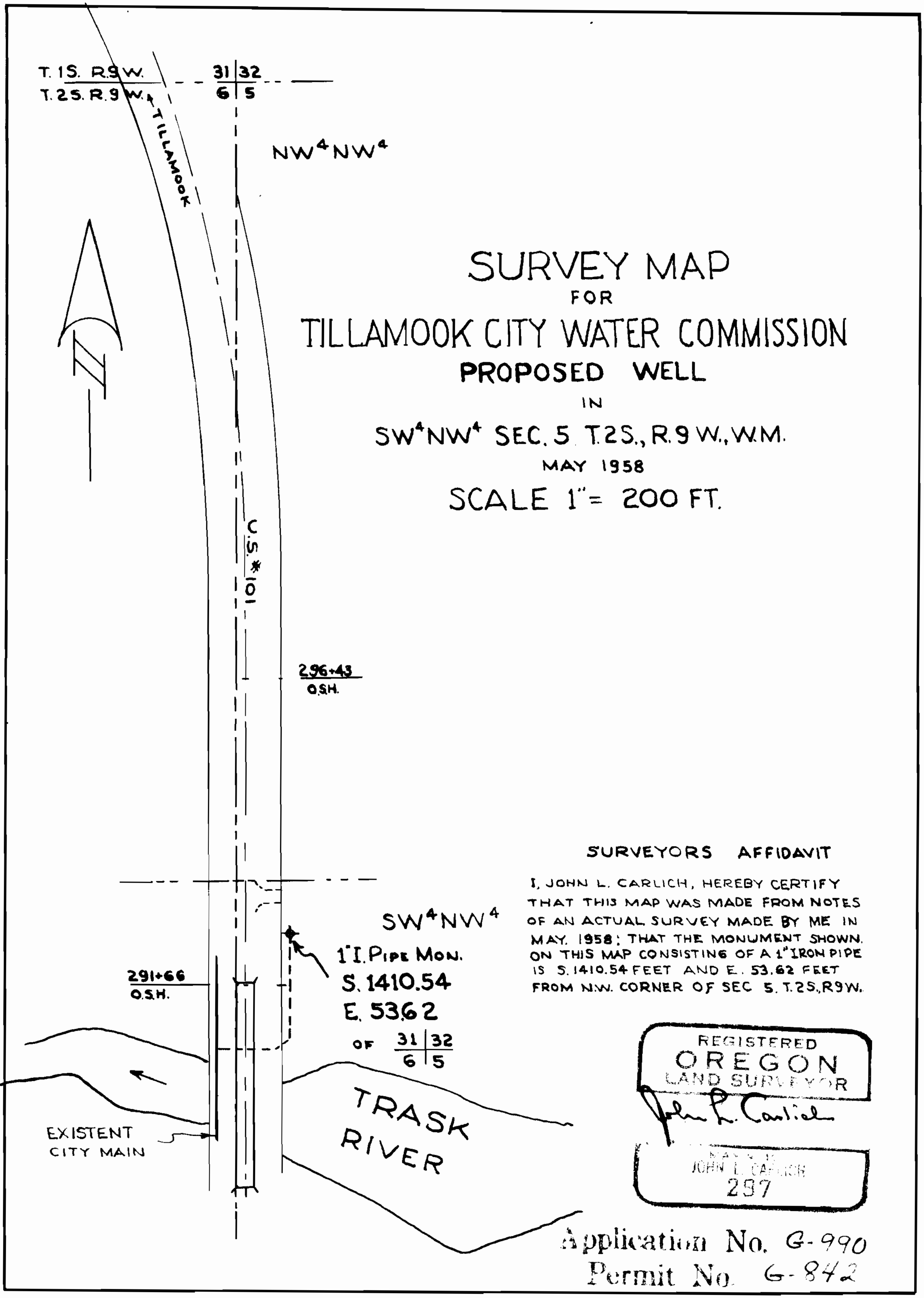
WITNESS the signature of the State Engineer, affixed

this date. May 24, 1965

CHRIS L. WHEELER

State Engineer

Recorded in State Record of Water Right Certificates, Volume 24 *, page* 32234


T. 1S. R.9W.
T. 2S. R.9W.
31 | 32
6 | 5
NW4NW4
TILLAMOOK
SURVEY MAP
FOR
TILLAMOOK CITY WATER COMMISSION
PROPOSED WELL
IN
SW4NW4 SEC. 5 T.2S., R.9 W., W.M.
MAY 1958
SCALE 1" = 200 FT.
U.S. #101
296+43
O.S.H.
SW4NW4
1" I. Pipe Mon.
S. 1410.54
E. 53.62
OF 31 | 32 6 | 5
291+66
O.S.H.
EXISTENT
CITY MAIN
TRASK
RIVER
SURVEYORS AFFIDAVIT
I, JOHN L. CARLICH, HEREBY CERTIFY THAT THIS MAP WAS MADE FROM NOTES OF AN ACTUAL SURVEY MADE BY ME IN MAY, 1958; THAT THE MONUMENT SHOWN ON THIS MAP CONSISTING OF A 1" IRON PIPE IS S. 1410.54 FEET AND E. 53.62 FEET FROM N.W. CORNER OF SEC 5. T.2S., R9W.
REGISTERED
OREGON
LAND SURVEYOR
John L. Carlich
JOHN L. CARLICH
297
Application No. G-990
Permit No. G-842

STATE OF OREGON

COUNTY OF TILLAMOOK

CERTIFICATE OF WATER RIGHT

This Is To Certify, *That* TILLAMOOK WATER COMMISSION

of Tillamook *, State of* Oregon *, has made proof to the satisfaction of the STATE ENGINEER of Oregon, of a right to the use of the waters of* Well No. 2 *a tributary of* Trask River *for the purpose of* municipal use *under Permit No.* G-1652 *of the State Engineer, and that said right to the use of said waters has been perfected in accordance with the laws of Oregon; that the priority of the right hereby confirmed dates from* July 25, 1960;

that the amount of water to which such right is entitled and hereby confirmed, for the purposes aforesaid, is limited to an amount actually beneficially used for said purposes, and shall not exceed 1.03 cubic foot per second

or its equivalent in case of rotation, measured at the point of diversion from the stream. The point of diversion is located in the SE$\frac{1}{4}$ SW$\frac{1}{4}$, Section 31, T. 1 S., R. 9 W., W. M. Well located: 392.40 feet North and 189.77 feet West from the S$\frac{1}{4}$ Corner, Section 31.

The amount of water used for irrigation, together with the amount secured under any other right existing for the same lands, shall be limited to — — — — — — — — *of one cubic foot per second per acre,*

and shall conform to such reasonable rotation system as may be ordered by the proper state officer.

A description of the place of use under the right hereby confirmed, and to which such right is appurtenant, is as follows:

S$\frac{1}{2}$ NW$\frac{1}{4}$
SW$\frac{1}{4}$
Section 29

S$\frac{1}{2}$ NW$\frac{1}{4}$
S$\frac{1}{2}$
Section 30

S$\frac{1}{2}$
Section 31

S$\frac{1}{2}$ SW$\frac{1}{4}$
S$\frac{1}{2}$ SE$\frac{1}{4}$
Section 32
T. 1 S., R. 9 W., W. M.

$S\frac{1}{2}$ $NE\frac{1}{4}$
$S\frac{1}{2}$ $NW\frac{1}{4}$
$S\frac{1}{2}$
Section 25

$S\frac{1}{2}$ $NE\frac{1}{4}$
$S\frac{1}{2}$ $NW\frac{1}{4}$
$SW\frac{1}{4}$
$N\frac{1}{2}$ $SE\frac{1}{4}$
Section 26

$S\frac{1}{2}$
Section 34

All
Section 35

All
Section 36
T. 1 S., R. 10 W., W. M.

$S\frac{1}{2}$
Section 4

$S\frac{1}{2}$
Section 5

$N\frac{1}{2}$
$E\frac{1}{2}$ $SE\frac{1}{4}$
Section 6

All
Section 7

All
Section 8

All
Section 9

$N\frac{1}{2}$ $NW\frac{1}{4}$
Section 16
T. 2 S., R. 9 W., W. M.

The right to the use of the water for the purposes aforesaid is restricted to the lands or place of use herein described.

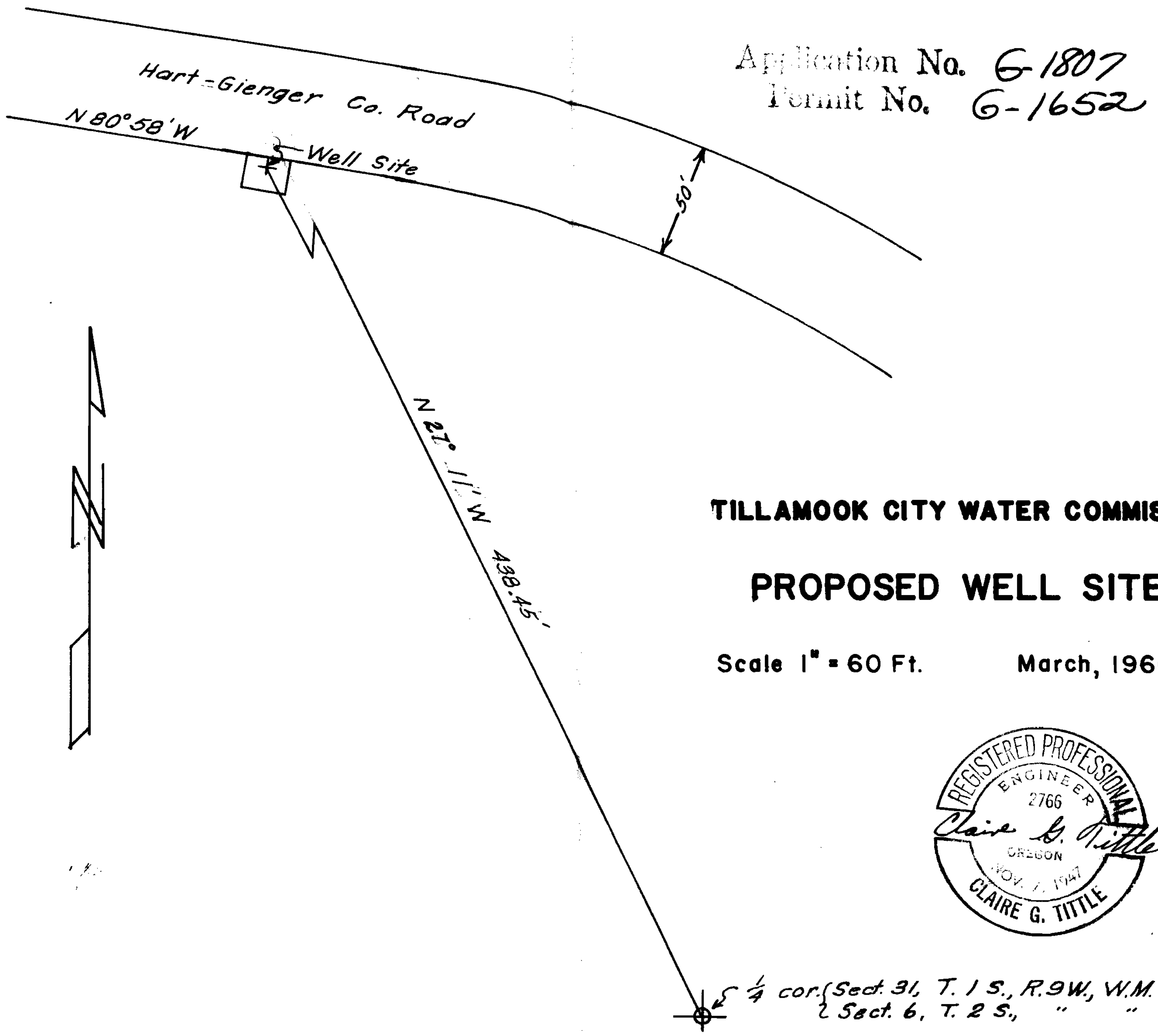
WITNESS the signature of the State Engineer, affixed

this 28th *day of* February , 19 69.

CHRIS L. WHEELER
State Engineer

Recorded in State Record of Water Right Certificates, Volume 27 *, page* 35782

Application No. G-1807
Permit No. G-1652



TILLAMOOK CITY WATER COMMISSION

PROPOSED WELL SITE

Scale 1" = 60 Ft. March, 1960

REGISTERED PROFESSIONAL ENGINEER 2766
Claire G. Tittle
OREGON
NOV. 7, 1947
CLAIRE G. TITTLE

* Reservoir Permit No. 4532

Application for a Permit to Construct a Reservoir and to Store for Beneficial Use the Unappropriated Waters of the State of Oregon

I, Tillamook Water Commission, City of Tillamook
(Name of Applicant)

of City Hall, Tillamook,
(Mailing Address)

State of Oregon, do hereby make application for a permit to construct the following described reservoir and to store the unappropriated waters of the State of Oregon, subject to existing rights.

If the applicant is a corporation, give date and place of incorporation Tillamook Oregon, 28 February 1891

1. The name of the proposed reservoir is Skookum Lake Reservoir

2. The name of the stream from which the reservoir is to be filled and the appropriation made is Fawcett Creek

tributary of Tillamook River

3. The amount of water to be stored is 700 acre feet.

4. The use to be made of the impounded water is municipal, domestic, and industrial water supply.
(Irrigation, power, domestic supply, etc.)

5. The location of the proposed reservoir will be in Sec. 19
(Give sections or townships to be submerged)

Tp. 2S, R. 8W, W.M., in the county of Tillamook

(a) State whether situated in channel of running stream and give character of material at outlet
The dam is situated in the channel of a running stream. The outlet is in stiff, brown, sandy silt containing boulders.

(b) If not in channel of running stream, state how it is to be filled. If through a feed canal, give name and dimensions

6. The dam will be located in NW 1/4 of SE 1/4, Sec. 19,
(Smallest legal subdivision)

Tp. 2S, R. 8W, W.M. The maximum height will be 40 feet above stream bed or ground surface on center line of dam. The length on top will be 600 feet; length on bottom 50 feet; width on top 20 feet; slope on front or water side 3:1 (Feet horizontal to 1 vertical); slope on back 2:1 (Feet horizontal to 1 vertical); height of dam above water line when full 9 feet.

* A different form of application should be used for the appropriation of stored water to beneficial use. Such forms can be secured without charge, together with instructions, by addressing the State Engineer, Salem, Oregon 97310.

4532

7. The construction of dam, the material of which it is to be built, and method of protective measures are as follows: The dam will be built as a homogeneous, earth fill dam of sandy clay silt which contains approximately 30 percent rock fragments. The face of the dam will be protected with 18 inches of well graded rock fragments with 18 inch maximum size which will be obtained from the oversize rock in the borrow areas or from the spillway excavation.

8. The location of wasteway with dimensions are as follows: The spillway will be cut in rock (State whether over or around the dam) through the south abutment. The spillway will be 26 feet wide and a minimum depth of 9 feet.

9. The location of outlet from the proposed reservoir, with character of construction and dimensions, are as follows: The outlet will be a 30-inch diameter corrugated metal pipe, (All dams across natural stream channels must be provided with an outlet sufficient in capacity and location to pass the normal flow of the stream at any time) 10 gauge, asbestos protected and asphalt coated, bedded in concrete, approximately 210 feet long, located through the dam.

10. The area submerged by the proposed reservoir, when full, will be 39 *acres, with a maximum depth of water of* 29 *feet; and approximate mean depth of water* 18 *feet.*

11. The estimated cost of the proposed work is $ 115,000

12. Construction work will begin on or before 1 July 1965

13. Construction work will be completed on or before 15 November 1965

(Signature of applicant)

President, Tillamook Water Commission

STATE OF OREGON, } *ss.*
County of Marion, }

This is to certify that I have examined the foregoing application, together with the accompanying maps and data, and return the same for ....

In order to retain its priority, this application must be returned to the State Engineer, with corrections on or before ...., *19*......

WITNESS my hand this .... *day of* ...., *19*......

....
STATE ENGINEER

By ....
ASSISTANT

Remarks: The drainage area is 2.2 square miles in area. It is steep, and generally covered with second growth forest. The source of the embankment material will be the right abutment and the reservoir area below the right abutment. The spillway is designed to discharge approximately 1,000 cfs with a head of 6 feet. This, combined with the storage above normal water surface will handle the estimated 100 year, 6 hour rainfall falling on snow, producing an equivalent rain of 7.8 inches. The water stored in this reservoir will be released during the summer and fall to supplement normal creek flow. The water will flow down Fawcett Creek and then be picked up in the existing diversion structure.

STATE OF OREGON, }
County of Marion, } *ss.*

This is to certify that I have examined the foregoing application and do hereby grant the same. subject to the following limitations and conditions: The right herein granted is limited to the construction of Skookum Lake Reservoir and storage of water from Fawcett Creek to be appropriated under application No. 40642, permit No. 30192 , and the dam shall be constructed under the supervision of a registered professional engineer, for municipal use.

The right hereunder shall be limited to the storage of 700.0 *acre feet.*

The priority date of this permit is February 25, 1965

Actual construction work shall begin on or before April 16, 1966 *and shall thereafter be prosecuted with reasonable diligence and be completed on or before October 1, 19*67

WITNESS my hand this 16th *day of* April *, 19*65

Chris L. Wheeler
STATE ENGINEER

OK
al

Application No. R-40411

Reservoir Permit No. 4532

PERMIT

To construct a reservoir and store for beneficial use the unappropriated waters of the State of Oregon.

This instrument was first received in the office of the State Engineer at Salem, Oregon, on the 25th *day of* February, 1965 *at* 8:00 *o'clock* A. *M.*

Returned to applicant:

Approved:

April 16, 1965

Recorded in Book No. .... *of Reservoirs, on Page* 4532

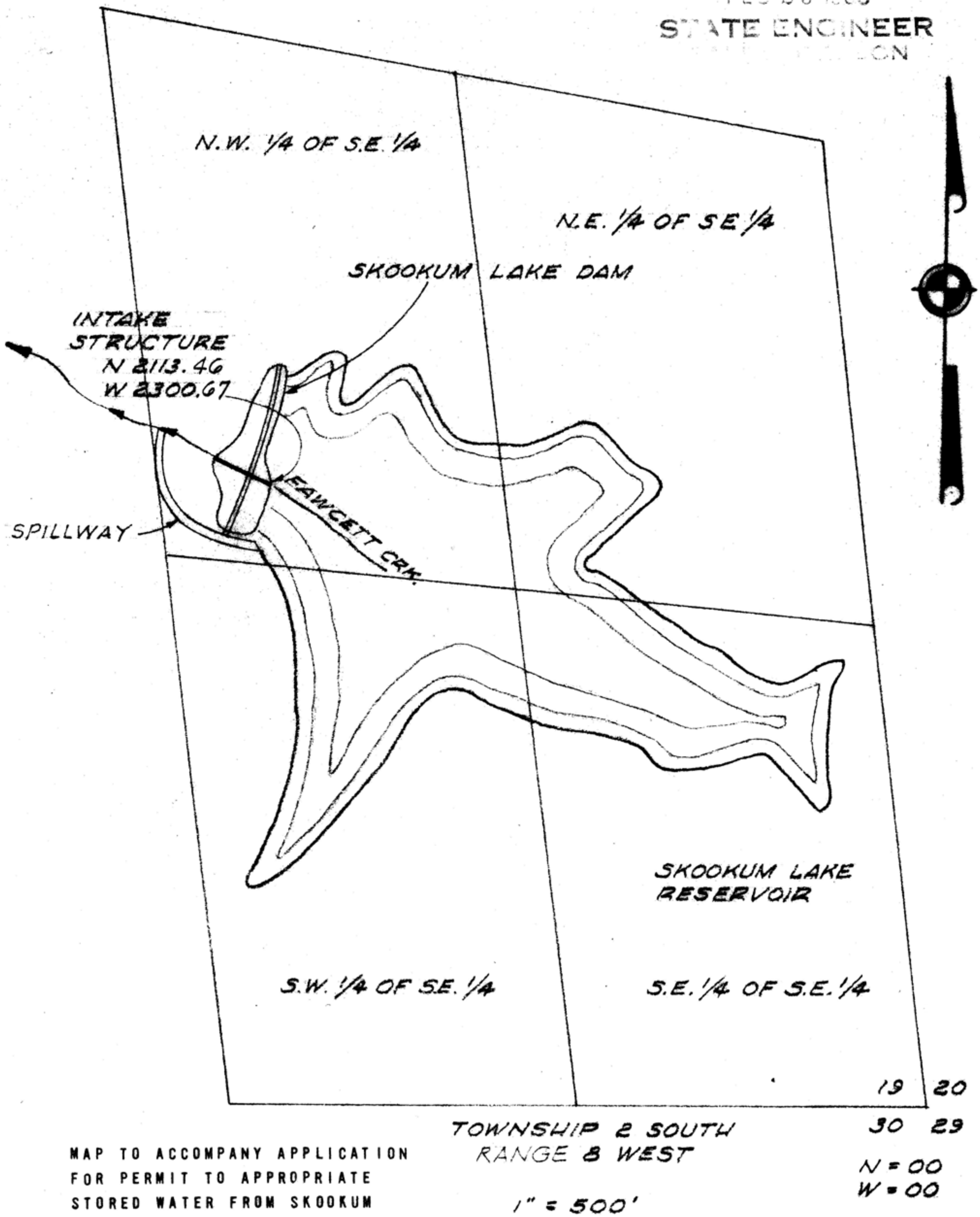
CHRIS L. WHEELER

State Engineer

Drainage Basin No. 1 *page* 18A

Fees ....

RECEIVED
FEB 25 1965
STATE ENGINEER



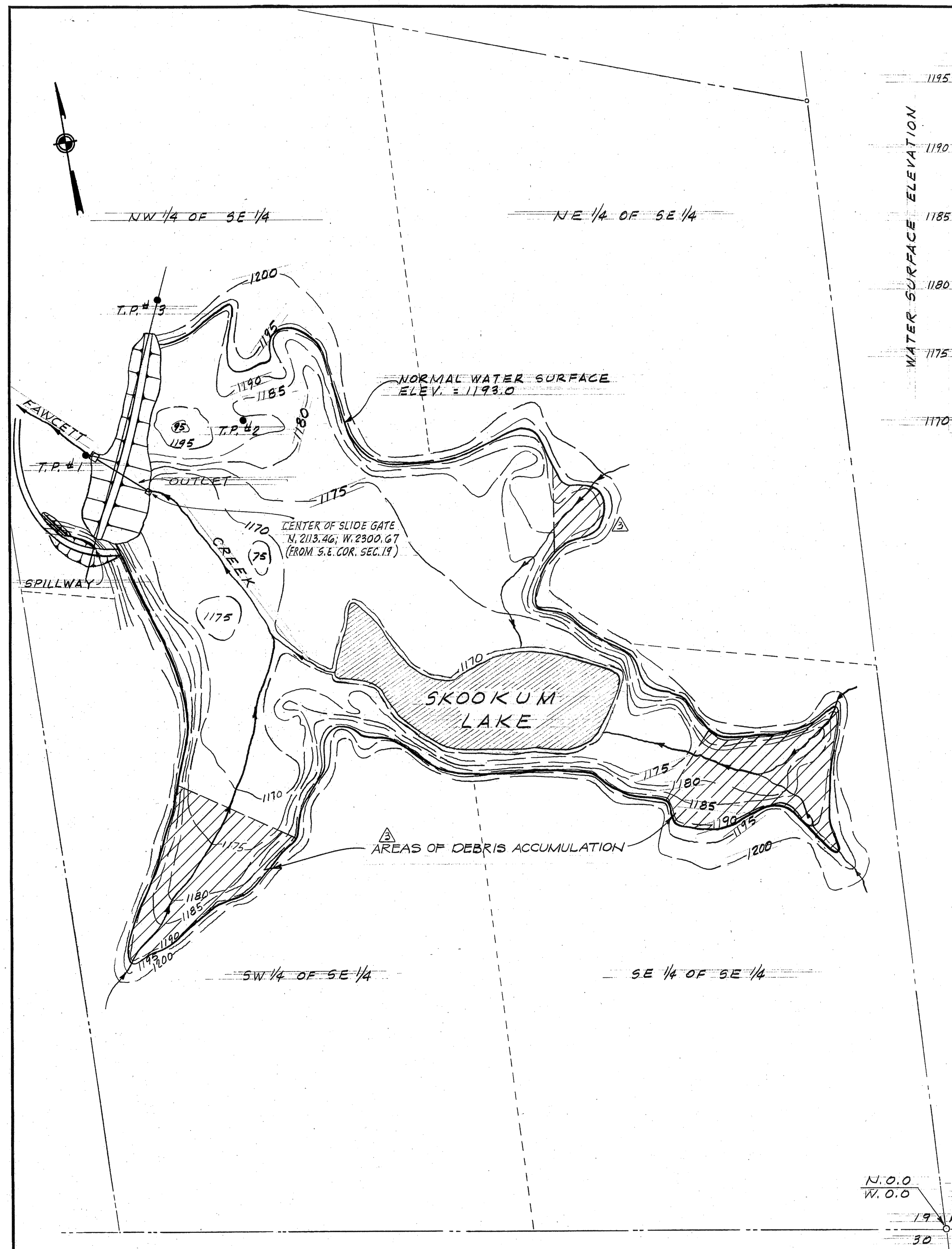
MAP TO ACCOMPANY APPLICATION FOR PERMIT TO APPROPRIATE STORED WATER FROM SKOOKUM LAKE RESERVOIR.

Application No. R-40641, 40642
Permit No. R-4532, 30192

CORNELL, HOWLAND, HAYES & MERRYFIELD
SEATTLE PORTLAND CORVALLIS BOISE

CH2M

C3398.1

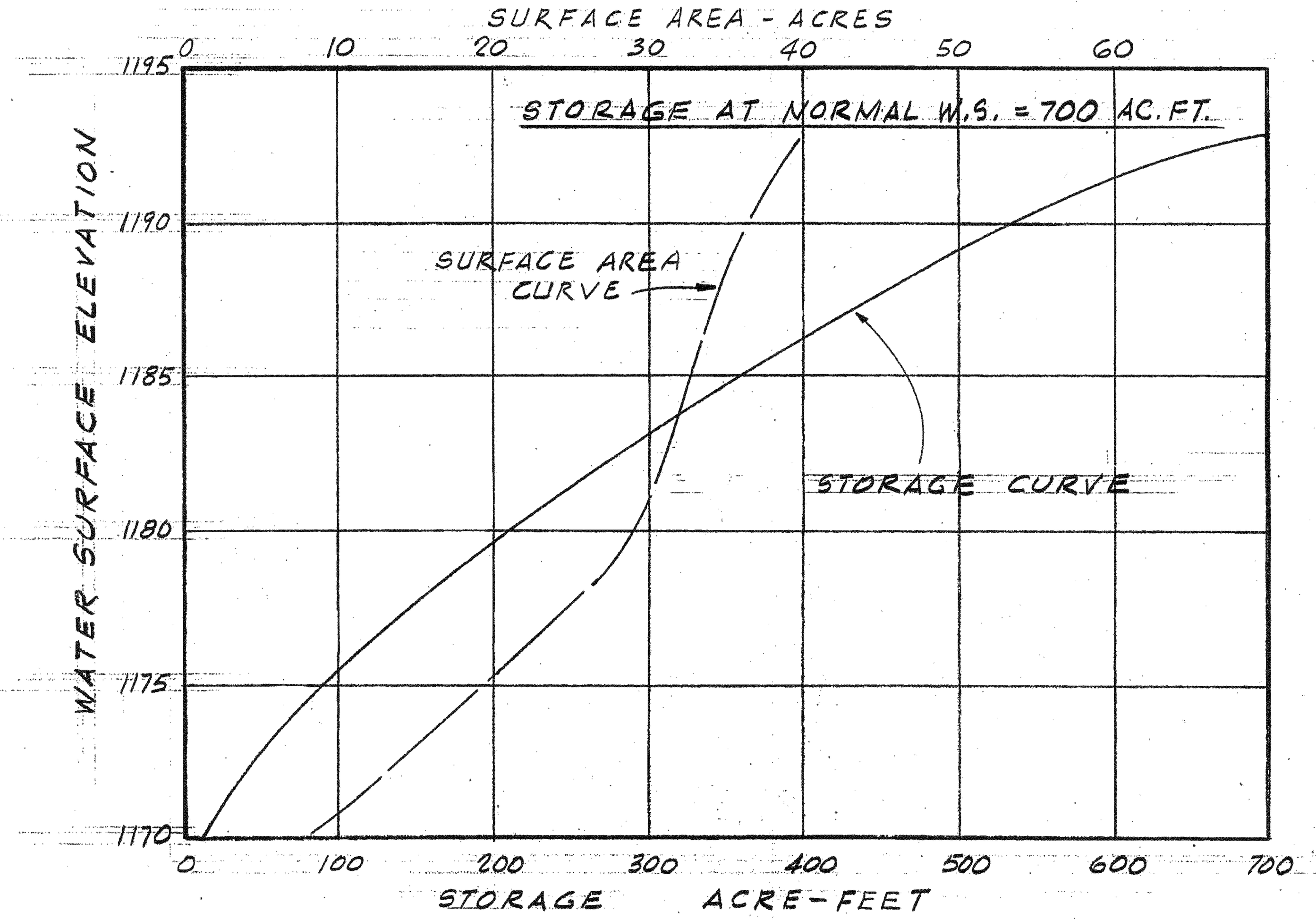


RESERVOIR PLAN

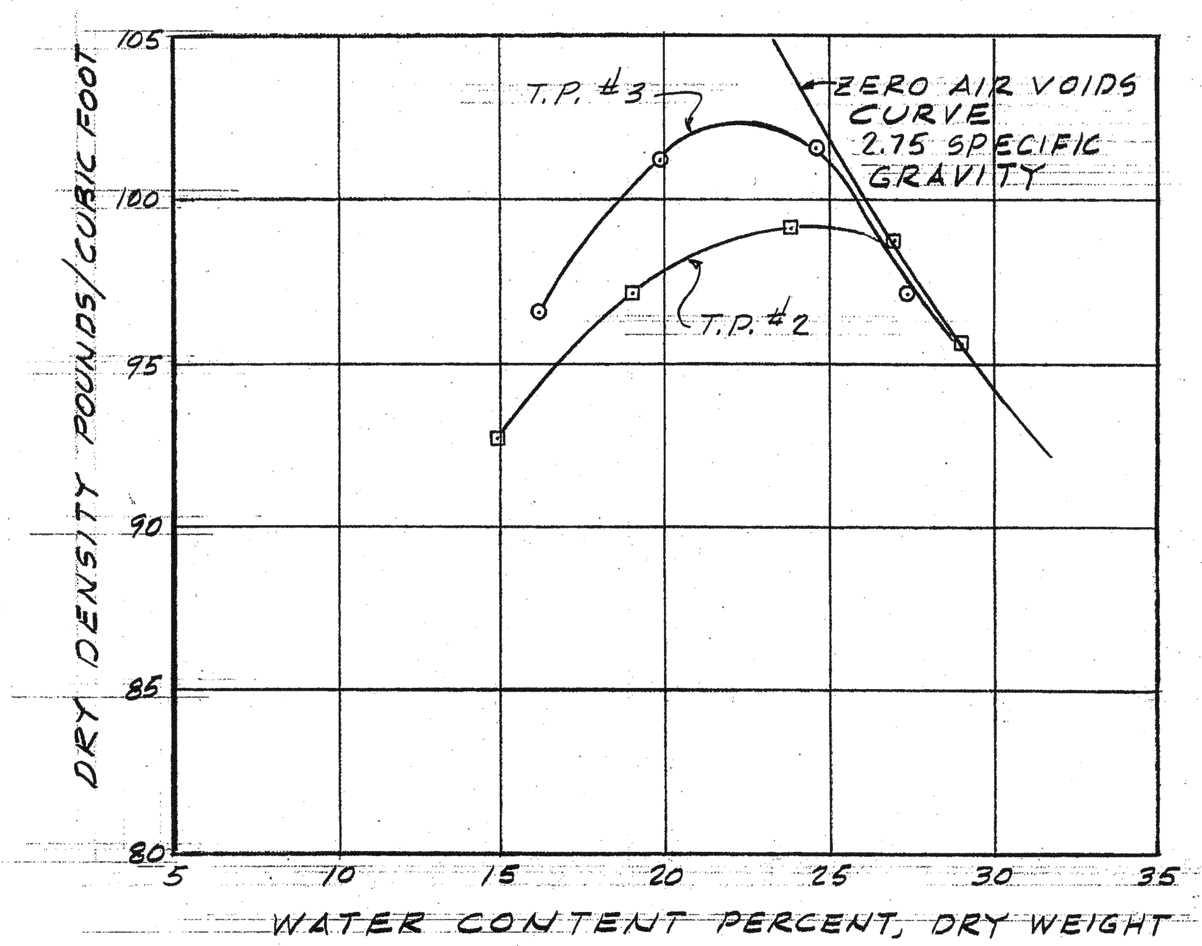
200 100 0 200 400 600

1" = 200'

SURVEY BY: JOHN CARLICH
MAP FROM W. E. ANDERSON

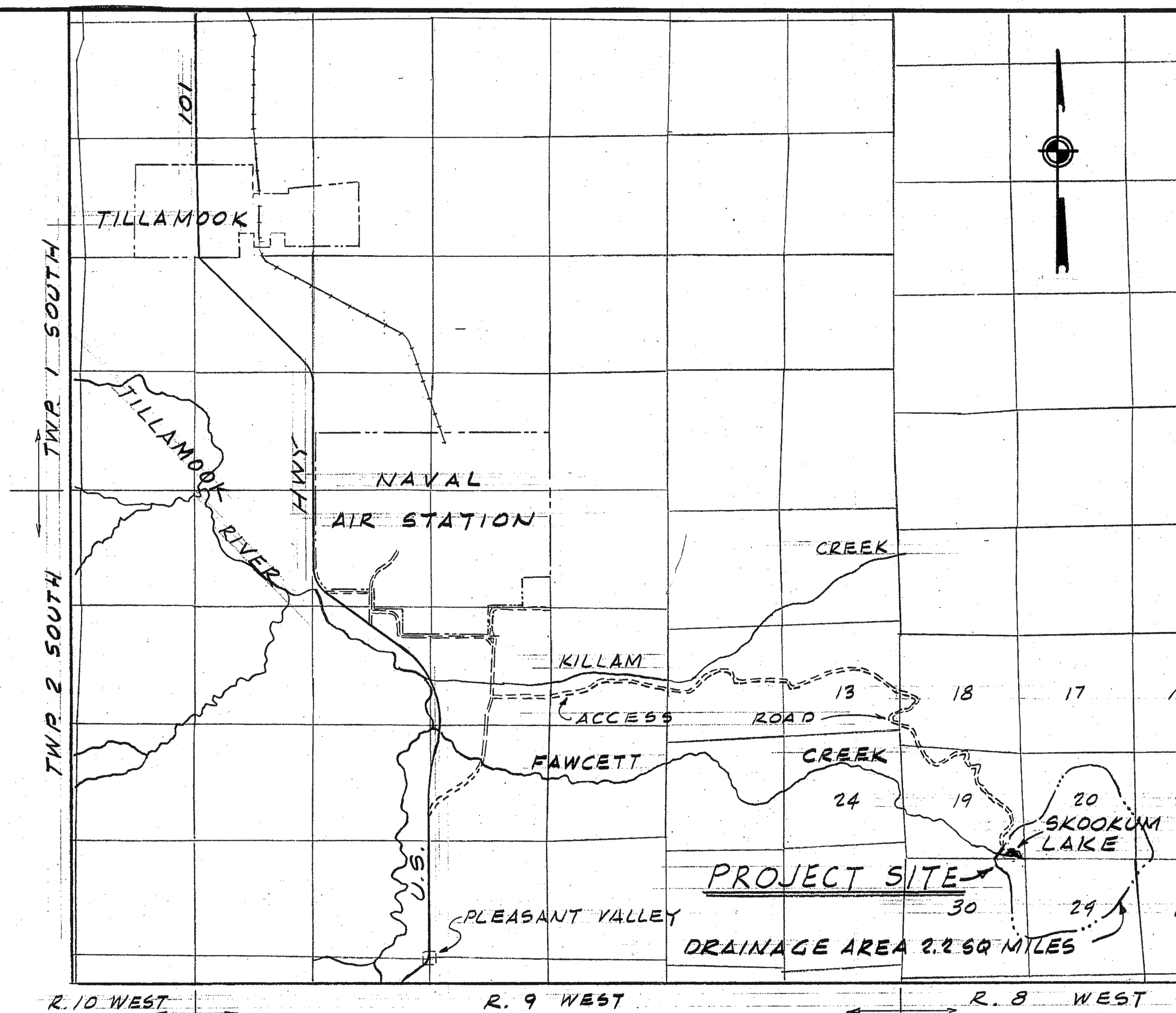


RESERVOIR CAPACITY



MOISTURE - DENSITY RELATIONS

AASHO T 99 METHOD C WITH
3/4"+ PARTICLES REMOVED.



VICINITY MAP

0 1 2 3

1" = 1 MILE

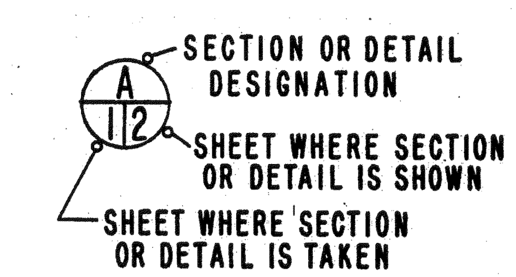
MAP FROM U.S.G.S. TILLAMOOK & BLAINE QUADRANGLE

INDEX TO DRAWINGS

1. VICINITY MAP, RESERVOIR PLAN AND SOILS DATA
2. GENERAL PLAN
3. SECTIONS AND PROFILES
4. OUTLET WORKS DETAILS - OUTLET BOX AND PIPE
5. OUTLET WORKS DETAILS - STILLING BASIN

NO.	DEPTH	CONDITIONS	LIQUID LIMIT	PLASTIC LIMIT	PLASCITY INDEX
T.P. #1	0 - 8.5'	BOULDERS & ROCK FRAGMENTS IN A MATRIX OF STIFF BROWN OR BLUE SANDY CLAY SILT.	55	42	13
T.P. #2	0 - 7' 7 - 8'	BROWN SILTY CLAY SAND W/ BOULDERS & ROCK FRAGMENTS. STIFF GREY CLAYEY SAND WITH ROCK FRAGMENTS.	48	43	5
T.P. #3	0 - 7'	BROWN CLAY SILT WITH ROCK FRAGMENTS, PLASTICITY VARIES FROM HIGH TO LOW.	47	38	9

TEST PIT LOG



SECTION DESIGNATION

REGISTERED PROFESSIONAL ENGINEER 4484 OREGON OCT. 30, 1959 ROGER W. LINDQUIST
Roger W. Lindquist

NO.	DATE	REVISIONS	BY	CHK	APD
3	JAN. 14 '72	REPAIRS TO SPILLWAY	RNW	RWL	RWL
2	NOV. 15 '65	AS BUILT	Jim	RWL	RWL

CORNELL, HOWLAND, HAYES & MERRYFIELD
ENGINEERS & PLANNERS
SEATTLE BOISE PORTLAND CORVALLIS

CITY OF TILLAMOOK, OREGON
WATER COMMISSION
SKOOKUM LAKE DAM

VICINITY MAP RESERVOIR PLAN AND SOILS DATA

DES RWL | DR Jim C | CK RWL | RN C3398.1
SHEET 1 OF 5
DATE FEB. 1965
SCALE AS SHOWN
DWG C 3398-1

KILHAM STATIONERY & PRINTING CO., PORTLAND

CONTROL DATA

ELEVATION DATA:
DATUM, ASSUMED FROM USC & GS QUAD SHEET.

T B M 1 SPIKE, W. SIDE 72" STUMP, 150' LEFT OF STA. 6 + 00 . . . ELEV. 1179.18

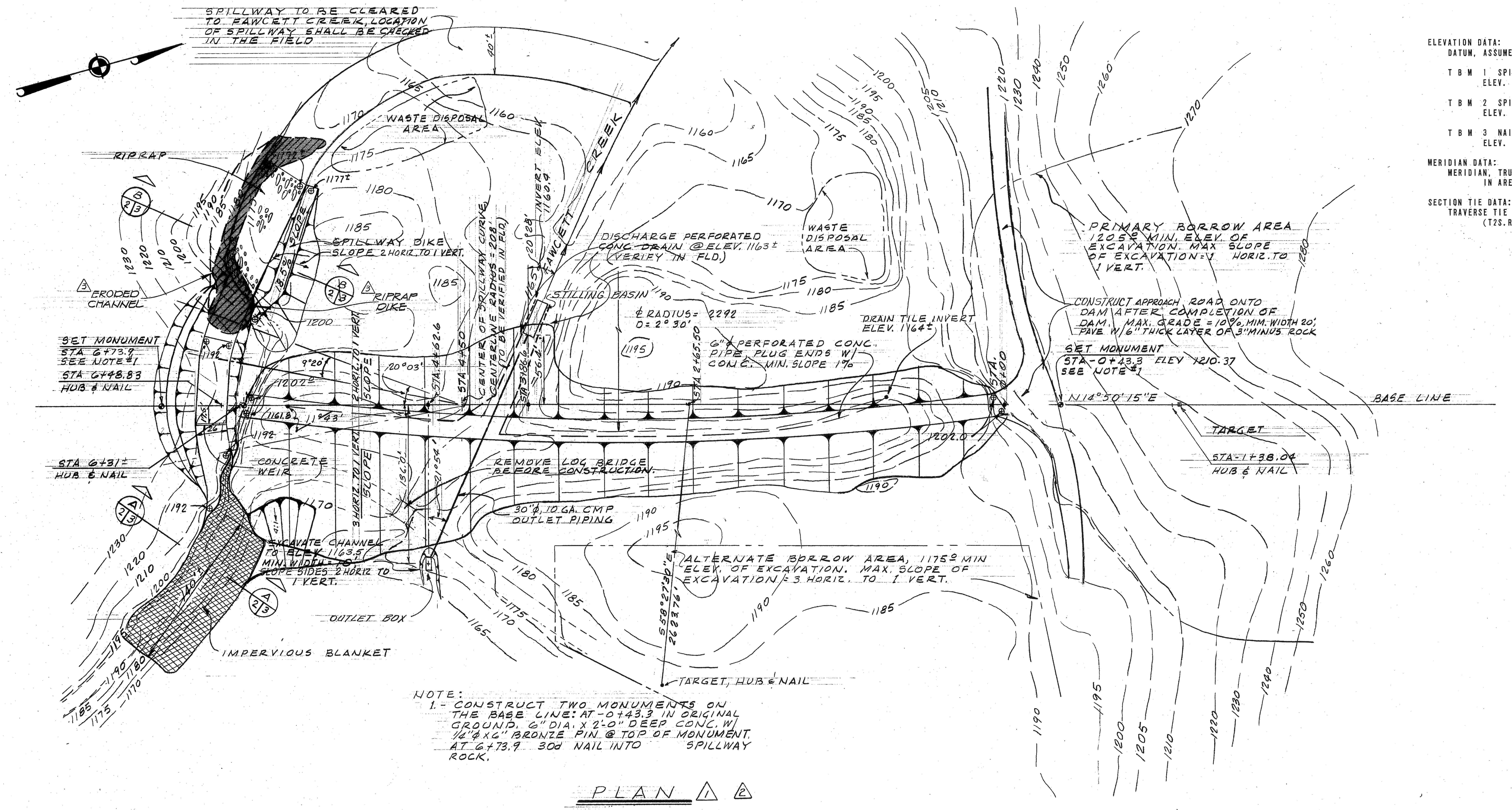
T B M 2 SPIKE, E. SIDE 60" STUMP, 80' RIGHT OF STA. 0 + 64 . . . ELEV. 1191.71.

T B M 3 NAIL, N. SIDE HEMLOCK STUMP 1235' FROM STA. 2 + 62.50 . ELEV. 1177.03, S. 58°27' 30" E.

MERIDIAN DATA:
MERIDIAN, TRUE FROM OREGON STATE FORESTRY BOARD SOLAR OBSERVATION IN AREA TO SOUTHWEST.

SECTION TIE DATA:
TRAVERSE TIE (TRANSIT AND CHAIN) FROM S.E. CORNER SECTION 19 (T2S.R8W. WM.) TO STA. 2 + 62.50 = N 2365.52
= W 2375.13

BY JOHN CARLICH REG. ORE. L.S.
MAY 9, 1952

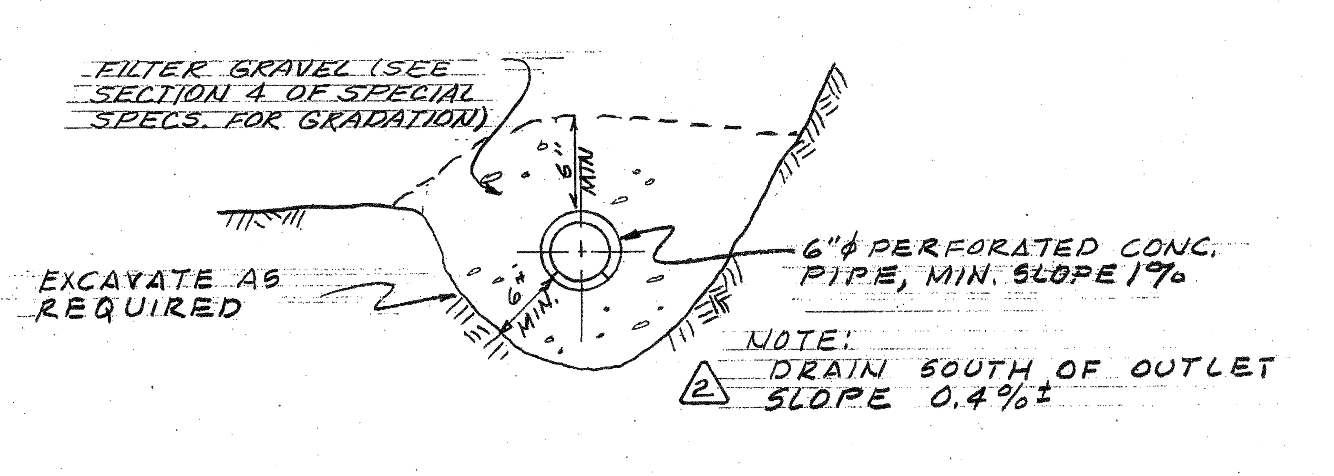


NOTE:
1.- CONSTRUCT TWO MONUMENTS ON THE BASE LINE: AT -0+43.3 IN ORIGINAL GROUND. 6" DIA. x 2'-0" DEEP CONC. W/ 1/2"ø x 6" BRONZE PIN @ TOP OF MONUMENT. AT 6+73.9 30d NAIL INTO SPILLWAY ROCK.

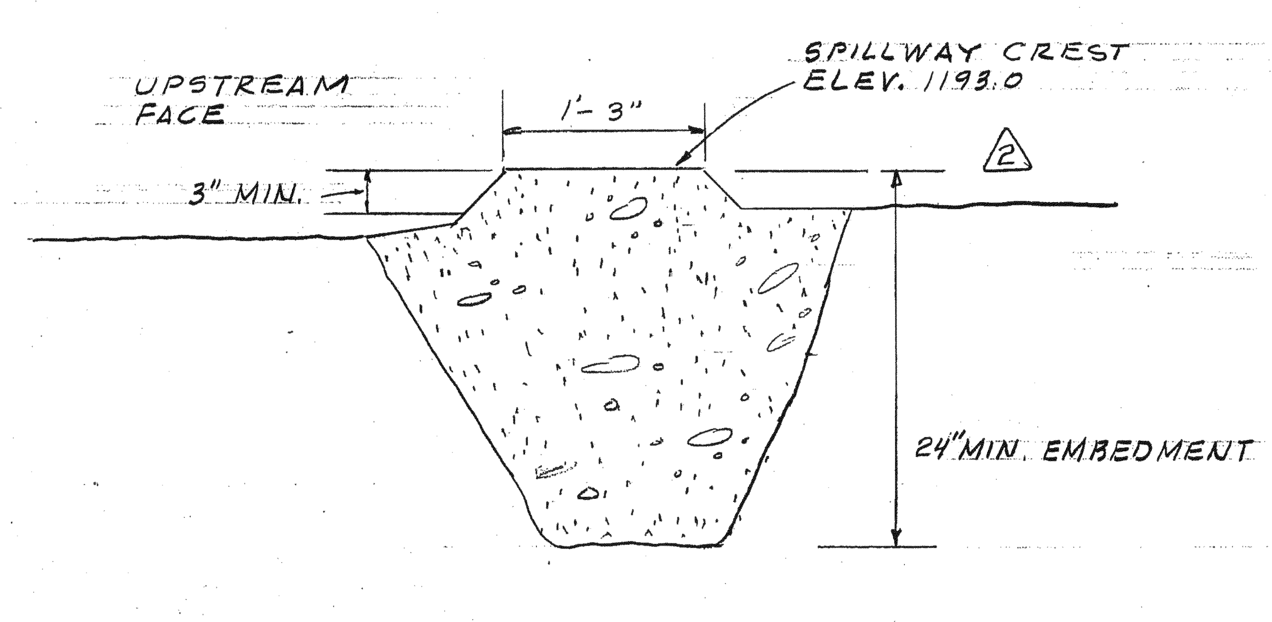
PLAN 1 2

50' 0' 50' 100' 150'
1" = 50'

BASE LINE STATION	OFFSET TO CENTER LINE OF DAM
0 + 25	3.4
0 + 50	6.4
0 + 64	8.0
1 + 00	11.7
1 + 50	15.9
2 + 00	19.0
2 + 50	20.9
3 + 00	21.8
3 + 50	21.5
3 + 80	20.6
4 + 25	19.2
4 + 50	17.8
5 + 00	14.3
5 + 50	9.7
6 + 00	4.0
6 + 12	2.7



PERFORATED PIPE DRAIN SYSTEM DETAIL
N.T.S.



CONCRETE SPILLWAY WEIR
N.T.S.

NO.	DATE	REVISION	BY	CHK.	APD.
3	JAN. 14 '72	REPAIRS TO SPILLWAY	RLM	RWL	RWL
2	NOV. 15 '65	AS BUILT	JMC	RWL	RWL
1	MAR. 26 '65	ADDENDUM NO. 1	FMT	RWL	RWL

REGISTERED PROFESSIONAL ENGINEER 4484 OREGON OCT. 30, 1950 ROGER W. LINDQUIST
Roger W. Lindquist

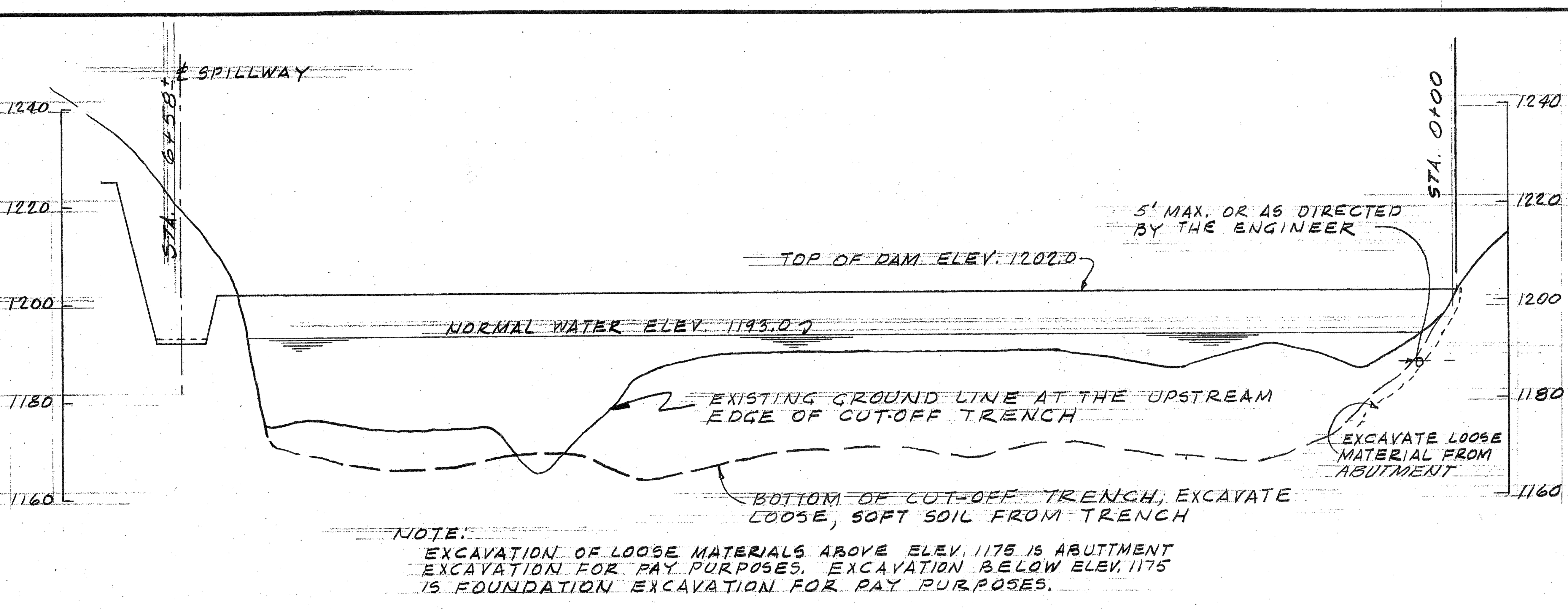
CH2M
CORNELL, HOWLAND, HAYES & MERRYFIELD
ENGINEERS & PLANNERS
SEATTLE BOISE PORTLAND CORVALLIS

CITY OF TILLAMOOK, OREGON
WATER COMMISSION
SKOOKUM LAKE DAM

GENERAL PLAN

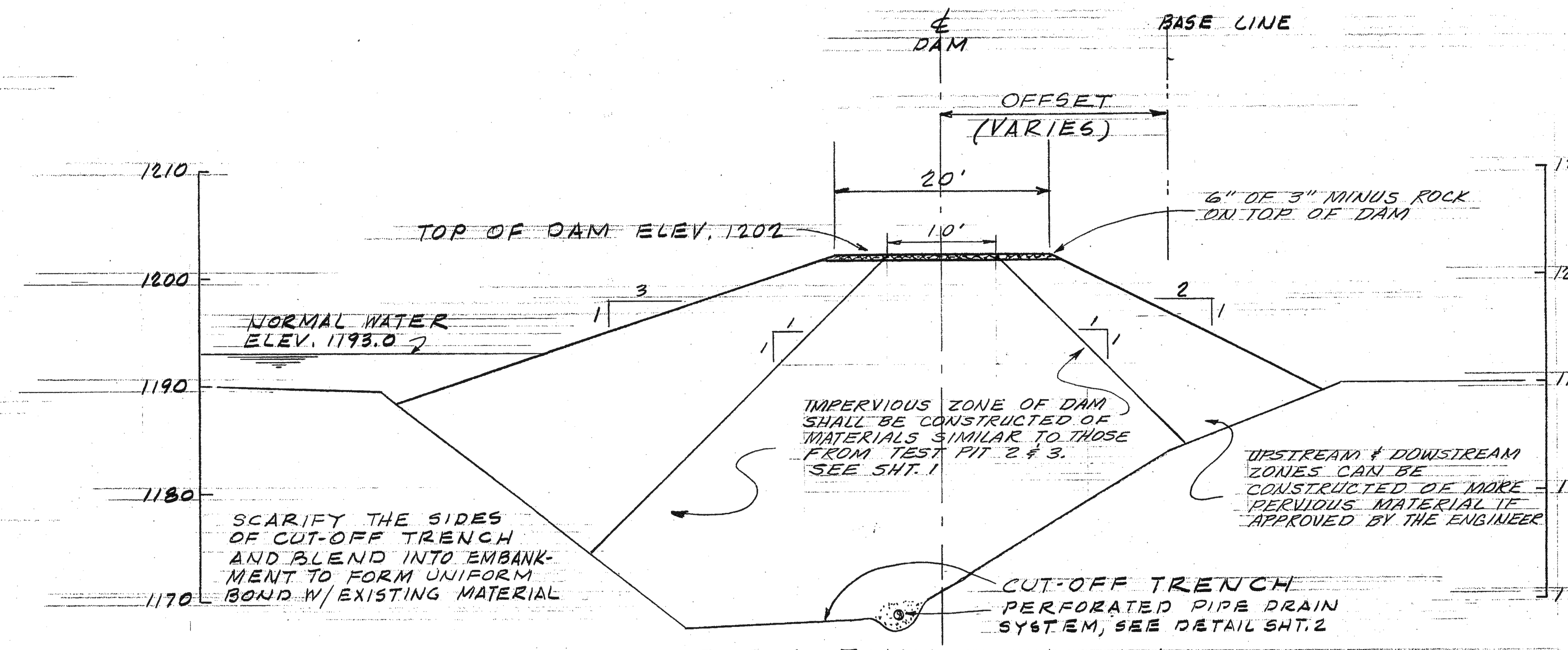
DES RWL | DR JMC | CK RWL | RN 5998.1 | SHEET 2 OF 5 | DATE FEB. 1965 | SCALE AS SHOWN | DWG C 3398-1

KILHAM STATIONERY & PRINTING CO., PORTLAND

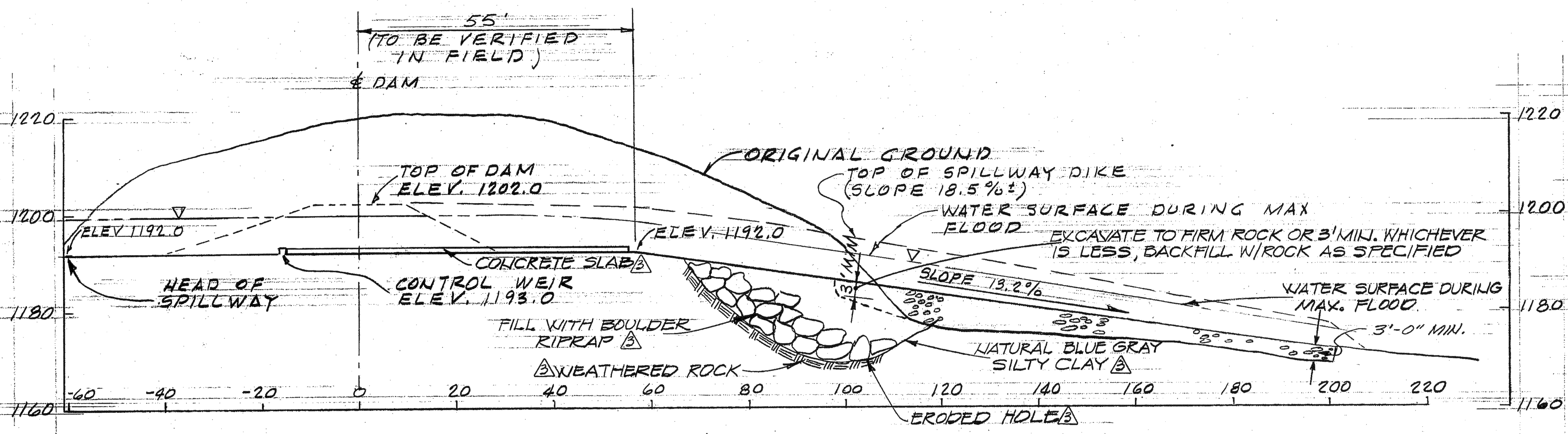


NOTE:
EXCAVATION OF LOOSE MATERIALS ABOVE ELEV. 1175 IS ABUTTMENT EXCAVATION FOR PAY PURPOSES. EXCAVATION BELOW ELEV. 1175 IS FOUNDATION EXCAVATION FOR PAY PURPOSES.

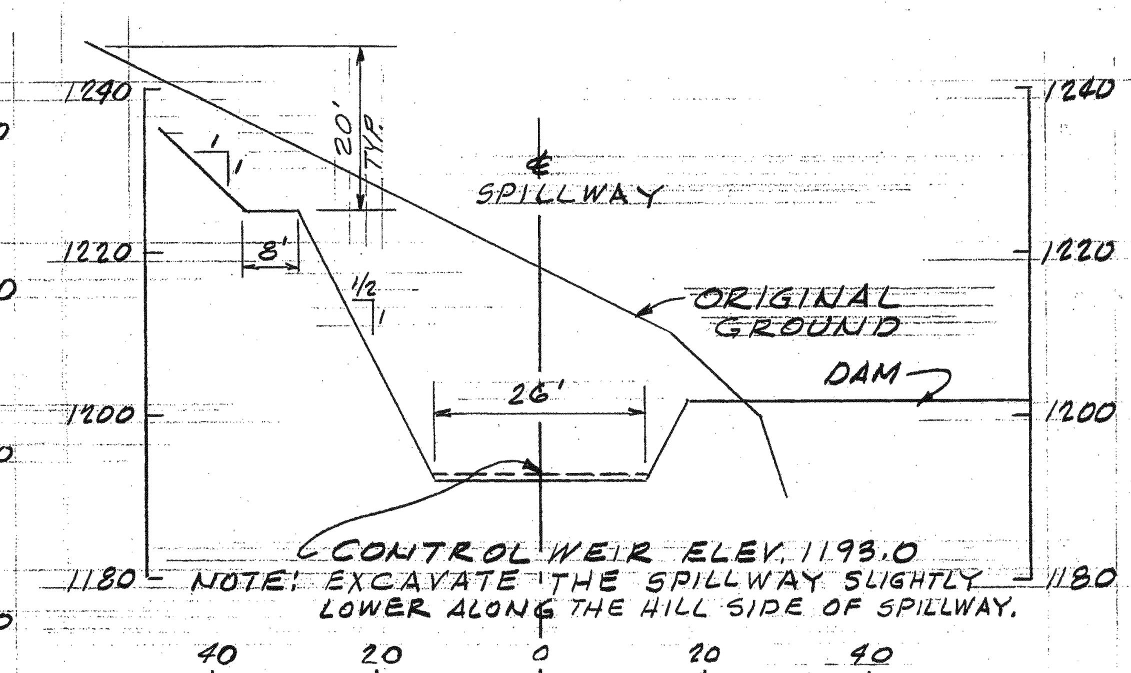
CENTERLINE PROFILE OF DAM
SCALE: 1" = 50' HORIZ.; 1" = 20' VERT.



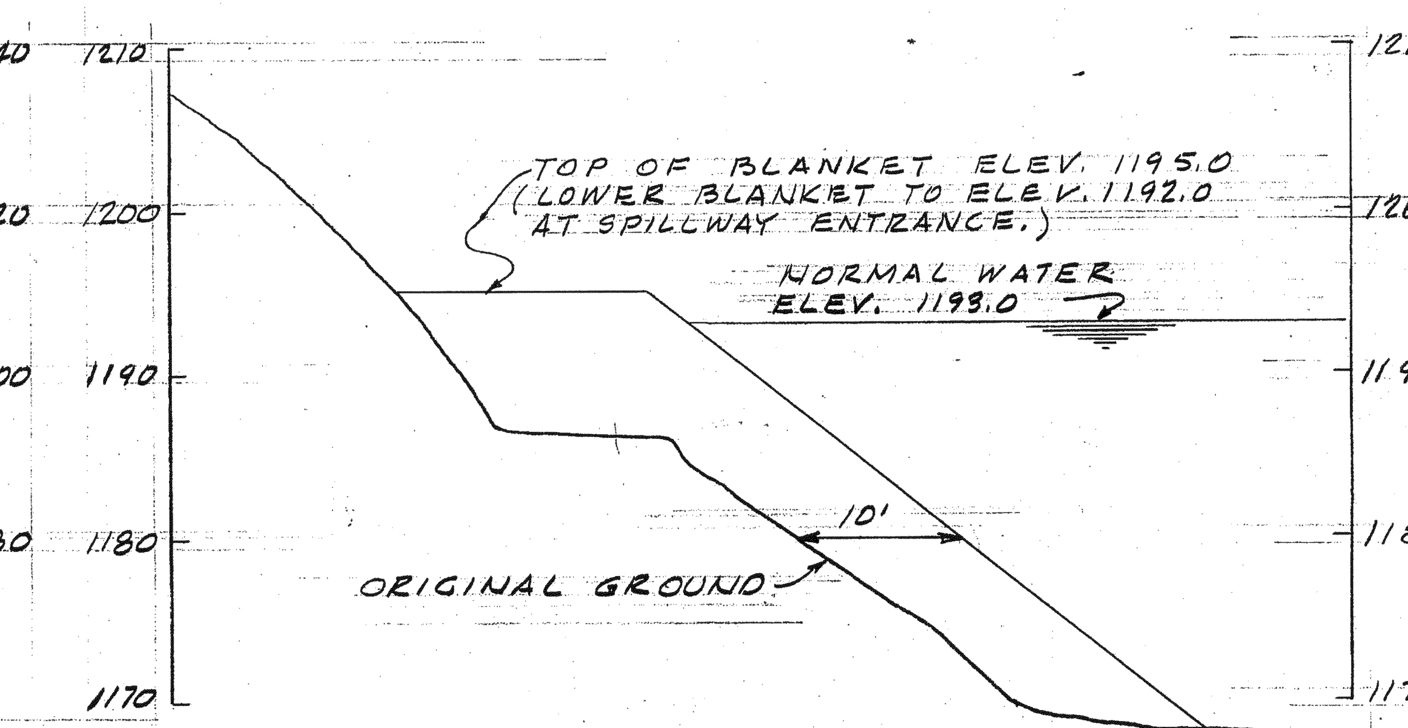
TYPICAL SECTION THROUGH DAM
SCALE: 1" = 10' HORIZ. & VERT.



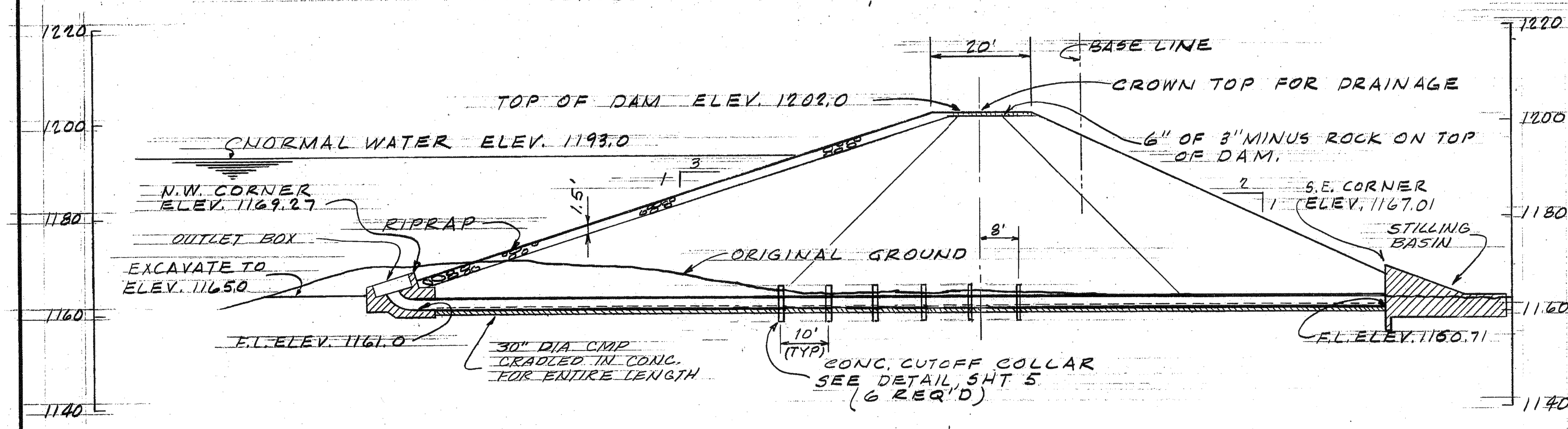
CENTER LINE PROFILE OF SPILLWAY ⚠2
SCALE: 1" = 20' HORIZ. & VERT.



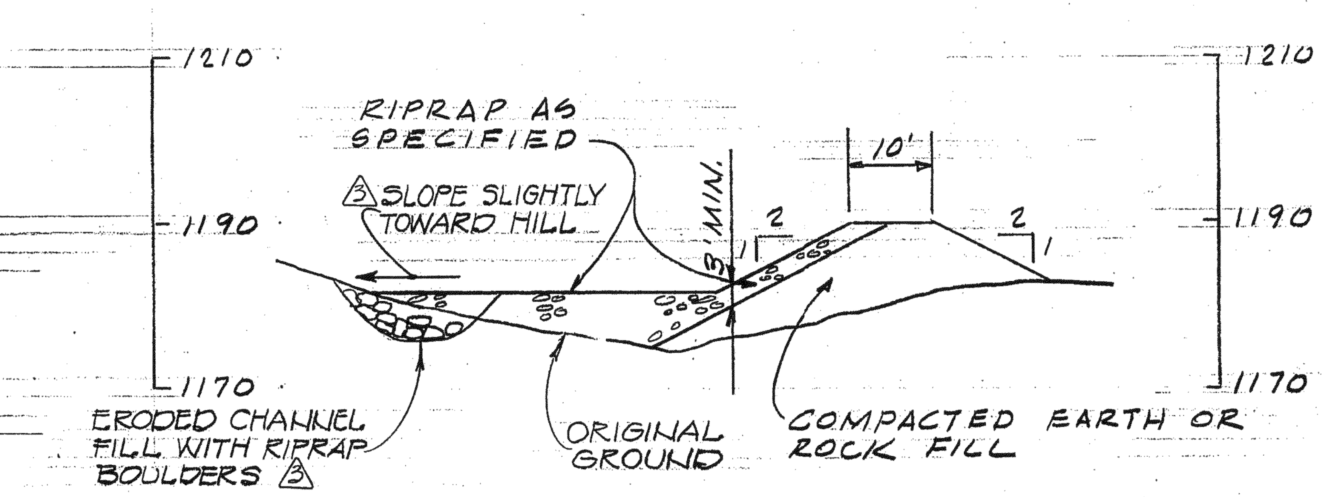
SECTION THROUGH SPILLWAY @ BASE LINE
SCALE: 1" = 20' HORIZ. & VERT.



SECTION @ BLANKET (A 2/3)
SCALE: 1" = 10' HORIZ. & VERT.



SECTION THROUGH OUTLET PIPING & STRUCTURES ⚠2
SCALE: 1" = 20' HORIZ. & VERT.



SECTION THROUGH SPILLWAY & SPILLWAY DIKE (B 2/3)
SCALE: 1" = 20' HORIZ. & VERT.

NO.	DATE	REVISIONS	BY	CHK	APD
3	JAN.14 '72	REPAIRS TO SPILLWAY	RNW	RWL	RWL
2	NOV.15 '65	AS BUILT		RWL	RWL

REGISTERED PROFESSIONAL ENGINEER 4484 OREGON ROGER W. LINDQUIST

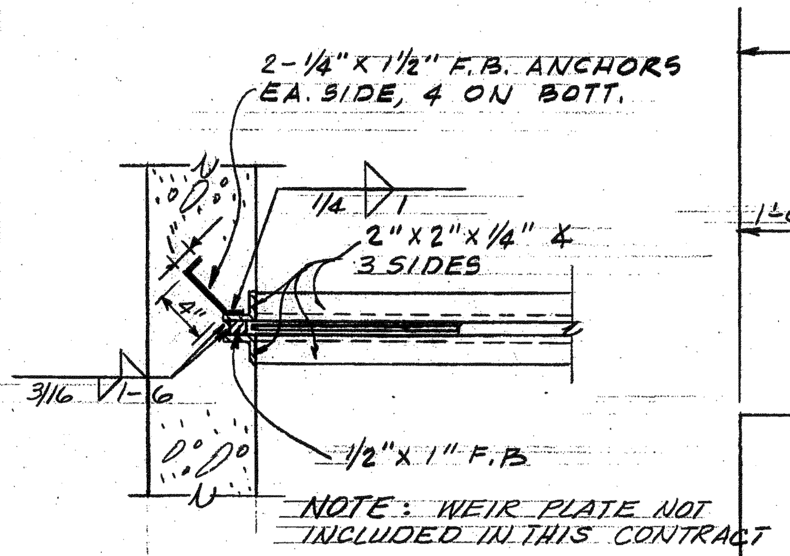
CORNELL, HOWLAND, HAYES & MERRYFIELD
ENGINEERS & PLANNERS
SEATTLE BOISE PORTLAND CORVALLIS

CITY OF TILLAMOOK, OREGON
WATER COMMISSION
SKOOKUM LAKE DAM

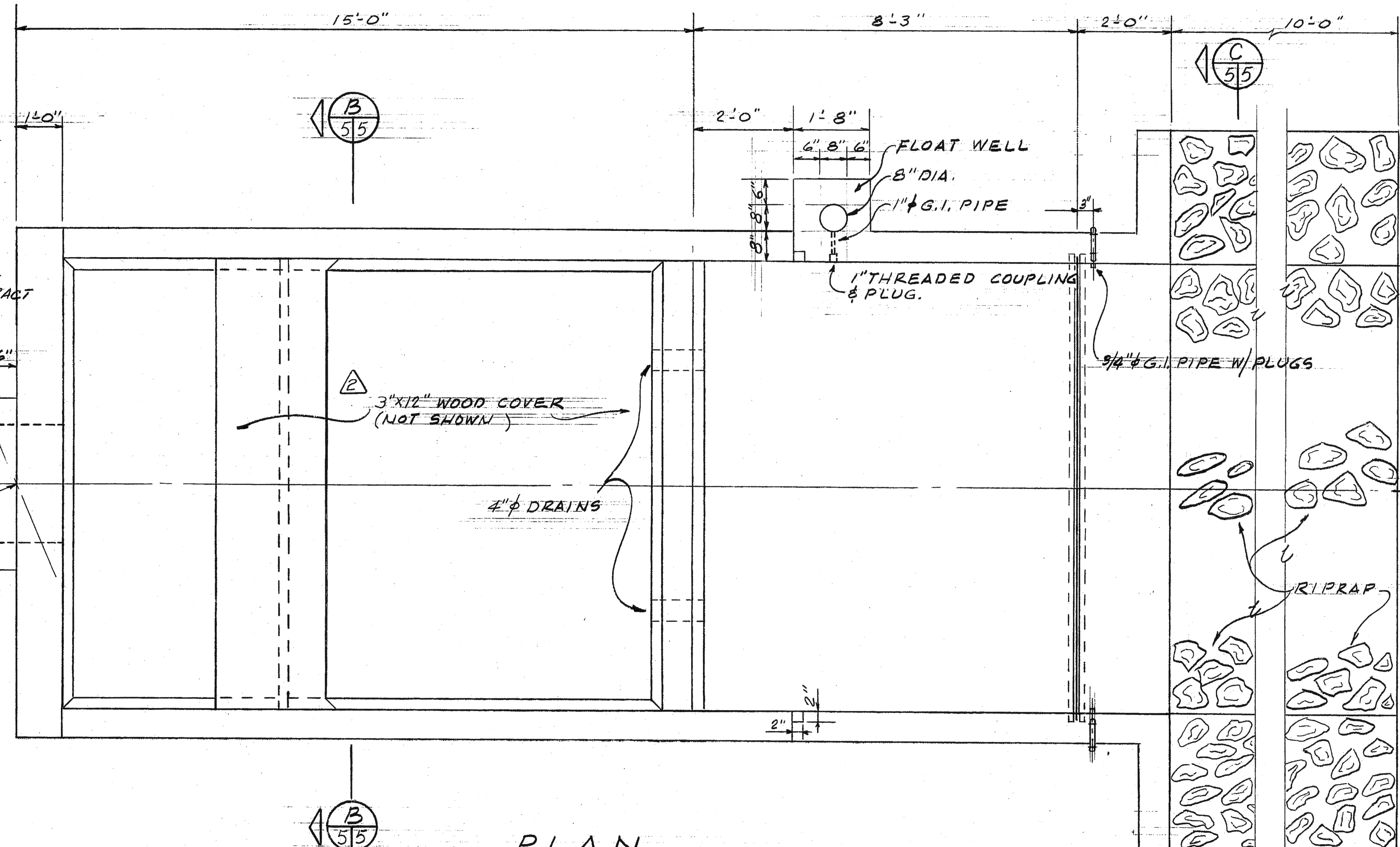
SECTIONS & PROFILES

DES RWL	SHEET 3 OF 5
DR	
CK RWL	DATE FEB. 1965
RN C3398.1	SCALE AS SHOWN
DWG	C3398-1

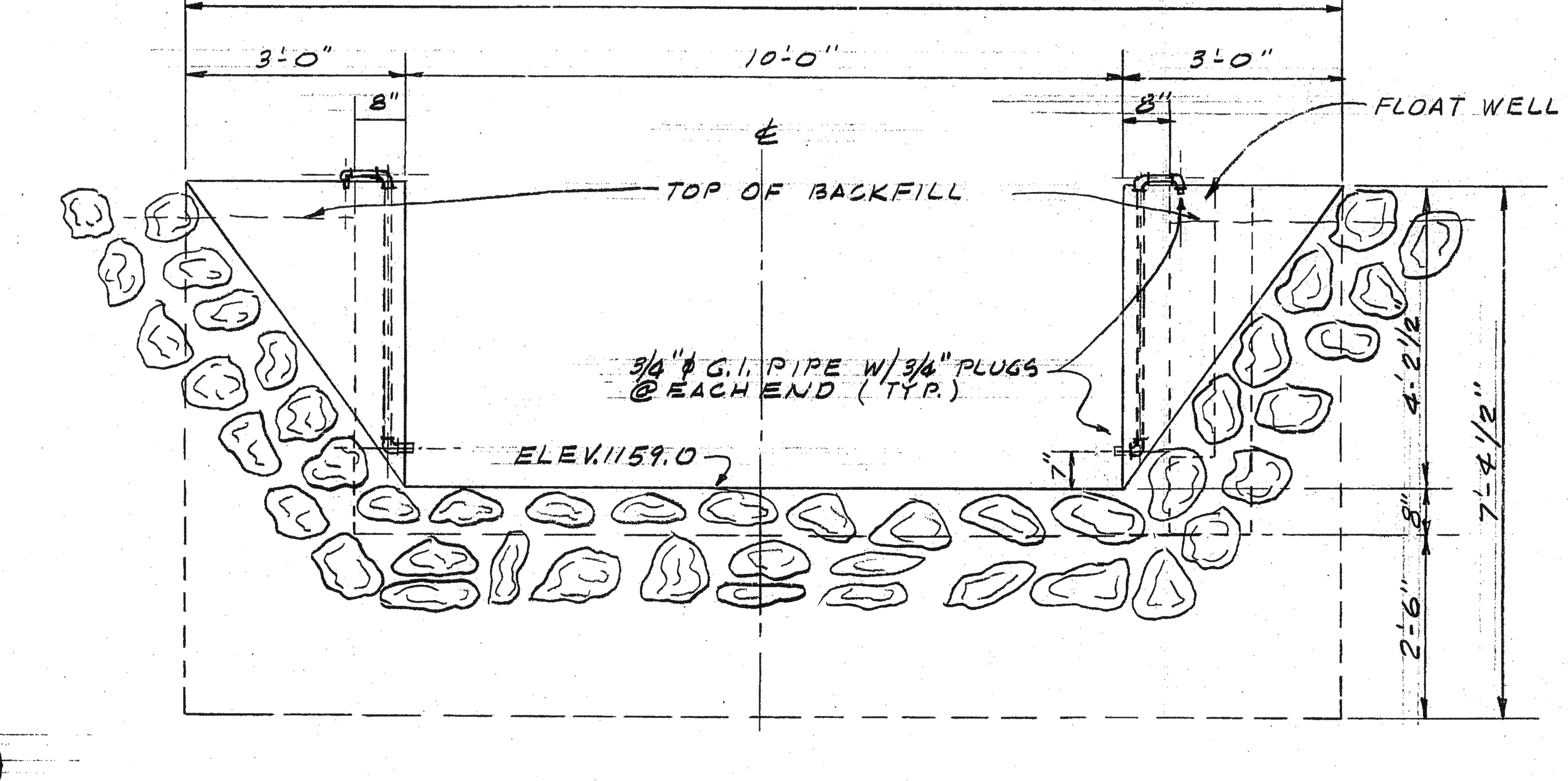

TRASH RACK
5/16" x 3" BARS @ 4" C.C.
136.0'
BASE LINE
90°
STA 47+62±
21°54' TO BE FIELD CKD.
4" DRAIN
STILLING BASIN
207.8' ±
PLAN
1/2" = 1'-0"
1'-0" MIN.
30" 10 GA. CMP
9" MIN.
3'-9" MIN.
CONC. CUTOFF COLLAR, POUR AGAINST UNDISTURBED EARTH, OR PREVIOUSLY COMPACTED EARTH FILL.
PLAN
SECTION
CONCRETE CUTOFF COLLAR DETAIL
N.T.S.
30" 10 GA. CMP
HAND COMPACTED EARTH BACKFILL COMPACTED IN LIFTS WHICH DO NOT EXCEED 4 INCHES THICK BEFORE COMPACTION. EARTH BACKFILL SHALL HAVE ALL ROCK PARTICLES LARGER THAN 2" DIA. REMOVED FROM WITHIN 6" OF PIPE. BACKFILL IS TO BE COMPACTED TO THE DENSITY SPECIFIED IN SECTION 3 OF THE SPECIAL SPECS.
3'-3" MIN.
LONGITUDINAL JOINT
4-#4 CONTINUOUS
CONC. CRADLE, POUR AGAINST UNDIST. EARTH, OR PREVIOUSLY COMPACTED EARTH FILL.
NOTE:
1. WHERE UNDISTURBED EARTH, AFTER FOUNDATION EXCAVATION IS COMPLETED, IS LOWER THAN 3'-3" ABOVE THE ℄ OF THE PIPE, COMPACTED EARTH FILL SHALL BE PLACED TO PROVIDE THE MIN. TRENCH DEPTH BEFORE TRENCH EXCAVATION IS BEGUN.
2. LONGITUDINAL JOINT OF CMP TO BE IMBEDDED IN CONCRETE.
TRENCH & BACKFILL DETAIL
N.T.S.
3/4" I.D. GALV. VENT PIPE, DRILL STEM HOUSING 3/4"ϕ HOLE
ELEV SW CORNER 1202.95
ARMCO GATE LIFT MODEL CPE #4 OR EQUAL.
TOP OF DAM ELEV. 1202.0
3/4"ϕ x 12" GALV. A.B.
2" CLR
#5 @ 9"
#5 @ 12"
#5 @ 12"
#5 @ 9"
3'-9"
1'-6"
2'-0"
2'-3"
1'-6"
5'-9"
x 4'-0" WIDE
GB12 EMBEDED 4" MIN. IN CONC. WALLS 2 REQ'D
9'-4"
8'-0"
2'-8"
ARMCO TYPE 2, CAST IRON OR EQUAL STEM GUIDE SPACED @ 10'-0" O.C.
ORIGINAL GROUND
1'-6"
2'-6"
GALV. ANCHOR BOLTS BY STEM GUIDE MFG.
TRASH RACK
4-#5 HOOPS
LOCKNUTS BOTH SIDES, 3/4" I.D. HALF CPL'G. TO STL. LINER, DRILL 3/4ϕ HOLE.
STEM GUIDE SEE DETAIL THIS SHT.
3/4" I.D. G.I. VENT PIPE
#5 x 4'-6" @ 9" O.C. (TYP.)
ELEV 65.0
WALL THIMBLE ARMCO TYPE F OR EQUAL
2'-0" MIN.
4" DRAIN
1'-0" MIN.
30" 10 GA. CMP
2'-10"
#5 x 4'-6" @ 9"
2'-6" MIN.
ELEV. 61.2
CONCRETE CRADLE SEE TRENCH & BACKFILL DETAIL THIS SHT.
30" 12 GA. SMOOTH STL. LINER (NOT CORRUGATED)
ARMCO 30"x30" SLIDE GATE MODEL 35-05 OR EQUAL.
4-#4 CONTINUOUS
JOINT BETWEEN CMP & LINER SHALL BE TIGHT & SMOOTH.
POUR AGAINST UNDISTURBED EARTH
SECTION
SLIDE GATE & OUTLET BOX.
1/2" = 1'-0"
4" DRAIN
FRONT ELEVATION
1/2" = 1'-0"
5/16 x 3" RACK BAR
TYP.
1/2ϕ SPACER ROD
3 1/2" x 3" x 1/4" ∠
STL SPLICE W/ COUNTER SUNK PINS OR RIVETS
#5 ANCHOR @ 12" C.C.
1'-6" MIN
℄ STEM GUIDE
8"
9"
3" I.D. STD. G.I. PIPE
2" STEM
1/2" A.B. (GALV.)
5" I.D. PIPE
STD CPL'G
3/8" FLANGE 1/4" WELDS
3/4" I.D. PIPE COUPLING DRILL STEM HOUSING FOR VENT, 3/4"ϕ HOLE.
3/4" I.D. GALV. PIPE UNION
STAINLESS STEEL STEM SECTION THROUGH PACKING, 6' MIN. LENGTH.
TRASH RACK & STEM GUIDE DETAILS
N.T.S.
FLAX PACKING
1" MIN.
BRONZE BUSHING
3" I.D. STD. G.I. PIPE
2" STEM
STEEL WASHERS 1/2" THICK
STD CPL'G
NOV 15 '65 AS BUILT
MAR 26 '65 ADDENDUM NO. 1
NO. DATE REVISION
BY CHK APD.
REGISTERED PROFESSIONAL ENGINEER 4484 OREGON OCT. 30, 19
ROGER W. LINDQUIST
CORNELL, HOWLAND, HAYES & MERRYFIELD
ENGINEERS & PLANNERS
SEATTLE BOISE PORTLAND CORVALLIS
CH2M
CITY OF TILLAMOOK, OREGON
WATER COMMISSION
SKOOKUM LAKE DAM
OUTLET WORKS DETAILS
OUTLET BOX & PIPE
SHEET 4 OF 5
DATE FEB. 1965
SCALE AS SHOWN
DWG C 3398-1
KILHAM STATIONERY & PRINTING CO., PORTLAND



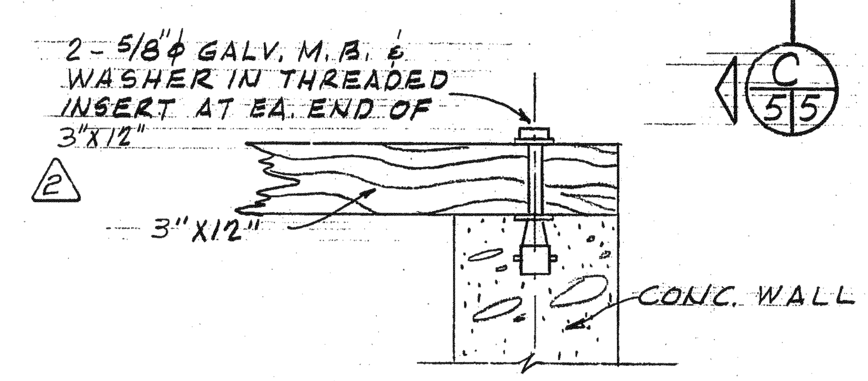
WEIR GUIDE DETAIL
N.T.S.



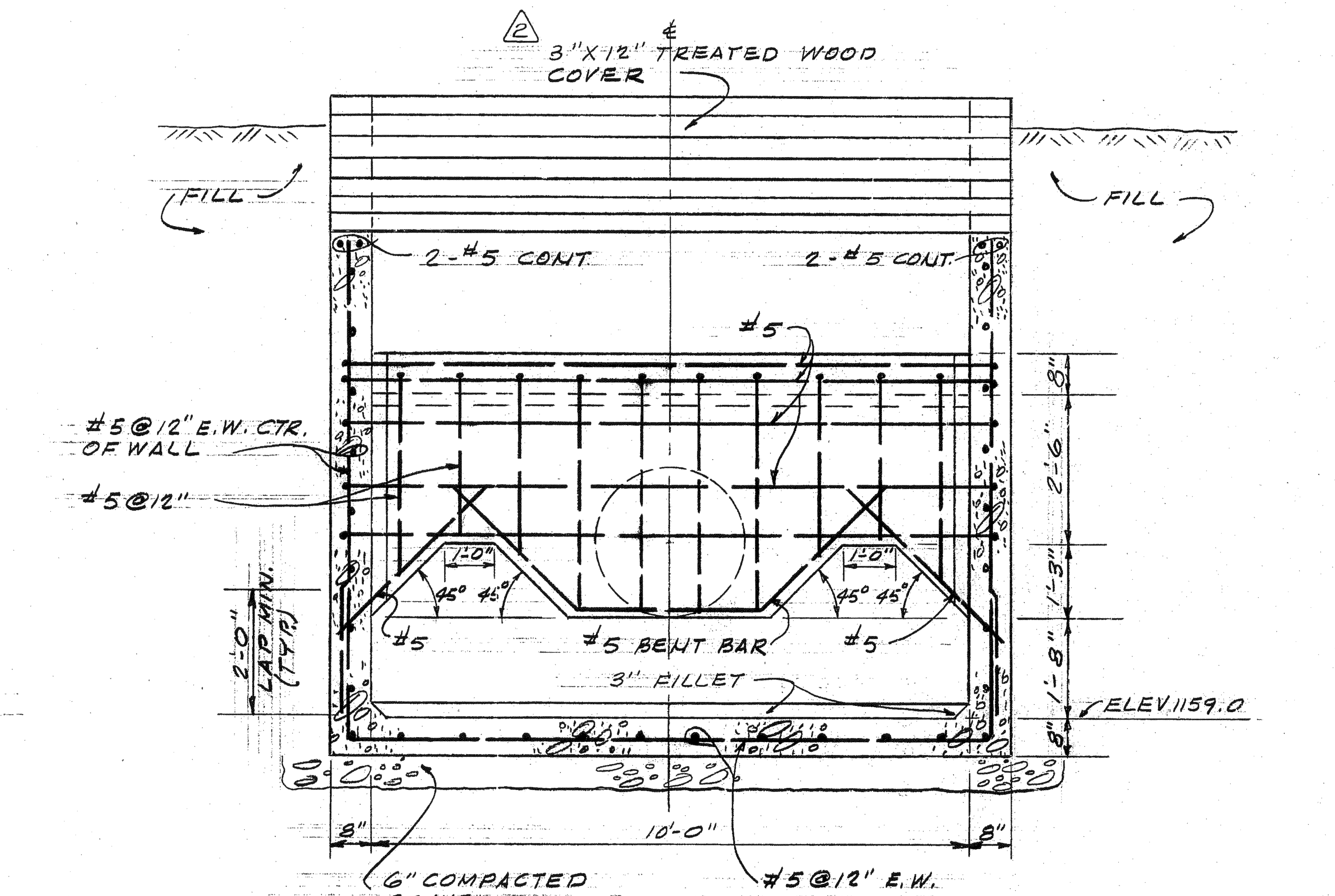
PLAN
STILLING BASIN
1/2" = 1'-0"



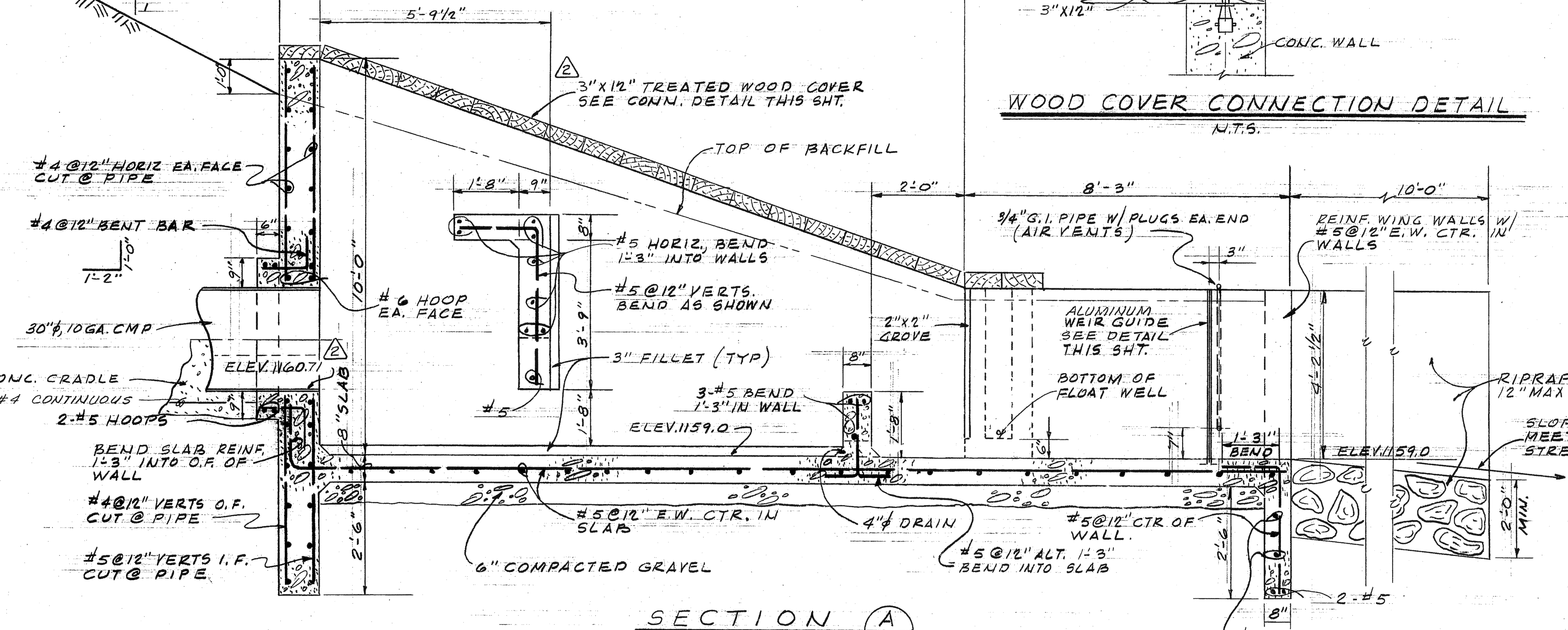
SECTION C 5/5
1/2" = 1'-0"



WOOD COVER CONNECTION DETAIL
N.T.S.



SECTION B 5/5
1/2" = 1'-0"



SECTION A 5/5
1/2" = 1'-0"

NOTE:
ALL HORIZONTAL REINFORCING CONTINUOUS AROUND CORNERS.

NO.	DATE	REVISION	BY	CK	APD
2	NOV. 15 65	AS BUILT		RWL	RWL

REGISTERED PROFESSIONAL ENGINEER 4484 OREGON OCT. 30, 1959 ROGER W. LINDQUIST

Roger W. Lindquist

CH2M
CORNELL, HOWLAND, HAYES & MERRYFIELD
ENGINEERS & PLANNERS
SEATTLE BOISE PORTLAND CORVALLIS

CITY OF TILLAMOOK, OREGON
WATER COMMISSION
SKOOKUM LAKE DAM

OUTLET WORKS DETAILS
STILLING BASIN

DES RWL
SHEET 5 OF 5
CK RWL
DATE FEB. 1965
SCALE AS SHOWN
DWG C 3398-1

SM

Permit No. [illegible]

***APPLICATION FOR PERMIT**

To Appropriate the Public Waters of the State of Oregon

I, Tillamook Water Commission, City of Tillamook
(Name of applicant)

of City Hall, Tillamook,
(Mailing address)

State of Oregon, *do hereby make application for a permit to appropriate the following described public waters of the State of Oregon, SUBJECT TO EXISTING RIGHTS:*

If the applicant is a corporation, give date and place of incorporation Tillamook, Oregon 28 February 1891

1. The source of the proposed appropriation is Skookum Lake Reservoir
(Name of stream)
constructed on Fawcett Creek, *a tributary of* Tillamook River

2. The amount of water which the applicant intends to apply to beneficial use is 700 acre-feet ~~cubic feet per second~~. (Maximum rate of use will be approx. 6.0 cfs initially and 12.0 cfs ultimately)
(If water is to be used from more than one source, give quantity from each)

***3. The use to which the water is to be applied is* municipal, domestic, and industrial water supply.
(Irrigation, power, mining, manufacturing, domestic supplies, etc.)

4. The point of diversion is located 2113.46 *ft.* N. (N. or S.) *and* 2300.67 *ft.* W. (E. or W.) *from the* S.E. *corner of* Section 19, Tp 2S, R8W, W.M. Where the water is discharged from the reservoir into Fawcett Creek during periods of low natural flow downstream, the water will be diverted from Fawcett Creek at the existing diversion structure which is described in previous permits. The outlet from the reservoir
(Section or subdivision)
(If preferable, give distance and bearing to section corner)

(If there is more than one point of diversion, each must be described. Use separate sheet if necessary)

being within the NW 1/4 of SE 1/4 (Give smallest legal subdivision) *of Sec.* 19, *Tp.* 2S (N. or S.),
R. 8W (E. or W.), *W. M., in the county of* Tillamook

5. The outlet pipe (Main ditch, canal or pipe line) *to be* 210 feet (Miles or feet)
in length, terminating in the NW 1/4 of SE 1/4 (Smallest legal subdivision) *of Sec.* 19, *Tp.* 2S (N. or S.),
R. 8W (E. or W.), *W. M., the proposed location being shown throughout on the accompanying map.*

DESCRIPTION OF WORKS

Diversion Works—

6. (a) Height of dam 40 *feet, length on top* 600 *feet, length at bottom* 50 *feet; material to be used and character of construction* homogeneous earth dam of sandy clay silt, the spillway will be around the dam through the south abutment
(Loose rock, concrete, masonry, rock and brush, timber crib, etc., wasteway over or around dam)

(b) Description of headgate One 30-inch diameter slide gate mounted in a concrete intake structure will regulate the flow through the dam outlet
(Timber, concrete, etc., number and size of openings)

(c) If water is to be pumped give general description
(Size and type of pump)

(Size and type of engine or motor to be used, total head water is to be lifted, etc.)

*A different form of application is provided where storage works are contemplated.

**Application for permits to appropriate water for the generation of electricity, with the exception of municipalities, must be made to the Hydroelectric Commission. Either of the above forms may be secured, without cost, together with instructions by addressing the State Engineer, Salem, Oregon.

30192

Canal System or Pipe Line— See Remarks.

7. *(a) Give dimensions at each point of canal where materially changed in size, stating miles from headgate. At headgate: width on top (at water line)* .... *feet; width on bottom* .... *feet; depth of water* .... *feet; grade* .... *feet fall per one thousand feet.*

(b) At .... *miles from headgate: width on top (at water line)* .... *feet; width on bottom* .... *feet; depth of water* .... *feet; grade* .... *feet fall per one thousand feet.*

(c) Length of pipe, ... *ft.; size at intake,* .... *in.; size at* .... *ft. from intake* .... *in.; size at place of use* .... *in.; difference in elevation between intake and place of use,* .... *ft. Is grade uniform?* .... *Estimated capacity,* .... *sec. ft.*

8. *Location of area to be irrigated, or place of use* Tillamook and suburban districts including areas of possible future expansion

Township North or South	Range E. or W. of Willamette Meridian	Section	Forty-acre Tract	Number Acres To Be Irrigated
1 South	9W	19, 29, 30 31, 32, 33		
1 South	10 W	24, 25, 26 34, 35, 36		
2 South	10 W	3, 13, 24		
2 South	9W	4, 5, 6, 7, 8, 9, 10,		
		16, 17, 18, 20, 21, 28		
		29		

(If more space required, attach separate sheet)

(a) Character of soil ....

(b) Kind of crops raised ....

Power or Mining Purposes—

9. *(a) Total amount of power to be developed* .... *theoretical horsepower.*

(b) Quantity of water to be used for power .... *sec. ft.*

(c) Total fall to be utilized .... (Head) *feet.*

(d) The nature of the works by means of which the power is to be developed ....

(e) Such works to be located in .... (Legal subdivision) *of Sec.* ....,

Tp. .... (No. N. or S.), *R.* .... (No. E. or W.), *W. M.*

(f) Is water to be returned to any stream? .... (Yes or No)

(g) If so, name stream and locate point of return ....

........, *Sec.* ...., *Tp.* .... (No. N. or S.), *R.* .... (No. E. or W.), *W. M.*

(h) The use to which power is to be applied is ....

(i) The nature of the mines to be served ....

Municipal or Domestic Supply—

30192

10. (a) *To supply the city of* Tillamook and suburban districts

Tillamook (Name of) *County, having a present population of* 5,000

and an estimated population of 5,500 *in 1985*

(b) *If for domestic use state number of families to be supplied*

(Answer questions 11, 12, 13, and 14 in all cases)

11. *Estimated cost of proposed works, $* 115,000

12. *Construction work will begin on or before* 1 July 1965

13. *Construction work will be completed on or before* 15 November 1965

14. *The water will be completely applied to the proposed use on or before* 1 July 1966

I. E. Sarin
(Signature of applicant)
President, Tillamook Water Commission

Remarks: The water from Skookum Lake Reservoir will be released during the summer and fall to supplement the normal creek flow. The water will flow down the Fawcett Creek about 3.3 miles where it will be picked up by the existing diversion structure. A map of the existing distribution system and the service area has been previously filed.

STATE OF OREGON, }
County of Marion, } ss.

This is to certify that I have examined the foregoing application, together with the accompanying maps and data, and return the same for

In order to retain its priority, this application must be returned to the State Engineer, with corrections on or before ...., *19*....

WITNESS *my hand this* .... *day of* ...., *19*....

STATE ENGINEER

By ....
ASSISTANT

PERMIT

STATE OF OREGON,
County of Marion, } *ss.*

This is to certify that I have examined the foregoing application and do hereby grant the same, SUBJECT TO EXISTING RIGHTS and the following limitations and conditions:

The right herein granted is limited to the amount of water which can be applied to beneficial use and shall not exceed 700.0 acre feet stored water only ~~cubic feet per second~~ *measured at the point of diversion from the stream, or its equivalent in case of rotation with other water users, from* Skookum Lake Reservoir to be constructed under application No. R-40641, permit No. R-4532

The use to which this water is to be applied is municipal

If for irrigation, this appropriation shall be limited to - - - - - ~~of one cubic foot per~~ *second or its equivalent for each acre irrigated*

and shall be subject to such reasonable rotation system as may be ordered by the proper state officer.

The priority date of this permit is February 25, 1965

Actual construction work shall begin on or before April 16, 1966 *and shall thereafter be prosecuted with reasonable diligence and be completed on or before October 1, 19*67.

*Complete application of the water to the proposed use shall be made on or before October 1, 19*68.

WITNESS my hand this 16th *day of* April, *19*65

Chris L. Wheeler
STATE ENGINEER

Application No. 40642
Permit No. 30192

PERMIT
TO APPROPRIATE THE PUBLIC WATERS OF THE STATE OF OREGON

This instrument was first received in the office of the State Engineer at Salem, Oregon, on the 25th *day of* February, 1965, *at* 8:00 *o'clock* A. *M.*

Returned to applicant:

Approved: April 16, 1965

Recorded in book No. ___ *of Permits on page* 30192

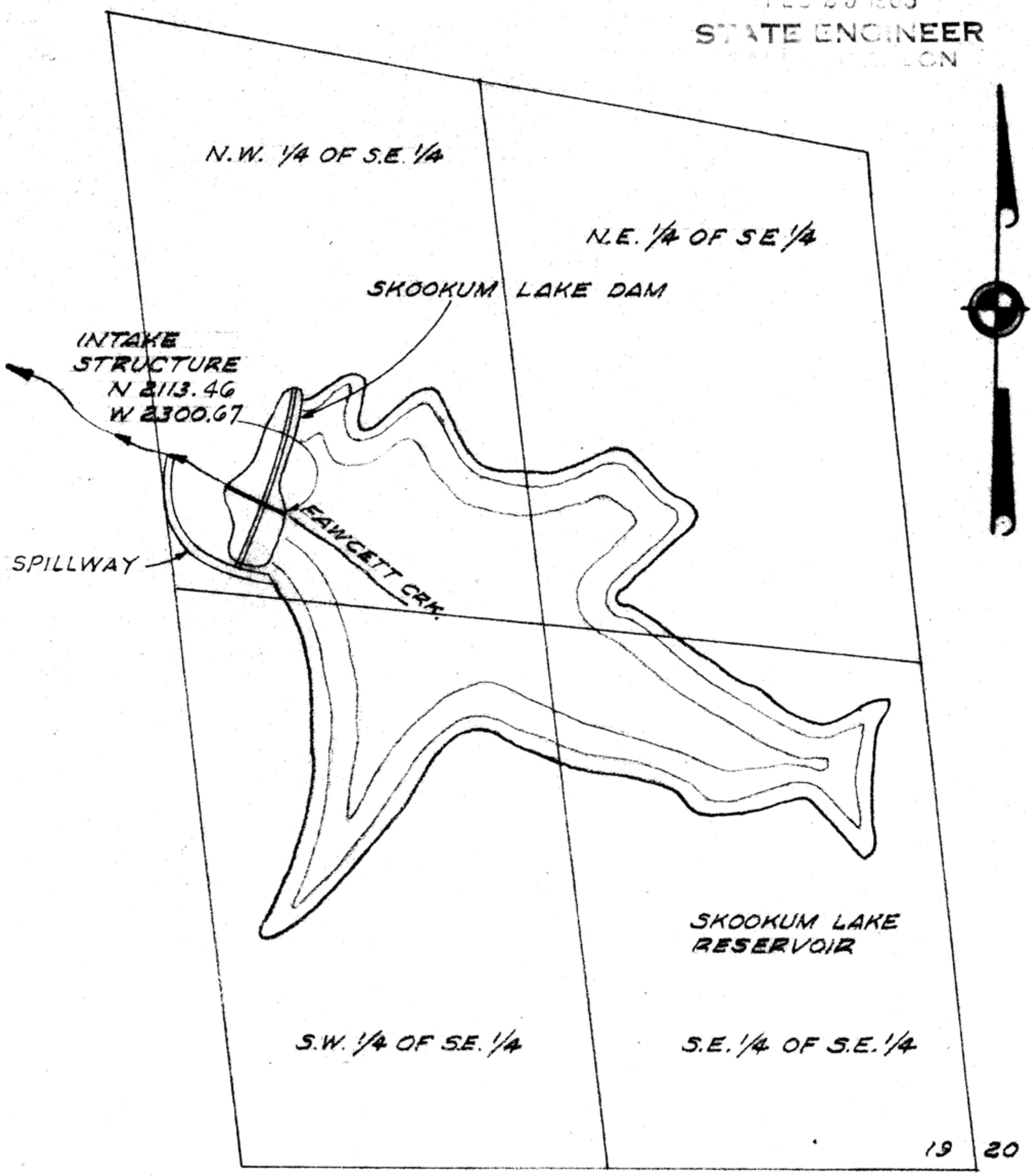
CHRIS L. WHEELER, STATE ENGINEER

Drainage Basin No. 1 *page* 18A

Fees ___

State Printing 98137

RECEIVED
FEB 25 1965
STATE ENGINEER
...ON



TOWNSHIP 2 SOUTH
RANGE 8 WEST

1" = 500'

N = 00
W = 00

MAP TO ACCOMPANY APPLICATION
FOR PERMIT TO APPROPRIATE
STORED WATER FROM SKOOKUM
LAKE RESERVOIR.

Application No. R-40641, 40642
Permit No. R-4532, 30192

CORNELL, HOWLAND, HAYES & MERRYFIELD
SEATTLE PORTLAND CORVALLIS BOISE

CH2M

C3398.1

SM—

RECEIVED
AUG 22 1975
WATER RESOURCES DEPT. APPLICATION FOR PERMIT
SALEM, OREGON

Permit No. 41438

To Appropriate the Public Waters of the State of Oregon

I, Tillamook Water Commission (Name of applicant)

of City Hall (Mailing address), Tillamook (City),

State of Oregon, 97141 (Zip Code), do hereby make application for a permit to appropriate the following described public waters of the State of Oregon, SUBJECT TO EXISTING RIGHTS:

If the applicant is a corporation, give date and place of incorporation

N/A

1. The source of the proposed appropriation is Simmons Creek (Name of stream), a tributary of Tillamook River

2. The amount of water which the applicant intends to apply to beneficial use is 2.0 cubic feet per second (If water is to be used from more than one source, give quantity from each)

3. The use to which the water is to be applied is ~~Quasi~~-Municipal (Irrigation, power, mining, manufacturing, domestic supplies, etc.)

4. The point of diversion is located 2288 ft. S (N. or S.) and 3344 ft. E (E. or W.) from the NW corner of Section 27 (Section or subdivision)

(If preferable, give distance and bearing to section corner)

(If there is more than one point of diversion, each must be described. Use separate sheet if necessary)

being within the SW 1/4 of NE 1/4 (Give smallest legal subdivision) of Sec. 27, Tp. 2S (N. or S.), R. 9W (E. or W.), W. M., in the county of Tillamook

5. The Pipe Line (Main ditch, canal or pipe line) to be 2.0 miles (Miles or feet) in length, terminating in the NW 1/4 of NW 1/4 (Smallest legal subdivision) of Sec. 22, Tp. 2S (N. or S.), R. 9W (E. or W.), W. M., the proposed location being shown throughout on the accompanying map.

DESCRIPTION OF WORKS

Diversion Works—

6. (a) Height of dam 3 feet, length on top 20 feet, length at bottom 15 feet; material to be used and character of construction timber crib w/concrete sidewall and foundation (Loose rock, concrete, masonry, rock and brush, timber crib, etc., wasteway over or around dam)

(b) Description of headgate Timber crib w/concrete foundation and sidewalls (Timber, concrete, etc., number and size of openings)

(c) If water is to be pumped give general description N/A (Size and type of pump)

(Size and type of engine or motor to be used, total head water is to be lifted, etc.)

* A different form of application is provided where storage works are contemplated. Such forms can be secured without charge, together with instructions, by addressing the State Engineer, Salem, Oregon 97310.

3444

Canal System or Pipe Line—

7. *(a) Give dimensions at each point of canal where materially changed in size, stating miles from headgate. At headgate: width on top (at water line)* .... *feet; width on bottom* .... *feet; depth of water* .... *feet; grade* .... *feet fall per one thousand feet.*

(b) At .... *miles from headgate: width on top (at water line)* .... *feet; width on bottom* .... *feet; depth of water* .... *feet; grade* .... *feet fall per one thousand feet.*

(c) Length of pipe, 10,560 *ft.; size at intake,* 10 *in.; size at* .... *ft. from intake* -- *in.; size at place of use* 10 *in.; difference in elevation between intake and place of use,* 60 *ft. Is grade uniform?* No *Estimated capacity,* 2.23 *sec. ft.*

8. *Location of area to be irrigated, or place of use* ALSO SEE ATTACHED SHEETS

Township North or South	Range E. or W. of Willamette Meridian	Section	PART OF SECTION Forty-acre Tract	USER Number Acres To Be Irrigated
T. 1 S.	R. 10 W.	13	S 1/2	Wilson River W. D.
T. 1 S.	R. 10 W.	14	S 1/2	Wilson River W. D.
T. 1 S.	R. 10 W.	22	NE 1/4	Wilson River W.D.
T. 1 S.	R. 10 W.	23	All except SW 1/4	Wilson River W.D.
T. 1 S.	R. 10 W.	24	All	Wilson River W.D.
T. 1 S.	R. 10 W.	25	All	City of Tillamook
T. 1 S.	R. 10 W.	26	All except NW 1/4	West Hills W.D.
T. 1 S.	R. 10 W.	34	S 1/2	West Hills W. D.
T. 1 S.	R. 10 W.	35	All	West Hills W. D.
T. 1 S.	R. 10 W.	36	All	Rodgers Water Assoc.
T. 1 S.	R. 9 W.	16	SW 1/4	Wilson River W. D.
T. 1 S.	R. 9 W.	17	SE 1/4	Wilson River W. D.

(If more space required, attach separate sheet) PLEASE SEE ATTACHED SHEETS

(a) Character of soil N/A

(b) Kind of crops raised N/A

Power or Mining Purposes—

9. *(a) Total amount of power to be developed* N/A *theoretical horsepower.*

(b) Quantity of water to be used for power N/A *sec. ft.*

(c) Total fall to be utilized N/A (Head) *feet.*

(d) The nature of the works by means of which the power is to be developed N/A

(e) Such works to be located in N/A (Legal subdivision) *of Sec.* ...., *Tp.* .... (No. N. or S.), *R.* .... (No. E. or W.), *W. M.*

(f) Is water to be returned to any stream? N/A (Yes or No)

(g) If so, name stream and locate point of return N/A

...................., *Sec.* ...., *Tp.* .... (No. N. or S.), *R.* .... (No. E. or W.), *W. M.*

(h) The use to which power is to be applied is N/A

(i) The nature of the mines to be served N/A

Permit # 44438

TOWNSHIP	RANGE	SECTION	PART OF SECTION	USER
T. 1 S.	R. 9 W.	18	SW 1/4	Wilson River W. D.
T. 1 S.	R. 9 W.	19	All	Wilson River W. D.
T. 1 S.	R. 9 W.	20	All	Fairview W. D.
T. 1 S.	R. 9 W.	21	All	Fairview W. D.
T. 1 S.	R. 9 W.	22	S 1/2	Fairview W. D.
T. 1 S.	R. 9 W.	23	S 1/2	Fairview W. D.
T. 1 S.	R. 9 W.	26	All	Fairview W. D.
T. 1 S.	R. 9 W.	27	All	Fairview W. D.
T. 1 S.	R. 9 W.	28	All	Fairview W. D.
T. 1 S.	R. 9 W.	29	All	Fairview W. D.
T. 1 S.	R. 9 W.	30	All	City of Tillamook
T. 1 S.	R. 9 W.	31	All	City of Tillamook
T. 1 S.	R. 9 W.	32	All	City of Tillamook
T. 1 S.	R. 9 W.	33	All	City of Tillamook
T. 1 S.	R. 9 W.	34	W 1/2	Fairview W. D.
T. 2 S.	R. 9 W.	2	NW 1/4	Long Prairie W. D.
T. 2 S.	R. 9 W.	3	All	Long Prairie W. D.
T. 2 S.	R. 9 W.	4	All	Long Prairie W. D.
T. 2 S.	R. 9 W.	5	All	Long Prairie W. D.
T. 2 S.	R. 9 W.	6	All	City of Tillamook
T. 2 S.	R. 9 W.	7	All except SW 1/4	South Prairie W. D.
T. 2 S.	R. 9 W.	8	All	Port of Tillamook Bay

RECEIVED
MAR 1 1977
WATER RESOURCES DEPT
SALEM, OREGON

Application # 53575
Permit # 41435

TOWNSHIP	RANGE	SECTION	PART OF SECTION	USER
T. 2 S.	R. 9 W.	9	All	Port of Tillamook Bay
T. 2 S.	R. 9 W.	10	W 1/2 NE 1/4	Long Prairie W. D.
T. 2 S.	R. 9 W.	15	NW 1/4	Long Prairie W. D.
T. 2 S.	R. 9 W.	16	All	Pleasant Valley W. D.
T. 2 S.	R. 9 W.	17	N 1/2	South Prairie W. D.
T. 2 S.	R. 9 W.	18	All except NW 1/4	South Prairie W. D.
T. 2 S.	R. 9 W.	19	Part of NW 1/4	South Prairie W. D.
T. 2 S.	R. 9 W.	20	E 1/2	Pleasant Valley W. D.
T. 2 S.	R. 9 W.	21	All except SE 1/4	Pleasant Valley W. D.
T. 2 S.	R. 9 W.	22	W 1/2	Pleasant Valley W. D.
T. 2 S.	R. 9 W.	28	W 1/2	Pleasant Valley W. D.
T. 2 S.	R. 9 W.	29	E 1/2	Pleasant Valley W. D.
T. 2 S.	R. 9 W.	32	NE 1/4	Pleasant Valley W. D.
T. 2 S.	R. 9 W.	33	NW 1/4	Pleasant Valley W. D.
T. 2 S.	R. 10 W.	1	All except SW 1/4	
T. 2 S.	R. 10 W.	12	Part of NE 1/4	
T. 2 S.	R. 10 W.	13	Part of SE 1/4	South Prairie W. D.
T. 2 S.	R. 10 W.	24	Part of NE 1/4	South Prairie W. D.
T 2 S.	R. 10 W.	2	Part of NE 1/4	

Municipal or Domestic Supply— 41438

10. *(a) To supply the city of* Tillamook and surrounding area,

Tillamook (Name of) *County, having a present population of* 5,269 (area wide)

and an estimated population of 7,450 *in 19* 75.

(b) If for domestic use state number of families to be supplied

(Answer questions 11, 12, 13, and 14 in all cases)

11. *Estimated cost of proposed works, $* 335,000

12. *Construction work will begin on or before* 1980

13. *Construction work will be completed on or before* 1981

14. *The water will be completely applied to the proposed use on or before*

See Below

x [signature] (Signature of applicant)

Remarks: The intent of this application is to reserve for future quasi-municipal use all water in Simmons Creek except those waters with prior appropriated rights.

WATER RESOURCES DEPT SALEM, OREGON

STATE OF OREGON, }
County of Marion, } *ss.*

This is to certify that I have examined the foregoing application, together with the accompanying maps and data, and return the same for correction and completion.

In order to retain its priority, this application must be returned to the State Engineer, with corrections on or before ~~April 11, 19 77~~
~~May 10 77~~
June 6, 1977

WITNESS my hand this ~~16th~~ *day of* ~~February~~, *19* ~~77~~.
~~10th March 77~~
6th day of April 1977

JAMES E. SEXSON
Director ~~STATE ENGINEER~~

By [signature] ~~Assistant~~
Vestal R. Garner

PERMIT

STATE OF OREGON, } ss.
County of Marion, }

41438

This is to certify that I have examined the foregoing application and do hereby grant the same, SUBJECT TO EXISTING RIGHTS and the following limitations and conditions:

The right herein granted is limited to the amount of water which can be applied to beneficial use and shall not exceed 2.0 *cubic feet per second measured at the point of diversion from the stream, or its equivalent in case of rotation with other water users, from* Simmons Creek

The use to which this water is to be applied is municipal purposes

If for irrigation, this appropriation shall be limited to .... *of one cubic foot per second or its equivalent for each acre irrigated*

and shall be subject to such reasonable rotation system as may be ordered by the proper state officer.

The priority date of this permit is August 22, 1975

Actual construction work shall begin on or before April 27, 1978 (Extended to Oct. 1 1980) *and shall thereafter be prosecuted with reasonable diligence and be completed on or before October 1, 19*78. (Extended to Oct. 1 1980) 10-1-94

*Complete application of the water to the proposed use shall be made on or before October 1, 19*79. (Extended to Oct. 1 1980) 10-1-94

WITNESS my hand this 27th *day of* April *19*77.

James E. Sexson
WATER RESOURCES DIRECTOR

Ext. BCOD 2X3

Application No. 53575

Permit No. 41438

PERMIT

TO APPROPRIATE THE PUBLIC WATERS OF THE STATE OF OREGON

This instrument was first received in the office of the State Engineer at Salem, Oregon, on the 22 *day of* August, *19*75, *at* 8 *o'clock* A *M.*

Returned to applicant:

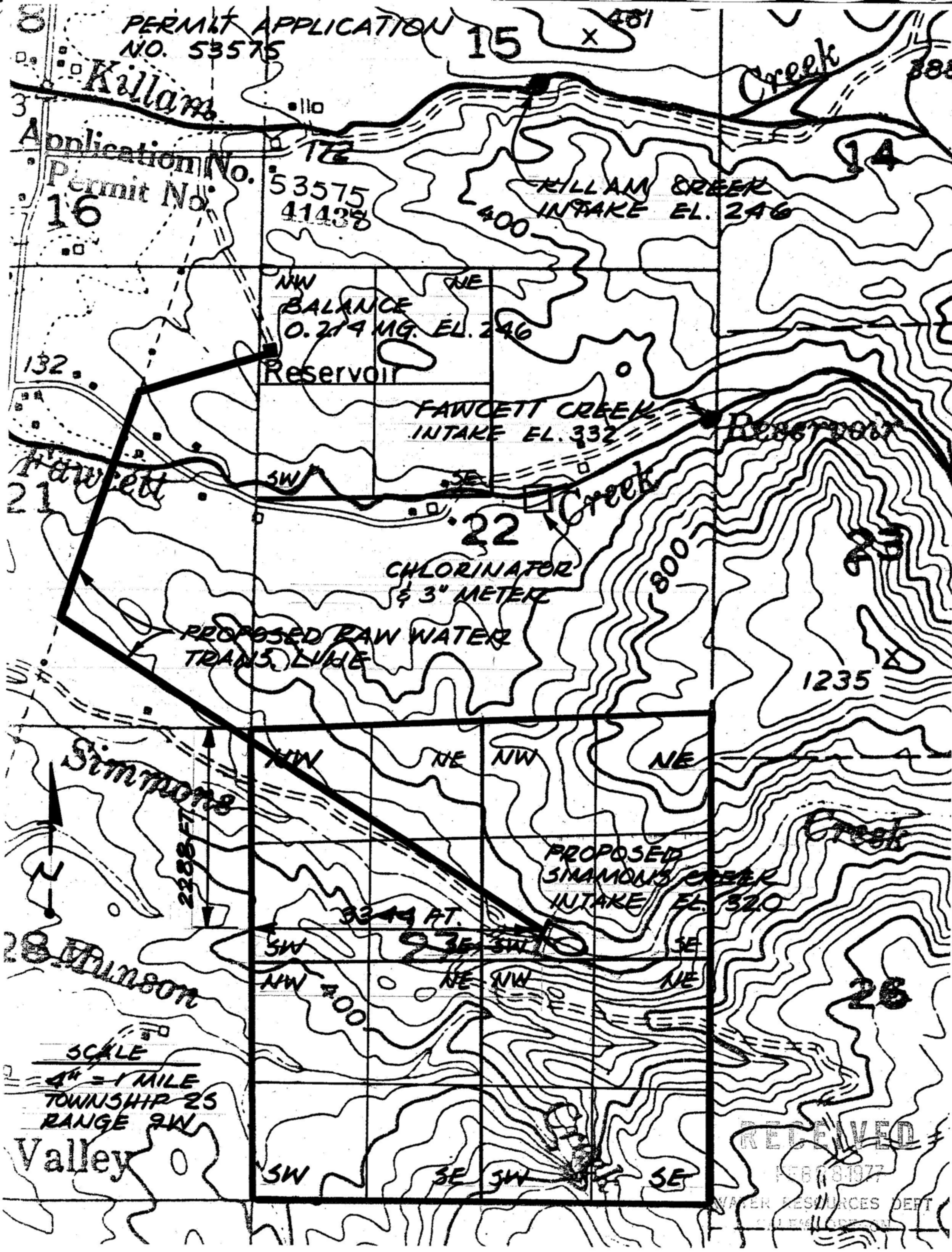
Approved:

Recorded in book No. .... *of Permits on page* 41438

STATE ENGINEER

Drainage Basin No. 1 *page* 188

Fees 37 ºº


PERMIT APPLICATION
NO. 53575
Killam
Creek
Application No.
Permit No.
53575
41438
15
14
16
KILLAM CREEK
INTAKE EL. 246
400
NW
NE
BALANCE
0.214 MG. EL. 246
Reservoir
132
FAWCETT CREEK
INTAKE EL. 332
Reservoir
Fawcett
Creek
21
SW
SE
22
CHLORINATOR
& 3" METER
800
1235
PROPOSED RAW WATER
TRANS. LINE
Simmons
Creek
2288 FT.
PROPOSED
SIMMONS CREEK
INTAKE EL. 320
3344 FT.
27
28
Munson
700
26
SCALE
4" = 1 MILE
TOWNSHIP 2S
RANGE 9W
Valley
RECEIVED
FEB 08 1977
WATER RESOURCES DEPT

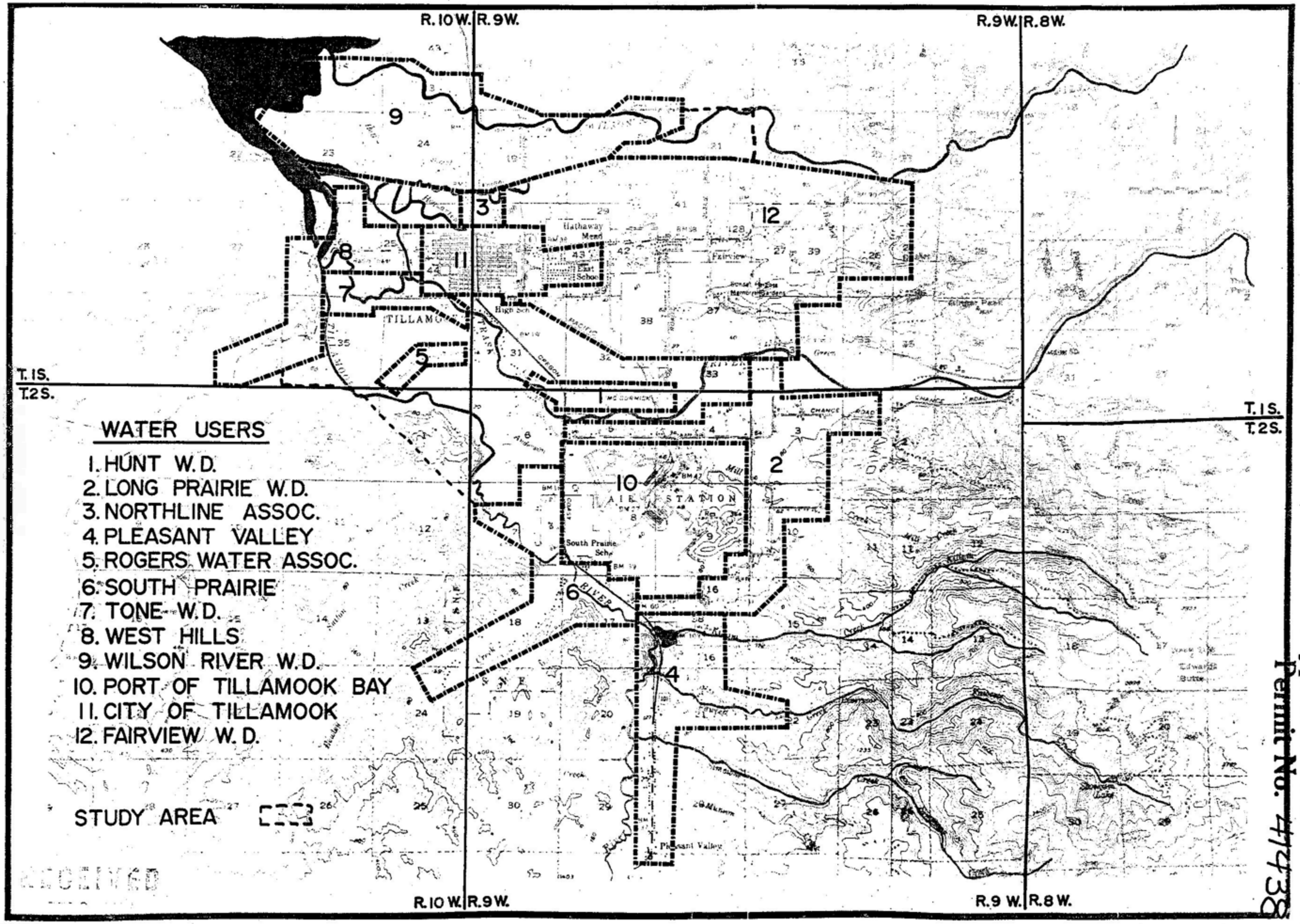


PLATE I

STUDY AREA

HGE ENGINEERS & PLANNERS
PORTLAND, OREGON / 520 OREGON PIONEER BUILDING 97204

Application No. 53575
Permit No. 41438

STATE OF OREGON

TILLAMOOK COUNTY

PERMIT TO APPROPRIATE THE PUBLIC WATERS

This is to certify that I have examined APPLICATION G-10574 and do hereby grant the same SUBJECT TO EXISTING RIGHTS and the following limitations and conditions:

This permit is issued to Tillamook Water Commission of 1902 Third Street, Tillamook, Oregon 97141, phone 842-2463, for the use of the waters of one well, for the PURPOSE of municipal use; that the PRIORITY OF THE RIGHT dates from July 14, 1982, and is limited to the amount of water which can be applied to beneficial use and shall not exceed 2.7 cubic feet per second measured at the point of diversion from the well, or its equivalent in case of rotation with other water users.

The well is to be LOCATED: 1,210 feet North and 660 feet East from the Southwest Corner of Section 29, being within the SW 1/4 SW 1/4 of Section 29, Township 1 South, Range 9 West, WM, in the County of Tillamook.

A description of the PLACE OF USE under the permit, and to which such right is appurtenant, is as follows:

C 8858

Township 1 South	Range 9 West, WM	Section 19	All		Municipal Use
		Section 20	All		
		Section 21	All		
		Section 22	All		
		Section 26	W 1/2	All	
		Section 27	All		
		Section 28	All		
		Section 29	All		
		Section 30	All		
		Section 31	All		
		Section 32	All		
		Section 33	All		
		Section 34	All		
	Range 10 West, WM	Section 23	All		
		Section 24	All		
		Section 25	All		
		Section 26	All		
		Section 34	All		
		Section 35	All		
		Section 36	All		
Township 2 South	Range 9 West, WM	Section 3	All		
		Section 4	All		
		Section 5	All		
		Section 6	All		
		Section 7	All		
		Section 8	All		
		Section 9	All		
		Section 10	All		
		Section 15	All		
		Section 16	All		
		Section 17	All		
		Section 18	All		
		Section 20	All		
		Section 21	All		

Township 2 South Range 9 West, WM Section 22 All
Section 28 All
Section 29 All

Township 2 South Range 10 West, WM Section 1 All
Section 13 All
Section 24 All

Township 2 South	Range 9 West, WM	Section 22	All
		Section 28	All
		Section 29	All
Township 2 South	Range 10 West, WM	Section 1	All
		Section 13	All
		Section 24	All

The well shall be constructed in accordance with the General Standards for the Construction and Maintenance of Water Wells in Oregon.

The works constructed shall include an air line and pressure gauge or an access port for measuring line, adequate to determine water level elevation in the well at all times.

The permittee shall install and maintain a weir, meter, or other suitable measuring device, and shall keep a complete record of the amount of ground water withdrawn.

Actual construction work shall begin on or before August 31, 1983 and shall thereafter be prosecuted with reasonable diligence and be completed on or before October 1, 1983. Extended to October 1, 1989 extended to 10-1-94, 10-1-99

Complete application of the water to the proposed use shall be made on or before October 1, 1984. Extended to October 1, 1989, extended to 10-1-94, 10-1-99

WITNESS my hand this 31st day of August, 1982.

/s/ JAMES E. SEXSON

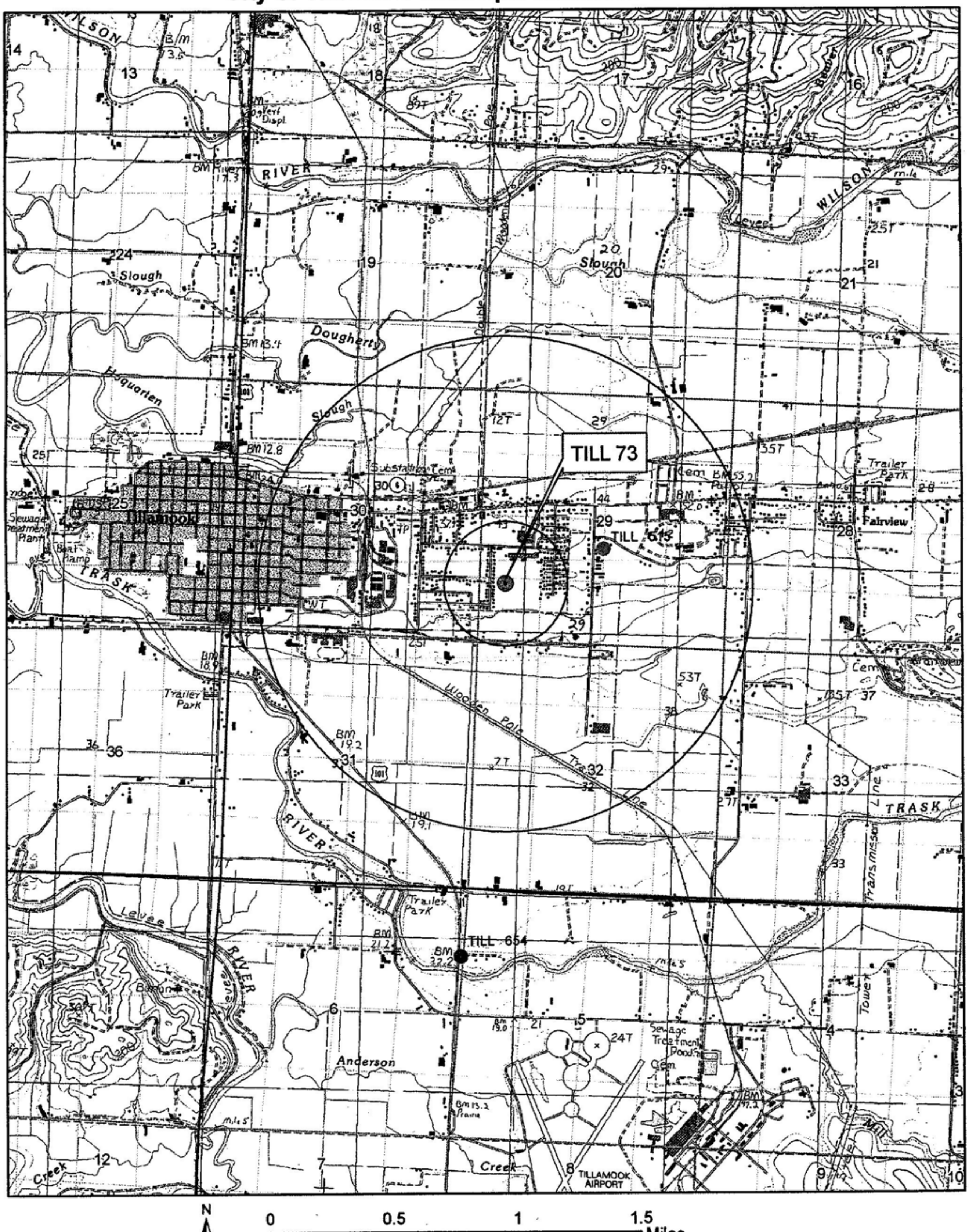
WATER RESOURCES DIRECTOR

APPLICATION G-10574 PERMIT G 9829

File G10574 continued Date 01/06/2010

Well Location Map

City of Tillamook Municipal Extention G 10574



BEFORE THE WATER RESOURCES DIRECTOR OF OREGON

IN THE MATTER OF THE)
REINSTATEMENT OF PERMIT G-9829) ORDER

The following Permittee has requested reconsideration of the December 3, 2007, order canceling their permit. The request for reconsideration was submitted within the timeline provided by the order.

PERMITS TO USE GROUNDWATER:

NAME	**BASIN #**	**WM #**	**FILE #**	**PERMIT #**
Tillamook Water Commission	1	1	G-10574	G-9829

NOW, THEREFORE, it is hereby ORDERED that the permit is reinstated in accordance with the provisions of ORS 537.260.

The Department will take no action to cancel this permit until April 5, 2008, to allow the permittee to come into compliance with the terms and conditions of the permit.

Dated at Salem, Oregon on December 7, 2007.

E. Timothy Wallin

E. Timothy Wallin, Water Rights Program Manager, *for*
Phillip C. Ward, Director

PLACED IN U.S. MAIL DEC 07 2007
BY OREGON WATER RESOURCES DEPARTMENT

This is a final order in other than contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review must be filed within the 60-day time period specified by ORS 183.484(2). Pursuant to ORS 536.075 and OAR 137-004-0080, you may either petition for judicial review or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date, the petition was filed, the petition shall be deemed denied.

Oregon Water Resources Department
Water Right Services Division

Water Rights Application
Number G-10574

Final Order
Extension of Time for Permit Number G-9829
Permit Holder: City of Tillamook

Permit Information
<u>Application File G-10574/ Permit G-9829</u>
Basin 1 – North Coast Basin / Watermaster District 1
Date of Priority: July 14, 1982

<u>Authorized Use of Water</u>

Source of Water:	One Well within the Trask River Basin
Purpose or Use:	Municipal
Maximum Rate:	2.7 Cubic Feet per Second (CFS)

This Extension of Time request is being processed in accordance with Oregon Revised Statute 537.630 and 539.010(5), and Oregon Administrative Rule Chapter 690, Division 315

<u>Appeal Rights</u>

This is a final order in other than a contested case. This order is subject to judicial review under ORS 183.484. A request for judicial review must be filed within the 60 day time period specified by ORS 183.484(2). Pursuant to ORS 536.075 and OAR 137-004-0080 you may either file for judicial review, or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied.

<u>Application History</u>

Permit G-9829 was issued by the Department on August 31, 1982. The permit called for completion of construction by October 1, 1983, and complete application of water to beneficial use by October 1, 1984. The most recent extension authorized completion of construction and complete application of water to beneficial use by October 1, 1999. On September 22, 2009, the City of Tillamook submitted an application to the Department for an extension of time for

Permit G-9829. In accordance with OAR 690-315-0050(2), on September 23, 2014, the Department issued a Proposed Final Order proposing to extend the time to complete construction to October 1, 2040 and to extend the time to fully apply water to beneficial use to October 1, 2040. The protest period closed November 7, 2014, in accordance with OAR 690-315-0060(1). No protest was filed.

FINDINGS OF FACT

The Department adopts and incorporates by reference the findings of fact in the Proposed Final Order dated September 23, 2014.

At time of issuance of the Proposed Final Order the Department concluded that, based on the factors demonstrated by the applicant, the permit may be extended subject to the following conditions:

CONDITIONS

1. Municipal Use Extension Condition

The use of any water beyond 1.60 cfs under Permit G-9829 is subject to this Municipal Use Extension Condition.

The water user shall develop a plan to monitor and report the impact of water use under Permit G-9829 on water levels within the aquifer that provides water to the permitted wells. The plan shall be submitted to the Department within one year of the date the Extension Order is issued and shall be subject to the approval of the Department. At a minimum, the plan shall include a program to periodically measure static water levels within the permitted wells or and adequate substitute such as water levels in nearby wells.

2. Development Limitations

Appropriation of any water beyond 1.60 cfs up to 2.7 cfs under Permit G-9829 shall only be authorized upon issuance of a final order approving a Water Management and Conservation Plan (WMCP) under OAR Chapter 690, Division 86 that authorizes access to a greater rate of appropriation of water under the permit consistent with OAR 690-086-0130(7). The required WMCP shall be submitted to the Department within 3 years of this Final Order. The amount of water used under Permit G-9829 must be consistent with this and subsequent WMCP's approved under OAR Chapter 690, Division 86 on file with the Department.

The deadline established in this Extension Final Order for submittal of a WMCP shall not relieve a permit holder of any existing or future requirement for submittal of a WMCP at an earlier date as established through other orders of the Department. A WMCP submitted to meet the requirements of this final order may also meet the WMCP submittal requirements of other Department orders.

CONCLUSION OF LAW

The applicant has demonstrated good cause for the permit extension pursuant to ORS 537.630, 539.010(5) and OAR 690-315-0080(3).

ORDER

The extension of time for Application G-10574, Permit G-9829, therefore, is approved subject to conditions contained herein. The deadline for completing construction is extended from October 1, 1999 to October 1, 2040. The deadline for applying water to full beneficial use within the terms and conditions of the permit is extended from October 1, 1999 to October 1, 2040.

November 14, 2014

Dwight French
Water Right Services Division Administrator, for
Thomas M. Byler Director,
Oregon Water Resources Department

If you have any questions about statements contained in this document, please contact Ann Reece at (503) 986-0834.

If you have other questions about the Department or any of its programs, please contact our Water Resources Customer Service Group at (503) 986-0900.

STATE OF OREGON

COUNTY OF TILLAMOOK

PERMIT TO APPROPRIATE THE PUBLIC WATERS

THIS PERMIT IS HEREBY ISSUED TO

TILLAMOOK WATER COMMISSION
PO BOX 99
TILLAMOOK, OREGON 97141 503-842-2343

to use the waters of A WELL in the TRASK RIVER BASIN for MUNICIPAL USE.

This permit is issued approving Application G-12443. The dates of priority are MARCH 8, 1991 for 2.0 CUBIC FEET PER SECOND (CFS) and JULY 15, 1992 for 0.23 CFS. The use is limited to not more than 2.23 CFS, or its equivalent in case of rotation, measured at the well.

The well is located as follows:

NE 1/4 SE 1/4, SECTION 30, T 1 S, R 9 W, W.M.; 3296 FEET SOUTH AND 82 FEET WEST FROM THE NE CORNER OF SECTION 30.

The use shall conform to such reasonable rotation system as may be ordered by the proper state officer.

A description of the proposed place of use under this permit is as follows:

TILLAMOOK WATER COMMISSION
SERVICE AREA

The well shall be constructed in accordance with the General Standards for the Construction and Maintenance of Water Wells in Oregon. The works shall be equipped with a usable access port, and may also include an air line and pressure gauge adequate to determine water level elevation in the well at all times.

Measurement, recording and reporting conditions:

A. Before water use may begin under this permit, the permittee shall install a meter or other suitable measuring device as approved by the Director. The permittee shall maintain the meter or measuring device in good working order, shall keep a complete record of the amount of water used each month and shall submit a report which includes the recorded water use measurements to the Department annually or more frequently as may be required by the Director. Further, the Director may require the permittee to report general water use information, including the place and nature of use of water under the permit.

B. The permittee shall allow the watermaster access to the meter or measuring device; provided however, where the meter or measuring device is located within a private structure, the watermaster shall request access upon reasonable notice.

Prior to receiving a certificate of water right, the permit holder shall submit the results of a pump test meeting the department's standards, to the Water Resources Department. The Director may require water level or pump test results every ten years thereafter.

Actual construction work shall begin on or before July 25, 1995 and shall be completed on or before October 1, 1996. Complete application of water shall be made on or before October 1, 1997.

Failure to comply with any of the provisions of this permit may result in action including, but not limited to, restrictions on the use, civil penalties, or cancellation of the permit.

This permit is for beneficial use of water without waste. The water user is advised that new regulations may require use of best practical technologies or conservation practices to achieve this end.

By law, the land use associated with this water use must be in compliance with statewide land-use goals and any local acknowledged land-use plan.

The use of water shall be limited when it interferes with any prior surface or ground water rights.

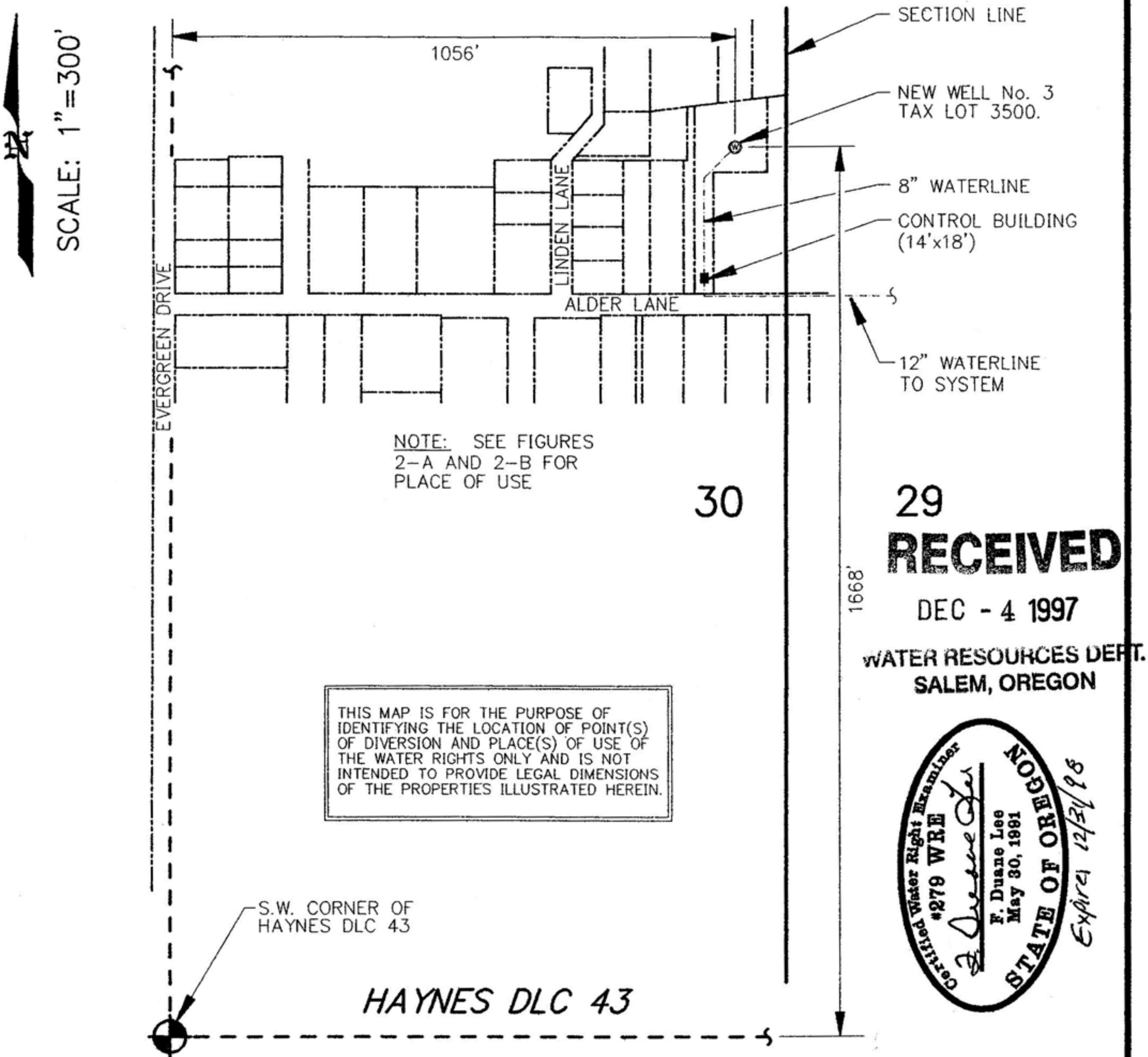
The Director of the Water Resources Department has found that the proposed use of water described by this permit, as conditioned, will not impair or be detrimental to the public interest.

Issued this date, July 25, 1994.

/s/ A. REED MARBUT

Water Resources Department
for Martha O. Pagel
Director

T.1S., R.9W., W.M.
SECTION 30



FINAL PROOF SURVEY

UNDER

APPLICATION No. G–12443 PERMIT No. G–11784

IN NAME OF

TILLAMOOK WATER COMMISSION

SURVEYED NOV , 1994 BY F. DUANE LEE, P.E., C.W.R.E.

OWNER: **TILLAMOOK WATER COMMISSION**	**LEE ENGINEERING, INC.** 1300 JOHN ADAMS ST. OREGON CITY, OR, 97045		
DWG TITLE: **FINAL PROOF SURVEY**	DATE: 11/22/94 FILE NO: 1289S03	REVISED:	**FIGURE 1**

Appendix E

Well 1 - Hwy 101

RECEIVED
DEC 9 1958
STATE ENGINEER
SALEM, OREGON

File Original and First Copy with the STATE ENGINEER, SALEM, OREGON

OBSERVATION WELL

TILL 654

bcb

WATER WELL REPORT
STATE OF OREGON

State Well No. 2/9W-5E(1)

State Permit No. G 842

(1) OWNER:
Name Tillamook Water Commission
Address Tillamook, Oregon

(2) LOCATION OF WELL:
County Tillamook Owner's number, if any— 1
SW ¼ of NW ¼ Section 5 T. 2S R. 9W W.M.
Bearing and distance from section or subdivision corner
1410.54ftS and 53.62 ft East from the NW corner of section ~~Section~~ 5

(3) TYPE OF WORK (check):
New Well ☑ Deepening ☐ Reconditioning ☐ Abandon ☐
bandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☑
Irrigation ☐ Test Well ☐ Other ☐

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☑ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED: Threaded ☐ Welded ☑
16" Diam. from 0 ft. to 146-6 ft. Gage 3/8
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(7) PERFORATIONS: Perforated? ☐ Yes ☐ No
Type of perforator used MILLS PerforATOR
SIZE of perforations 3/8 in. by 24 in.
5 ft. perforations from 88 ft. to 93 ft.
5 ft. perforations from 135 ft. to 140 ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(8) SCREENS: Well screen installed ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.
Was a surface seal provided? ☒ Yes ☐ No To what depth? 12 ft.
Material used in seal— Concrete
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? Depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level 21 ft. ft. below land surface Date July 29
Artesian pressure lbs. per square inch Date

Log Accepted by:
[Signed] Tillamook Water Commission Date 7/31/58, 19
(Owner) Supt
Ted Fischer

(11) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☑ Yes ☐ No If yes, by whom? Glenn Harty
Yield: 1160 gal./min. with 20 ft. drawdown after 2 hrs.
" 1250 " 43 " 3 "
" 1320 " 66 " 5 "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water 50 Was a chemical analysis made? ☒ Yes ☐ No

(12) WELL LOG: Diameter of well 16 inches.
Depth drilled 146-7 ft. Depth of completed well 146 7 ft.

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Top Soil	0	20
Blue Mud + Logs	20	41
Coarse Sand + Mud	41	50
Blue Mud + Logs	50	68
Blue Cemented Gravel	68	94
Showing of Water	90	92
Redish Brown Cemented	94	134
Gravel Water Strata	134	140
Cemented Gravel	140	143
Blue Shale	143	146-7

Work started June 30 1958 Completed July 31 1958

(13) PUMP:
Manufacturer's Name Johnston
Type: Turbine H.P. 75

Well Driller's Statement:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Harty Bros.
(Person, firm, or corporation) (Type or print)
Address 3115 SW Illinois Portland, Oregon

Driller's well number

[Signed] Glenn Harty
(Well Driller)

License No. 168 Date July 31, 1958

(USE ADDITIONAL SHEETS IF NECESSARY)

2/9w-5bcb
Tillamook

OREGON STATE BOARD OF HEALTH

Mineral Content of Water

Name of Water Supply Tillamook

Source Well #1

Sampling Point Well Head

Collected By F.G. Katzel Date 2-3-65

Analysis By A.W. Hose Date 2-10-65

Laboratory Number 906

	Mg/L		Mg/L
Color	2	Conductance (mc mho/cm)	221
Turbidity	27	Chlorides	10.7
Solids, Total	203	Sodium	12.6
Solids, Volatile	66	Potassium	0.5
Carbon Dioxide	39.	Fluoride	0.21
pH	6.9	Phosphates	0.35
Alkalinity, Total as $CaCO_3$	150	Sulfates	2.0
Hardness as $CaCO_3$	138	Silicon	50
Calcium	30.0	Aluminum	$\leqslant$ 0.02
Magnesium	15.3	Nitrogen, Ammonia	0.64
Iron	0.11	Nitrogen, Nitrite	0.01
Manganese	0.7	Nitrogen, Nitrate	0.05
Arsenic	< 0.005		

REMARKS

WSSP-10, 6/62

Well 2 (old) - Gienger Rd

G1807 TILL 530

OBSERVATION WELL

File Original and First Copy with the STATE ENGINEER, SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON

State Well No. 1/9w-31P(1)

State Permit No. ....

(1) OWNER:

Name Tillamook Water Commission

Address Tillamook, Oregon

(2) LOCATION OF WELL:

County Tillamook Owner's number, if any— #2

SE ¼ SW ¼ Section 31 T. 1S R. 9W W.M.

Bearing and distance from section or subdivision corner

438.45' N 27° 11'W from common ~~xxxxxx~~ quarter corner to S 31 T 1S R 9 W, W.M. And S 6 T 2S R 9 W., W.M.

(3) TYPE OF WORK (check):

New Well ☑ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☑

Irrigation ☐ Test Well ☐ Other ☐

(5) TYPE OF WELL:

Rotary ☐ Driven ☐

Cable ☑ Jetted ☐

Dug ☐ Bored ☐

(6) CASING INSTALLED: Threaded ☐ Welded ☑

16" Diam. from 0 ft. to 107-6" ft. Gage 3/8

...." Diam. from .... ft. to .... ft. Gage ....

...." Diam. from .... ft. to .... ft. Gage ....

(7) PERFORATIONS: Perforated? ☑ Yes ☐ No

Type of perforator used

SIZE of perforations ¼" Wide in. by 6" Long

24" perforations from 87 ft. to 92 ft.

.... perforations from .... ft. to .... ft.

.... perforations from .... ft. to .... ft.

.... perforations from .... ft. to .... ft.

.... perforations from .... ft. to .... ft.

(8) SCREENS: Well screen installed ☐ Yes ☑ No

Manufacturer's Name ....

Type .... Model No. ....

Diam. .... Slot size .... Set from .... ft. to .... ft.

Diam. .... Slot size .... Set from .... ft. to .... ft.

(9) CONSTRUCTION:

Was well gravel packed? ☐ Yes ☑ No Size of gravel: ....

Gravel placed from .... ft. to .... ft.

Was a surface seal provided? ☐ Yes ☐ No To what depth? .... ft.

Material used in seal—

Did any strata contain unusable water? ☐ Yes ☐ No

Type of water? Depth of strata

Method of sealing strata off

(10) WATER LEVELS:

Static level 13.5 ft. below land surface Date June 17

Artesian pressure lbs. per square inch Date

Log Accepted by:

[Signed] Victor Creech Date July 20, 1960, 19

(Owner)

Ass't Sec.

(11) WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☑ Yes ☐ No If yes, by whom? Harty Bros

Yield: 450 gal./min. with 65 ft. drawdown after 10 hrs.

" 540 " 71.5 " 11 "

" " " "

Bailer test gal./min. with ft. drawdown after hrs.

Artesian flow g.p.m. Date

Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(12) WELL LOG: Diameter of well 16" inches.

Depth drilled 107.5 ft. Depth of completed well 107.5 ft.

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Top Soil	0	20
Blue Mud	20	39
Fine Sand + Pea Gravel	39	40
Blue Mud + Logs	40	86
Water Bearing Gravel	86	92
Brown Clay Mixed		
With Gravel	92	107-6"

Work started May 31 1960 Completed June 17 1960

(13) PUMP:

Manufacturer's Name Layne & Bowler Pump

Type: Turbine H.P. 50

Well Driller's Statement:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Harty Bros

(Person, firm, or corporation) (Type or print)

Address 3340 S.W. Seymour

Driller's well number

[Signed] Glenn Harty

(Well Driller)

License No. 168 Date June 20, 1960

(USE ADDITIONAL SHEETS IF NECESSARY)

Well 2 East Elem.

WATER WELL REPORT
STATE OF OREGON

TILL 073

RECEIVED
AUG 5 1981
WATER RESOURCES DEPT
SALEM, OREGON

State Well No. 1S/9W-29cc

State Permit No.

(1) OWNER:
Name Tillamook Water Commission
Address City Hall
City Tillamook State Oregon

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Reverse Rotary Air ☒ Driven ☐
Rotary Mud ☐ Dug ☐
Cable ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐
Thermal: Withdrawal ☐ Reinjection ☐

CASING INSTALLED: Steel ☒ Plastic ☐ Threaded ☐ Welded ☒
14" Diam. from +2 ft. to 95 ft. Gauge .250
12" Diam. from 87 ft. to 95 ft. Gauge .250
12" Diam. from 100 ft. to 102 ft. Gauge .250
~~LINER INSTALLED:~~
12" Diam. from 122 ft. to 123 ft. Gauge .250
plate & ball on bottom

(6) PERFORATIONS: Perforated? ☐ Yes ☒ No
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☒ Yes ☐ No
Manufacturer's Name UOP Johnson
Type Hi-CAP dbl extra strong Model No.
Diam. 12" PS Slot Size .200 Set from 95 ft. to 100 ft.
Diam. 12" PS Slot Size .200 Set from 102 ft. to 122 ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? SEI
Yield: 1110 gal./min. with 72 ft. drawdown after 43½ hrs.
" 750 " 43 " 47 "
Air test gal./min. with drill stem at ft. hrs.
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION: Special standards: Yes ☐ No ☒
Well seal—Material used cement
Well sealed from land surface to 40 ft.
Diameter of well bore to bottom of seal 24 in.
Diameter of well bore below seal 18 in.
Number of sacks of cement used in well seal 87 sacks
How was cement grout placed? pumped from bottom upwards as surface casing was removed

Was pump installed? No Type HP Depth ft.
Was a drive shoe used? ☐ Yes ☒ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of Water? depth of strata
Method of sealing strata off
Was well gravel packed? ☒ Yes ☐ No Size of gravel: 3/4
Gravel placed from 40 ft. to bottom ft.

(10) LOCATION OF WELL:
County Tillamook Driller's well number 8109
SW ¼ SW ¼ Section 29 T. 1S R. 9W W.M.
Tax Lot # Lot Blk Subdivision
Address at well location:

(11) WATER LEVEL: Completed well.
Depth at which water was first found 22 ft.
Static level 19 ft. below land surface. Date 7/6/81
Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing
Depth drilled 125 ft. Depth of completed well 122½ ft.
Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
See attached sheet			

Work started 6/1 1981 Completed 7/8 1981
Date well drilling machine moved off of well 7/8 1981

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Donald D. Davis (Drilling Machine Operator) Date 8/3, 1981
Drilling Machine Operator's License No. 1085

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Schneider Equipment, Inc. (Person, firm or corporation) (Type or print)
Address 21601 River Rd NE, St. Paul, Or 97137
[Signed] Stephen J. Schneider (Water Well Contractor)
Contractor's License No. 649 Date 8/3, 1981

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310
within 30 days from the date of well completion.

SP*12658-690

Tillamook Water Commission 8109

Material	From	To
Top soil, brown	0	3
Gravel & clay, cemented, rusty brown	3	12
Clay w/ gravel 3/4 minus, brown	12	16
Clay, dark brown	16	17
Clay, blue gray	17	22
Gravel & sand, 2" minus, dark blue	22	25
Gravel 4" minus	25	26
Gravel w/ rusty clay binder	26	34
Clay, blue green w/ occasional gravel	34	39
Gravel 1½" minus	39	44
Gravel 3" minus semi-cemented	44	52
Gravel & sand, 3/4" minus, black	52	56
Gravel w/ clay, blue-green	56	57
Gravel, 1¼" minus, rusty brown	57	64
Gravel, 1¼" minus, black	64	67
Gravel, pea size w/ trace of brown clay	67	70
Clay, rusty brown w/ gravel	70	72
Gravel, 3/4" minus, rusty w/ some clay	72	77
Sand, med-coarse, brown	77	81
Gravel, 3" minus, brown	81	87
Gravel, 5" minus, semi cemented, brown	87	93
Clay, rusty brown, w/ some sand & gravel	93	95
Sand w/ gravel, medium, brown	95	97
Gravel, 3/4 minus, brown	97	100
Clay, brown w/ gravel	100	102
Gravel, 5" minus w/ some coarse sand	102	109
Gravel, 8" minus w/ some coarse brown sand	109	119
Gravel, 8" minus	119	121
Clay, gray	121	124½
Basalt, grey hard	124½	125

RECEIVED
AUG 5 1981
WATER RESOURCES DEPT
SALEM, OREGON

Well 3 Till Jr High

Till 013

SEP 25 1990

1S/9W/29 cb

STATE OF OREGON
WATER WELL REPORT
(as required by ORS 537.765)

(START CARD) # 19830

(1) OWNER: Well Number: 3
Name Tillamook Water Commission
Address 807 Main
City Tillamook State OR Zip 97141

(2) TYPE OF WORK:
☒ New Well ☐ Deepen ☐ Recondition ☐ Abandon

(3) DRILL METHOD
☐ Rotary Air ☐ Rotary Mud ☐ Cable
☒ Other Reverse Circulation Rotary

(4) PROPOSED USE:
☐ Domestic ☒ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval Yes ☐ No ☒ Depth of Completed Well 198 ft.
Explosives used Yes ☐ No ☒ Type ____ Amount ____

HOLE Diameter	From	To	SEAL Material	From	To	Amount sacks or pounds
26	0	99	cement w/bent	0	75	262 sks
24	99	201	following is not part of seal:			
			Hole Plug Bent	75	80	10 sks
			Sand	80	85	10 sks

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E
☐ Other
Backfill placed from 198 ft. to 201 ft. Material cement
Gravel placed from 85 ft. to 201 ft. Size of gravel pea

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	18	+2	201	.375	☒	☐	☒	☐
	except at screen				☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:
☐ Perforations Method
☒ Screens Type Vshape wire wrap Material 304SS

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
154	194	.150	cont	18	PS	☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
935	103.8		1 hr.
918	105.1		4 hr.
900	106.5		24 hr.

Temperature of water approx55°F Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

(9) LOCATION OF WELL by legal description:
County Tillamook Latitude ____ Longitude ____
Township 1S N or S, Range 9W E or W, WM.
Section 29 NW ¼ of SW ¼
Tax Lot 3500 Lot ____ Block ____ Subdivision ____
Street Address of Well (or nearest address) 3906 Alder Lane Tillamook, OR 97141

(10) STATIC WATER LEVEL:
31.5 ft. below land surface. Date 8/16/90
Artesian pressure ____ lb. per square inch. Date ____

(11) WATER BEARING ZONES:
Depth at which water was first found estimate 37'

From	To	Estimated Flow Rate	SWL
all sand and/or gravel		see (8)	see
formations below SWL			(10)

(12) WELL LOG: Ground elevation approx. 40'

Material	From	To	SWL
See attached log.			

Date started 6/22/90 Completed 8/30/90

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to my best knowledge and belief.
Signed Donald G Davis WWC Number 1085 Date 9/20/90

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. all work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.
Signed Stephen Schneider WWC Number 649 Date 9/20/90

ORIGINAL & FIRST COPY - WATER RESOURCES DEPARTMENT SECOND COPY - CONSTRUCTOR THIRD COPY - CUSTOMER 9809C 3/88

SEI #9015

Tillamook Water Commission
Well #3

Start Card #19830
by
Schneider Equipment, Inc. and Drilling Co.
1990

Depth in Feet	Formations
0 - 2	Top soil, dark brown
2 - 7	Clay, reddish brown
7 - 9	Clay, brown w/ some gravel 1/2"
9 - 12	Gravel 1"- w/ some clay
12 - 15	Gravel 2"- & sand, coarse
15 - 18	Gravel 2" & 3"- w/ sand, coarse
18 - 19	Gravel 2"-, rusty
19 - 22	Clay, rusty, brown & tan
22 - 37	Clay, grey
37 - 47	Gravel, rusty, cemented 1" to 1 1/4"-
47 - 60	Gravel, 1 1/4"-, rusty, some cemented
60 - 62	Gravel, 1 1/4"-, brown w/ some sand
62 - 64	Clay, brown, some hard
64 - 75	Clay, grey, silty, soft
75 - 81	Clay, grey & brown to brown, fine, sandy
81 - 83	Sand, brown cemented w/ clay, brown
83 - 87	Gravel, brown w/ some sand, w/ trace brown clay
87 - 99	Gravel 4"-, w/ coarse sand
99 - 109	Gravel 4-6"- w/ coarse sand, some cemented, and trace of brown clay
109 - 115	Gravel 2"- w/ clay, brown layers
115 - 123	Gravel 6"- w/ sand, coarse, brown
123 - 125	Gravel 4"-, clay, brown
125 - 137	Gravel 4"-, sand, coarse w/ trace brown clay
137 - 138	Gravel 2"-, w/ clay, grey, wood
138 - 139	Gravel 2"-, w/ clay, brown
139 - 140	Gravel 2"-, cemented
140 - 142	Clay, brown
142 - 144	Gravel 1 1/2"-, cemented
144 - 146	Gravel & clay, brown
146 - 151	Gravel 2"-, w/ sand, coarse, brown
151 - 153	Gravel 3/4"-, & sand, coarse
153 - 165	Gravel 4"-, & sand, coarse w/ some cemented
165 - 189	Gravel 6"-, some cemented
189 - 194	Gravel 6"-, w/ clay brown
194 - 197	Gravel 6"-, some cemented
197 - 200	Gravel 6"-, and clay, blue
200 - 201	Clay, grey

W0039.TWC

Appendix F

SOURCE WATER ASSESSMENT REPORT
Summary of Analysis

City of Tillamook Water Department
Tillamook, Oregon
Tillamook County
PWS #4100893

May, 2005

Prepared By

Oregon Department of Human Services
Health Services
Drinking Water Program

And

Oregon Department of Environmental Quality
Water Quality Division
Drinking Water Protection

DHS
Oregon Department of Human Services

DEQ
State of Oregon
Department of Environmental Quality

Available in Alternate Formats by contacting the DHS DWP at (541) 726-2587

TABLE OF CONTENTS

City of Tillamook Water Department
Source Water Assessment Report
Summary of Analysis

1. Introduction

The Source Water Assessment Program, mandated by the 1996 Amendments to the Safe Drinking Water Act, requires that states provide the information needed by public water systems to develop drinking water protection plans. That information includes the identification of the area most critical to maintaining safe drinking water (i.e., the Drinking Water Protection Area), an inventory of potential sources of contamination within the Drinking Water Protection Area, and an assessment of the relative threat that these potential sources pose to the water system. We have collected this information in this Source Water Assessment Report.

We hope this report will be used to reduce the risk of contamination to your drinking water resource. We believe that the best way to reduce the risk to your drinking water is for you to develop a plan to minimize potential contamination to your water system. If you elect to prepare a Drinking Water Protection Plan, this report can serve as the foundation for that plan. Drinking Water Protection Plans are not required. However, they are strongly recommended. The time and expense associated with prevention is almost always much less than the time and expense associated with contamination.

This report presents the best available information about your water system. Subsequent changes (changes that took place after the information was collected) in the land use around the water system or the system water usage will not be included. Time constraints also did not allow for most protection areas to be determined with consideration of the effects of water use from adjacent water systems (fortunately, the effects are usually negligible). If a more comprehensive analysis of the local hydrogeology, the water system susceptibility, or the system water use is needed to prepare the Drinking Water Protection Plan, then a more in-depth analysis might be possible. You should contact the DHS Drinking Water Program Groundwater Coordinator if you believe this Source Water Assessment Report needs to be revised.

The Source Water Assessment results are based-on the methodology described in the "Source Water Assessment Methodology" section in the Appendix. This section includes a discussion of the source water assessment project; groundwater basics; and the processes involved with conducting the delineation, sensitivity analysis, potential contaminant source inventory, and overall water system susceptibility. The assessment results should be reviewed in conjunction with the methodology and rational presented in the Appendix. If questions arise regarding our conclusions with respect to any specific part of the assessment (i.e. type of delineation used, aquifer sensitivity, well construction sensitivity, etc.), the methodologies that lead to our conclusions are available.

We believe that public awareness is very important to protecting drinking water resources. The information provided in this report, when shared with people whose actions (or inaction) might potentially impact your water resource, can be a powerful tool for increasing local awareness of the relationship between land use activities and drinking water quality. The Appendix also includes information that we believe will be helpful to promoting drinking water awareness in the area surrounding your water system.

2. Water System Background

The public-owned City of Tillamook Water Department water system is a Community water system (serving the same people regularly in a residential setting) located in Tillamook County. According to the DHS Safe Drinking Water Information System (**SDWIS**) on-line database, this system which serves approximately 4,000 people is supplied by two surface water sources and two water wells (designated as Wells #2 and #3). A third well, Well #1, is used as an emergency well. Its location was not determined. Hypo-chlorination for disinfection purposes is the water treatment for this water system.

This report is an assessment of the groundwater sources of this water system, primarily the drinking water wells. The protection areas for the surface water sources, identified as Killam Creek and Fawcett Creek in the SDWIS database, were delineated in a previous report prepared by the Department of Environmental Protection.

2.1 Location of the Groundwater Drinking Water Sources

The groundwater drinking water sources (the two wells that contribute to the water usage) for this water system were located using a Trimble GeoExplorer II Global Positioning System (GPS) unit. The data were differentially corrected to remove some common positioning errors. The location of the wells, with the corresponding Drinking Water Protection Area, were placed in a Geographic Information System (GIS) layer and projected onto a USGS 7.5 minute topographic map that is included within this report. In order to be consistent with the topographic map, the projection uses the NAD1927 datum. The latitude and longitude values given on the map and below, however, reflect a projection in the more commonly used WGS1984 datum. This means the report uses NAD 1927 maps while giving the well locations in WGS1984 map coordinates.

Data collection specifics include:

- 150 individual measurements,
- linked to a minimum of four satellites,
- a PDOP (Position Dilution of Precision) of less than 6 (pertains to precision of measurement), and
- a SNR (Signal-to-Noise Ratio) of greater than 5 (pertains to the strength of the satellite signal).

The raw data was then subjected to differential correction using PATHFINDER software.

The location data for your drinking water sources are as follows:

Source	Latitude	Longitude
Well #1, Source BA (emergency well)	45° 25' 48.452"	123° 49' 25.613"
Well #2, Source CA	45° 27' 07.668"	123° 49' 16.505"
Well #3, Source DA	45° 27' 18.519"	123° 49' 27.480"

2.2 Source Construction

Well #1 is a 16 inch diameter well that was installed in 1958 to a depth of 146 feet. The construction log for this well indicates it was cased (piping installed) to a depth of 88 feet and that perforated piping was installed between the depths of 88 and 93 feet and between the depths of 135 to 140 feet. It was concrete sealed in the upper twelve feet of the cased hole. A proper well seal fills the annular space between the casing and the hole, preventing the well from increasing the aquifer's susceptibility to surface water and contaminant infiltration. According to current well construction guidelines, the thickness of the well seal should have been at least eighteen feet.

Well #2 was installed in 1981 to a depth of 125 feet. The construction log for this 12 inch diameter well indicates it was cased to a depth to 95 feet, and it was screened between 95 and 100 feet and between 102 and 122 feet. This well was cement sealed to a depth of 40 feet. As described, the well seal is adequate.

Well #3 was installed to a depth of 201 feet in 1990. This 18 inch diameter well was cased to 154 feet and screened between 154 and 194 feet. It was cement and Bentonite sealed in the upper 99 feet Bentonite is a clay-rich material that expands when wet. The well seal is adequate as described.

It should be noted that the age of Well #1 is a concern because even if it were constructed correctly, well seals typically deteriorate over time and this well is over 45 years old.

The construction logs for these wells (called the Water Well Reports) are found in the Appendix.

2.3 Nature and Characteristics of the Aquifer

The Tillamook Valley Alluvial Aquifer supplying drinking water to the City of Tillamook Water Department water system consists of unconsolidated sands and gravels.

Descriptions in the construction logs of this system's wells indicate that the materials encountered during the drilling were intermixed layers of sand, gravel, sand & gravel, and clay.

The average depth to water during the well installations were approximately 25 feet, which is very close to the static water levels found in the wells (the water level in the wells after their construction). The materials above the aquifer appear to be as porous as the aquifer itself, indicating that this aquifer is unconfined. There is significant potential for surface water and potential contaminants to migrate down to the aquifer.

While an interval with greater flow was not identified in the any of the boring logs for the source wells, we know that the high flow zones were likely located where the perforated piping or well screen was installed. The average thickness of the production interval for this aquifer, based on the well construction, is approximately 16 feet. While the depth to the aquifer is approximately 20 feet, the depth to the principal water producing zones (the production interval) is between 90 and 150 feet.

3. Delineation Results

DHS Drinking Water Program staff collected and reviewed source location data, aquifer description information and the water use data (see below) to delineate the Drinking Water Protection Area (DWPA) for this water system. The DWPA identifies the surface area which overlies the portion of the aquifer that's supplying groundwater to the water system (see Figure 1 in the Appendix). The area included in the DWPA is designed to illustrate where the next 15 years of groundwater supply is coming from, with additional one-year, two-year, and five-year "Time-Of-Travel Zones" to enhance the figures usefulness.

The following information is needed determine a DWPA: precise source locations, the aquifer porosity (the ratio of water volume to aquifer volume), the aquifer thickness (the production interval of the aquifer) and the approximate water use within the system. Having determined the source locations (see section 1), estimated the production interval (see section 2), and assigned the likely porosity value (25% is a typical value for sand and gravel aquifers), the next step is estimating the aquifer usage. Based on water use reports submitted for this water system, and using the highest values for any three month period, it is estimated that water use for the wells in this system is approximately 18.4 gallons per minute at Well #2 and 38 gallons per minute at Well #3. The resulting DWPA for the City of Tillamook Water Department water system (shown in the Appendix as Figure 1) was determined using the Enhanced Calculated Fixed Radius method. Additional information regarding the parameters used in the delineation process including; the delineation method, estimated pump rate(s), and aquifer characteristics can be found in "Parameters Used in Delineation Model" in the Appendix.

4. Sensitivity Analysis Results

After the Drinking Water Protection Area (DWPA) has been identified, water system susceptibility to potential contaminant sources inside the DWPA can be evaluated. The water systems susceptibility is dependent on two factors, the natural environment's characteristics that permit migration of a contaminant into the systems aquifer (i.e., the aquifer sensitivity) and the distribution and nature of the potential contaminant sources within the DWPA. It should be understood that a public water system's drinking water sources typically are not susceptible to contamination, even if potential contaminant sources are present, unless either the aquifer or the constructed source water intakes (the wells or springs) are sensitive to contamination. Sensitivity analysis helps to identify those areas within the DWPA where the aquifer is most sensitive to contamination. The analysis is based on data collected or generated during the DWPA delineation process and is designed to meet the needs of other existing or developing programs such as Monitoring Waivers and the Groundwater Rule.

The results of the sensitivity analysis are provided in the tables that follow. Information and sensitivity ratings regarding the aquifer and water quality are provided in Table 4.1 while information and sensitivity ratings regarding the well and their construction are provided in Table 4.2. A clarification of the ratings is provided as comments where appropriate.

Based on this analysis, the aquifer supplying the City of Tillamook Water Department water system is considered highly sensitive to contamination. This determination is based on the high soil sensitivity in the DWPA (see the soil sensitivity distribution in Figure 3) and our belief that the aquifer is unconfined.

Also contributing to the DWPA sensitivity are concerns about the well construction at Well #1. Even though this well is not used regularly, its construction suggests it still might be a conduit for contamination to the aquifer. Please review the following tables to see the factors that helped determine this aquifer's relative sensitivity.

Table 4.1 Aquifer Sensitivity Analysis.				
	Sensitivity			
Parameter	H	M	L	Comments
Depth to first water-bearing zone below casing seal.				Just below the well seals in the production wells at 100 feet
Aquifer characteristics and hydraulic nature.				Unconfined sand & gravel aquifer
Overburden thickness and characteristics.	X			Clays, sands & gravel.
Highest soil sensitivity in Protection Area.	X			High
Traverse potential score (10 = High).			X	= 2 (at wells #2 & #3)
Infiltration potential score (10 = High).		X		= 7 (at wells #2 & #3)
Organic chemical detections.**			X	None above standards
Inorganic chemical detections.**			X	None above standards
Source related coliform detections.**	X			Two positive samples in 2002
Nitrate concentrations (Drinking Water Standard = 10 mg/L).**		X		1.60 mg/l on 12/20/04
Fractured bedrock near surface in Protection Area.			X	None Known
Other wells score (Significant Risk = 400).			X	= 33
Surface water within 500 feet of wellhead.			X	None within 500 feet
Other:				

** The website address of the DHS Safe Drinking Water Information System (SDWIS) on-line database is "http://170.104.158.16/countyinventory.php3". This database includes the water system registration information and all posted laboratory sampling results.

Table 4.2 Well Construction Sensitivity Analysis.						
	Sensitivity			Comments		
Parameter	**H**	**M**	**L**	Well #1	Well #2	Well #3
Well depth (ft).				147	125	200
Casing depth (ft).				88	95	154
Casing seal depth (ft).				12	40	99
Well construction setback deficiencies from site visit.			X	None	None	None
Well report information missing or unknown.			X	Have it	Have it	Have it
Casing seal information missing or unknown.			X	Have it	Have it	Have it
Casing seal material.			X	adequate	adequate	adequate
Well open to multiple aquifers (commingling suspected).			X	No	No	No
Casing seal construction.	X			**poor**	adequate	adequate
Year Constructed.		X		**1958**	1981	1990
Other:						

5. Potential Contaminant Source Inventory

An inventory of potential contamination sources was performed to identify and locate significant potential contaminant sources of concern within the Drinking Water Protection Area (the results are shown in Figure 2 in the Appendix). The inventory was conducted by reviewing applicable state and federal regulatory databases and land use maps, interviewing persons knowledgeable of the area, and conducting a windshield survey by driving through the drinking water protection area to field locate and verify as many of the potential contaminant source activities as possible. It is important to remember the sites and areas identified are only potential contaminant sources. Environmental contamination rarely occurs when contaminants are used and managed properly.

It is also important to remember that this inventory reflects the best information available when the inventory was performed. Subsequent changes in land use within the DWPA will not be represented in this report.

5.1 Potential Contaminant Sources within the Two-Year Time-of-Travel Zone for the Wells

The delineated two-year time of travel zones for the groundwater portion of Tillamook's delineation are primarily dominated by residential land use. A total of four potential contaminant source locations (Reference Numbers 6 through 7 on Figure 2 and Table 2 in the Appendix) were identified in the combined two-year time-of-travel zones for the wells. Potential sources of contamination (PCS's) identified within the 2-year time-of-travel for each of the wells are detailed below in Table 5.1:

Table 5.1 PCS'S WITHIN TWO YEAR TIME-OF-TRAVEL ZONE	
Source Location	**Potential Contaminant Source's (PCS's)**
Well # 3	High density housing areas, sewer lines, an auto body shop, and 3rd Street.
Well # 2	High density housing areas and sewer lines.

The potential contaminant sources within the two-year time-of-travel all pose a relatively higher to moderate risk to the drinking water supply. The sewer lines in close proximity to the well have a high risk of transmitting micro-organisms to the groundwater.

5.2 Potential Contaminant Sources within the Five-Year and Fifteen-Year Time-of-Travel Zones for the Wells

The drinking water protection area for the groundwater portion of Tillamook's delineation within the five-year and fifteen-year time-of-travel zones is primarily occupied by residential land use, but also has some areas with industrial, commercial and agricultural land use. An additional twenty potential contaminant source locations were identified in this area which are detailed on Table 2 in the Appendix and summarized below in Table 5.2. Area-wide potential sources such as the residential areas and transportation corridors extend from the two-year time-of-travel zone into the fifteen-year time-of-travel zone. These land uses occur throughout the drinking water protection area and are shown on Figure 2 in the location nearest to the well.

Table 5.2 PCS'S WITHIN 5 AND 15 YEAR TIME-OF-TRAVEL ZONES	
Source Location	**Potential Contaminant Source's (PCS's)**
Well # 3	Bulk oil plant, Wilson River Highway, a cemetery, a business with chemical/petroleum processing/storage, a utility substation, a mini-storage facility, an underground storage tank, the county maintenance facility, an auto repair shop, lumber mill, school, irrigated crops, and a manure holding tank.
Well # 2	A school, a confined animal feeding operation, a sewer lift station, apartment complexes, stormwater outfalls, and a large capacity septic system.

The potential contaminant sources within the five-year and fifteen-year time-of-travel all pose relatively higher to moderate risk to the drinking water supply with the exception of the schools, stormwater outfall, apartments, the business with chemical storage, and the mini-storage facility, which present a lower risk.

6. Susceptibility of the Drinking Water Source

In general, Potential Contaminant Sources (PCSs) within the shorter time-of-travel zones pose a greater risk than those in the longer time-of-travel zones. This is because natural degradation processes within the aquifer often reduce the potential health effects associated with the contaminant(s). However, the relative risk associated with PCSs cannot be evaluated until the location and distribution of these sources are compared to the high and moderately sensitive areas that have been identified within the DWPA. Overlaying the PCS location map (Figure 2 in the Appendix) on top of the soil sensitivity map for the water system provides a tool to determine the susceptibility of the community's drinking water supply to contamination from each PCS (see Figure 3 in the Appendix).

6.1 Aquifer Susceptibility to Potential Contaminant Sources inside the Drinking Water Protection Area.

Tables 6.1a and 6.1b, illustrate the relationship between potential contaminant source risk, aquifer sensitivity, and estimated contaminant arrival time at the wells. By using the PCS location numbers on the inventory map, in conjunction with the displayed aquifer sensitivity and relative risk rankings for each PCS from Table 2 in the Appendix, you can identify the susceptibility of the drinking water source to contamination from each PCS and take steps to reduce the risk accordingly.

We have attempted to quantify the relative susceptibility of the water system with regard to the PCS's present in the Drinking Water Protection Area (DWPA) by using Tables 6.1a and 6.1b. Across the top of the tables, each Time-of-Travel (TOT) zone is subdivided to account for areas of high, moderate, and low sensitivity that may exist between each TOT. Potential contaminant source risk categories (high, moderate, and low) are listed down the left hand side of the tables. The relative aquifer susceptibility to each PCS is demonstrated by the shading of each cell in the tables. Cells that are shaded dark gray indicate a highly-susceptible condition, light gray shaded cells indicate a moderately-susceptible condition, and white cells indicate conditions of low susceptibility. The number in each cell indicates the number of potential contaminant sources that meet the conditions for that cell. Cells that do not contain a number indicate that there are no known potential contaminant sources that meet the conditions for the cell. Potential contaminant sources that meet the specific criteria for a cell in Tables 6.1a and 6.1b can be identified by reviewing Table 2 in the Appendix. The numbers of potential contaminant sources are totaled across the bottom of the tables.

Table 6.1a. City of Tillamook Water Department Water System Susceptibility at Well #2 as a Function of PCS Risk, TOT Zone, and Aquifer Sensitivity.

	2-Yr TOT			2- to 5-Yr TOT			5- to 15-Yr TOT			Just outside DWPA
	Aquifer Sensitivity			Aquifer Sensitivity			Aquifer Sensitivity			
	High	Mod	Low	High	Mod	Low	High	Mod	Low	
High Risk PCSs	1			1			3			
Moderate Risk PCSs	1			1			3			
Low Risk PCSs				1			1	1		
Total PCSs	2			3			7	1		

Table 6.1b. City of Tillamook Water Department Water System Susceptibility at Well #3 as a Function of PCS Risk, TOT Zone, and Aquifer Sensitivity.

	2-Yr TOT			2- to 5-Yr TOT			5- to 15-Yr TOT			Just outside DWPA
	Aquifer Sensitivity			Aquifer Sensitivity			Aquifer Sensitivity			
	High	Mod	Low	High	Mod	Low	High	Mod	Low	
High Risk PCSs	2			3			10		1	
Moderate Risk PCSs	2			3			5			
Low Risk PCSs							2		1	
Total PCSs	4			6			17		2	

High Susceptibility Moderate Susceptibility Low Susceptibility

The distribution of high, moderate, and low sensitivity areas inside the Drinking Water Protection Area can be determined using either soil sensitivity (permeability) or the mapped distribution of Traverse Potential (TP) or Infiltration Potential (IP). In the case of the City of Tillamook Water Department water system we have decided to rely upon the soil sensitivity as an indicator of the aquifer sensitivity (See tables 4.1 and 4.2 for factors that might increase or decrease aquifer sensitivity). Highly permeable soils are found within the Drinking Water Protection Area. The IP score calculated for the well also indicates a moderate sensitive condition due to the rainfall amounts and moderately permeable subsurface materials. Therefore, it is reasonable to assume that the natural aquifer sensitivity to contamination throughout the DWPA is high (see pattern distribution in Figure 3).

During the potential contaminant source inventory, a total of 24 potential contaminant source locations and 42 potential contaminant sources were identified inside the DWPAs. If any of the potential contaminant sources were identified as an area-wide source, they were evaluated with respect to each time-of-travel zone in which they occurred. This means a potential contaminant source with multiple locations (such as high density housing) is counted in each zone it is found, even though its location is illustrated in the figures only once (in the nearest zone). As a result, the number of potential contaminant sources evaluated in the susceptibility tables often exceeds the number identified on the potential contaminant source inventory map (Figure 2 in the Appendix).

As indicated in the above tables, six potential contaminant sources occur inside the 2-year TOTs, nine sources fall between the 2- and 5-year TOTs, and 27 sources have been identified between the 5- and 15-year TOTs. Of the potential contaminant sources identified inside the 2-year TOTs, three are of high-risk and three are of moderate-risk. Based on the analysis results shown in the relative susceptibility tables, we consider the City of Tillamook Water Department to be highly susceptible to the moderate and high-risk potential contaminant sources identified inside the 2-year TOTs (Potential contaminant Source Reference No. 6 - 9 on Figure 3, in the attached appendix materials). **Therefore we recommend that these potential contaminant sources not only be addressed in any Drinking Water Protection Plan but also in any Water System Emergency Response Plan.**

The water supply also appears to be highly susceptible to all but one of the remaining high- and moderate-risk potential contaminant sources identified between the 2- and 15-year TOT zones. As a result of this analysis, we recommend that the water system develop a Drinking Water Protection Plan that addresses all high- and moderate-risk potential contaminant sources within the DWPA, beginning with those sources which represent the greatest susceptibility risk. At a minimum, the water system should work with representatives from those PCS's posing a moderate- to high-susceptibility risk within the DWPA to (1) determine the level of environmental protection employed in the day-to-day operations of the facility and (2) identify any reasonable Best Management Practices that will lead to an overall reduction of contamination risk.

6.2 Water System Susceptibility to Viral Contaminant Sources within the Two-Year Time-of-Travel Zone.

The area within the two-year TOT roughly identifies the next two years of groundwater supply for the water system. The two-year time frame is used as a conservative estimate of the survival time for some viruses. Based on the assessment results, the drinking water source is considered highly sensitive. **Therefore, the City of Tillamook Water Department's water supply <u>is</u> considered to be susceptible to viral contamination** because viral sources (sewer lines) were identified in areas of high aquifer sensitivity inside the two-year TOT.

7. Conclusions

The City of Tillamook Water Department's water system draws water from the sands and gravels of the Tillamook Valley Alluvial Aquifer. Assessment results indicate the water system is highly susceptible to a contamination event inside the identified Drinking Water Protection Area. The presence of several high- and moderate-risk potential contaminant sources within the protection area was confirmed through a potential contaminant source inventory. Under a "worst case" scenario, where it is assumed that nothing is being done to protect groundwater quality at the identified potential contaminant sources, the assessment results indicate the water system would be highly susceptible to most of the identified high- and moderate-risk potential contaminant sources. In addition, the assessment results indicate that, at this time, the water system is considered susceptible to viral contamination.

8. The Next Step: Recommended Use of the Source Water Assessment Report

The costs associated with dealing with contaminated drinking water are high. Water treatment can be expensive, alternative water sources are not always available and cleanup when possible can be both very expensive and time consuming. Developing an approach to protect that resource, such as a Drinking Water Protection Plan, can reduce the potential for contamination of your drinking water supply. This report contains a summary of the local geology and well construction issues as they pertain to the quality of your drinking water sources. We have identified the area we believe to be most critical to preserving your water quality (the Drinking Water Protection Area) and have identified potential sources of contamination within that area. <u>In addition, we provide you with recommendations, i.e., Best Management Practices, regarding the proper use and practices associated with some common potential contamination sources (See "BMPs for Activities Commonly Found in Drinking Water Protection Areas" in the Appendix).</u>

We believe public awareness is a powerful tool for protecting drinking water and that the information provided in this report will help you increase local awareness regarding the relationship between land use activities and drinking water quality. To that end, the process for developing a Drinking Water Protection Plan can be summarized as follows:

Assessment Phase (Source Water Assessment Provided by DHS and DEQ)

- Delineate the area that serves as the source of the public water supply (Drinking Water Protection Area (DWPA))
- Inventory the potential risks or sources of contamination within the DWPA
- Determine the areas most susceptible to contamination

Protection Phase (performed by the water system or community)

- Assemble a local Drinking Water Protection Team
- Enhance the Source Water Assessment if necessary
- Develop a plan to reduce the risk of contamination (protect the resource)
- Develop a contingency plan to address the potential loss of the drinking water supply
- Certify (optional) and implement the Drinking Water Protection Plan

The assessment phase was funded by the federal Safe Drinking Water Act. Its purpose is to supply water system operators with the information necessary to develop Drinking Water Protection Plans. In Oregon, development of a protection plan is voluntary.

Prior to moving into the protection phase, DEQ recommends the inventory presented in this document be reviewed in detail to clarify the presence, location, operational practices, actual risks, etc., of the identified facilities and land use activities. The Source Water Assessment (SWA) inventory should be regarded as a preliminary review of potential sources of contamination within the drinking water protection area. In most cases, resources within the community should be used to perform an "enhanced inventory" to refine this preliminary list of potential contaminant sources.

It is also important to remember that not all of the inventoried activities will need to be addressed if you choose to develop a Drinking Water Protection Plan. When developing a protection plan, potential contaminant sources which pose little or no threat to your drinking water supply can be screened out. For example, if any of the land use activities are conducted in a manner that already significantly reduces the risk of a contamination release, the facility would not need to re-evaluate their practices based on drinking water protection "management". One of the goals for developing a plan based on the inventory results is to address those land use activities that do pose high or moderate risks to your public water supply. The system should target these facilities with greater levels of education and technical assistance to minimize the risk of contamination.

Limited technical assistance is available through the DEQ and Drinking Water Program at DHS for water systems that choose to move beyond the assessments and voluntarily develop a Drinking Water Protection Plan. By using the results of the assessment, the water system/ community can form a Drinking Water Protection Team comprised of individuals that have a stake in the plan's implementation.

Forming a local team to help with the development of a protection plan is very important. Oregon's drinking water protection approach relies upon the concept of "community based protection", as are many other water quality programs. This simply refers to the concept of allowing local control and decision-making to implement the water quality protection effort. Community-based protection is successful only with significant local citizen stakeholder involvement. Community-based protection can draw on the knowledge and successful adaptive practices within the area. Landowners generally know best how to achieve water resource restoration and protection as long as a thorough explanation of the problem is provided, the objectives to solve the problem are clearly defined, and technical assistance is available.

In community-based protection, citizens have more control and are therefore more likely to participate in the program and be more willing to assist with the educational and outreach effort which will make the plan successful. We recommend that the protection plan be developed so as to minimize any burdens on individual property owners, but maximize the equity in responsibility for reducing the risks of future contamination.

Protecting the drinking water supply in a community can also be a very effective way to encourage all citizens to participate in issues which directly affect everyone in that community. This often leads to more public involvement in other significant local decisions concerning future livability issues, e.g., land use planning. In communities already developing and implementing Drinking Water Protection Plans, the process has served to bring many diverse interests together on a common goal and strengthen the local rural and urban relationships through communication and increased understanding. The risks and sources of water quality problems are not only from industries, farmers, and managed forest, but every individual living, commuting, and working in that area.

Communities/water systems interested in developing Drinking Water Protection Plans may contact the Department of Environmental Quality (503-229-5413) or the DHS Drinking Water Program (541-726-2587) for further information.

Appendix Materials

References

Figures

Inventory of Potential Contaminant Sources

Well Reports

Parameters Used in Delineation Model

Groundwater Fact Sheet

Best Management Practices (BMP's) for activities commonly found in Drinking Water Protection Areas

Drinking Water Protection in Oregon

Source Water Assessment Methodology

Additional copies of the Appendix materials are available upon written request to the following address:

Groundwater Coordinator
Drinking Water Program
Department of Human Services
444 A Street
Springfield, OR 97477

References

Blandford, T. N. and Huyakorn, P. S., 1991. WHPA: A Modular Semi-Analytical Model for the Delineation of Wellhead Protection Areas. U.S. Environmental Protection Agency Contract No. 68-08-0003.

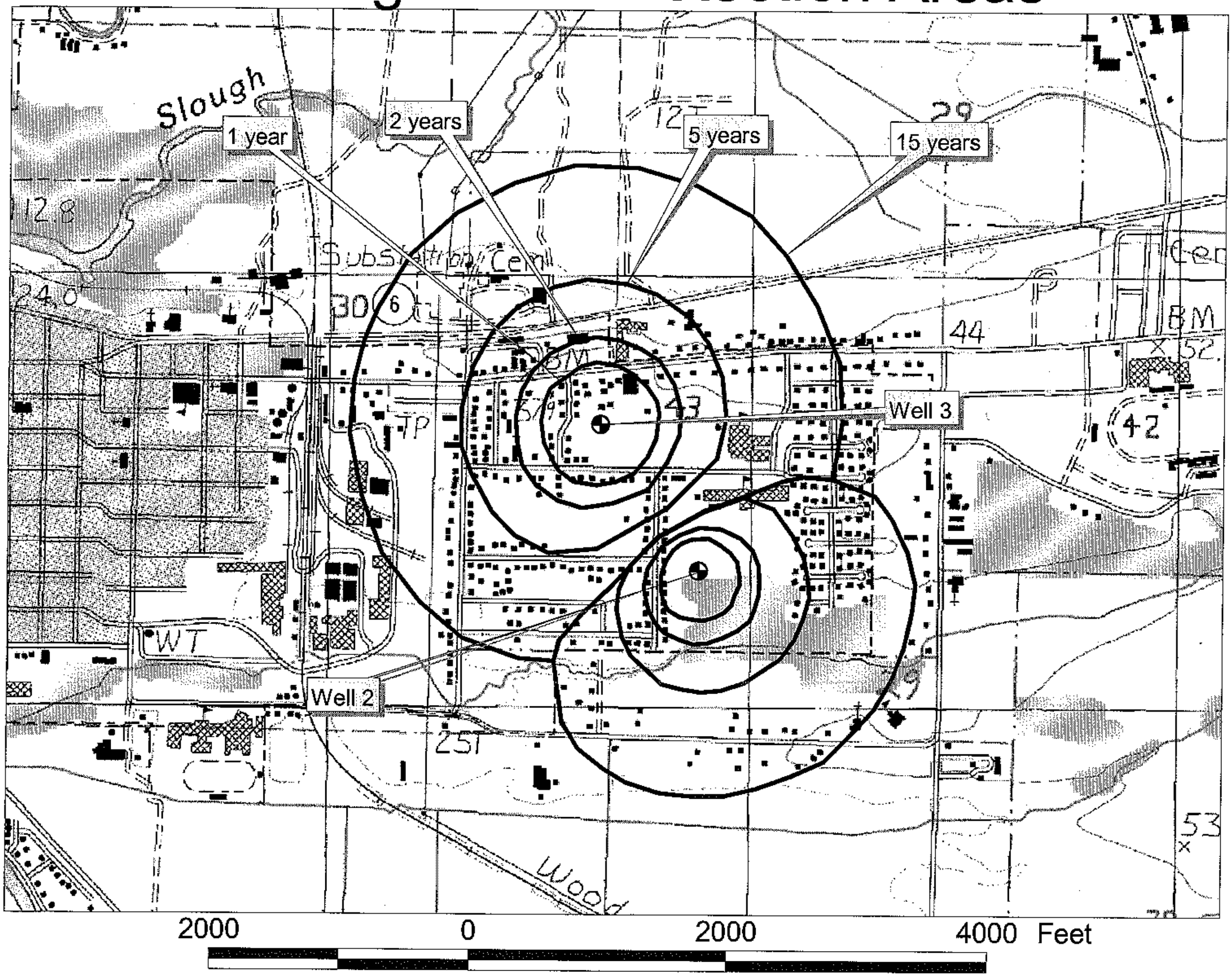
Stewart, S. and Nelson, D., 1996. Oregon Wellhead Protection Program Guidance Manual. Oregon Department of Environmental Quality (available at http://www.deq.state.or.us/wq/dwp/dwphome.htm).

Stewart, S. and Nelson, D., 1999. Oregon Source Water Assessment Plan. Oregon Department of Environmental Quality.

USDA and Soil Conservation Service, 1964. Soil Survey of Tillamook County Area, Oregon.

Walker, G.W. and MacLeod, N.S., 1991. Geologic Map of Oregon. U.S. Geological Survey.

Figure 1. City of Tillamook Drinking Water Protection Areas



Drinking Water Protection Area (DWPA) with the 1, 2, 5 and 15 Year Time-Of-Travel (TOT) for groundwater to move to the wells through the aquifer, as determined by the Enhanced Calculated Fixed Radius Method

Model Parameters
Production Interval (ft): 16
Effective Porosity: 0.25
Usage (gal/min): Well 2 = 18.4, Well 3 = 38

Prepared by: Tom Stodd (09/01/04)
Reviewed by: Dennis Nelson RG 1224
PWS #: 4100893

Well Location (WGS84 Datum): Tillamook County
Township 1 S, Range 9 W, Section 29

Well #2: Lat. 45° 27' 07.668" N,
Long. 123° 49' 16.505" W
Well #3: Lat. 45° 27' 18.518" N,
Long. 123° 49' 27.480" W

Topo Quad Name: Tillamook 7.5-minute

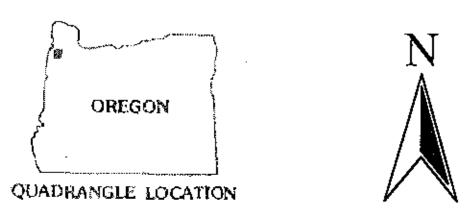
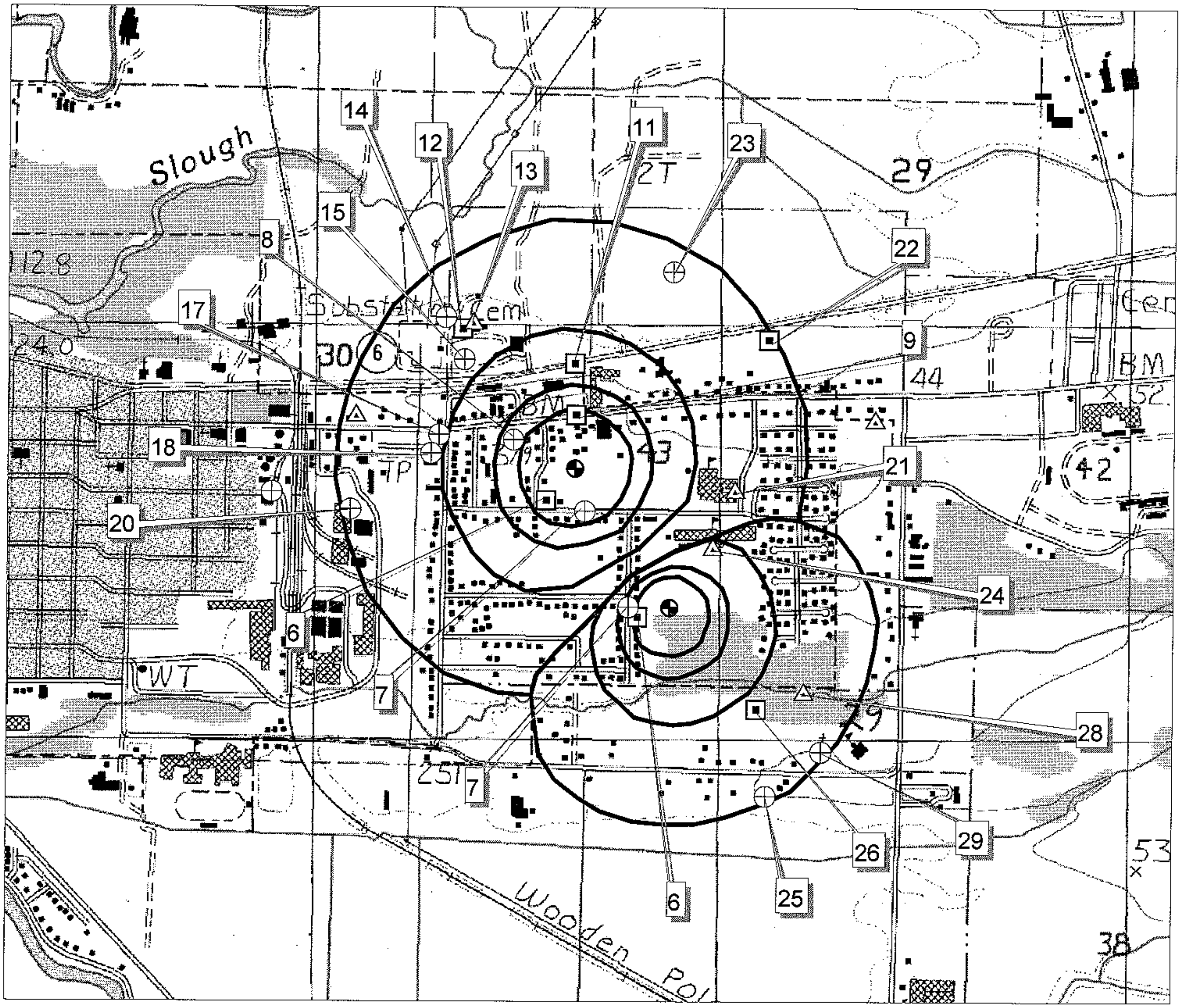


Figure 2: City of Tillamook
Potential Contaminant Sources



2000 0 2000 4000 Feet

Scale 1: 15,000

Drinking Water Protection Area (DWPA)
1, 2, 5, and 15 year Time of Travel (TOT)
Calculated Fixed Radius Method

Prepared by: KG
Project Manager: DN RG# 1224
File# 4100893

N

Potential Contaminant Sources
- ⊕ **Higher Relative Risk**
- ▣ **Moderate Relative Risk**
- △ **Low Relative Risk**

Note: Sites and areas noted in this figure are potential sources of contamination to the drinking water identified by Oregon drinking water protection staff. Environmental contamination is not likely to occur when chemicals are used and managed properly.

Numbers indicate potential contaminant sources which are explained in Appendix.

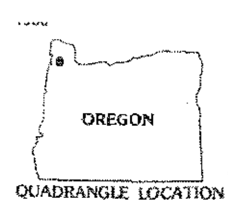
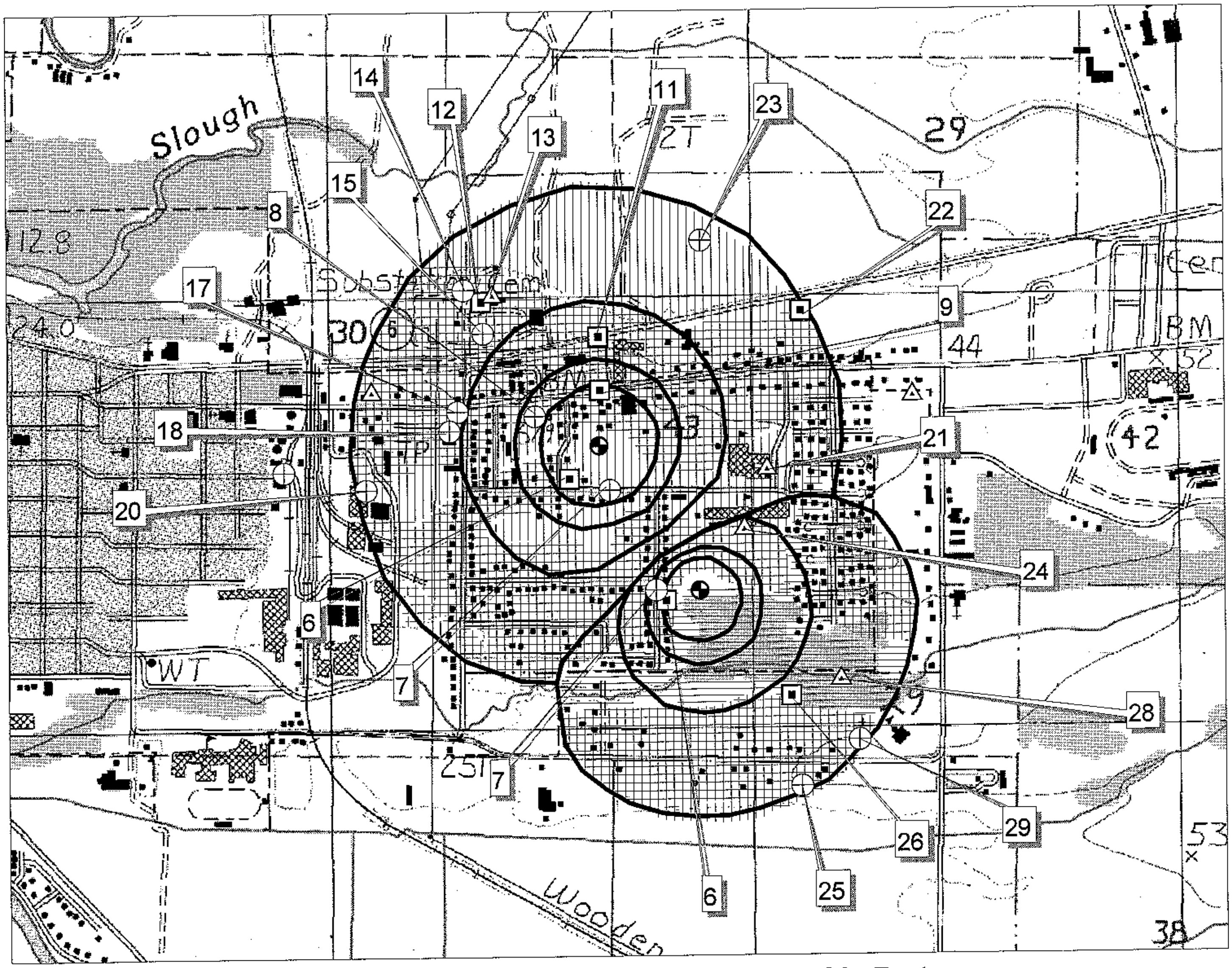


Figure 3: City of Tillamook
Drinking Water Source Susceptibility



2000 0 2000 4000 Feet

Scale 1: 15,000

Drinking Water Protection Area (DWPA)
1, 2, 5, and 15 Year Time of Travel (TOT)
Calculated Fixed Radius Method

Potential Contaminant Sources
- ⊕ **Higher Relative Risk**
- ▣ **Moderate Relative Risk**
- △ **Low Relative Risk**

Sensitivity Analysis
- **High Soil Sensitivity**
- **Medium Soil Sensitivity**
- **Low Soil Sensitivity**

Note: Sites and areas noted in this figure are potential sources of contamination to the drinking water as identified by Oregon Drinking Water Protection Staff.
Environmental contamination is not likely to occur when chemicals are used and managed properly.

Features or activities that are identified as high or moderate risk that occur within an area designated as high or moderate sensitivity pose a greater risk to drinking water quality than those in areas of low sensitivity.

Numbers indicate potential contaminant sources indexed to the Appendix.

N

APPENDIX C - INVENTORY OF POTENTIAL CONTAMINANT SOURCES
TILLAMOOK WATER COMMISSION - PWS # 4100893
OREGON SOURCE WATER ASSESSMENT

Inventory Results

Table 1A. Summary of Potential Contaminant Sources by Land Use for the Surface Water Source

Table 1B. Summary of Potential Contaminant Sources by Land Use for the Groundwater Source

Table 2. Inventory Results - List of Potential Contaminant Sources

Table 3. Results of Regulatory Database Search

Notes for Tables:

- These tables detail the results of the inventory completed for the protection area for the surface water intakes on Killam and Fawcett Creeks and for the area that overlies the groundwater wells. The potential contaminant sources (PCSs) were numbered sequentially with PCS reference numbers 1-5 located in the surface water portion of the protection area and PCS reference numbers 6-29 located in the groundwater portions of the protection area.

- Sites and areas identified in these Tables are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.

- Total number of sources listed in Table 1 in the DWPA may not add up to the total number of potential contaminants sources in Table 2 because more than one type of potential contaminant source may be present at any given facility.

- Inventory data for the surface water intake (PCS Ref. No. 1-5) was collected in August 2002. Inventory data of the groundwater protection areas (PCS Ref. No. 6-29) was collected in November 2004. All data was collected by Sue Gries, Oregon DEQ.

Information from applicable state and federal regulatory databases is current as of 9/27/2004.

Acronyms:

AST - Aboveground Storage Tank

DC - DEQ's Dry Cleaner database

DEQ - Oregon Department of Environmental Quality

DWPA - Drinking Water Protection Area

ECSI - DEQ's Environmental Cleanup Site Information database

HWIMSY - DEQ's Hazardous Waste Information Management System database

LUST - DEQ's Leaking Underground Storage Tank database

NPDES - National Pollution Discharge Elimination System

PCS - Potential Contaminant Source

PWS - Public Water System

SFM - State Fire Marshall's database of hazardous materials

SIS - DEQ's Source Information System database (includes WPCF & NPDES permits)

SWMS - DEQ's Solid Waste Management System database

UST - DEQ's Underground Storage Tank database or Underground Storage Tank

WPCF - Water Pollution Control Facility

WRD - Oregon Water Resources Division database for water rights information

TABLE 1A. SUMMARY OF POTENTIAL CONTAMINANT SOURCES BY LAND USE

PWS # 4100893 TILLAMOOK WATER COMMISSION

Residential/Municipal Land Uses

Potential Contamination Source	Notes	Relative Risk Level	Total in DWPA
Airport - Maintenance/Fueling Area		Higher	0
Apartments and Condominiums		Lower	0
Campgrounds/RV Parks	(1)	Lower	0
Cemeteries - Pre-1945		Moderate	0
Drinking Water Treatment Plants		Moderate	0
Fire Station		Lower	0
Fire Training Facilities		Moderate	0
Golf Courses		Moderate	0
Housing - High Density (> 1 House/0.5 acres)		Moderate	0
Landfill/Dumps	(1)	Higher	0
Lawn Care - Highly Maintained Areas		Moderate	0
Motor Pools		Moderate	0
Parks		Moderate	0
Railroad Yards/Maintenance/Fueling Areas		Higher	0
Schools		Lower	0
Septic Systems - High Density (> 1 system/acre)	(1)	Higher	0
Sewer Lines - Close Proximity to PWS	(1)	Higher	0
Utility Stations - Maintenance Transformer Storage		Higher	0
Waste Transfer/Recycling Stations	(1)	Moderate	0
Wastewater Treatment Plants/Collection Stations	(1)	Moderate	0
Other			0

NOTES:
Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.
(1) - Potential source of microbial contamination
(2) - Drip irrigated crops, such as vineyards and some vegetables, are considered lower risk than spray irrigation
(3) - For groundwater public water systems, septic systems located within the 2-year time-of-travel (TOT) are considered moderate risks.

TABLE 1A. SUMMARY OF POTENTIAL CONTAMINANT SOURCES BY LAND USE

PWS # 4100893 TILLAMOOK WATER COMMISSION

Commercial/Industrial Land Uses

Potential Contamination Source	Notes	Relative Risk Level	Total in DWPA
Automobiles - Body Shops		Higher	0
Automobiles - Car Washes		Moderate	0
Automobiles - Gas Stations		Higher	0
Automobiles - Repair Shops		Higher	0
Boat Services/Repair/Refinishing		Higher	0
Cement/Concrete Plants		Moderate	0
Chemical/Petroleum Processing/Storage		Higher	0
Dry Cleaners		Higher	0
Electrical/Electronic Manufacturing		Higher	0
Fleet/Trucking/Bus Terminals		Higher	0
Food Processing		Moderate	0
Furniture/Lumber/Parts Stores		Moderate	0
Home Manufacturing		Higher	0
Junk/Scrap/Salvage Yards		Higher	0
Machine Shops		Higher	0
Medical/Vet Offices	(1)	Moderate	0
Metal Plating/Finishing/Fabrication		Higher	0
Mines/Gravel Pits		Higher	1
Office Buildings/Complexes		Lower	0
Parking Lots/Malls (> 50 Spaces)		Higher	0
Photo Processing/Printing		Higher	0
Plastics/Synthetics Producer		Higher	0
Research Laboratories		Higher	0
RV/Mini Storage		Lower	0
Wood Preserving/Treating		Higher	0
Wood/Pulp/Paper Processing and Mills		Higher	0
Other			0

NOTES:
Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.
(1) - Potential source of microbial contamination
(2) - Drip irrigated crops, such as vineyards and some vegetables, are considered lower risk than spray irrigation
(3) - For groundwater public water systems, septic systems located within the 2-year time-of-travel (TOT) are considered moderate risks.

TABLE 1A. SUMMARY OF POTENTIAL CONTAMINANT SOURCES BY LAND USE

PWS # 4100893 TILLAMOOK WATER COMMISSION

Agricultural/Forest Land Uses

Potential Contamination Source	Notes	Relative Risk Level	Total in DWPA
Auction Lots	(1)	Higher	0
Boarding Stables	(1)	Moderate	0
Confined Animal Feeding Operations (CAFOs)	(1)	Higher	0
Crops - Irrigated (inc. orchards, vineyards, nurseries, greenhouses)	(2)	Moderate	0
Crops - Nonirrigated (inc. Christmas trees, grains, grass seed, pasture)		Lower	0
Farm Machinery Repair		Higher	0
Grazing Animals (> 5 large animals or equivalent/acre)	(1)	Moderate	0
Lagoons/Liquid Wastes	(1)	Higher	0
Land Application Sites	(1)	Moderate	0
Managed Forest Land - Broadcast Fertilized Areas		Lower	0
Managed Forest Land - Clearcut Harvest (< 35 yrs.)		Higher	2
Managed Forest Land - Partial Harvest (< 10 yrs.)		Moderate	0
Managed Forest Land - Road Density (> 2 mi./sq. mi.)		Moderate	0
Pesticide/Fertilizer/Petroleum Storage, Handling, Mixing, & Cleaning Ar		Higher	0
Recent Burn Areas (< 10 yrs.)		Lower	0
Managed Forest Lands - Status Unknown		Moderate	0
Other: - Landslides		Moderate	2

NOTES:
Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.
(1) - Potential source of microbial contamination
(2) - Drip irrigated crops, such as vineyards and some vegetables, are considered lower risk than spray irrigation
(3) - For groundwater public water systems, septic systems located within the 2-year time-of-travel (TOT) are considered moderate risks.

TABLE 1A. SUMMARY OF POTENTIAL CONTAMINANT SOURCES BY LAND USE

PWS # 4100893 TILLAMOOK WATER COMMISSION

Miscellaneous Land Uses

Potential Contamination Source	Notes	Relative Risk Level	Total in DWPA
Above Ground Storage Tanks - Excluding Water		Moderate	0
Channel Alterations - Heavy		Lower	0
Combined Sewer Outfalls	(1)	Lower	0
Stormwater Outfalls	(1)	Lower	0
Composting Facilities	(1)	Moderate	0
Historic Gas Stations		Higher	0
Historic Waste Dumps/Landfills	(1)	Higher	0
Homesteads - Rural - Machine Shops/Equipment Maintenance		Higher	0
Homesteads - Rural - Septic Systems (< 1/acre)	(1)(3)	Lower	0
Injection/Dry Wells, Sumps - Class V UICs	(1)	Higher	0
Kennels (> 20 Pens)	(1)	Lower	0
Military Installations		Higher	0
Random Dump Sites		Moderate	0
River Recreation - Heavy Use (inc. campgrounds)	(1)	Lower	0
Sludge Disposal Areas	(1)	Moderate	0
Stormwater Retention Basins	(1)	Moderate	0
Transmission Lines - Right-of-Ways		Higher	2
Transportation - Freeways/State Highways/Other Heavy Use Roads		Moderate	0
Transportation - Railroads		Moderate	0
Transportation - Right-Of-Ways - Herbicide Use Areas		Moderate	0
Transportation - River Traffic - Heavy		Lower	0
Transportation - Stream Crossing - Perennial		Lower	0
UST - Confirmed Leaking Tanks - DEQ List		Higher	0
UST - Decommissioned/Inactive		Lower	0
UST - Nonregulated Tanks (< 1,100 gals or Large Heating Oil Tanks)		Higher	0
UST - Not Upgraded and/or Registered Tanks		Higher	0
UST - Upgraded/Registered - Active		Lower	0
UST - Status Unknown		Higher	0
Upstream Reservoirs/Dams		Moderate	1
Wells/Abandoned Wells		Higher	0
Large Capacity Septic Systems (serves > 20 people) - Class V UICs	(1)	Higher	0
Construction/Demolition Areas		Moderate	0
Other			0

NOTES:
Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.
(1) - Potential source of microbial contamination
(2) - Drip irrigated crops, such as vineyards and some vegetables, are considered lower risk than spray irrigation
(3) - For groundwater public water systems, septic systems located within the 2-year time-of-travel (TOT) are considered moderate risks.

TABLE 1B. SUMMARY OF POTENTIAL CONTAMINANT SOURCES BY LAND USE

PWS # 4100893 TILLAMOOK WATER COMMISSION

Residential/Municipal Land Uses

Potential Contamination Source	Notes	Relative Risk Level	Total in DWPA
Airport - Maintenance/Fueling Area		Higher	0
Apartments and Condominiums		Lower	1
Campgrounds/RV Parks	(1)	Lower	0
Cemeteries - Pre-1945		Moderate	1
Drinking Water Treatment Plants		Moderate	0
Fire Station		Lower	0
Fire Training Facilities		Moderate	0
Golf Courses		Moderate	0
Housing - High Density (> 1 House/0.5 acres)		Moderate	2
Landfill/Dumps	(1)	Higher	0
Lawn Care - Highly Maintained Areas		Moderate	0
Motor Pools		Moderate	0
Parks		Moderate	0
Railroad Yards/Maintenance/Fueling Areas		Higher	0
Schools		Lower	2
Septic Systems - High Density (> 1 system/acre)	(1)	Higher	0
Sewer Lines - Close Proximity to PWS	(1)	Higher	2
Utility Stations - Maintenance Transformer Storage		Higher	1
Waste Transfer/Recycling Stations	(1)	Moderate	0
Wastewater Treatment Plants/Collection Stations	(1)	Moderate	1
Other			0

NOTES:
Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.
(1) - Potential source of microbial contamination
(2) - Drip irrigated crops, such as vineyards and some vegetables, are considered lower risk than spray irrigation
(3) - For groundwater public water systems, septic systems located within the 2-year time-of-travel (TOT) are considered moderate risks.

TABLE 1B. SUMMARY OF POTENTIAL CONTAMINANT SOURCES BY LAND USE

PWS # 4100893 TILLAMOOK WATER COMMISSION

Commercial/Industrial Land Uses

Potential Contamination Source	Notes	Relative Risk Level	Total in DWPA
Automobiles - Body Shops		Higher	1
Automobiles - Car Washes		Moderate	0
Automobiles - Gas Stations		Higher	0
Automobiles - Repair Shops		Higher	1
Boat Services/Repair/Refinishing		Higher	0
Cement/Concrete Plants		Moderate	0
Chemical/Petroleum Processing/Storage		Higher	2
Dry Cleaners		Higher	0
Electrical/Electronic Manufacturing		Higher	0
Fleet/Trucking/Bus Terminals		Higher	2
Food Processing		Moderate	0
Furniture/Lumber/Parts Stores		Moderate	0
Home Manufacturing		Higher	0
Junk/Scrap/Salvage Yards		Higher	0
Machine Shops		Higher	0
Medical/Vet Offices	(1)	Moderate	0
Metal Plating/Finishing/Fabrication		Higher	0
Mines/Gravel Pits		Higher	0
Office Buildings/Complexes		Lower	0
Parking Lots/Malls (> 50 Spaces)		Higher	0
Photo Processing/Printing		Higher	0
Plastics/Synthetics Producer		Higher	0
Research Laboratories		Higher	0
RV/Mini Storage		Lower	1
Wood Preserving/Treating		Higher	0
Wood/Pulp/Paper Processing and Mills		Higher	1
Other			0

NOTES:
Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.
(1) - Potential source of microbial contamination
(2) - Drip irrigated crops, such as vineyards and some vegetables, are considered lower risk than spray irrigation
(3) - For groundwater public water systems, septic systems located within the 2-year time-of-travel (TOT) are considered moderate risks.

TABLE 1B. SUMMARY OF POTENTIAL CONTAMINANT SOURCES BY LAND USE

PWS # 4100893 TILLAMOOK WATER COMMISSION

Agricultural/Forest Land Uses

Potential Contamination Source	Notes	Relative Risk Level	Total in DWPA
Auction Lots	(1)	Higher	0
Boarding Stables	(1)	Moderate	0
Confined Animal Feeding Operations (CAFOs)	(1)	Higher	1
Crops - Irrigated (inc. orchards, vineyards, nurseries, greenhouses)	(2)	Moderate	1
Crops - Nonirrigated (inc. Christmas trees, grains, grass seed, pasture)		Lower	0
Farm Machinery Repair		Higher	0
Grazing Animals (> 5 large animals or equivalent/acre)	(1)	Moderate	0
Lagoons/Liquid Wastes	(1)	Higher	1
Land Application Sites	(1)	Moderate	0
Managed Forest Land - Broadcast Fertilized Areas		Lower	0
Managed Forest Land - Clearcut Harvest (< 35 yrs.)		Moderate	0
Managed Forest Land - Partial Harvest (< 10 yrs.)		Moderate	0
Managed Forest Land - Road Density (> 2 mi./sq. mi.)		Moderate	0
Pesticide/Fertilizer/Petroleum Storage, Handling, Mixing, & Cleaning Ar		Higher	0
Recent Burn Areas (< 10 yrs.)		Lower	0
Managed Forest Lands - Status Unknown		Moderate	0
Other			0

NOTES:
Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.
(1) - Potential source of microbial contamination
(2) - Drip irrigated crops, such as vineyards and some vegetables, are considered lower risk than spray irrigation
(3) - For groundwater public water systems, septic systems located within the 2-year time-of-travel (TOT) are considered moderate risks.

TABLE 1B. SUMMARY OF POTENTIAL CONTAMINANT SOURCES BY LAND USE

PWS # 4100893 TILLAMOOK WATER COMMISSION

Miscellaneous Land Uses

Potential Contamination Source	Notes	Relative Risk Level	Total in DWPA
Above Ground Storage Tanks - Excluding Water		Moderate	1
Channel Alterations - Heavy		Lower	0
Combined Sewer Outfalls	(1)	Lower	0
Stormwater Outfalls	(1)	Lower	1
Composting Facilities	(1)	Moderate	0
Historic Gas Stations		Higher	0
Historic Waste Dumps/Landfills	(1)	Higher	0
Homesteads - Rural - Machine Shops/Equipment Maintenance		Higher	0
Homesteads - Rural - Septic Systems (< 1/acre)	(1)(3)	Lower	0
Injection/Dry Wells, Sumps - Class V UICs	(1)	Higher	0
Kennels (> 20 Pens)	(1)	Lower	0
Military Installations		Higher	0
Random Dump Sites		Moderate	0
River Recreation - Heavy Use (inc. campgrounds)	(1)	Lower	0
Sludge Disposal Areas	(1)	Moderate	0
Stormwater Retention Basins	(1)	Moderate	0
Transmission Lines - Right-of-Ways		Lower	0
Transportation - Freeways/State Highways/Other Heavy Use Roads		Moderate	2
Transportation - Railroads		Moderate	0
Transportation - Right-Of-Ways - Herbicide Use Areas		Moderate	0
Transportation - River Traffic - Heavy		Lower	0
Transportation - Stream Crossing - Perennial		Lower	0
UST - Confirmed Leaking Tanks - DEQ List		Higher	1
UST - Decommissioned/Inactive		Lower	0
UST - Nonregulated Tanks (< 1,100 gals or Large Heating Oil Tanks)		Higher	0
UST - Not Upgraded and/or Registered Tanks		Higher	0
UST - Upgraded/Registered - Active		Lower	0
UST - Status Unknown		Higher	3
Upstream Reservoirs/Dams		Lower	0
Wells/Abandoned Wells		Higher	0
Large Capacity Septic Systems (serves > 20 people) - Class V UICs	(1)	Higher	1
Construction/Demolition Areas		Moderate	0
Other: - State cleanup site (ECSI)		Higher	1

NOTES:
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(3) - For groundwater public water systems, septic systems located within the 2-year time-of-travel (TOT) are considered moderate risks.

TABLE 2. INVENTORY RESULTS - LIST OF POTENTIAL CONTAMINANT SOURCES

PWS# 4100893 TILLAMOOK WATER COMMISSION

Reference No. (See Figure)	Potential Contaminant Source Type	Name	Approximate Location	City	Method for Listing	Proximity to Sensitive Areas	Relative Risk Level (1)	Potential Impacts	Comments
1	Managed Forest Land - Clearcut Harvest (< 35 yrs.)	Clear-cuts	Throughout DWPA	Tillamook	Field-Observation Interview	Within sensitive area for FAWCETT CREEK	Higher	Cutting and yarding of trees may contribute to increased erosion, resulting in turbidity and chemical changes in drinking water supply. Over-application or improper handling of pesticides or fertilizers may impact drinking water source.	PWS contact indicates that the watershed is closed to the public. A private timber company, the City, and Tillamook State Forest are the landowners in the watershed.
	Managed Forest Land - Clearcut Harvest (< 35 yrs.)					Within sensitive area for KILLAM CREEK	Higher	Cutting and yarding of trees may contribute to increased erosion, resulting in turbidity and chemical changes in drinking water supply. Over-application or improper handling of pesticides or fertilizers may impact drinking water source.	PWS contact indicates that the watershed is closed to the public. A private timber company, the City, and Tillamook State Forest are the landowners in the watershed.

Note: Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.

(1) Where multiple potential contaminant sources exist at a site, the highest level of risk is used.

(2) See Table 3 for database listings (if necessary).

TABLE 2. INVENTORY RESULTS - LIST OF POTENTIAL CONTAMINANT SOURCES

PWS# 4100893 TILLAMOOK WATER COMMISSION

Reference No. (See Figure)	Potential Contaminant Source Type	Name	Approximate Location	City	Method for Listing	Proximity to Sensitive Areas	Relative Risk Level (1)	Potential Impacts	Comments
2	Other - Landslides	Landslides	Throughout DWPA	Tillamook	Interview	Within sensitive area for FAWCETT CREEK	Moderate	The impacts of this potential contaminant source will be addressed during the enhanced inventory.	In Fawcett Creek, a large landslide occurred in 1996, and minor slides occur occasionally. A small landslide occurred last year in the headwaters of Killiam Creek. Approximate locations indicated by PWS contact. No visual observation of site - site location is based on interview.
	Other - Landslides					Within sensitive area for KILLAM CREEK	Moderate	The impacts of this potential contaminant source will be addressed during the enhanced inventory.	In Fawcett Creek, a large landslide occurred in 1996, and minor slides occur occasionally. A small landslide occurred last year in the headwaters of Killiam Creek. Approximate locations indicated by PWS contact. No visual observation of site - site location is based on interview.
3	Transmission Lines - Right-of-Ways	Transmission Lines	Runs N-S Through DWPA	Tillamook	Interview	Within sensitive area for KILLAM CREEK	Higher	Construction and corridor maintenance may contribute to increased erosion and turbidity in drinking water supply. Over-application or improper handling of pesticides or fertilizers may impact drinking water supply.	No visual observation of site - site location is based on topographic map and interview.
	Transmission Lines - Right-of-Ways		NE edge of Fawcett watershed			Within sensitive area for FAWCETT CREEK	Higher	Construction and corridor maintenance may contribute to increased erosion and turbidity in drinking water supply. Over-application or improper handling of pesticides or fertilizers may impact drinking water supply.	No visual observation of site - site location is based on topographic map and interview.

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TABLE 2. INVENTORY RESULTS - LIST OF POTENTIAL CONTAMINANT SOURCES

PWS# 4100893 TILLAMOOK WATER COMMISSION

Reference No. (See Figure)	Potential Contaminant Source Type	Name	Approximate Location	City	Method for Listing	Proximity to Sensitive Areas	Relative Risk Level (1)	Potential Impacts	Comments
4	Mines/Gravel Pits	Rock Quarry	Coyote Point	Tillamook	Interview	Within sensitive area for FAWCETT CREEK	Moderate	Spills, leaks, or improper handling of chemicals and wastes generated in mining operations or from heavy equipment may impact the drinking water supply.	No visual observation of site - site location is based on interview. Risk reduced to Moderate because PWS contact indicates that the rock quarry is small and used infrequently.
5	Upstream Reservoirs/Dams	Upstream Dam	Skookum Lake	Tillamook	Interview	Within sensitive area for FAWCETT CREEK	Moderate	During major storm events, reservoirs may contribute to prolonged turbidity for downstream intakes for drinking water. Construction, fluctuating water levels, and heavy waterside use can increase erosion and turbidity in reservoir/drinking water source.	No visual observation of site - site location is based on interview. PWS Contact indicates that the dam was checked recently, and has good integrity.
6	Housing - High Density (> 1 House/0.5 acres)	High Density Housing	Throughout the DWPA	Tillamook	Field-Observation	Within the 2-yr TOT for WELL #3	Moderate	Improper use, storage, and disposal of household chemicals may impact the drinking water supply. Stormwater run-off or infiltration may carry contaminants to drinking water supply.	
	Housing - High Density (> 1 House/0.5 acres)					Within the 2-yr TOT for WELL #2	Moderate	Improper use, storage, and disposal of household chemicals may impact the drinking water supply. Stormwater run-off or infiltration may carry contaminants to drinking water supply.	
7	Sewer Lines - Close Proximity to PWS	Sewer Lines	Throughout the DWPA	Tillamook	Interview	Within the 2-yr TOT for WELL #2	Higher	If not properly designed, installed, and maintained, sewer lines can impact drinking water, especially adjacent to a waterbody or within the 2-year time-of-travel zone for drinking water wells.	
	Sewer Lines - Close Proximity to PWS					Within the 2-yr TOT for WELL #3	Higher	If not properly designed, installed, and maintained, sewer lines can impact drinking water, especially adjacent to a waterbody or within the 2-year time-of-travel zone for drinking water wells.	

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TABLE 2. INVENTORY RESULTS - LIST OF POTENTIAL CONTAMINANT SOURCES

PWS# 4100893 TILLAMOOK WATER COMMISSION

Reference No. (See Figure)	Potential Contaminant Source Type	Name	Approximate Location	City	Method for Listing	Proximity to Sensitive Areas	Relative Risk Level (1)	Potential Impacts	Comments
8	Automobiles - Body Shops	EE Auto Body Shop	35th and 3rd Street	Tillamook	Database (2) Field-Observation	Within the 2-yr TOT for WELL #3	Higher	Improper management of vehicle paints, thinners, and primer products may impact the drinking water supply.	
9	Transportation - Freeways/State Highways/Other Heavy Use Roads	3rd Street	Runs through the DWPA	Tillamook	Field-Observation	Within the 2-yr TOT for WELL #3	Moderate	Vehicle use increases the risk for leaks or spills of fuel & other haz. materials. Road building, maintenance & use can increase erosion/slope failure causing turbidity. Over-application or improper handling of pesticides/fertilizers may impact water.	
10	Other - State cleanup site (ECSI)	Unocal Former Bulk Plant	2805 5th Street	Tillamook	Database (2)	Between 2-yr and 5-yr TOT for WELL #3	Higher	The impacts of this potential contaminant source will be addressed during the enhanced inventory.	PCS location based on regulatory database search - needs verification.
	Chemical/Petroleum Processing/Storage						Higher	Spills, leaks, or improper handling of chemicals and other materials during transportation, use, storage and disposal may impact the drinking water supply.	PCS location based on regulatory database search - needs verification.
11	Transportation - Freeways/State Highways/Other Heavy Use Roads	Wilson River Highway 6	Runs through the DWPA	Tillamook	Field-Observation	Between 2-yr and 5-yr TOT for WELL #3	Moderate	Vehicle use increases the risk for leaks or spills of fuel & other haz. materials. Road building, maintenance & use can increase erosion/slope failure causing turbidity. Over-application or improper handling of pesticides/fertilizers may impact water.	
12	Cemeteries - Pre-1945	Cemetery	Evergreen Street	Tillamook	Field-Observation	Between 5-yr and 15-yr TOT for WELL #3	Moderate	Embalming fluids (for example, arsenic) and decomposition by-products may impact drinking water supply.	

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TABLE 2. INVENTORY RESULTS - LIST OF POTENTIAL CONTAMINANT SOURCES

PWS# 4100893 TILLAMOOK WATER COMMISSION

Reference No. (See Figure)	Potential Contaminant Source Type	Name	Approximate Location	City	Method for Listing	Proximity to Sensitive Areas	Relative Risk Level (1)	Potential Impacts	Comments
13	Chemical/Petroleum Processing/Storage	BPA	Evergreen	Tillamook	Database (2)	Between 5-yr and 15-yr TOT for WELL #3	Lower	Spills, leaks, or improper handling of chemicals and other materials during transportation, use, storage and disposal may impact the drinking water supply.	PCS location based on regulatory database search - needs verification. Risk reduced to Lower because storage of lead acid batteries inside building.
14	Utility Stations - Maintenance Transformer Storage	Tillamook Substation	Evergreen	Tillamook	Database (2)	Between 5-yr and 15-yr TOT for WELL #3	Higher	Spills, leaks, or improper handling of chemicals and other materials including PCBs during transportation, use, storage and disposal may impact the drinking water supply.	PCS location based on regulatory database search - needs verification.
	UST - Status Unknown						Higher	Spills, leaks, or improper handling of stored materials may impact the drinking water supply.	PCS location based on regulatory database search - needs verification.
15	Fleet/Trucking/Bus Terminals - fleet maintenance	Tillamook PUD	25th and Evergreen	Tillamook	Database (2)	Between 5-yr and 15-yr TOT for WELL #3	Higher	Spills, leaks, or improper handling of fuels, grease, solvents, and other materials from vehicle service, fueling, and parking areas may impact the drinking water supply.	PCS location based on regulatory database search - needs verification.
16	RV/Mini Storage	Pacific Storage	3rd Street	Tillamook	Field-Observation	Between 5-yr and 15-yr TOT for WELL #3	Lower	Spills, leaks, or improper handling of automotive fluids and other materials during transportation, storage and disposal may impact the drinking water supply.	
17	UST - Status Unknown	C.E. Lewis TV & Appliance	33rd and 3rd Street	Tillamook	Database (2) Field-Observation	Between 5-yr and 15-yr TOT for WELL #3	Higher	Spills, leaks, or improper handling of stored materials may impact the drinking water supply.	

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TABLE 2. INVENTORY RESULTS - LIST OF POTENTIAL CONTAMINANT SOURCES

PWS# 4100893 TILLAMOOK WATER COMMISSION

Reference No. (See Figure)	Potential Contaminant Source Type	Name	Approximate Location	City	Method for Listing	Proximity to Sensitive Areas	Relative Risk Level (1)	Potential Impacts	Comments
18	Fleet/Trucking/Bus Terminals	ODOT Tillamook Maintenance Facility	Evergreen Drive	Tillamook	Database (2) Field-Observation	Between 5-yr and 15-yr TOT for WELL #3	Higher	Spills, leaks, or improper handling of fuels, grease, solvents, and other materials from vehicle service, fueling, and parking areas may impact the drinking water supply.	
19	Automobiles - Repair Shops	Grunder Equipment Repair	Main Ave N.	Tillamook	Database (2) Field-Observation	Between 5-yr and 15-yr TOT for WELL #3	Higher	Spills, leaks, or improper handling of automotive fluids, solvents, and repair materials during transportation, use, storage and disposal may impact the drinking water supply.	
20	UST - Status Unknown	Hampton Lumber Mills	31st and 3rd Street	Tillamook	Database (2) Field-Observation	Between 5-yr and 15-yr TOT for WELL #3	Higher	Spills, leaks, or improper handling of stored materials may impact the drinking water supply.	Also listed as Tillamook Lumber Co. Site is beyond public access, no visual observation - needs verification.
	UST - Confirmed Leaking Tanks - DEQ List						Higher	Existing contamination from spills, leaks, or improper handling of stored materials may impact the drinking water supply.	Also listed as Tillamook Lumber Co. Site is beyond public access, no visual observation - needs verification.
	Wood/Pulp/Paper Processing and Mills						Higher	Spills, leaks, or improper handling of wood preservatives and other chemicals during transportation, use, storage and disposal may impact the drinking water supply.	Also listed as Tillamook Lumber Co. Site is beyond public access, no visual observation - needs verification.

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(1) Where multiple potential contaminant sources exist at a site, the highest level of risk is used.

(2) See Table 3 for database listings (if necessary).

TABLE 2. INVENTORY RESULTS - LIST OF POTENTIAL CONTAMINANT SOURCES

PWS# 4100893 TILLAMOOK WATER COMMISSION

Reference No. (See Figure)	Potential Contaminant Source Type	Name	Approximate Location	City	Method for Listing	Proximity to Sensitive Areas	Relative Risk Level (1)	Potential Impacts	Comments
21	Schools	School	Alder Street	Tillamook	Field-Observation	Between 5-yr and 15-yr TOT for WELL #3	Lower	Over-application or improper handling of cleaning products, pesticides or fertilizers used on the school grounds may impact drinking water. Vehicle maintenance wastes may contribute contaminants.	
22	Crops - irrigated (inc. orchards, vineyards, nurseries, greenhouses)	Irrigated crop area(s)	Throughout the DWPA	Tillamook	Field-Observation	Between 5-yr and 15-yr TOT for WELL #3	Moderate	Over-application or improper handling of pesticides/fertilizers may impact drinking water. Excessive irrigation may transport contaminants or sediments to groundwater/surface water through runoff. Drip-irrigated crops are considered to be a low risk.	
23	Lagoons/Liquid Wastes	Manure Holding Tank	North of Wilson River Highway	Tillamook	Interview	Between 5-yr and 15-yr TOT for WELL #3	Higher	Improper seepage or overflows of liquid wastes may impact the drinking water supply.	
24	Schools	School	Alder	Tillamook	Field-Observation	Between 2-yr and 5-yr TOT for WELL #2	Lower	Over-application or improper handling of cleaning products, pesticides or fertilizers used on the school grounds may impact drinking water. Vehicle maintenance wastes may contribute contaminants.	
25	Confined Animal Feeding Operations (CAFOs)	Confined animal feeding operation	12th Ave.	Tillamook	Field-Observation	Between 5-yr and 15-yr TOT for WELL #2	Higher	Improper storage and management of animal wastes and wastewater in areas of concentrated livestock may impact drinking water.	

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(2) See Table 3 for database listings (if necessary).

TABLE 2. INVENTORY RESULTS - LIST OF POTENTIAL CONTAMINANT SOURCES

PWS# 4100893 TILLAMOOK WATER COMMISSION

Reference No. (See Figure)	Potential Contaminant Source Type	Name	Approximate Location	City	Method for Listing	Proximity to Sensitive Areas	Relative Risk Level (1)	Potential Impacts	Comments
26	Above Ground Storage Tanks - Excluding Water	City of Tillamook 12th Street Lift Station	12th Street	Tillamook	Database (2)	Between 5-yr and 15-yr TOT for WELL #2	Moderate	Spills, leaks, or improper handling of stored materials may impact the drinking water supply.	PCS location based on regulatory database search - needs verification.
	Wastewater Treatment Plants/Collection Stations						Moderate	Improper management of wastewater, treatment chemicals, or equipment maintenance materials may impact drinking water supply.	PCS location based on regulatory database search - needs verification.
27	Apartments and Condominiums	Apartment complexes	Throughout the DWPA	Tillamook	Field-Observation	Between 5-yr and 15-yr TOT for WELL #2	Lower	Improper use, storage, and disposal of household and facility maintenance chemicals may impact the drinking water supply. Stormwater run-off or infiltration may carry contaminants to water supply.	
28	Stormwater Outfalls	Stormwater Outfall	North of 12th, South of Meadow Street	Tillamook	Interview	Between 5-yr and 15-yr TOT for WELL #2	Lower	Stormwater run-off may contain contaminants from residential (homesites and roads), commercial/industrial, and agricultural use areas.	
29	Large Capacity Septic Systems (serves > 20 people) - Class V UICs	Tillamook LDS Church	12th Street	Tillamook	Database (2) Field-Observation	Between 5-yr and 15-yr TOT for WELL #2	Higher	If not properly sited, designed, installed, and maintained, septic systems can impact drinking water.	

Note: Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.

(1) Where multiple potential contaminant sources exist at a site, the highest level of risk is used.

(2) See Table 3 for database listings (if necessary).

TABLE 3. RESULTS OF REGULATORY DATABASE SEARCH

PWS# 4100893 TILLAMOOK WATER COMMISSION

Reference No. (1)	Name	Database Listings (2)
8	EE Auto Body Shop	SFM - Paint stored in Can SFM - Thinner stored in Can SFM - Waste Paint Thinner stored in Steel Drum UST list-PWS needs to verify tank permit status HWIMSY list as a conditionally exempt generator.
10	Unocal Former Bulk Plant	ECSI site with no further state action required. HWIMSY list as a small quantity generator of dangerous/hazardous waste. LUST list with unknown status
13	BPA	SFM - Lead Acid Batteries-wet stored in Plastic Bottle, Jug, Bucket
14	Tillamook Substation	UST list-PWS needs to verify tank permit status
15	Tillamook PUD	SFM - Transformer Oil stored in Tank Inside Building SFM - Waste Oil stored in Tank Inside Building SFM - Lead Acid Batteries-wet stored in Other
17	C.E. Lewis TV & Appliance	UST list-PWS needs to verify tank permit status
18	ODOT Tillamook Maintenance Facility	HWIMSY list as a conditionally exempt generator. LUST list with unknown status UST list-PWS needs to verify tank permit status
19	Grunder Equipment Repair	SFM - Waste Oil stored in Aboveground Tank SFM - Antifreeze stored in Plastic Bottle, Jug, Bucket SFM - Diesel stored in Tank Inside Building

Notes: (1) See Table 2 and Figure. (2) For State Fire Marshals (SFM) list, information on materials in a gaseous-form is not presented since gaseous compounds rarely pose a threat to groundwater or surface water.

TABLE 3. RESULTS OF REGULATORY DATABASE SEARCH

PWS# **4100893** **TILLAMOOK WATER COMMISSION**

Reference No. (1)	Name	Database Listings (2)
19	Grunder Equipment Repair	SFM - Lead Acid Batteries-wet stored in Other
		SFM - Motor Oil stored in Plastic Or Non-metallic Drum
		SFM - Solvent stored in Steel Drum
		SFM - Used Lead Acid Batteries-wet stored in Other
		SFM - Waste Antifreeze stored in Aboveground Tank
20	Hampton Lumber Mills	SFM - Paint Water Based stored in Steel Drum
		UST list-PWS needs to verify tank permit status
		SFM - Watercare 2272 stored in Plastic Or Non-metallic Drum
		SFM - Watercare 2255 stored in Plastic Or Non-metallic Drum
		SFM - Watercare 2153 stored in Plastic Or Non-metallic Drum
		SFM - Watercare 2137 stored in Plastic Or Non-metallic Drum
		SFM - Watercare 2103 stored in Plastic Or Non-metallic Drum
		SFM - Waste Oil stored in Aboveground Tank
		SFM - Waste Antifreeze stored in Plastic Or Non-metallic Drum
		SFM - Turbine Oil stored in Steel Drum
		SFM - Antifreeze stored in Steel Drum
		SFM - Safety-kleen Premium Gold Solvent stored in Steel Drum
		SFM - Motor Oil stored in Steel Drum
		SFM - Lubricating Oil stored in Steel Drum
		SFM - Hydraulic Oil stored in Aboveground Tank
		SFM - Grease stored in Steel Drum

Notes: (1) See Table 2 and Figure. (2) For State Fire Marshals (SFM) list, information on materials in a gaseous-form is not presented since gaseous compounds rarely pose a threat to groundwater or surface water.

TABLE 3. RESULTS OF REGULATORY DATABASE SEARCH

PWS# 4100893 TILLAMOOK WATER COMMISSION

Reference No. (1)	Name	Database Listings (2)
20	Hampton Lumber Mills	SFM - Frosto stored in Tank Inside Building SFM - Diesel Fuel stored in Aboveground Tank SFM - Cherry Brown Ws-814 stored in Steel Drum SFM - Big Red Chemical Cleaner stored in Steel Drum SFM - Babbitt Tin Based stored in Box SFM - Transmission Fluid stored in Totebin
26	City of Tillamook 12th Street Lift Station	SFM - Diesel Fuel stored in Tank Inside Building
29	Tillamook LDS Church	SIS list with a individual WPCF permit for an on-site system.

Notes: (1) See Table 2 and Figure. (2) For State Fire Marshals (SFM) list, information on materials in a gaseous-form is not presented since gaseous compounds rarely pose a threat to groundwater or surface water.

WATER WELL REPORT
STATE OF OREGON

State Well No. 1S/9W-29CC

AUG 5 1981
WATER RESOURCES DEPT
SALEM, OREGON

State Permit No.

Well #2

(1) OWNER:
Name Tillamook Water Commission
Address City Hall
City Tillamook State Oregon

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Reverse
Rotary Air ☒ Driven ☐
Rotary Mud ☐ Dug ☐
Cable ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐
Thermal: Withdrawal ☐ Reinjection ☐

(5) CASING INSTALLED: Steel ☒ Plastic ☐ Threaded ☐ Welded ☒
14" Diam. from +2 ft. to 95 ft. Gauge .250
12" Diam. from 87 ft. to 95 ft. Gauge .250
" Diam. from 100 ft. to 102 .250

LINER INSTALLED:
12" Diam. from 122 ft. to 123 ft. Gauge .250
plate & bail on bottom

(6) PERFORATIONS: Perforated? ☐ Yes ☒ No
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☒ Yes ☐ No
Manufacturer's Name UOP Johnson
Type Hi-CAP dbl extra strong Model No.
Diam. 12" PS Slot Size .200 Set from 95 ft. to 100 ft.
Diam. 12" PS Slot Size .200 Set from 102 ft. to 122 ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? SEI
Yield: 1110 gal./min. with 72 ft. drawdown after 43½ hrs.
" 750 " 43 " 47 "
Air test gal./min. with drill stem at ft. hrs.
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION: Special standards: Yes ☐ No ☒
Well seal—Material used cement
Well sealed from land surface to 40 ft.
Diameter of well bore to bottom of seal 24 in.
Diameter of well bore below seal 18 in.
Number of sacks of cement used in well seal 87 sacks
How was cement grout placed? pumped from bottom upwards as surface casing was removed

Was pump installed? No Type HP Depth ft.
Was a drive shoe used? ☐ Yes ☒ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of Water? depth of strata
Method of sealing strata off
Was well gravel packed? ☒ Yes ☐ No Size of gravel: 3/4-1"
Gravel placed from 40 ft. to bottom ft.

(10) LOCATION OF WELL:
County Tillamook Driller's well number 8109
SW ¼ SW ¼ Section 29 T. 1S R. 9W W.M.
Tax Lot # Lot Blk Subdivision
Address at well location:

(11) WATER LEVEL: Completed well.
Depth at which water was first found 22 ft.
Static level 19 ft. below land surface. Date 7/6/81
Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing
Depth drilled 125 ft. Depth of completed well 122½ ft.
Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
See attached sheet			

Work started 6/1 1981 Completed 7/8 1981
Date well drilling machine moved off of well 7/8 1981

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Donald D. Davis (Drilling Machine Operator) Date 8/3, 1981
Drilling Machine Operator's License No. 1085

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Schneider Equipment, Inc. (Person, firm or corporation) (Type or print)
Address 21881 River Rd NE St. Paul, Or 97137
[Signed] Stephen J. Schneider (Water Well Contractor)
Contractor's License No. 649 Date 8/3, 1981

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310
within 30 days from the date of well completion.

SP*12658-690

Tillamook Water Commission 8109

Material	From	To
Top soil, brown	0	3
Gravel & clay, cemented, rusty brown	3	12
Clay w/ gravel 3/4 minus, brown	12	16
Clay, dark brown	16	17
Clay, blue gray	17	22
Gravel & sand, 2" minus, dark blue	22	25
Gravel 4" minus	25	26
Gravel w/ rusty clay binder	26	34
Clay, blue green w/ occasional gravel	34	39
Gravel 1½" minus	39	44
Gravel 3" minus semi-cemented	44	52
Gravel & sand, 3/4" minus, black	52	56
Gravel w/ clay, blue-green	56	57
Gravel, 1¼" minus, rusty brown	57	64
Gravel, 1¼" minus, black	64	67
Gravel, pea size w/ trace of brown clay	67	70
Clay, rusty brown w/ gravel	70	72
Gravel, 3/4" minus, rusty w/ some clay	72	77
Sand, med-coarse, brown	77	81
Gravel, 3" minus, brown	81	87
Gravel, 5" minus, semi cemented, brown	87	93
Clay, rusty brown, w/ some sand & gravel	93	95
Sand w/ gravel, medium, brown	95	97
Gravel, 3/4 minus, brown	97	100
Clay, brown w/ gravel	100	102
Gravel, 5" minus w/ some coarse sand	102	109
Gravel, 8" minus w/ some coarse brown sand	109	119
Gravel, 8" minus	119	121
Clay, gray	121	124½
Basalt, grey hard	124½	125

RECEIVED
AUG 5 1981
WATER RESOURCES DEPT
SALEM, OREGON

Till 013

RECEIVED
SEP 25 1990
WATER RESOURCES DEPT.
SALEM, OREGON

1S/9W/29 cb

STATE OF OREGON
WATER WELL REPORT
(as required by ORS 537.765)

(START CARD) # 19830

(1) OWNER:
Well Number: 3

Name: Tillamook Water Commission
Address: 807 Main
City: Tillamook State: OR Zip: 97141

(2) TYPE OF WORK:
☒ New Well ☐ Deepen ☐ Recondition ☐ Abandon

(3) DRILL METHOD
☐ Rotary Air ☐ Rotary Mud ☐ Cable
☒ Other: Reverse Circulation Rotary

(4) PROPOSED USE:
☐ Domestic ☒ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval: Yes ☐ No ☒ Depth of Completed Well: 198 ft.

Explosives used: Yes ☐ No ☒ Type ____ Amount ____

HOLE Diameter	From	To	SEAL Material	From	To	Amount sacks or pounds
26	0	99	cement w/bent	0	75	262 sks
24	99	201	following is not part of seal:			
			Hole Plug Bent	75	80	10 sks
			Sand	80	85	10 sks

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E
☐ Other

Backfill placed from 198 ft. to 201 ft. Material: cement
Gravel placed from 85 ft. to 201 ft. Size of gravel: pea

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	18	+2	201	.375	☒	☐	☒	☐
	except at screen				☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s) ____

(7) PERFORATIONS/SCREENS:
☐ Perforations Method ____
☒ Screens Type: Vshape wire wrap Material: 304SS

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
154	194	.150	cont	18	PS	☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
935	103.8		1 hr.
918	105.1		4 hr.
900	106.5		24 hr.

Temperature of water: approx55°F Depth Artesian Flow Found ____
Was a water analysis done? ☐ Yes By whom ____
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other ____
Depth of strata: ____

(9) LOCATION OF WELL by legal description:
County: Tillamook Latitude ____ Longitude ____
Township: 1S N or S, Range: 9W E or W, WM.
Section: 29 NW ¼ of SW ¼
Tax Lot: 3500 Lot ____ Block ____ Subdivision ____
Street Address of Well (or nearest address): 3906 Alder Lane, Tillamook, OR 97141

(10) STATIC WATER LEVEL:
31.5 ft. below land surface. Date: 8/16/90
Artesian pressure ____ lb. per square inch. Date ____

(11) WATER BEARING ZONES:
Depth at which water was first found: estimate 37'

From	To	Estimated Flow Rate	SWL
all sand and/or gravel		see (8)	see
formations below SWL			(10)

(12) WELL LOG:
Ground elevation: approx. 40'

Material	From	To	SWL
See attached log.			

Date started: 6/22/90 Completed: 8/30/90

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to my best knowledge and belief.

Signed: Donald G Davis WWC Number: 1085 Date: 9/20/90

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. all work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

Signed: Stephen J Schneider WWC Number: 649 Date: 9/20/90

ORIGINAL & FIRST COPY - WATER RESOURCES DEPARTMENT SECOND COPY - CONSTRUCTOR THIRD COPY - CUSTOMER 9809C 3/88

SEI #9015

Tillamook Water Commission
Well #3

Start Card #19830
by
Schneider Equipment, Inc. and Drilling Co.
1990

Depth in Feet	Formations
0 - 2	Top soil, dark brown
2 - 7	Clay, reddish brown
7 - 9	Clay, brown w/ some gravel 1/2"
9 - 12	Gravel 1"- w/ some clay
12 - 15	Gravel 2"- & sand, coarse
15 - 18	Gravel 2" & 3"- w/ sand, coarse
18 - 19	Gravel 2"-, rusty
19 - 22	Clay, rusty, brown & tan
22 - 37	Clay, grey
37 - 47	Gravel, rusty, cemented 1" to 1 1/4"-
47 - 60	Gravel, 1 1/4"-, rusty, some cemented
60 - 62	Gravel, 1 1/4"-, brown w/ some sand
62 - 64	Clay, brown, some hard
64 - 75	Clay, grey, silty, soft
75 - 81	Clay, grey & brown to brown, fine, sandy
81 - 83	Sand, brown cemented w/ clay, brown
83 - 87	Gravel, brown w/ some sand, w/ trace brown clay
87 - 99	Gravel 4"-, w/ coarse sand
99 - 109	Gravel 4-6"- w/ coarse sand, some cemented, and trace of brown clay
109 - 115	Gravel 2"- w/ clay, brown layers
115 - 123	Gravel 6"- w/ sand, coarse, brown
123 - 125	Gravel 4"-, clay, brown
125 - 137	Gravel 4"-, sand, coarse w/ trace brown clay
137 - 138	Gravel 2"-, w/ clay, grey, wood
138 - 139	Gravel 2"-, w/ clay, brown
139 - 140	Gravel 2"-, cemented
140 - 142	Clay, brown
142 - 144	Gravel 1 1/2"-, cemented
144 - 146	Gravel & clay, brown
146 - 151	Gravel 2"-, w/ sand, coarse, brown
151 - 153	Gravel 3/4"-, & sand, coarse
153 - 165	Gravel 4"-, & sand, coarse w/ some cemented
165 - 189	Gravel 6"-, some cemented
189 - 194	Gravel 6"-, w/ clay brown
194 - 197	Gravel 6"-, some cemented
197 - 200	Gravel 6"-, and clay, blue
200 - 201	Clay, grey

W0039.TWC

Parameters Used in Delineation Model

Delineation Method: [ ] Analytical [ ] Calculated Fixed Radius (CFR) [X] Enhanced CFR [ ] Numerical [ ] Hydro-geologic Mapping [ ] Analytic Element

Pump Rate[1] (Q in gpm) at Well #2: 18.4 Pump Rate[1] (Q in gpm) at Well #3: 38.0

Source: [ ] System [X] Water Resources Dept [ ] Comparable Community [ ] Pump Capacity [ ] Population Estimate [ ] 90% of Safe Yield

Nature of the Aquifer: [ ] Unknown [X] Unconfined [ ] Semi-confined [ ] Confined

Aquifer name: **Tillamook Valley Alluvial Aquifer**

Confining Unit lithology: Not Applicable
Depth to Confining Unit: N/A
Confining Unit thickness: N/A
Depth to Aquifer: 20 feet

Aquifer Characteristics

Lithology:

[ ] Unknown [ ] Sandy Silt [ ] Layered Volcanic Rocks
[ ] Sand [X] Sand & Gravel [ ] Fractured Volcanic Rocks
[X] Gravel [ ] Cobbles/Gravel [ ] Fractured Sedimentary Rocks
[ ] Other: ____________

Thickness (b): **16** feet

Effective Porosity (n): **0.25**

Hydraulic Conductivity (Permeability): ______ ft/day [X] N/A
[ ] Estimated from lithology [ ] Specific Capacity (Well Report)
[ ] Published Report [ ] Aquifer Test

Other High Capacity Wells Accounted for: None

1. Groundwater models used do not allow for variable pump rates, e.g., pumps turning off and on. Therefore, we must calculate an average continuous pump rate over a 24-hour period. Pump rate, therefore, represents average daily use of highest three months divided by 1440 minutes/day to obtain gallons/minute value.

System Name: City of Tillamook Water Department

Best Management Practice Materials

INCLUDED	BEST MANAGEMENT PRACTICE FACT SHEET
√	Groundwater Contamination and Septic Systems
√	Household Hazardous Waste (1) What is Household Hazardous Waste? (2) Household Hazardous Waste Table
√	Improving Drinking Water Well Condition
√	Improving Pesticide Storage and Handling
√	Improving Fertilizer Storage and Handling
√	Improving Petroleum Product Storage and Handling
√	Improving Hazardous Waste Management (farms & ranches)
√	Improving Household Wastewater Treatment (septic systems)
√	Improving Livestock Waste Storage
√	Improving Livestock Yards Management
	Improving Milking Center Wastewater Handling
√	Drinking Water Protection for Automotive Repair and Maintenance Industry
√	Drinking Water Protection for Business and Industrial Operation
	Drinking Water Protection for Shallow Injection Well Owners and Operators
√	Keeping Your Well Water Well
	Abandoning Your Well
√	Health Effects Information - Nitrate
√	Health Effects Information – Coliform Bacteria

Appendix G

Source Water Assessment Report

Tillamook Water Commission
Tillamook, Oregon

PWS #4100893

January 14, 2003

Prepared for
Tillamook Water Commission

Prepared by

DEQ
State of Oregon
Department of
Environmental
Quality

Water Quality Division
Drinking Water Protection Program

DHS
Oregon Department
of Human Services

Drinking Water Program

Oregon
Theodore Kulongoski, Governor

Department of Environmental Quality
Headquarters
811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
FAX (503) 229-6124
TTY (503) 229-6993

January 14, 2003

Arley Sullivan
Tillamook Water Commission
210 Laurel Ave A
Tillamook, Oregon 97141

RE: Source Water Assessment Report
Tillamook Water Commission
PWS # 4100893

Dear Mr. Sullivan:

Enclosed is the Source Water Assessment Report for the surface water portion of Tillamook Water Commission's drinking water protection area. A source water assessment report for the groundwater supply will be addressed in a separate report. The assessment was prepared under the requirements and guidance of the Federal Safe Drinking Water Act and the US Environmental Protection Agency, as well as a detailed Source Water Assessment Plan developed by a statewide citizen's advisory committee here in Oregon over the past two years. The Department of Environmental Quality (DEQ) and the Oregon Department of Human Services (DHS) are conducting the assessments for all public water systems in Oregon. The purpose is to provide information so that the public water system staff/operator, consumers, and community citizens can begin developing strategies to protect your source of drinking water.

As you know, the 1996 Amendments to the Safe Drinking Water Act requires *Consumer Confidence Reports* (CCR) by community water systems. CCRs include information about the quality of the drinking water, the source of the drinking water, and a summary of the source water assessment. Public water systems are responsible for notifying their customers of the assessment results. The information from this assessment can be presented by distributing the "Summary Brochure" attached to the report. There is a blank space to insert instructions for how customers can obtain or review a copy of your source water assessment report. Distribution of any copies of the report must be done at the local level. At a minimum, we would suggest that a copy be placed at the local library, city hall, and/or public water supply office and your customers can review the report at their convenience. By mid-2003, all results of these assessments will also be made available electronically to the public on DEQ's and DHS's websites.

There are no regulatory requirements for you to develop a protection plan using the assessment results, but we hope your community will take the initiative to do so voluntarily. One of the goals of developing a Drinking Water Protection Plan is to address the facilities and land use activities that pose high or moderate risks for contaminating your public water supply. At a minimum, we recommend that the community seek ways to communicate and extend outreach to these facilities/activities with education and technical assistance to minimize the risk of contamination. As you begin thinking about developing a protection plan, it is also important to remember that not all of the assessment's inventoried activities will need to be addressed in a voluntary protection plan. If you move forward with developing a protection plan, the next step is to enhance the assessment inventory and, at that time, the "potential contaminant sources" which pose little to no threat to your public water supply can be eliminated from your list.

We look forward to working with you to move forward with developing a protection plan and can assist you with limited resources at this time. In addition, we are developing some useful written guidance and materials that will assist your protection efforts and you will receive these when complete.

We have enclosed one copy of the large GIS map of the watershed and the assessment results. A smaller version of this exact map is found in the report. If you have a need for additional copies of the large map, we must charge a small fee for each to cover the costs that were not budgeted by the program. Let me know if you need additional copies.

If you have any questions or need more information, please do not hesitate to call me at 503-229-5664 or Sheree Stewart at 503-229-5413.

Sincerely,

Julie K Harvey

Julie K. Harvey, R.G.
Drinking Water Protection Specialist
Water Quality Division

Enclosures

Table of Contents

Figures

Tables

Attachment

Executive Summary

Tillamook Water Commission's water is supplied by three groundwater wells, Fawcett Creek, and Killam Creek. This Source Water Assessment addresses only the surface water component of Tillamook Water Commission's drinking water supply. This public water system serves approximately 4,000 citizens. The intakes are located in the Tillamook River Watershed in the Wilson-Trask-Nestucca Sub-Basin of the Northern Oregon Coastal Basin. The combination of the geographic areas contributing to the Killam Creek and Fawcett Creeks intakes make-up Tillamook's drinking water protection area. The drinking water protection area extends upstream a total of approximately 19.8 miles (10.2 miles for Killam Creek and 9.6 miles for Fawcett Creek including the lake perimeter) in an easterly direction and encompasses a total area of 9.7 square miles (4.8 square miles for Killam Creek and 4.9 square miles for Fawcett Creek). The Killam and Fawcett Creek intakes are located at an approximate elevation of 240 feet and 320 feet, respectively. The upper edge of the watershed is located at an elevation of approximately 3,170 feet at Edwards Butte.

An inventory of potential contamination sources *for surface water sources* was performed within Tillamook's drinking water protection area. The primary intent of this inventory was to identify and locate significant potential sources of contaminants of concern. The inventory was conducted by reviewing applicable state and federal regulatory databases and land use maps, interviewing persons knowledgeable of the area, and conducting a windshield survey by driving through the drinking water protection area to field locate and verify as many of the potential contaminant source activities as possible. The primary contaminants of concern for surface water intakes are sediments/turbidity, microbiological, and nutrients. It is important to remember that the sites and areas identified are only potential sources of contamination to the drinking water. Water quality impacts are not likely to occur when contaminants are used and managed properly and land use activities occur in such a way as to minimize erosion and contaminant releases.

The delineated drinking water protection area for surface water sources is primarily dominated by forestry land uses. A total of five potential contamination sources were identified within Tillamook Water Commission's drinking water protection area. All of those are located in the sensitive areas. The potential contaminant sources identified in the Killam Creek Watershed include clear-cuts, landslides, and a transmission line. The potential contaminant sources identified in the Fawcett Creek Watershed include clear-cuts, landslides, a transmission line, a rock quarry, and an upstream dam. The potential contaminant sources within the drinking water protection area all pose a relatively higher to moderate risk to the drinking water supply. This provides a quick look at the existing potential sources of contamination that could, if improperly managed or released, impact the water quality in the watershed.

The susceptibility analysis combines the results of the locations of the potential contaminant sources with the locations of the sensitive areas. Overlaying the locations of the moderate- to high-risk sources within the sensitive areas provides an indication of the areas that are highly susceptible to contamination. In the Tillamook watershed, the results of the susceptibility "analysis" include the distribution of five identified high- to moderate-risk sources within the areas of highly permeable soils, high erosional soils, high runoff potential soils, and within the 1000' setback from the streams. The susceptibility analysis provides the community and the public water system with information on where the greatest risk occurs and where to focus resources for protection of this valuable drinking water resource.

Introduction

In 1996, Congress amended the Safe Drinking Water Act, implemented some new requirements, and provided resources for state agencies to assist communities in protecting the sources of their public water supplies. The US Environmental Protection Agency (EPA) developed guidelines for implementing the new requirements to conduct "source water assessments" (EPA, 1997). In Oregon, the Oregon Department of Human Services (DHS) and the Department of Environmental Quality (DEQ) are conducting the source water assessments. An assessment such as this one will be done for every public water system in Oregon regulated by the Safe Drinking Water Act. DEQ and DHS will each have specific tasks in accomplishing the assessments for a total of 2656 public water systems in Oregon. Of those 2656 public water systems, about 90% of these are groundwater systems drawing water from wells or springs, and 10% are surface water systems with intakes on streams, rivers, or lakes/reservoirs.

The assessments in Oregon include delineating the source area supplying the public water system, identifying areas "sensitive" to contamination, and conducting an inventory of potential contamination sources in the area. Using the results of the inventory and sensitive areas, the susceptibility of the public water system is determined. DHS will provide the delineation for all groundwater systems and the identification of the sensitive areas within their source area. DEQ will delineate and identify the sensitive areas within the watersheds for the surface water systems. DEQ will conduct all inventories of the potential contaminant sources inside the drinking water protection areas and this is then used to estimate the public water system's susceptibility to contamination.

Sources of information reviewed during this assessment included U.S. Geological Survey (U.S.G.S.) documents/websites, DEQ reports, EPA/DEQ databases, and other readily accessible reports. The reference list provides a few of the good sources of information used in the report. Time constraints do not allow research into all existing technical resources available for each system. As the assessment is performed, assistance from municipal water staff, state/federal land management officials, and community members will increase DHS and DEQ's abilities to characterize local hydrogeologic/hydrologic conditions, site-specific information, and ultimately increase the quality of the assessment. Where possible, DEQ staff has consulted local Natural Resource Conservation Service, county planning agencies, irrigation districts, and other natural resource officials.

Many watersheds in Oregon provide water used for public or "domestic" drinking water supplies, irrigation, industry, hydro power, fish hatcheries, and of course, natural in-stream fish rearing. Watersheds vary considerably in terms of overall health and susceptibility to contamination. Most surface water sources for drinking water are filtered and undergo treatment (disinfection) prior to delivery to the consumer. The ability to adequately (and cost-effectively) treat drinking water from a surface water source is directly related to the quality of the water at the intake. Surface water intakes for public water supplies are generally very susceptible to increases in coarse sediments. Treatment facilities for public water supplies are very susceptible to increases in fine sediments, nutrients and other organic and inorganic contaminants. Treatment facilities are also negatively impacted by changes in temperature.

Changes in surface water quality parameters can be caused by a variety of factors in any watershed. Detailed consideration of all the variables was beyond the scope of this assessment. The procedures for conducting these assessments were developed by a statewide advisory committee (Source Water Assessment Plan, 1999). The value of preparing detailed procedures is in the ability to be consistent from one system to the next. There are also severe time constraints for the amount of time allowed to complete each public water system assessment. It is our intent to provide as much information about the watershed as our program resources allow.

Using the results of this assessment, the public water system and the local community can then move forward with voluntarily developing and implementing a *drinking water protection plan*. The requirements for water quality monitoring of public water systems in Oregon provide some degree of assurance of safe drinking water; however, all systems are vulnerable to potential contamination. One of the best ways to ensure safe drinking water and minimize future treatment costs is to develop a local plan designed to protect against potential contamination. Not only will this measure add a margin of safety, it will raise awareness in the local community of the risks of drinking water contamination, and provide information to them about how they can help protect the system. It is our hope that each community will use the assessment results as a basis for developing a drinking water protection plan.

Background

Tillamook is located in Tillamook County, Oregon on Highway 101. The drinking water for the Tillamook is partially supplied by intakes on Killam Creek and Fawcett Creek. This public water system serves approximately 4,000 citizens. The intakes are located in the Tillamook River Watershed in the Wilson-Trask-Nestucca Sub-Basin in the Northern Oregon Coastal Basin, Hydrologic Unit Code (HUC) # 17100203. DEQ obtained the coordinates for the intake using a Geographic Positioning System (GPS) in February 1999; these coordinates are available to the public water system operator upon request. In addition, Tillamook uses groundwater wells as drinking water supply. This Source Water Assessment addresses only the surface water component of Tillamook's drinking water supply. The groundwater supply will be addressed in a separate report.

The study area for evaluating the extent of the Tillamook Drinking Water Protection Area (DWPA) includes US Geological Survey topographic maps for the Tillamook, (1985), Blaine (1984), The Peninsula (1984), and Beaver (1985) quadrangles at the 1:24,000 scale. The surface water intake plots on the U.S. Geological Survey Tillamook quadrangle topographic map. The Wilson-Trask-Nestucca Sub-Basin where the Tillamook intakes are located is the catchment basin for approximately 973 square acres (USGS) that all drain to the ocean either at Tillamook Bay or near Pacific City and Neskowin. The Sub-basin includes the Miami, Kilchis, and Wilson, Trask, Tillamook and Nestucca Rivers as well as numerous smaller tributaries. These systems flow in a westerly direction from the slopes of the Coast Range to the ocean.

The climate in the Wilson-Trask-Nestucca Sub-Basin area is characterized by moderate annual temperature and precipitation variations. Information on climate in the Tillamook area is based on the National Oceanic and Atmospheric Administration's (NOAA) Tillamook climate station located at an elevation of 10 feet above mean sea level (Western Regional Climate Center). The average annual temperature is 50 degrees for the period of 1948 to 2001. Winters are cool and wet, with temperatures usually staying above freezing. The Tillamook station gets an average of 2.6 inches of total snowfall per year but none of it accumulates to measurable depths. The summers are dry and moderately warm to hot, with average monthly temperature highs of approximately 65 to 70 degrees. Average annual precipitation is about 91 inches, with almost 70% of that occurring between November and March.

Delineation of the Protection Area

Methodology

The delineation of the source area or the "drinking water protection area" is a fundamental aspect of the assessment of a public water system. For surface water systems such as Tillamook's, the drinking water protection area delineation process begins by identifying the *watershed.* The watershed area is also called the *catchment basin* of a receiving water body. The outer boundary of this watershed is the drainage divide formed by the surrounding ridges and hills. The surface water delineation includes the entire watershed area upstream of the public water system intake structure. This watershed area provides "source" water to the surface water intake.

A map of the drinking water protection area provides the community with the knowledge of the geographic area providing the water to the intake. This is the area where contamination poses the greatest threat to the drinking water supply. Information about the drinking water protection area allows the community to develop management strategies that will have the most impact on protecting the source of the drinking water.

Results

DEQ has collected and reviewed data for the purpose of delineating the drinking water protection area for Tillamook's intakes on Killam Creek and Fawcett Creek. The scope of work for this report included collecting information from the water system operator, researching written reports, and establishing a Geographic Information Systems (GIS) basemap of the delineated watershed. *Tillamook's drinking water protection area for surface water sources is shown in Figure 1.* Tillamook's drinking water protection area extends upstream a total of approximately 19.8 miles (10.2 miles for Killam Creek and 9.6 miles for Fawcett Creek including the lake perimeter) in an easterly direction and encompasses a total area of 9.7 square miles (4.8 square miles for Killam Creek and 4.9 square miles for Fawcett Creek).

The Killam Creek and Fawcett Creeks intakes are located at approximate elevations of 240 feet and 320 feet, respectively. The upper edge of the watershed is located at an elevation of approximately 3,170 feet for the Killam Creek intake and 3062 feet for the Fawcett Creek intake; therefore, the elevation change from the upper edge of the watershed to the intake is approximately 2,700 to 2,900 feet.

Identification of Sensitive Areas

Methodology

After delineating the entire watershed, DEQ identified the "sensitive areas" within the watershed. *The objective in determining the sensitive areas for surface water sources is to produce reliable information to the community and public water system that is useful in developing and prioritizing protection strategies*. The list of the sensitive areas to be identified within drinking water watersheds was defined by the DEQ advisory committee as the procedures were developed (SWAP, 1999). The sensitive areas within a drinking water watershed includes both setbacks (land adjacent to stream) and other natural factors that increase the risk of contamination of the surface water. The result is an identification of a subset of the entire watershed. *The sensitive areas are those where potential contamination sources or land use activities, if present, have a greater potential to impact the water supply.*

In establishing sensitive areas in a watershed, there are several limiting factors to take into account. In using a Geographic Information System (GIS) to delineate the sensitive areas within the watershed, DEQ locates existing GIS layers and other natural resource agency data sets. Not all areas of the state have been mapped for the natural resource parameters of interest or at the level of detail ideal for this type of analysis. The availability of data at appropriate scales is also a potential limitation. The sensitive area mapping may be limited simply by the lack of readily available data, and conducting additional research is not possible within the time frame allowed to do this assessment. DEQ staff has sought to obtain the best available information for each water system as the source water assessment was performed.

There are four individual characteristics that determine the sensitivity of areas within the drinking water watersheds in the Source Water Assessment Plan (1999) procedures for Oregon water systems. A brief description of the sensitive area characteristics and the sources of the GIS data are included below.

Sensitive Area Setbacks
The first sensitive area is a setback using a consistent 1000' (about 300 meters) distance from the water body. The 1000' sensitive area setbacks are intended to identify those areas where there are higher risks of contamination by spills or other releases, simply due to their proximity to the water body. The sensitive area setbacks are identified as a minimum of 1000' from centerline of the intake stream and all perennial tributaries within the delineated drinking water watershed. The distance of 1000' was based on EPA national guidance for the distance to conduct the potential contamination source inventories adjacent to streams.

High Soil Erosion Potential
The soil erosion potential is typically determined by combining the effects of slope and the soil erodibility factor ("K-factor") which are evaluated using the 1:24,000 SSURGO (Soil Survey Geographic Database) data sets from the *Natural Resources Conservation Service*. For this area in Tillamook County, there is presently no SSURGO data available. Therefore, the 1:250,000 State Soil Geographic (STATSGO) data set which is also from the *Natural Resources Conservation Service* was used to evaluate the runoff and erosion potentials for the soils part of the sensitivity analysis. In general, the STATSGO data are not designed to be detailed enough to make interpretations for local areas within a county but may be used as a reference source. The slope for a map unit is a weighted average of the average slope. The soil erodibility factor is also available in the STATSGO database and quantifies the susceptibility of soil particles to detachment and movement by water including the effects of rainfall, runoff, and infiltration. The K-factor used is a weighted average of only the value for the surface layer of the map unit. In the watershed, only soils with "high" erodibility ratings were mapped as sensitive areas. Soils that classify as "high" include soil with slopes greater than 30% <u>and</u> K-factors greater than 0.25. This rating system is based on the *Revised Universal Soil Loss Equation* from the USDA Agricultural Research Service as defined in the Washington's Standard Methodology for Conducting Watershed Analysis (Washington Forest Practices Board, 1993).

High Permeability Soils
Soils identified in the *U.S. Geological Survey* geologic map of Oregon GIS layer (1:500,000 scale) as Recent Alluvial Deposits (Qal), Dune Sand (Qd) and Landslide and

Debris Flow Deposits (Qls) are mapped as sensitive areas due to the high potential for groundwater recharge adjacent to the stream. Alluvial deposits, dune sand and landslide deposits are typically very high permeability soils. These areas may be very vulnerable to rapid infiltration of contaminants to groundwater and subsequent discharge to a stream or lake/reservoir.

High Runoff Potential
The potential for high runoff rates is typically evaluated using the SSURGO data sets from the *Natural Resources Conservation Service*. As discussed previously, there is presently no SSURGO data available for this area in Tillamook County and the State Soil Geographic (STATSGO) data set was used to evaluate the runoff and erosion potentials for the soils part of the sensitivity analysis. Class D soils, which are defined as soils with very slow infiltration rates were mapped as sensitive areas within the boundaries of the drinking water protection area. Map units are assigned to hydrologic groups based on their majority component. A Class D soil is typified as clayey, has a high water table, or an impervious layer occurs at a shallow depth. Soils with these characteristics would have the potential for rapid runoff and subsequent transport of sediments and possible contaminants to the surface water body supplying the public water system.

Additional Sensitive Areas
There may be other natural characteristics within a watershed that can be mapped as sensitive. Modifying the list of sensitive areas in this assessment can be done by the public water system or the community by identifying resources and procedures that are appropriate for the individual system. For example, the local community may choose to add "transient snow zones", high rainfall areas, and landslide/debris-flow hazards to the sensitive areas within their watershed. Due to time constraints, these additional areas will not be mapped by DEQ as part of this source water assessment, but can be added by the local community before developing a protection plan.

Transient snow zones are typically defined as areas above 1500 feet in the Oregon Coast Range, or above 2000 feet in the Cascades. In some watersheds, these areas may be subject to rapid snowmelt or rain-on-snow events which increase the likelihood of transport of sediments to the surface water bodies in the watershed. Areas of high rainfall or irrigation rates may increase the likelihood of transport of sediments and possible contaminants to the surface water body. These areas can be identified using average annual precipitation data from Oregon Climate Service (years 1961 through 1990) and irrigation/water rights data from Oregon Water Resources Department's water rights database. Mapping the high risk landslide and debris-flow areas can also be useful for evaluating sediment risks from natural hazards within a drinking water watershed. The Department of Forestry has recently completed GIS-based landslide and debris flow maps for western Oregon (Website address: http://www.odf.state.or.us/gis/debris.html).

The final watershed map for each public water system intake includes a composite of all sensitive areas identified by DEQ within the watershed. This composite or overlay will enable the communities and responsible agencies to focus future protection efforts in these sensitive areas.

Results

The sensitive areas within the Tillamook's drinking water protection area for surface water sources are shown on Figure 2. These include the setbacks from Killam Creek and Fawcett Creek and all perennial tributaries and large area of high soil erosion potential. Areas with high soil permeability or high runoff potential were not identified in the GIS layers. Good data coverage was available for the Tillamook watershed for each of the sensitive areas.

Inventory of Potential Contaminant Sources

Methodology

The primary intent of an inventory is to identify and locate significant potential sources of any of the contaminants of concern within the drinking water protection area. Significant potential sources of contamination can be defined as any facility or activity that stores, uses, or produces the contaminants of concern and has a sufficient likelihood of releasing such contaminants to the environment at levels that could contribute significantly to the concentration of these contaminants in the source waters of the public water supply. An inventory is a very valuable tool for the local community in that it:

- provides information on the locations of potential contaminant sources, especially those that present the greatest risks to the water supply,
- provides an effective means of educating the local public about potential problems,
- provides valuable awareness to those that own or operate facilities and land use activities in the drinking water protection area, and
- provides a reliable basis for developing a local protection plan to reduce the risks to the water supply.

Inventories are focused primarily on the potential sources of contaminants regulated under the federal Safe Drinking Water Act. This includes contaminants with a maximum contaminant level (MCL), contaminants regulated under the Surface Water Treatment Rule, and the microorganism Cryptosporidium. The inventory was designed to identify several categories of potential sources of contaminants including micro-organisms (i.e., viruses, Giardia lamblia, Cryptosporidium, and fecal bacteria); inorganic compounds (i.e., nitrates and metals); organic compounds (i.e., solvents, petroleum compounds and pesticides) and turbidity/sediments. Contaminants can reach a water body (groundwater, rivers, lakes, etc.) from activities occurring on the land surface or below it. Contaminant releases to water bodies can also occur on an area-wide basis or from a single point source.

When identifying potential risks to a public water supply, it is necessary to make "worst-case" assumptions. This is important because it is the POTENTIAL risk that we are attempting to determine through this procedure and it is simply not possible within our time constraints to conduct individual reviews or inspections at any of the facilities or land uses. The worst-case assumption that is made when considering potential risks to water bodies is that the facility or activity is not employing good management practices or pollution prevention. Under today's regulatory standards and environmental awareness, the majority of the identified activities and land uses employ "best management practices" (BMPs) in handling contaminants or preventing water quality degradation from their operations. It is important to note that while this assessment will list all POTENTIAL risks, many of these do not present actual risks to the water system. Environmental contamination is not likely to occur when contaminants are handled and *used properly, or when BMPs are employed. The day-to-day operating practices and environmental (contamination) awareness varies considerably from one facility or land use activity to another. In-depth analysis or research was not completed to assess each specific source's compliance status with local, state and/or federal programs or laws. Further, the inventory process did not include an attempt to identify unique contamination risks at individual sites such as facilities (permitted or not) that do not safely store potentially hazardous materials. After the assessment is completed, the next step is to conduct an "enhanced" inventory that will look at the site-specific practices. The potential sources listed in the assessment that employ BMPs (required through regulations OR voluntarily) can be removed from the list during the next step in the process of developing a voluntary drinking water protection plan.*

Assumptions are also made about what potential contamination sources are included in the various types of land uses. For example, it is assumed that rural residences associated with farming operations have specific potential contamination sources such as fuel storage, chemical storage and mixing areas, and machinery repair shops. Again, any errors in these assumptions can be easily corrected as the community moves beyond the assessment to develop a protection plan.

Past, current, and possible future potential sources of contaminants were identified through a variety of methods and resources. In completing this inventory, DEQ used readily available information including review of DEQ, EPA, and other agencies' databases of currently listed sites, interviews with the public water system operator, and field observation as discussed below. The process for completing the inventory for Tillamook's drinking water protection area included several steps, which are summarized as follows:

1. Collected relevant information as of February 2002 from applicable state and federal regulatory databases including the following lists:
   - DEQ Environmental Cleanup Site Information System (ECSI) which includes the U.S. EPA National Priorities List (NPL) and the U.S. EPA Comprehensive Environmental Response, Compensation and Liability Information System (CERCLA) list;
   - DEQ leaking underground storage tank (LUST) list;
   - DEQ registered underground storage tank (UST) list;
   - DEQ Active Solid Waste Disposal Permits list;
   - DEQ Dry Cleaners list;
   - DEQ Site Information System (SIS) which includes Water Pollution Control Facility (WPCF) and National Pollutant Discharge Elimination System (NPDES) permitted facilities;
   - State Fire Marshall Hazardous Material Handlers (HAZMAT) site list (information on materials in a gas-form was not used since gaseous compounds rarely pose a threat to surface water or groundwater);
   - DEQ Underground Injection Control (UIC) list of facilities with registered underground injection control systems; and
   - DEQ Hazardous Waste Management Information System (HWIMSY) list which includes U.S. EPA Resource Conservation Recovery Act (RCRA) generators or notifiers and U.S. EPA RCRA Treatment, Storage, and Disposal Facility (TSDF) Permits.

   Because of the way various state and federal databases are set up, the specific location of listed sites is not always given or accurate within the database. DEQ verified the presence and approximate location of potential contaminant sources and land uses within the drinking water protection area by consulting with local community members and/or by driving through the area (windshield survey) as discussed below in subsequent inventory steps.

2. Land use/ownership maps were obtained from statewide geographic information system (GIS) coverage and/or local planning department. The land use maps were evaluated to establish the potential threat that existing or future land uses might pose to the quality of your water supply. Four general categories of land use were evaluated: residential/municipal, commercial/industrial, agricultural/forest, and other land uses (see Table 1).

3. Interviewed public water system officials, or someone they designated as knowledgeable of the area to identify potential sources that are not listed elsewhere in databases or on maps and to assist in locating potential sources listed in the state and federal databases.

4. Assigned high-, moderate-, or low-risk ratings to each potential contaminant source based on the Oregon Source Water Assessment Plan (1999). A summary of the types of potential contaminant sources and level of assigned risk is presented in Table 1 (Summary of Potential Contaminant Sources by Land Use). The "comments" section of Table 2 (Inventory Results- List of Potential Contaminant Sources) provides justification for any modifications to the risk rating that may have resulted from field observations that were different from what is typically expected for the specific facility. Relative risk ratings are considered an effective way for the water supply officials and community to prioritize management efforts for the drinking water protection area. When the local water supply officials and community "team" enhance the inventory for use in developing management options, further analysis may need to be conducted to more closely evaluate the actual level of risk.

5. Produced final summary of the inventoried sources and the GIS base map, which are presented in this report.

Results

The results of the inventory were analyzed in terms of current, past, and future land uses; their proximity to the intake; and their associated potential risk. In general, land uses that are closest to the intake and those with the highest risk rating pose the greatest threat to your drinking water supply. *The inventory results are summarized in Tables 1 and 2 and are shown on Figure 3.*

The drinking water protection area for the surface water portion of Tillamook Water Commission's delineation is primarily dominated by forestry land uses. Five potential contaminant sources (detailed on Figure 3 and Table 2) were identified in the watershed. The potential contaminant sources identified in Killam Creek Watershed include clear-cuts, landslides, and transmission lines. The potential contaminant sources identified in Fawcett Creek Watershed include clear-cuts, landslides, a transmission line, a rock quarry, and an upstream dam. The potential contaminant sources within the drinking water protection area all pose a relatively higher to moderate risk to the drinking water supply. Area-wide potential sources such as the transmission line and clear-cuts occur throughout the drinking water protection area and are shown on Figure 2 in the location nearest to the intake. There were no facilities or sites identified on the regulatory databases that were searched (see Step 1 in the previous section) within the Drinking Water Protection Area.

This inventory of potential contaminant sources within the surface water portion of Tillamook Water Commission's drinking water protection area provides a quick look at the potential sources that could, if improperly managed, impact the water quality in the watershed. Even very small quantities of certain contaminants can significantly impact water bodies. It is important to remember the sites and areas identified in this section are only **potential** sources of contamination to the drinking water.

Susceptibility Analysis

Methodology

Susceptibility can be defined as the potential for contamination in the drinking water protection area to reach the intake on the surface water body being used by a public water system for drinking water purposes. Whether or not a particular drinking water source becomes contaminated depends on three major factors: 1) the occurrence of a facility or land use that releases contamination, 2) the location of the release, and 3) the hydrologic and/or soil characteristics in the watershed that allow the transport of the contaminants to the surface water body.

In conducting a susceptibility analysis the first step is identifying that part of the watershed that is most sensitive to contamination. This was accomplished after the delineation phase of this assessment. The second step consists of identifying and locating the potential contaminant sources in the drinking water protection area. Based on the type of facility and the nature of the chemicals they use, these sources represent a lower-, moderate-, or higher-relative risk to the surface water body. This step was accomplished in the inventory phase of the assessment.

The third step in the susceptibility analysis is to overlay the results of the inventory with the map of the sensitive areas. The results of the inventory are analyzed in terms of current, past, and future land uses; their time-of-travel relationship or proximity to the intake site; and their associated risk rating. In general, land uses that are closest to the intake and those with the highest risk rating pose the greatest threat to a drinking water supply. The presence and locations of the potential contamination sources within the sensitive areas will determine where the water system has the highest susceptibility to contamination. The susceptibility analysis cannot predict when or if contamination will actually occur, but it does recognize conditions that are highly favorable for contamination to occur. If a contaminant release to soils or water should occur in a sensitive area, it is very likely that contamination of the surface water body would occur if remedial actions are not undertaken.

When several high or moderate risk sources are located within the sensitive areas, the public water system may also be said to have a high overall susceptibility to contamination. If a public water system's drinking water source is determined to be of high susceptibility, it is recommended that the system identify those condition(s) that lead to the high susceptibility and take steps to protect the resource (e.g., reducing soil erosion, or working directly with facility operators to implement sound management practices, etc.). Water systems with a low susceptibility should consider all identified factors that could lead to higher susceptibility in the future and take action to prepare a strategy to protect the resource in the future.

Results

The results of the potential contamination source inventory are combined with the locations of the sensitive areas to determine the most susceptible areas within Tillamook's drinking water watershed. The total number of sources within the sensitive areas is summarized as follows:

	Within Sensitive Areas	Outside of Sensitive areas	Total Within Drinking Water Protection Area
Total Number of **High and Moderate** Risk Potential Contamination Sources	5	0	5
Higher Risk Potential Contamination Sources Identified	2	0	2
Moderate Risk Potential Contamination Sources Identified	3	0	3
Lower Risk Potential Contamination Sources Identified	0	0	0
Total Potential Contamination Sources Identified	5	0	5

Overlaying the locations of the moderate- to high-risk sources with the sensitive areas provides an indication of the areas that are highly susceptible to contamination. The susceptibility analysis results are shown on Figure 3 (Source Water Assessment Results). *Where the moderate- to higher-risk sources fall within the sensitive areas are those areas most vulnerable to contamination.* In the Tillamook watershed, it includes the distribution of the five identified sources within the areas of highly permeable soils, high erosional soils, high runoff potential soils, and within the 1000' setback from the streams. In general, potential contaminant sources within the sensitive areas in the lower watershed pose greater risk than those in the higher areas of the watershed. The susceptibility analysis provides the water system with information on where the greatest risk occurs and where to focus resources for protection.

When all of the assessments are completed in Oregon, DEQ will provide a second type of susceptibility analysis for the surface water systems, an "inter-system susceptibility" on a statewide basis. DEQ will develop a summary report describing how the Tillamook watershed compares with other drinking water watersheds in the state. To normalize the results of the assessments, the total number of potential contamination sources will not be used. The density of the moderate- to higher-risk sources within the drinking water protection area and within the sensitive areas will be calculated. This comparison will be based upon the number and distribution of the potential contamination sources in the watersheds that serve as drinking water resources. The purpose is not to rank individual systems, but to provide general groupings of overall risk relative to other Oregon public water systems. This will enable state agencies to develop priorities for staffing and funding more detailed assessments and protection measures.

Summary and Recommendations

This assessment provides a basis for focusing limited resources within the community to protect the drinking water source. The delineation provides the community with information regarding the location of the land area that directly supplies the surface water intake, i.e., the drinking water protection area. The sensitive areas are those where potential contamination sources or land use activities, if present, have the greater potential to impact the water supply. When the sensitive area information is combined with the potential contaminant source inventory, the highly vulnerable areas are identified (referred to as a susceptibility analysis). These should become high priority areas to be addressed first with educational information, technical assistance, and focused outreach to landowners to encourage voluntary cooperation in protecting the water quality in this watershed.

~~This assessment provides a basis for informed decision-making regarding community planning.~~ The delineation, inventory and susceptibility analysis provides the community with a significant amount of information regarding where their drinking water comes from and an identification of some of the potential risks to the quality of that source. For example, knowing the location and status of the source area allows the community's planning authority to potentially make informed decisions regarding proposed land uses that are compatible with both the drinking water resource and the vision of community growth embraced by the community. Educating the community citizens about the susceptibility and risks to your system enables more public involvement in any future decisions about the public water system.

The results of this Source Water Assessment and the recommendations based on the results are summarized below.

♦ Tillamook Water Commission's water is supplied by three groundwater wells, Fawcett Creek, and Killam Creek. This Source Water Assessment addresses only the surface water component of Tillamook Water Commission's drinking water supply. The source of this water is within the Wilson-Trask-Nestucca Sub-Basin of the Northern Oregon Coastal Basin. Tillamook's drinking water protection area extends a total of approximately 19.8 miles (10.2 miles for Killam Creek and 9.6 miles for Fawcett creek including the lake perimeter) in an easterly direction and encompasses a total area of 9.7 square miles.

♦ Within the Tillamook drinking water protection area *for surface water sources,* there are large areas identified as sensitive to contamination. Areas that are adjacent to the streams/river, areas that have high soil erosion potential, high runoff potential, and high permeability should all receive special considerations for protection. These are some of the areas where the risk is greatest for existing **and future** potential sources of contamination impacting the water quality in the watershed. It is recommended that other natural conditions be considered and possibly added to the assessment results before proceeding with voluntary development of a drinking water protection plan.

♦ The susceptibility of the public drinking water system source depends on both the natural conditions in the watershed as well as the land uses and facilities operating in the watershed. The purpose of the susceptibility exercise is to identify those factors that may pose more of a risk than others within the community's drinking water protection area. It provides information with respect to facilities or land uses in the sensitive areas within the drinking water protection area that should be given greater priority in developing protection strategies. A review of the inventory and the sensitive areas indicates that the Tillamook public water system has at least five high and moderate-risk sources within the sensitive areas in the watershed. It is highly recommended that the community "enhance" or refine the delineation of the sensitive areas and the identification of the potential contamination sources through further research and local input.

♦ Due to the streamlined procedures for conducting the source water assessments, the results could potentially create a misperception that the "human activities" within the watersheds are higher risks than natural conditions or disturbances such as landslides and storm events. For example, it would be erroneous for communities to conclude that their source water was not at risk from natural conditions that produce sediments, such as landslides, even if there were no potential contamination sources identified within their watershed. It is recommended that the community take steps to ensure the natural conditions (both those identified in this assessment and any other additional areas identified by the community) within the watershed are considered when developing strategies for protection.

♦ Public water systems may be threatened by contamination already in the surface water. Many public water systems conduct routine tests for contamination in the raw water prior to treatment. It is highly recommended that such data be used to determine existing risks in the watershed. Collecting and analyzing this raw water data by DEQ or DHS has not been done and is beyond the scope of this assessment.

♦ This assessment provides a basis for dealing with future water quality work in the watershed. The delineation, inventory, and susceptibility analysis has been designed to serve as a strong foundation for further in-depth watershed assessments or water quality improvement efforts, such as Oregon's Total Maximum Daily Load (TMDL) plans.

♦ The primary intent of this source water assessment is to provide the background information for the community to use in developing a local Drinking Water Protection Plan. The Tillamook and/or the public water system should assemble a team to assist in the development and implementation of a Drinking Water Protection Plan. Clean safe drinking water is fundamental to the viability of any community. Protecting the drinking water source is a wise and relatively inexpensive investment in the community's future. The next section will discuss this voluntary process.

Developing a Drinking Water Protection Plan

This Source Water Assessment (SWA) Report for your public water system is a compilation of the results of the delineation of the source area, identification of the sensitive areas, and an inventory of significant risks. The final product, the susceptibility analysis, provides the basis for prioritizing the areas in and around your community that need to be protected. As we discussed in the introduction, our hope is that the community will use the assessment as a basis for developing a "Drinking Water Protection Plan".

The process for developing a complete Drinking Water Protection Plan can be summarized as follows:

ASSESSMENT PHASE (Source Water Assessment Report performed by DEQ and DHS)

1. Delineate the area that serves as the source of the public water supply ("drinking water protection area" for groundwater wells or surface water intakes)
2. Inventory the potential risks or sources of contamination
3. Determine the areas most susceptible to contamination

PROTECTION PHASE (performed by community)

4. Assemble a local Drinking Water Protection Team
5. Enhance the Source Water Assessment
6. Develop a plan to protect the supply (reduce the risks of contamination)
7. Develop a contingency plan to address the potential loss of the system
8. Certify (optional) and implement the Drinking Water Protection Plan

As you know, the assessment phase work was funded by the federal Safe Drinking Water Act. The assessment is simply the first three steps of developing a protection plan for your public water supply. Developing a protection plan is voluntary.

Prior to moving into the protection phase, DEQ recommends the inventory presented in this document be reviewed in detail to clarify the presence, location, operational practices, actual risks, etc. of the identified facilities and land use activities. The SWA inventory should be regarded as a preliminary review of potential sources of contamination within the drinking water protection area. Resources within the community should be used to do an "enhanced inventory" to complete this preliminary list of potential sources of contamination.

It is also important to remember that not all of the inventoried activities will need to be addressed if you choose to develop a Drinking Water Protection Plan. When developing a protection plan, sources which pose little to no threat to your public water supply can be screened out. For example, if any of the land use activities are conducted in a manner that already significantly reduces the risk of a contamination release, the facility would not need to re-evaluate their practices based on drinking water protection "management". One of the goals of developing a Drinking Water Protection Plan based on the inventory results is to address those land use activities that do pose high or moderate risks to your public water supply. The community should target these facilities with greater levels of education and technical assistance to minimize the risk of contamination.

Limited technical assistance is available through both DEQ and DHS for communities that choose to move beyond the assessments and voluntarily develop a Drinking Water Protection Plan. Using the results of the assessment (and enhanced inventory), the local community can form a "Drinking Water Protection Team" of community members and develop a plan to reduce the risks of contamination from those sources.

Forming a local team to help with the development of a protection plan is very important. Oregon's drinking water protection approach relies upon the concept of "community-based protection", as are many other water quality programs. Community-based protection simply refers to the concept of allowing local control and decision-making to implement the water quality protection effort. Community-based protection is successful only with significant local citizen and stakeholder involvement.

The primary advantage of community-based protection is that it links community needs to environmental needs. Any successful protection program will need to be flexible enough to allow the community to adopt the "tools" or elements that are most appropriate for them. Allowing this local control in making the changes necessary for improving water quality will accomplish two key elements of restoration and protection. Community-based protection can draw on the knowledge and successful adaptive practices of the local area. Landowners generally know best how to achieve water resource restoration and protection as long as a thorough explanation of the problem is provided, the objectives are defined, and some free technical assistance is provided. Secondly, knowing they have more local control, citizens will also be more likely to participate in the program and more willing to assist with the educational and outreach effort which will make the plan successful. We recommend that the protection plan be developed so as to *minimize any burdens on individual property owners, but maximize the equity in responsibility for reducing the risks of future contamination.*

Drinking water protection involves developing protection strategies for groundwater or surface water sources of public water supplies. There are many similarities between this program and other water quality protection programs, and it is essential that water quality efforts are coordinated and linked in each geographic area as much as possible. DEQ is committed to linking the drinking water protection efforts to other habitat and water quality improvement efforts for fish in Oregon, as well as the ongoing work to address Clean Water Act 303(d) water-quality-limited streams. One of the primary means of providing technical assistance is to give your community the information and coordination necessary to create these links. Other agencies will also be involved in providing technical assistance as protection plans are developed. For example, on farmlands, the Oregon Department of Agriculture will provide assistance as provided for under Senate Bill 1010. In developing recommendations for protecting the drinking water source area, your community can maximize the use of existing programs in Oregon that offer free technical assistance. Examples of such programs include:

- pollution prevention technical assistance from the Department of Environmental Quality,
- sanitary survey assistance from the Oregon Department of Human Services,
- household hazardous waste assistance from the Department of Environmental Quality,
- land use planning from the Department of Land Conservation and Development,
- agricultural water quality management plans Oregon Department of Agriculture,
- water conservation education from the Water Resources Department, or
- rural water quality outreach from the Oregon State University Extension Service.

Protecting the drinking water supply in a community can also be a very effective way to encourage all citizens to participate in an issue which directly affects everyone in that community. This often leads to more public involvement in other significant local decisions concerning future livability issues (i.e., land use planning). In communities already developing and implementing Drinking Water Protection Plans, the process has served to bring many diverse interests together on a common goal and strengthened the local rural and urban relationships through communication and increased understanding. We must continue to do a better job in our outreach efforts to point out that we are all part of the existing water quality problems. The risks and sources of water quality problems are not only from industries, farmers, and managed forests, but every individual living, commuting and working in that area.

We encourage communities interested in developing Drinking Water Protection Plans to contact the DEQ or DHS resources listed below:

For technical assistance with the monitoring and operation of your public water system:

Oregon Department of Human Services
Main Office - Portland Oregon
800 NE Oregon St., Room 611
PO Box 14450, Portland, OR 97293
(503) 731-4317
Fax (503) 731-4077

or:
Dennis Nelson, Groundwater Coordinator, (541) 726-2587
donelson@oregonvos.net
Oregon Department of Human Services
Springfield Field Office
442 A Street, Springfield, OR 97477
Fax (541) 726-2596

For technical assistance with developing plans to protect your public water system:

Department of Environmental Quality
Water Quality Division
811 SW 6th Avenue
Portland, OR 97204-1390
(503) 229-5630 Fax (503) 229-5408
Toll Free 1-800-452-4011

Surface Water - Sheree Stewart, (503) 229-5413
stewart.sheree@deq.state.or.us

Groundwater - Julie Harvey, (503) 229-5664
harvey.julie@deq.state.or.us

References*

US Department of Agriculture, Natural Resource Conservation Service (NRCS). State Soil Geographic Database (STATSGO), Data use information, miscellaneous publication number 1492 (rev.ed.). National Cartography and Geospatial Center, Fort Worth, Texas. http://www.ftw.nrcs.usda.gov/stat_data.html

Source Water Assessment Plan: Implementation of the Safe Drinking Water Act 1996 Amendments. Sheree Stewart, Oregon Department of Environmental Quality, and Dennis Nelson, Oregon Department of Human Services, February 1999. http://www.deq.state.or.us/wq/dwp/dwphome.htm

US Environmental Protection Agency, 1997. State Source Water Assessment and Protection Programs Guidance, US EPA Office of Water, EPA816-R-97-009, August 1997. http://www.epa.gov/ogwdw/swp.html

US Geological Survey, Oregon Hydrologic Units. http://oregon.usgs.gov/data_dir/orehuclist.html

Washington Forest Practices Board. 1993. Standard Methodology for Conducting Watershed Analysis, Version 2.0, October 1993

Western Regional Climate Center, Oregon Climate Summaries. http://www.wrcc.dri.edu/summary/climsmor.html

*Please note that there may be other sources of information for Killam Creek, Fawcett Creek and the Wilson-Trask-Nestucca Sub -Basin. Conducting an exhaustive search of all data and technical reports was beyond the scope of this Source Water Assessment Report.

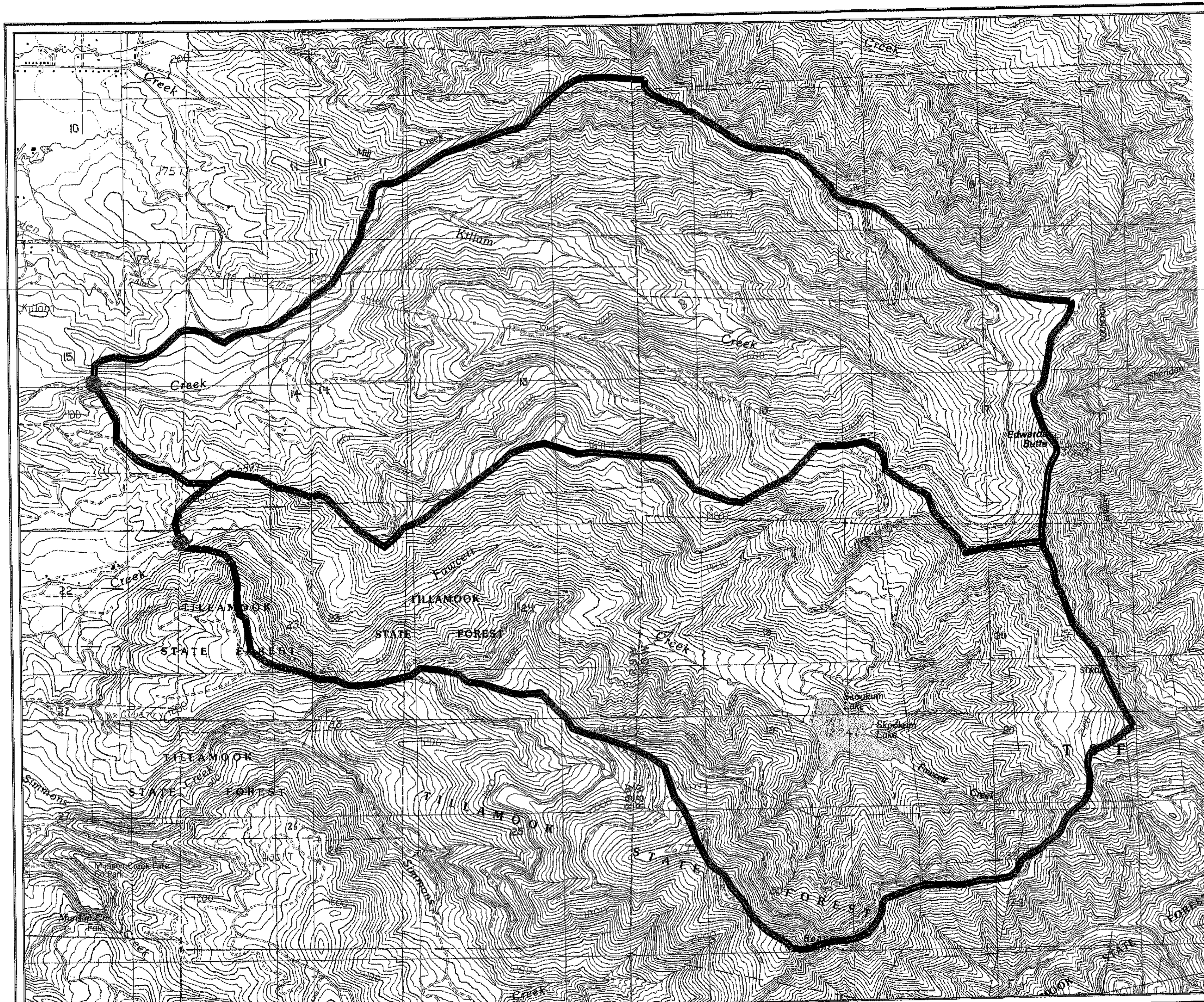
Figures

Source Water Assessment Report
Tillamook Water Commission
PWS # 4100893

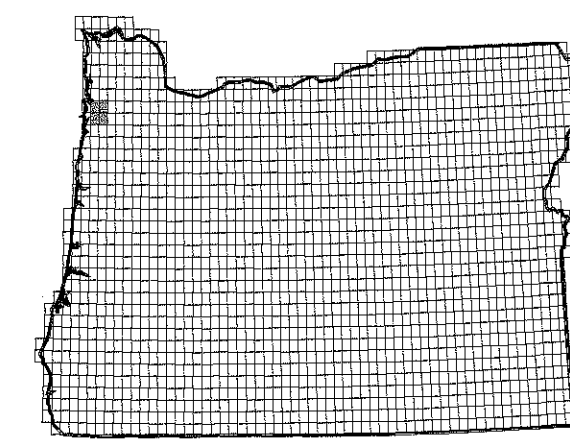
Figure 1: Tillamook Water Commission's Drinking Water Protection Area

PWS 4100893

- Drinking Water Intake - Surface Water
- Drinking Water Protection Area



Note on Base Map: 1:24,000 scale U.S. Geological Survey Digital Raster Graphics (DRGs) for Blaine (1984), The Peninsula (1984), Tillamook (1985), and Beaver (1985) are displayed. DRGs are scanned images of topographic sheets. Where the DRGs join, seams and/or gaps may be visible. Between DRGs, variations in information displayed also may be seen.



DEQ
State of Oregon Department of Environmental Quality

Kilometers
0 1

0 1000 2000 3000
Feet

Printed December, 2002

Oregon Department of Environmental Quality GIS

Figure 2: Sensitive Areas within the Tillamook Water Commission's Drinking Water Protection Area PWS 4100893

- Drinking Water Intake - Surface Water
- Drinking Water Protection Area

Sources of Information:
High Soil Erodibility: Defined by slopes greater than 30 percent and K factor greater than .25. Soils derived from 1:250,000, STATSGO data. Slope is in the STATSGO database Component Table. Slope displayed is a weighted average of the average slope for the map unit. K factor is contained in the STATSGO Layer Table. K factor displayed is a weighted average (of only the surface layer) for the map unit.
High Runoff Potential: Hydrology Group D (very slow infiltration rates) from the STATSGO Component Table.
High Permeability Soils: Alluvial deposits (Qal) from the U.S. Geological Survey Geologic Map of Oregon GIS layer.
Sensitive Area Setbacks Adjacent to Streams and Reservoirs: 1000 foot buffer from the centerline of perennial streams and the shoreline of any reservoir.

Note on Sensitive Areas: In determining the most sensitive areas within this Drinking Water Protection Area, DEQ used existing GIS layers and other natural resource agency data sets. Not all areas of the state have been mapped for the natural resource parameters of interest or at the level of detail ideal for this type of analysis. DEQ has sought to obtain the best available information for this composite.

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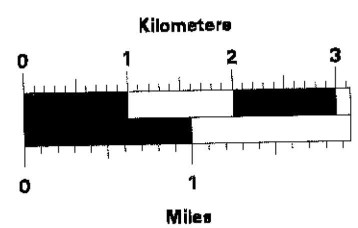
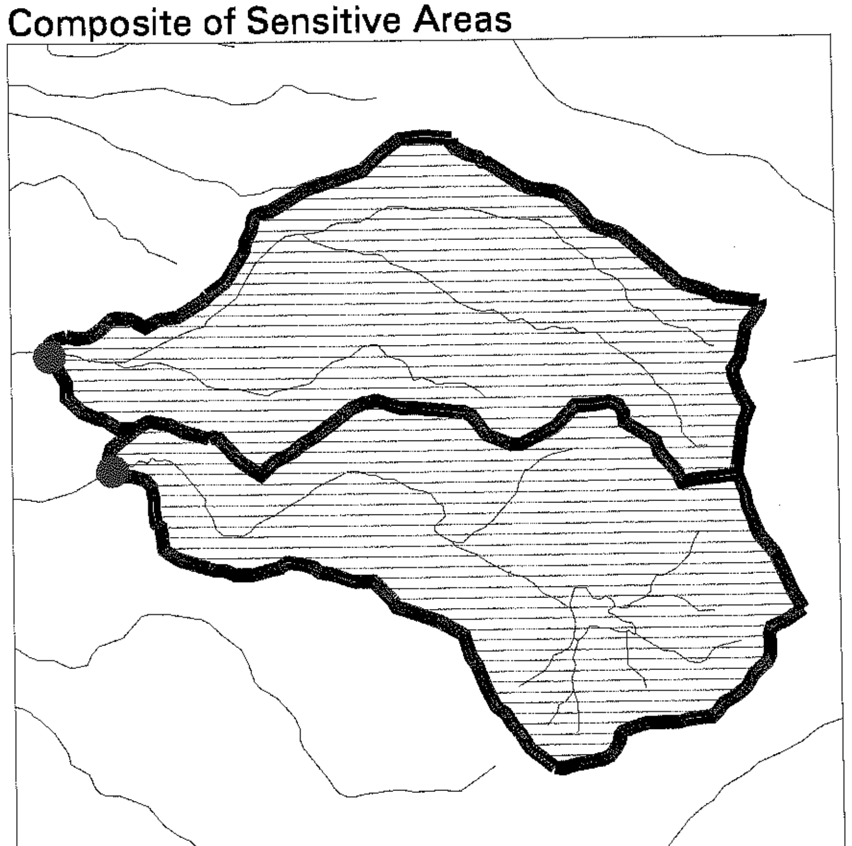
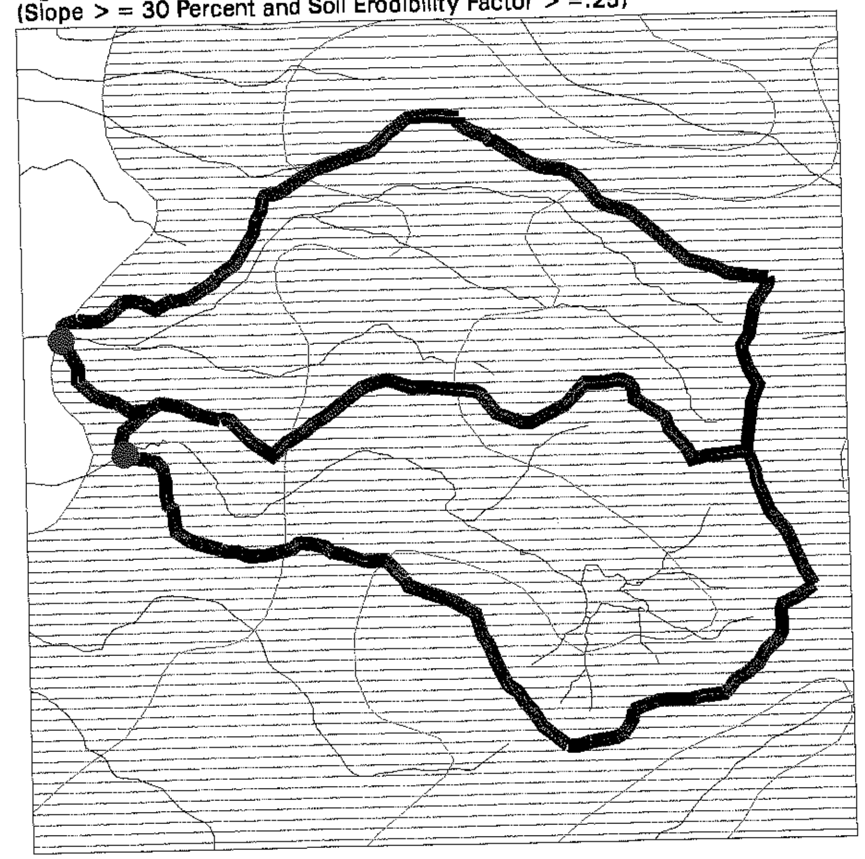


Composite of Sensitive Areas

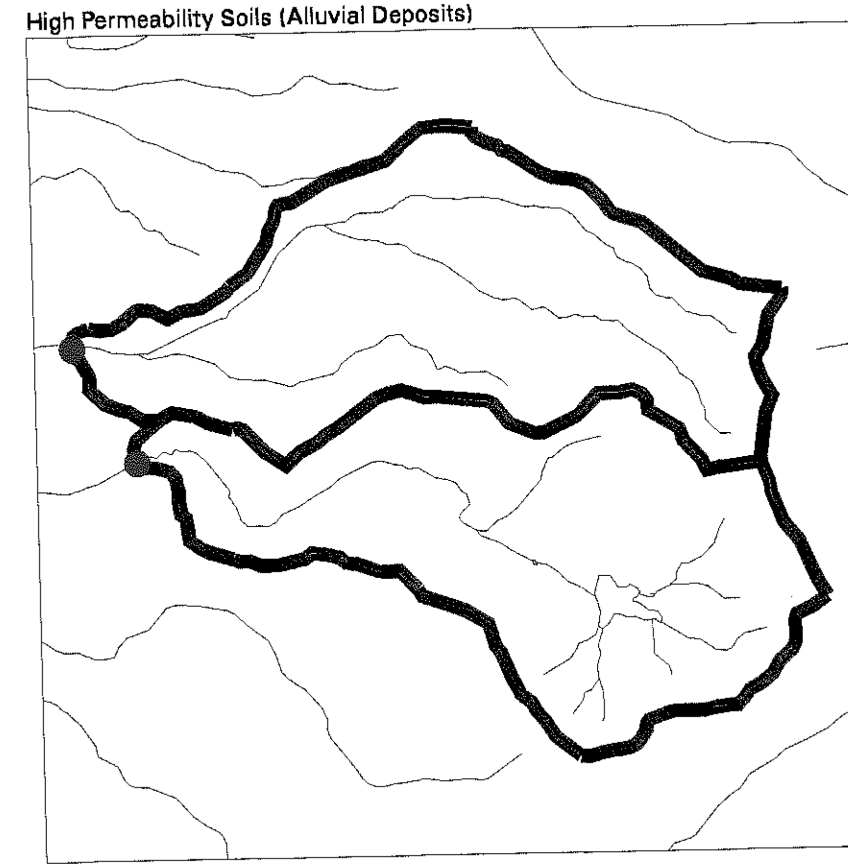


Sensitive Areas in Watershed

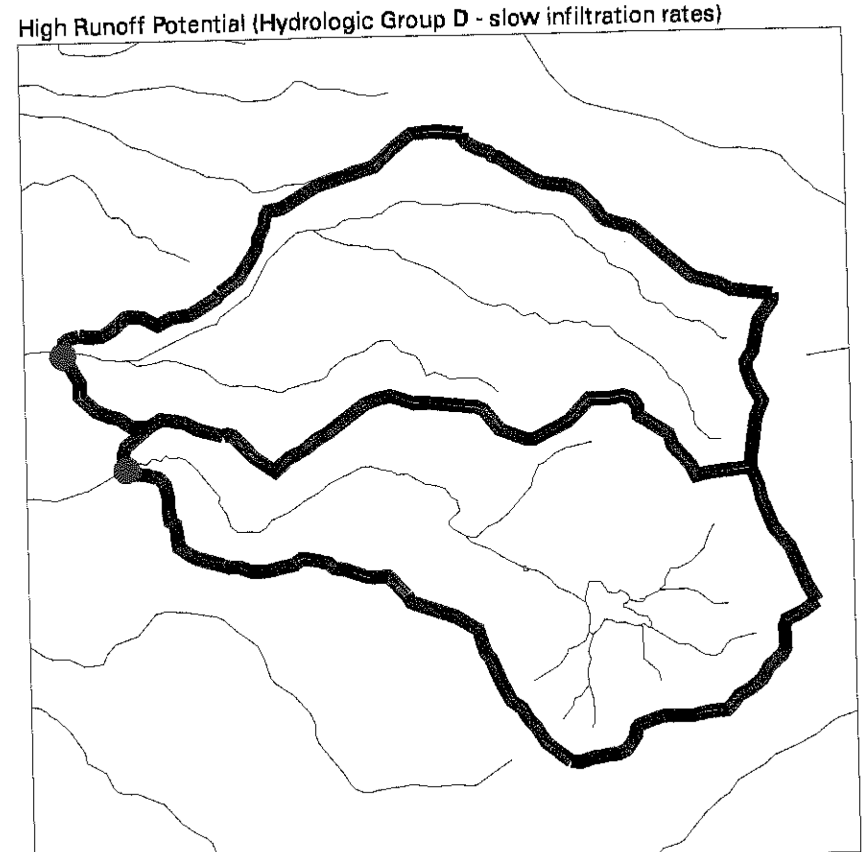
High Soil Erosion Potential
(Slope > = 30 Percent and Soil Erodibility Factor > =.25)



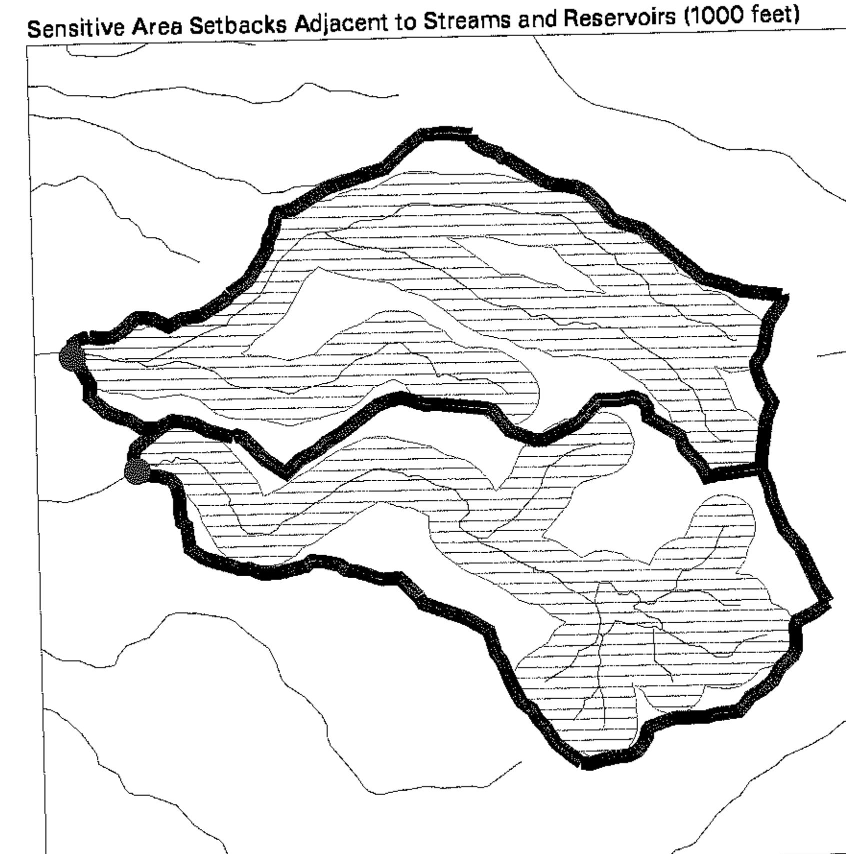
High Permeability Soils (Alluvial Deposits)



High Runoff Potential (Hydrologic Group D - slow infiltration rates)



Sensitive Area Setbacks Adjacent to Streams and Reservoirs (1000 feet)



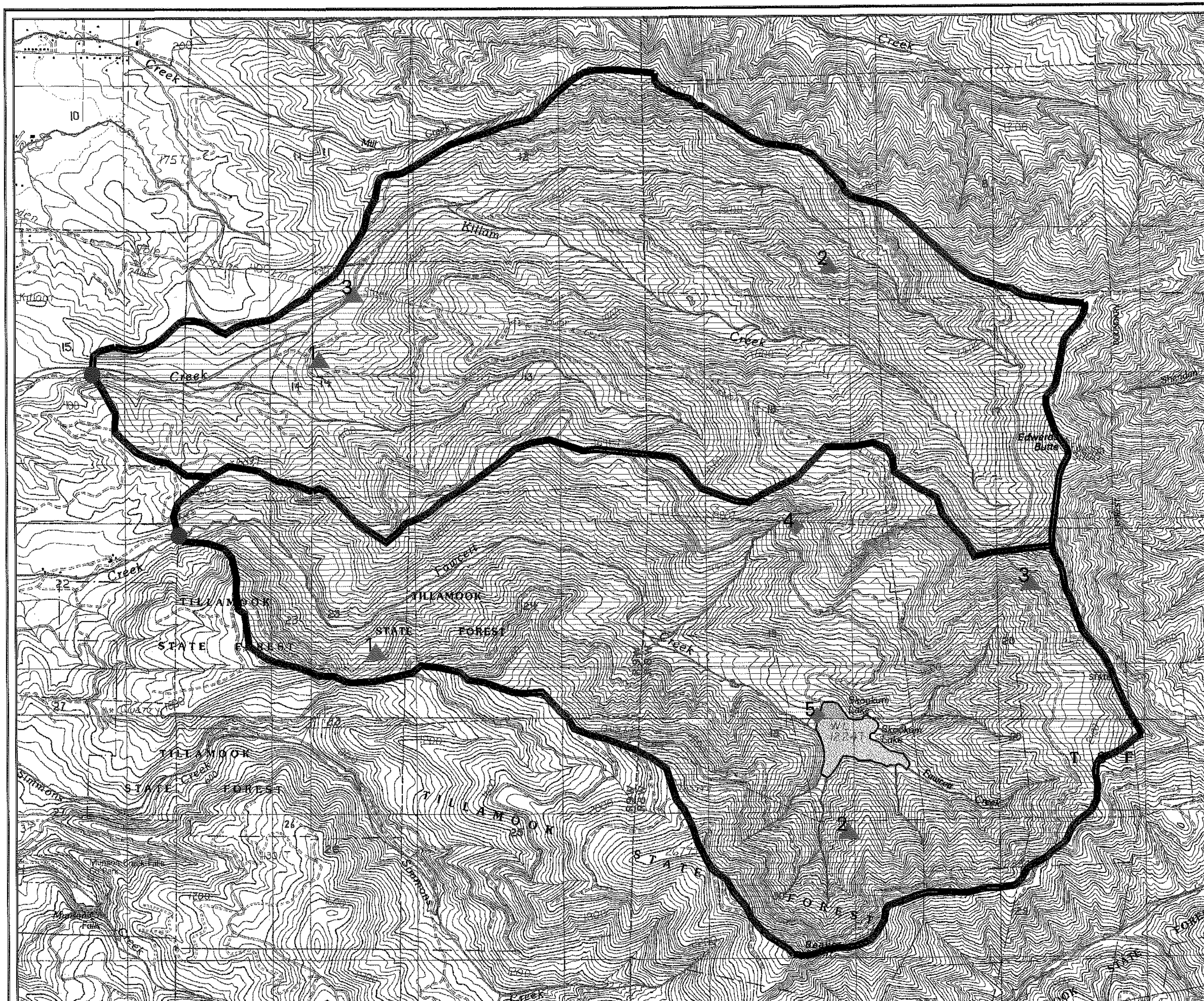


Figure 3: Source Water Assessment Results

Tillamook Water Commission's Drinking Water Protection Area with Sensitive Areas and Potential Contamination Sources PWS 4100893

- Drinking Water Intake - Surface Water
- Drinking Water Protection Area
- Sensitive Areas
- Area Feature (see Note 2)
- Point Feature (see Note 2)

Notes on Potential Contaminant Sources

Note 1: Sites and areas noted in this Figure are potential sources of contamination to the drinking water identified by Oregon drinking water protection staff. Environmental contamination is not likely to occur when contaminants are handled and used properly or when best management practices are employed.

Note 2: Feature identification numbers correspond to the potential contaminant source numbers in Table 2. The area features represent the approximate area where the land use or activity occurs and is marked at the point closest to the intake. The point features represent the approximate point where the land use or activity occurs.

DEQ
State of Oregon Department of Environmental Quality

Kilometers
0 1
0 1000 2000 3000
Feet

Printed December, 2002
Oregon Department of Environmental Quality GIS

Tables

Source Water Assessment Report
Tillamook Water Commission
PWS # 4100893
Inventory Results

Table 1. Summary of Potential Contaminant Sources by Land Use
Table 2. Inventory Results – List of Potential Contaminant Sources

Notes for Tables

- Sites and areas identified in Tables 1 and 2 are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.
- Total number of sources listed in Table 1 in the DWPA may not add up to the total number of potential contaminant sources in Table 2 because more than one type of potential contaminant source may be present at any given facility.
- The data was collected by Sue Gries, DEQ's Northwest Region Office, on August 20, 2002.

Acronyms

AST - Aboveground Storage Tank
DC - DEQ's Drycleaner database
DEQ - Oregon Department of Environmental Quality
DWPA - Drinking Water Protection Area
ECSI - DEQ's Environmental Cleanup Site Information database
HWIMSY - DEQ's Hazardous Waste Information Management System database
LUST - DEQ's Leaking Underground Storage Tank database
NPDES - National Pollution Discharge Elimination System
PCS - Potential Contaminant Source
PWS - Public Water System
SFM - State Fire Marshall's database of hazardous materials
SIS - DEQ's Source Information System database (includes WPCF and NPDES permits)
SWMS - DEQ's Solid Waste Management System database
UST - DEQ's Underground Storage Tank database or Underground Storage Tank
WPCF - Water Pollution Control Facility
WRD -Oregon Water Resources Division database for water rights information system

TABLE 1. SUMMARY OF POTENTIAL CONTAMINANT SOURCES BY LAND USE

PWS # 4100893 TILLAMOOK WATER COMMISSION

Residential/Municipal Land Uses

Potential Contamination Source	Note	Relative Risk Level	Total in DWPA
Airport - Maintenance/Fueling Area		Higher	0
Apartments and Condominiums		Lower	0
Campgrounds/RV Parks	(1)	Lower	0
Cemeteries - Pre-1945		Moderate	0
Drinking Water Treatment Plants		Moderate	0
Fire Station		Lower	0
Fire Training Facilities		Moderate	0
Golf Courses		Moderate	0
Housing - High Density (> 1 House/0.5 acres)		Moderate	0
Landfill/Dumps	(1)	Higher	0
Lawn Care - Highly Maintained Areas		Moderate	0
Motor Pools		Moderate	0
Parks		Moderate	0
Railroad Yards/Maintenance/Fueling Areas		Higher	0
Schools		Lower	0
Septic Systems - High Density (> 1 system/acre)	(1)	Higher	0
Sewer Lines - Close Proximity to PWS	(1)	Higher	0
Utility Stations - Maintenance Transformer Storage		Higher	0
Waste Transfer/Recycling Stations	(1)	Moderate	0
Wastewater Treatment Plants/Collection Stations	(1)	Moderate	0
Other			0

NOTES:
Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.
(1) - Potential source of microbial contamination
(2) - Drip irrigated crops, such as vineyards and some vegetables, are considered lower risk than spray irrigation
(3) - For groundwater public water systems, septic systems located within the 2-year time-of-travel (TOT) are considered moderate risks.

TABLE 1. SUMMARY OF POTENTIAL CONTAMINANT SOURCES BY LAND USE

PWS # 4100893 TILLAMOOK WATER COMMISSION

Commercial/Industrial Land Uses

Potential Contamination Source	Note	Relative Risk Level	Total in DWPA
Automobiles - Body Shops		Higher	0
Automobiles - Car Washes		Moderate	0
Automobiles - Gas Stations		Higher	0
Automobiles - Repair Shops		Higher	0
Boat Services/Repair/Refinishing		Higher	0
Cement/Concrete Plants		Moderate	0
Chemical/Petroleum Processing/Storage		Higher	0
Dry Cleaners		Higher	0
Electrical/Electronic Manufacturing		Higher	0
Fleet/Trucking/Bus Terminals		Higher	0
Food Processing		Moderate	0
Furniture/Lumber/Parts Stores		Moderate	0
Home Manufacturing		Higher	0
Junk/Scrap/Salvage Yards		Higher	0
Machine Shops		Higher	0
Medical/Vet Offices	(1)	Moderate	0
Metal Plating/Finishing/Fabrication		Higher	0
Mines/Gravel Pits		Higher	1
Office Buildings/Complexes		Lower	0
Parking Lots/Malls (> 50 Spaces)		Higher	0
Photo Processing/Printing		Higher	0
Plastics/Synthetics Producer		Higher	0
Research Laboratories		Higher	0
RV/Mini Storage		Lower	0
Wood Preserving/Treating		Higher	0
Wood/Pulp/Paper Processing and Mills		Higher	0
Other			0

NOTES:
Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.
(1) - Potential source of microbial contamination
(2) - Drip irrigated crops, such as vineyards and some vegetables, are considered lower risk than spray irrigation
(3) - For groundwater public water systems, septic systems located within the 2-year time-of-travel (TOT) are considered moderate risks.

TABLE 1. SUMMARY OF POTENTIAL CONTAMINANT SOURCES BY LAND USE

PWS # 4100893 TILLAMOOK WATER COMMISSION

Agricultural/Forest Land Uses

Potential Contamination Source	Note	Relative Risk Level	Total in DWPA
Auction Lots	(1)	Higher	0
Boarding Stables	(1)	Moderate	0
Confined Animal Feeding Operations (CAFOs)	(1)	Higher	0
Crops - Irrigated (inc. orchards, vineyards, nurseries, greenhouses)	(2)	Moderate	0
Crops - Nonirrigated (inc. Christmas trees, grains, grass seed, pasture)		Lower	0
Farm Machinery Repair		Higher	0
Grazing Animals (> 5 large animals or equivalent/acre)	(1)	Moderate	0
Lagoons/Liquid Wastes	(1)	Higher	0
Land Application Sites	(1)	Moderate	0
Managed Forest Land - Broadcast Fertilized Areas		Lower	0
Managed Forest Land - Clearcut Harvest (< 35 yrs.)		Higher	2
Managed Forest Land - Partial Harvest (< 10 yrs.)		Moderate	0
Managed Forest Land - Road Density (> 2 mi./sq. mi.)		Moderate	0
Pesticide/Fertilizer/Petroleum Storage, Handling, Mixing, & Cleaning Ar		Higher	0
Recent Burn Areas (< 10 yrs.)		Lower	0
Managed Forest Lands - Status Unknown		Moderate	0
Other: - Landslides		Moderate	2

NOTES:
Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.
(1) - Potential source of microbial contamination
(2) - Drip irrigated crops, such as vineyards and some vegetables, are considered lower risk than spray irrigation
(3) - For groundwater public water systems, septic systems located within the 2-year time-of-travel (TOT) are considered moderate risks.

TABLE 1. SUMMARY OF POTENTIAL CONTAMINANT SOURCES BY LAND USE

PWS # 4100893 TILLAMOOK WATER COMMISSION

Miscellaneous Land Uses

Potential Contamination Source	Note	Relative Risk Level	Total in DWPA
Above Ground Storage Tanks - Excluding Water		Moderate	0
Channel Alterations - Heavy		Lower	0
Combined Sewer Outfalls	(1)	Lower	0
Stormwater Outfalls	(1)	Lower	0
Composting Facilities	(1)	Moderate	0
Historic Gas Stations		Higher	0
Historic Waste Dumps/Landfills	(1)	Higher	0
Homesteads - Rural - Machine Shops/Equipment Maintenance		Higher	0
Homesteads - Rural - Septic Systems (< 1/acre)	(1)(3)	Lower	0
Injection/Dry Wells, Sumps - Class V UICs	(1)	Higher	0
Kennels (> 20 Pens)	(1)	Lower	0
Military Installations		Higher	0
Random Dump Sites		Moderate	0
River Recreation - Heavy Use (inc. campgrounds)	(1)	Lower	0
Sludge Disposal Areas	(1)	Moderate	0
Stormwater Retention Basins	(1)	Moderate	0
Transmission Lines - Right-of-Ways		Higher	2
Transportation - Freeways/State Highways/Other Heavy Use Roads		Moderate	0
Transportation - Railroads		Moderate	0
Transportation - Right-Of-Ways - Herbicide Use Areas		Moderate	0
Transportation - River Traffic - Heavy		Lower	0
Transportation - Stream Crossing - Perennial		Lower	0
UST - Confirmed Leaking Tanks - DEQ List		Higher	0
UST - Decommissioned/Inactive		Lower	0
UST - Nonregulated Tanks (< 1,100 gals or Large Heating Oil Tanks)		Higher	0
UST - Not Upgraded and/or Registered Tanks		Higher	0
UST - Upgraded/Registered - Active		Lower	0
UST - Status Unknown		Higher	0
Upstream Reservoirs/Dams		Moderate	1
Wells/Abandoned Wells		Higher	0
Large Capacity Septic Systems (serves > 20 people) - Class V UICs	(1)	Higher	0
Construction/Demolition Areas		Moderate	0
Other			0

NOTES:
Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.
(1) - Potential source of microbial contamination
(2) - Drip irrigated crops, such as vineyards and some vegetables, are considered lower risk than spray irrigation
(3) - For groundwater public water systems, septic systems located within the 2-year time-of-travel (TOT) are considered moderate risks.

TABLE 2. INVENTORY RESULTS - LIST OF POTENTIAL CONTAMINANT SOURCES

PWS# 4100893 TILLAMOOK WATER COMMISSION

Reference No. (See Figure)	Potential Contaminant Source Type	Name	Approximate Location	City	Method for Listing	Proximity to Sensitive Areas	Relative Risk Level (1)	Potential Impacts	Comments
1	Managed Forest Land - Clearcut Harvest (< 35 yrs.)	Clear-cuts	Throughout DWPA	Tillamook	Field-Observation Interview	Within sensitive area. for FAWCETT CREEK	Higher	Cutting and yarding of trees may contribute to increased erosion, resulting in turbidity and chemical changes in drinking water supply. Over-application or improper handling of pesticides or fertilizers may impact drinking water source.	PWS contact indicates that the watershed is closed to the public. A private timber company, the City, and Tillamook State Forest are the landowners in the watershed.
	Managed Forest Land - Clearcut Harvest (< 35 yrs.)					Within sensitive area. for KILLAM CREEK	Higher	Cutting and yarding of trees may contribute to increased erosion, resulting in turbidity and chemical changes in drinking water supply. Over-application or improper handling of pesticides or fertilizers may impact drinking water source.	PWS contact indicates that the watershed is closed to the public. A private timber company, the City, and Tillamook State Forest are the landowners in the watershed.

Note: Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.

(1) Where multiple potential contaminant sources exist at a site, the highest level of risk is used.

(2) See Table 3 for database listings (if necessary).

TABLE 2. INVENTORY RESULTS - LIST OF POTENTIAL CONTAMINANT SOURCES

PWS# 4100893 TILLAMOOK WATER COMMISSION

Reference No. (See Figure)	Potential Contaminant Source Type	Name	Approximate Location	City	Method for Listing	Proximity to Sensitive Areas	Relative Risk Level (1)	Potential Impacts	Comments
2	Other - Landslides	Landslides	Throughout DWPA	Tillamook	Interview	Within sensitive area. for FAWCETT CREEK	Moderate	The impacts of this potential contaminant source will be addressed during the enhanced inventory.	In Fawcett Creek, a large landslide occurred in 1996, and minor slides occur occasionally. A small landslide occurred last year in the headwaters of Killiam Creek. Approximate locations indicated by PWS contact. No visual observation of site - site location is based on interview.
	Other - Landslides					Within sensitive area. for KILLAM CREEK	Moderate	The impacts of this potential contaminant source will be addressed during the enhanced inventory.	In Fawcett Creek, a large landslide occurred in 1996, and minor slides occur occasionally. A small landslide occurred last year in the headwaters of Killiam Creek. Approximate locations indicated by PWS contact. No visual observation of site - site location is based on interview.
3	Transmission Lines - Right-of-Ways	Transmission Lines	NE edge of Fawcett watershed	Tillamook	Interview	Within sensitive area. for FAWCETT CREEK	Higher	Construction and corridor maintenance may contribute to increased erosion and turbidity in drinking water supply. Over-application or improper handling of pesticides or fertilizers may impact drinking water supply.	No visual observation of site - site location is based on topographic map and interview.
	Transmission Lines - Right-of-Ways		Runs N-S Through DWPA			Within sensitive area. for KILLAM CREEK	Higher	Construction and corridor maintenance may contribute to increased erosion and turbidity in drinking water supply. Over-application or improper handling of pesticides or fertilizers may impact drinking water supply.	No visual observation of site - site location is based on topographic map and interview.

Note: Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.

(1) Where multiple potential contaminant sources exist at a site, the highest level of risk is used.

(2) See Table 3 for database listings (if necessary).

TABLE 2. INVENTORY RESULTS - LIST OF POTENTIAL CONTAMINANT SOURCES

PWS# 4100893 TILLAMOOK WATER COMMISSION

Reference No. (See Figure)	Potential Contaminant Source Type	Name	Approximate Location	City	Method for Listing	Proximity to Sensitive Areas	Relative Risk Level (1)	Potential Impacts	Comments
4	Mines/Gravel Pits	Rock Quarry	Coyote Point	Tillamook	Interview	Within sensitive area. for FAWCETT CREEK	Moderate	Spills, leaks, or improper handling of chemicals and wastes generated in mining operations or from heavy equipment may impact the drinking water supply.	No visual observation of site - site location is based on interview. Risk reduced to Moderate because PWS contact indicates that the rock quarry is small and used infrequently.
5	Upstream Reservoirs/Dams	Upstream Dam	Skookum Lake	Tillamook	Interview	Within sensitive area. for FAWCETT CREEK	Moderate	During major storm events, reservoirs may contribute to prolonged turbidity for downstream intakes for drinking water. Construction, fluctuating water levels, and heavy waterside use can increase erosion and turbidity in reservoir/drinking water source.	No visual observation of site - site location is based on interview. PWS Contact indicates that the dam was checked recently, and has good integrity.

Note: Sites and areas identified in this Table are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.

(1) Where multiple potential contaminant sources exist at a site, the highest level of risk is used.

(2) See Table 3 for database listings (if necessary).

Attachment A

Source Water Assessment Report
Tillamook Water Commission
PWS # 4100893

Attachment A. Source Water Assessment Summary Brochure

SOURCE WATER ASSESSMENT SUMMARY BROCHURE

TILLAMOOK WATER COMMISSION
PWS # 4100893

WHAT IS A SOURCE WATER ASSESSMENT?

The Source Water Assessment was recently completed by the Department of Environmental Quality (DEQ) and the Oregon Department of Human Services (DHS) to identify the surface areas (and/or subsurface areas) that supply water to Tillamook Water Commission's public water system intakes and to inventory the potential contaminant sources that may impact the water supply.

WHY WAS IT COMPLETED?

The Source Water Assessment was completed to provide information so that Tillamook Water Commission's public water system staff/operator, consumers, and community citizens can begin developing strategies to protect the source of their drinking water, and to minimize future public expenditures for drinking water treatment. The assessment was prepared under the requirements and guidelines of the Federal Safe Drinking Water Act (SDWA).

WHAT AREAS ARE INCLUDED IN TILLAMOOK WATER COMMISSION'S DRINKING WATER PROTECTION AREA?

Tillamook's water is supplied by three groundwater wells, Fawcett Creek, and Killam Creek. This Source Water Assessment addresses only the surface water component of Tillamook's drinking water supply. This public water system serves approximately 4,000 citizens. The intakes are located in the Tillamook River Watershed in the Wilson-Trask-Nestucca Sub-Basin of the Northern Oregon Coastal Basin. The combination of the geographic areas contributing to the Killam Creek and Fawcett Creeks intakes make-up Tillamook's drinking water protection area. The drinking water protection area extends upstream a total of approximately 19.8 miles (10.2 miles for Killam Creek and 9.6 miles for Fawcett Creek including the lake perimeter) in an easterly direction and encompasses a total area of 9.7 square miles. The boundaries of the Drinking Water Protection Area are illustrated on the figure attached to this summary.

WHAT ARE THE POTENTIAL SOURCES OF CONTAMINATION TO TILLAMOOK'S PUBLIC DRINKING WATER SUPPLY?

The primary intent of this inventory was to identify and locate significant potential sources of contaminants of concern. The delineated drinking water protection area for surface water sources is primarily dominated by forestry land uses. The potential contaminant sources identified include area-wide landslides, clear-cuts, a transmission line, a rock quarry, and an upstream dam. This provides a quick look at the existing potential sources of contamination that could, if improperly managed or released, impact the water quality in the watershed.

WHAT ARE THE RISKS FOR OUR SYSTEM?

A total of five potential contaminant sources were identified in Tillamook's drinking water protection area. All of these are located in the sensitive areas and are high- to moderate-risk sources within "sensitive areas". The sensitive areas within the Tillamook Water Commission drinking water protection area include areas with high soil permeability, high soil erosion potential, high runoff potential and areas within 1000' from the river/streams. The sensitive areas are those where the potential contamination sources, if present, have a greater potential to impact the water supply. The information in this assessment provides a basis for prioritizing areas in and around our community that are most vulnerable to potential impacts and can be used by the Tillamook community to develop a voluntary Drinking Water Protection Plan.

NEED MORE INFORMATION?

Tillamook Water Commission's Source Water Assessment Report provides additional details on the methodology and results of this assessment. The full report is available for review at:

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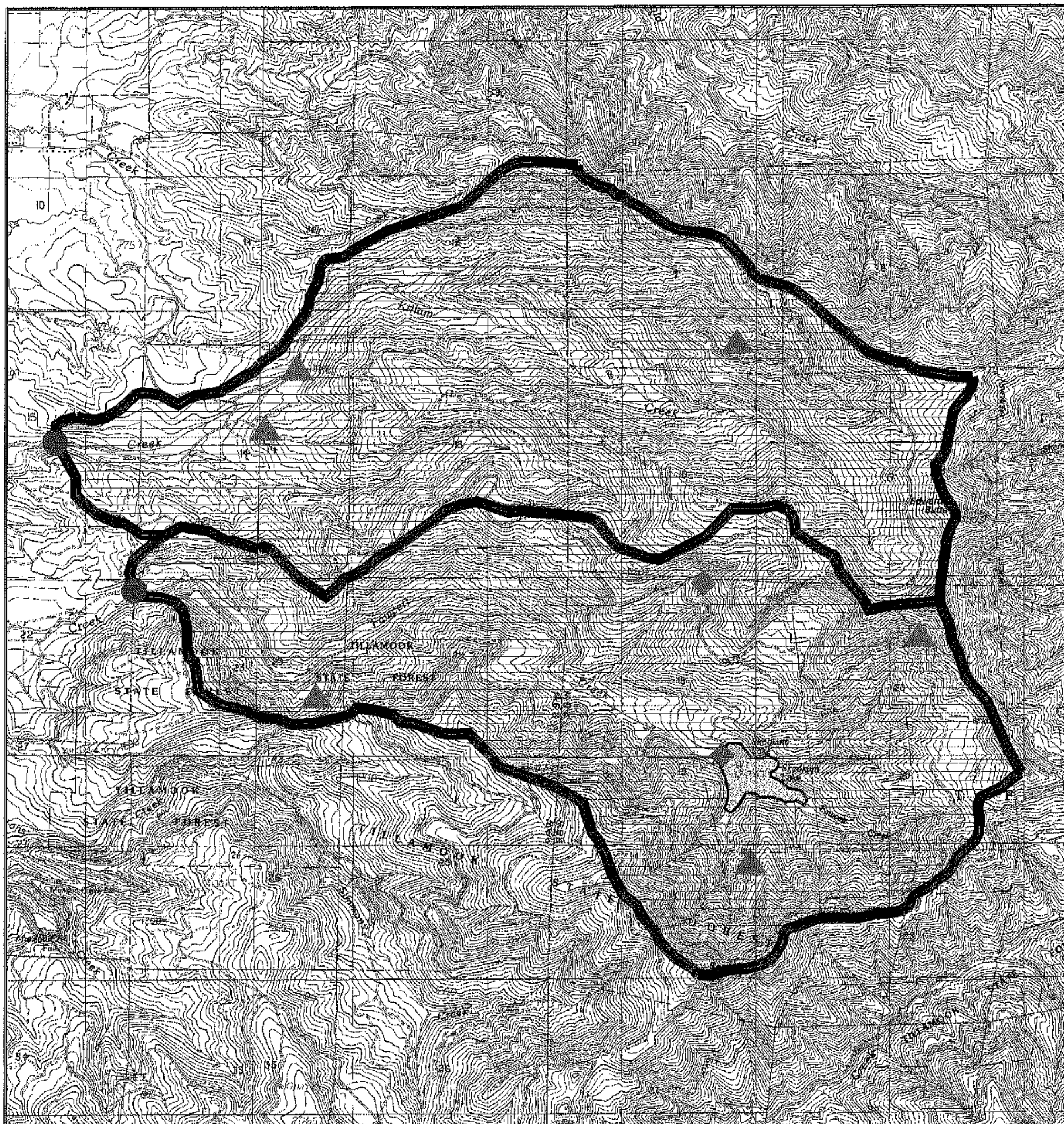
Contact Tillamook Water Commission's staff if you would like additional information on these Source Water Assessment results.



Source Water Assessment Results

Tillamook Water Commission's Drinking Water Protection Area with Sensitive Areas and Potential Contamination Sources

PWS 4100893

Drinking Water Protection Area

Drinking Water Intake - Surface Water

Sensitive Areas

Area Feature (see Note 2)

Point Feature (see Note 2)

Notes on Potential Contaminant Sources

Note 1: Sites and areas noted in this Figure are potential sources of contamination to the drinking water identified by Oregon drinking water protection staff. Environmental contamination is not likely to occur when contaminants are used and managed properly.

Note 2: Feature identification markers correspond to the potential contaminant source numbers in the SWA Report. The area features represent the approximate area where the land use or activity occurs and is marked at the point closest to the intake. The point features represent the approximate point where the land use or activity occurs.

Kilometers 0 1

Miles 0 1

DEQ State of Oregon Department of Environmental Quality

Printed December, 2002

Oregon Department of Environmental Quality GIS

Appendix H

Public Health Division
Drinking Water Services
John A. Kitzhaber, MD, Governor

Oregon Health Authority
800 NE Oregon St, Ste 640
Portland, OR 97232
Ph. (971) 673-0405
Fax (971) 673-0694
http://healthoregon.org/dwp

June 3, 2014

RECEIVED
JUN 5 - 2014
By

Arley Sullivan
City of Tillamook Water Department
210 Laurel Avenue A
Tillamook, OR 97141

Re: City of Tillamook WD drinking water source sampling
PWS No. 00893

Dear Mr. Sullivan:

As part of regional and statewide studies, the Tillamook Estuary Partnership and Oregon Department of Environmental Quality (DEQ) have recently completed analysis of water samples collected from surface water sources in the North Coast watersheds. The source water upstream of Tillamook's drinking water intakes was sampled in Spring and Fall of 2013 as part of the Tillamook Estuary Partnership study. The samples were analyzed for over 120 different pesticides using 4 different laboratory methods. Sampling and analyzing for low levels of chemicals in streams provides DEQ, OHA and others the ability to prioritize pollutant reduction efforts on activities and land uses that are impacting those streams.

The analytical results for the samples collected from the water system used by your utility are attached as Table 1. A list of all chemicals that were analyzed for by the DEQ Laboratory is attached as Table 2. Two sampling techniques were used, each with different applications and providing different analysis results. The *POCIS* (polar organic chemical integrative sampler) is a passive sampler that is deployed and left in the stream over a period of approximately one month. POCIS sampling provides time-weighted average concentrations of chemicals over the deployment period and is generally used by DEQ to identify presence vs. absence of specific chemicals. Water column sampling provides direct concentration values of the chemicals in the stream at a point in time. The analyses focused on current use pesticides for POCIS and water column sampling.

Samples were collected during peak pesticide application times in the Spring and Fall. A total of fifteen samples (including several duplicate samples) were analyzed from Fawcett and Killiam creeks either by POCIS or water column sampling methods. Out of the 120 pesticides analyzed, a total of three pesticides were detected in your source water.

Glyphosate and its metabolite aminomethylphosphonic acid (AMPA) were detected in one of the Fawcett Creek water column samples. The glyphosate and AMPA were measured at concentrations that are close to the laboratory instrument detection limits. The concentrations detected are thousands of times lower than the primary maximum contaminant level (MCL) for glyphosate. A human health benchmark concentration is not available for AMPA so the MCL for its parent compound, glyphosate, is used as a surrogate.

Sulfometuron-methyl was measured in the POCIS samples collected from Killiam Creek in both Spring and Fall at concentrations that are close to the laboratory instrument detection limits. Sulfometuron-methyl is a broad spectrum urea herbicide used for the control of annual and perennial grasses and broad-leaved weeds in non crop land. It also has forestry applications where it is used to control woody tree species. Detections for pesticides in the POCIS samples indicate presence of the compound and do not represent water concentrations. POCIS results cannot be directly compared to the health benchmark. Sulfometuron-methyl was not detected in the three water column samples collected in Killiam Creek in April, May or August 2013. For more information about the public health significance of your results contact David Farrer, a public health toxicologist, at 971-673-0971 or at david.g.farrer@state.or.us.

Overall the monitoring effort demonstrates that a variety of pesticides can be detected at very low levels in surface waters. Detections of pesticides in surface waters indicate off-target movement and an opportunity for continued improvement. DEQ and OHA will work with partner agencies like Oregon Departments of Agriculture and Forestry (ODA and ODF) as well as landowners using pesticides to develop prevention strategies as reducing contamination in source waters is a cost-effective way to ensure safe drinking water supplies for the future. If you wish to discuss potential follow-up strategies to reduce the occurrences of any contaminants in your drinking water please contact Sheree Stewart, DEQ Drinking Water Protection Coordinator at 503-229-5413. Thank you for participating in DEQ and Tillamook Estuary Partnership's monitoring studies.

Sincerely,

Karen Kelley, REHS
Interim Section Manager and
Region 2 Technical Services Manager
Drinking Water Services

cc: Sheree Stewart, DEQ

Table 1. DEQ TEP/TMP Monitoring Project - 2014

Public Water System Source Samples - Tillamook Water District PWS 00893

Detected Analytes* for Surface Water Samples and Drinking Water/Health Standards

Station ID Sample Type DEQ Lab Report No Sample ID Date Location Compound	Sample Type	Units	Reporting Limit	Drinking Water/Health Benchmark/Standards (see notes)	12849 River/Stream 1304043 1304043-04 4/10/2013 Fawcett Creek at Fawcett Creek Farm	12849 River/Stream 1304043 1304043-05 4/10/2013 Fawcett Creek at Fawcett Creek Farm (Field Dup)	12849 River/Stream 1305032 1305032-02 5/8/2013 Fawcett Creek at Fawcett Creek Farm	12849 River/Stream 1305032 1305032-03 5/8/2013 Fawcett Creek at Fawcett Creek Farm (Field Dup)	12849 POCIS 1305034 1305034-02 5/8/2013 Fawcett Creek at Fawcett Creek Farm	12849 POCIS 1305034 1305034-03 5/8/2013 Fawcett Creek at Fawcett Creek Farm (Field Dup)	12849 River/Stream 1308090 1308090-05 8/21/2013 Fawcett Creek at Fawcett Creek Farm	12849 POCIS 1309052 1309052-05 9/18/2013 Fawcett Creek at Fawcett Creek Farm	12849 POCIS 1309052 1309052-05 9/18/2013 Fawcett Creek at Fawcett Creek Farm (Field Dup)	36223 River/Stream 1304043 1304043-09 4/11/2013 Killiam Cr AB City Diversion	36223 River/Stream 1305033 1305033-02 5/9/2013 Killiam Cr AB City Diversion	36223 POCIS 1305035 1305035-03 5/9/2013 Killiam Cr AB City Diversion	36223 River/Stream 1305033 1305033-09 5/16/2013 Killiam Cr AB City Diversion	36223 River/Stream 1308090 1308090-07 8/21/2013 Killiam Cr AB City Diversion	36223 POCIS 1309052 1309052-07 9/18/2013 Killiam Cr AB City Diversion
Low Level Analysis of Pesticides by Gas Chromatography/Mass Spectrometry (EPA Method 8270D)																			
	Grab POCIS	ng/L ng/POCIS	varies	varies	ND	ND	ND	ND	ND/void (***)	ND/void (***)	ND	ND/void (***)	ND/void (***)	ND	ND	ND/void (***)	NA	ND	ND/void (***)
Pesticides by Liquid Chromatography/Tandem Mass Spectrometry (Method DEQ 11-LAB-0031-SOP)																			
Sulfometuron-methyl	Grab POCIS	ng/L ng/POCIS	4.0 - 5.0 3.0 - 4.0	**2,000,000 ng/L= 2000 ppb (HBSL)	ND	ND	ND	ND	ND/void (***)	ND/void (***)	ND	ND/void (***)	ND/void (***)	ND	ND	**1.63 J ng/POCIS**	NA	ND	**9.96 ng/POCIS**
Remaining pesticides	Grab POCIS	ng/L ng/POCIS	varies	varies	ND	ND	ND	ND	ND/void (***)	ND/void (***)	ND	ND/void (***)	ND/void (***)	ND	ND	ND/void (***)	NA	ND	ND/void (***)
Phenoxy Herbicides by Electron Capture Detector (Method SM6640)																			
	Grab	ng/L	varies	varies	ND	ND	ND	ND	NA	NA	ND	NA	NA	ND	ND	NA	NA	ND	NA
Glyphosate by Liquid Chromatography/Tandem Mass Spectrometry (Method DEQ 11-LAB-0031-SOP)																			
Glyphosate	Grab	ng/L	50	700,000 ng/L = 700 ppb (MCL)	ND	ND	ND	ND	NA	NA	**92.2 ng/L**	NA	NA	ND	void	NA	ND	ND	NA
Aminomethylphosphonic acid (AMPA) (metabolite of glyphosate)	Grab	ng/L	50	700,000 ng/L = 700 ppb (MCL for parent compound)	ND	ND	ND	ND	NA	NA	**70.6 ng/L**	NA	NA	ND	void	NA	ND	ND	NA
General Parameters																			
Turbidity (Method SM2130 B)	Grab	NTU	1	(TT)	2	3	ND	ND	NA	NA	1	NA	NA	2	1	NA	1	1	NA
Total Suspended Solids (Method SM 2540 D)	Grab	mg/L	1	Not Available	4	3	1	1	NA	NA	1	NA	NA	1	ND	NA	ND	1	NA

Notes:

* A complete list of analytical methods, compounds, and typical detection limits is available in the analytical report

** POCIS Samplers were deployed in the stream locations for a duration of 28-29 days. Detections for herbicides in the POCIS samples indicate presence of the compound and do not represent water concentrations. POCIS results cannot be directly compared to the health benchmark

*** Due to the limitations of the POCIS media with respect to recovery, analytes which are non-detect are void

J- Sample result is estimated. Analyte concentration is greater than 3x the signal to noise ratio but less than the LOQ

Drinking Water/Health Standards:

Where MCLs have not been developed, other values are listed to provide a health/risk-based context for the values that were measured in raw water

(MCL) Primary Maximum Contaminant Level - MCLs are legally binding standards under the Safe Drinking Water Act for public water systems to meet (post-treatment)

(HBSL) USGS/EPA Health-based Screening levels (Toccalino, P.L., Norman, J.E., Booth, N.L, and Zogorski, J.S., 2008, Health-based screening levels: A tool for evaluating what water-quality data may mean to human health. U.S. Geological Survey, National Water-Quality Assessment Program, accessed October 6, 2008 at http://water.usgs.gov/nawqa/HBSL/)

(TT) / (TT-AL) Treatment Technique required – Action Level is given

Acronyms:

TEP - Tillamook Estuary Partnership
TMP - DEQ's Toxics Monitoring Program
DEQ - Oregon Department of Environmental Quality

NA - Not analyzed
ND - Not detected
NTU - nephelometric turbidity units

ng/L - nanograms/liter (parts per trillion, ppt)
ug/L - micrograms per liter (parts per billion, ppb)
mg/L - milligrams/liter (parts per million, ppm)

Table 2. DEQ TEP/TMP Monitoring Project - 2014
Public Water System Source Samples
Analytical Methods, Compounds, and Detection Limits

Notes:

*** = detected in at least one source water sample (surface water)**

(1) LOQ = Limit of quantitation/method detection limit - note that slight variations of the LOQ are present in individual lab reports. Refer to specific lab report for precise LOQ if needed.

Acronyms:

TEP - Tillamook Estuary Partnership
TMP - DEQ's Toxics Monitoring Program
DEQ - OR Department of Environmental Quality

ng/L - nanograms/liter (parts per trillion, ppt)
ug/L - micrograms per liter (parts per billion, ppb)
mg/L - milligrams/liter (parts per million, ppm)

Low Level Analysis of Pesticides by Gas Chromatography/Mass Spectrometry (EPA Method 8270D)

Analyte	LOQ (1) Unit	Analyte	LOQ (1) Unit
4,4'-DDD	21.0-22.0 ng/L	Fenvalerate+Esfenvalerate	210-220 ng/L
4,4'-DDE	21.0-22.0 ng/L	Fluridone	21.0-22.0 ng/L
4,4'-DDT	21.0-22.0 ng/L	gamma-BHC (Lindane)	21.0-22.0 ng/L
Aldrin	21.0-22.0 ng/L	Heptachlor	21.0-22.0 ng/L
alpha-BHC	21.0-22.0 ng/L	Heptachlor epoxide	21.0-22.0 ng/L
beta-BHC	21.0-22.0 ng/L	Hexazinone	21.0-22.0 ng/L
Bifenthrin	21.0-22.0 ng/L	Malathion	21.0-22.0 ng/L
Bromacil	21.0-22.0 ng/L	Methoxychlor	21.0-22.0 ng/L
Butachlor	21.0-22.0 ng/L	Methyl paraoxon	21.0-22.0 ng/L
Butylate	21.0-22.0 ng/L	Mevinphos	21.0-22.0 ng/L
Chlorobenzilate	21.0-22.0 ng/L	MGK 264	21.0-22.0 ng/L
Chloroneb	21.0-22.0 ng/L	Mirex	21.0-22.0 ng/L
Chlorothalonil	21.0-22.0 ng/L	Molinate	21.0-22.0 ng/L
Chlorpropham	21.0-22.0 ng/L	Napropamide	21.0-22.0 ng/L
Chlorpyrifos	21.0-22.0 ng/L	Norflurazon	21.0-22.0 ng/L
cis-Chlordane	21.0-22.0 ng/L	Parathion-ethyl	21.0-22.0 ng/L
Cyanazine	21.0-22.0 ng/L	Parathion-methyl	21.0-22.0 ng/L
Cycloate	21.0-22.0 ng/L	Pebulate	21.0-22.0 ng/L
Dacthal (DCPA)	21.0-22.0 ng/L	Pendimethalin	21.0-22.0 ng/L
delta-BHC	21.0-22.0 ng/L	Permethrin	43.0-44.0 ng/L
Diazinon	21.0-22.0 ng/L	Phosmet	53.0-56.0 ng/L
Dichlorvos	21.0-22.0 ng/L	Pronamide	21.0-22.0 ng/L
Dieldrin	21.0-22.0 ng/L	Propachlor	21.0-22.0 ng/L
Dimethoate	21.0-22.0 ng/L	Pyriproxyfen	110-110 ng/L
Diphenamid	21.0-22.0 ng/L	Tebuthiuron	21.0-22.0 ng/L
Endosulfan	21.0-22.0 ng/L	Terbacil	21.0-22.0 ng/L
Endosulfan	21.0-22.0 ng/L	Terbufos	21.0-22.0 ng/L
Endosulfan sulfate	21.0-22.0 ng/L	Tetrachlorvinphos(Stirophos)	53.0-56.0 ng/L
Endrin	21.0-22.0 ng/L	trans-Chlordane	21.0-22.0 ng/L
Endrin aldehyde	21.0-22.0 ng/L	trans-Nonachlor	21.0-22.0 ng/L
EPTC	21.0-22.0 ng/L	Triadimefon	21.0-22.0 ng/L
Ethoprop	21.0-22.0 ng/L	Tricyclazole	53.0-56.0 ng/L
Etridiazole	21.0-22.0 ng/L	Trifluralin	21.0-22.0 ng/L
Fenarimol	21.0-22.0 ng/L	Vernolate	21.0-22.0 ng/L

Pesticides by Liquid Chromatography/Tandem Mass Spectrometry (DEQ 11-LAB-0031-SOP)

Analyte	LOQ [1] Unit	Analyte	LOQ [1] Unit
Acetamiprid	4.0-5.0 ng/L	Methiocarb	4.0-5.0 ng/L
Acetochlor	10.0-12.0 ng/L	Methomyl	4.0-5.0 ng/L
Alachlor	10.0-12.0 ng/L	Metolachlor	10.0-12.0 ng/L
Ametryn	4.0-5.0 ng/L	Metribuzin	4.0-5.0 ng/L
Aminocarb	4.0-5.0 ng/L	Mexacarbate	4.0-5.0 ng/L
Atrazine	4.0-5.0 ng/L	Neburon	5.0-6.0 ng/L
Azinphos-methyl (Guthion)	20.0-23.0 ng/L	Oxamyl	4.0-5.0 ng/L
Baygon (Propoxur)	4.0-5.0 ng/L	Prometon	4.0-5.0 ng/L
Carbaryl	5.0-6.0 ng/L	Prometryn	4.0-5.0 ng/L
Carbofuran	4.0-5.0 ng/L	Propazine	4.0-5.0 ng/L
DEET	20.0-23.0 ng/L	Propiconazole	20.0-23.0 ng/L
Deisopropylatrazine	4.0-5.0 ng/L	Pyraclostrobin	4.0-5.0 ng/L
Desethylatrazine	4.0-5.0 ng/L	Siduron	4.0-5.0 ng/L
Diuron	4.0-5.0 ng/L	Simazine	4.0-5.0 ng/L
Fluometuron	4.0-5.0 ng/L	Simetryn	4.0-5.0 ng/L
Imazapyr	40.0-45.0 ng/L	Sulfometuron-methyl	4.0-5.0 ng/L
Imidacloprid	20.0-23.0 ng/L	Terbutryn (Prebane)	4.0-5.0 ng/L
Linuron	4.0-5.0 ng/L	Terbutylazine	4.0-5.0 ng/L

Phenoxy Herbicides by Electron Capture Detector (SM6640)

Analyte	LOQ [1] Unit	Analyte	LOQ [1] Unit
2,4,5-T	0.3 µg/L	Dichloroprop	0.3 µg/L
2,4,5-TP (Silvex)	0.1 µg/L	Dinoseb	0.3 µg/L
2,4-D	0.1 µg/L	MCPA	18.0-20.0 µg/L
2,4-DB	0.6 µg/L	MCPP	55.0-59.0 µg/L
3,5-Dichlorobenzoic acid	0.3 µg/L	Pentachlorophenol	0.1 µg/L
Acifluorfen	0.2 µg/L	Picloram	0.6 µg/L
DCPA acid metabolites	0.6 µg/L	Triclopyr	0.3 µg/L
Dicamba	0.3 µg/L		

Glyphosate by Liquid Chromatography/Tandem Mass Spectrometry (DEQ 11-LAB-0031-SOP)

Analyte	LOQ [1] Unit
Aminomethylphosphonic acid (AMPA)	50 ng/L
Glyphosate	50 ng/L

General Field Parameters

Analyte	LOQ [1] Unit	Method
Conductivity	1 µmhos/cm	SM 2510 B
Dissolved	1 mg/L	SM 4500-OC
Dissolved Oxygen, Saturation	1 %	SM 4500-OC
pH	0.1 pH Units	SM 4500-H+B
Temperature	0 °C	EPA 170.1
Turbidity	1 NTU	SM 2130B

General Chemistry

Analyte	LOQ [1] Unit	Method
Total Suspended Solids	1 mg/L	SM 2540D

Extension Service
Department of Agricultural Chemistry
Environmental Toxicology & Chemistry Program
Oregon State University

National Institute of Environmental Health Services
Environmental Health Sciences Center
Community Outreach Program
Oregon State University

Sulfometuron-methyl

Pesticide Fact Sheet: Forestry Use

Product Information

▪ Sulfometuron-methyl is the common name for the active ingredient in **Oust**, a broad spectrum grass and broadleaf herbicide with pre- and post-emergence uses.

▪ Sulfometuron-methyl is formulated as a dispersible granule that is mixed with water and applied as a spray. The undiluted material contains 75% active ingredients and 25% inert ingredients.

▪ Sulfometuron-methyl is typically applied at very low rates. Application rates range from 1.5 to 3 ounces of active ingredient per acre.

▪ Sulfometuron-methyl is applied by ground rigs or helicopter before or after weeds emerge and when rainfall is sufficient to activate it in soil.

▪ For comparative purposes, the Environmental Protection Agency (EPA) categorizes pesticides by their short-term toxicity on a scale of I (most toxic) to IV (least toxic. Most undiluted sulfometuron-methyl formulations are Toxicity Category IV.

Public Health

▪ Researchers use animal studies to define the potential for a pesticide to cause harmful effects to human health. It is important to know that these tests are carried out using doses high enough to cause toxicity (poisoning). Effects seen at toxic doses in animals are unlikely to occur after short-term, low-level exposure in humans. The level of exposure must be considered to estimate the risk of harmful effects.

▪ Based on laboratory studies, sulfometuron-methyl is classified as practically non-toxic to mammals on a short term (acute) basis.

▪ On a long-term basis, sulfometuron-methyl is toxic only at very high doses.

▪ Sulfometuron-methyl is rapidly metabolized and excreted. In goats, most of the dose was excreted in the feces and urine after 7 days.

▪ Except at high doses, there is no evidence that sulfometuron-methyl causes birth defects, reproductive problems, nerve damage, DNA damage, or cancer.

Wildlife Effects

▪ Based on laboratory and field studies, sulfometuron-methyl is classified as practically non-toxic to birds, terrestrial mammals, and fish on a short term (acute) basis.

▪ Sulfometuron-methyl is not expected to bioaccumulate in wildlife.

Environmental Fate

▪ Sulfometuron-methyl persistence in surface water is largely dependent on pH. Reported values for the half-lives in water range from 14 days under acidic conditions to 60 days at high pHs. The half-life of sulfometuron-methyl in sediments is 30 to 60 days.

▪ Sulfometuron-methyl is biologically active at low concentrations, and small amounts of drift can cause damage to adjacent plants or trees. Note that drift damage to plants is not a good indicator of human health risks because the chemical’s mode of action is specific to plants.

▪ The half-life of sulfometuron-methyl in soils is 5 to 33 days. Its half-life in plants is 4 to ll days.

▪ Sulfometuron-methyl is classified as moderately mobile and can move with runoff and enter surface water. Its low application rates minimize potential impacts on surface or groundwater. Right-of-way uses should be evaluated for potential surface and groundwater contamination.

Risk Assessment

▪ The EPA has evaluated use practices, environmental fate, potential exposure routes, and toxicity of sulfometuron- methyl. Because sulfometuron-methyl is not used on food crops (and therefore is exempt from a tolerance) the EPA has not established a Reference Dose (RfD). The RfD is the amount of daily pesticide exposure judged to pose no appreciable risk over a 70-year lifetime. Rats fed diets containing 50 mg/kg sulfometuron-methyl for 2 years did not exhibit any adverse effects.

- EPA has determined that the expected exposure associated with sulfometuron-methyl in right-of-way use will not result in adverse health effects. However, you should take reasonable precautions to avoid exposure. Do not walk through freshly-sprayed vegetation. Do not eat berries, mushrooms, or other edibles, or drink the water from newly-treated areas. If you are concerned about exposure, consult the resources listed in **Additional Information**.

References

- EXTOXNET: Extension Toxicology Network. Pesticide Information Profile: Sulfometuron-methyl. Resource Center. Cornell University. Ithaca, NY.

- Koeppe, M.K. and C. F. Mucha. 1996. Metabolism of sulfometuron methyl in lactating goats. *J. Agric. Food Chem*. 39, 2304-2309.

- Meister, R.T., editor. 1996. Farm Chemicals Handbook '96. Meister Publishing Company. Willoughby, OH.

- Thomson, W.T. 1993. Agricultural Chemicals Book II. Herbicides. Thomson Publications. Fresno, CA.

- U.S. Environmental Protection Agency. 1995. Pesticide Environmental Fate One-Line Summary: Sulfometuron-methyl. Environmental Fate and Effects Division. Washington, DC.

Vogue, P.A., E.A. Kerle, and J.J. Jenkins. 1994. OSU Extension Pesticide Properties Database. Department of Agricultural Chemistry. Oregon State University. Corvallis, OR.

Compiled by D. Buchwalter, J. Jenkins, N. Kerkvliet, P. Thompson 12/96
Updated by W. Trevathan 11/02

Additional Information: Oregon

- Oregon State University Extension Environmental Chemistry and Toxicology Program
  1-541-737-5993 Extension Specialist

- Oregon Poison Control
  1-800-222-1222 (National)
  1-503-494-8968 (Portland)
  1-800-452-7165 (Outside Portland)

- Oregon Department of Agriculture
  1-503-986-4550
  1-503-986-4635 (Pesticide Division)

- Oregon Health Division Pesticide Analytical Response Center
  1-503-731-4025 (8 a.m.-5 p.m., M-F)
  1-503-731-4030 (evenings, weekends)

Washington

- Poison Control Center
  1-800-222-1222 (National)
  1-206-526-2121 (Seattle)
  1-800-732-6985 (Outside Seattle)

- Washington Department of Agriculture, Pesticide Management Division
  1-877-301-4555 (toll free)
  1-360-902-2040 (Olympia)
  1-509-576-3064 (Yakima)

- Washington State University Food and Environmental Quality Laboratory
  100 Sprout Road
  Richland, WA 99352-1643
  1-509-372-7462 (phone)
  1-509-372-7460 (fax)

- Washington Department of Health
  1-800-525-0127
  1-360-236-3360 (Pesticide Program)
  1-888-586-9427 (toll free)

Nationwide

- National Pesticide Information Center
  1-800-858-PEST (7378)
  http://npic.orst.edu/

- Extension Toxicology Network (EXTOXNET)
  http://ace.orst.edu/info/extoxnet/

- DuPont Agricultural Products
  P.O. Box 80038 Wilmington, DE 19880-0038
  1-800-441-7515
  1-800-441-3637 (emergency phone)
  1-302-992-2276 (fax)

Extension Service
Department of Agricultural Chemistry
Environmental Toxicology & Chemistry Program
Oregon State University

National Institute of Environmental Health Services
Environmental Health Sciences Center
Community Outreach Program
Oregon State University

Glyphosate

Pesticide Fact Sheet: Forestry Use

Product Information

▪ Glyphosate is the common name for the active ingredient in many products including Accord **Concentrate, Accord SP** and **Roundup Pro.** These are post-emergence herbicides commonly used in forestry and right-of-way vegetation management. **Roundup Pro and Accord SP are** designed for use strictly on terrestrial applications. **Accord Concentrate** can be used on plants in and around water.

▪ These products are formulated as salts and sold in liquid form. **Accord SP** and **Roundup Pro** include a surfactant designed to increase the uptake of glyphosate by plants; **Accord Concentrate** does not contain this surfactant.

▪ Forestry users typically apply glyphosate by air or ground at .5 to 3 pounds active ingredient per acre. It is a non-selective herbicide that can be applied during the growing season after weeds and woody plants start growing. Glyphosate can be used as a cut stump or injection application containing 50 to 100% active ingredient.

▪ For comparative purposes, the Environmental Protection Agency (EPA) categorizes pesticides by their short-term toxicity on a scale of I (most toxic) to IV (least toxic). Most undiluted glyphosate formulations containing surfactant are Toxicity Category II or lll, those without surfactant are Toxicity Category lV.

Public Health

▪ Researchers use animal studies to define the potential for a pesticide to cause harmful effects to human health. It is important to know that these tests are carried out using doses high enough to cause toxicity (poisoning). Effects seen at toxic doses in animals are unlikely to occur after short-term, low-level exposure in humans. The level of exposure must be considered to estimate the risk of harmful effects.

▪ Based on laboratory studies, glyphosate is classified as practically non-toxic to mammals.

▪ The primary breakdown product of glyphosate is aminomethylphosphonic acid (AMPA). AMPA is also practically non-toxic to mammals.

▪ Laboratory tests on rats show that more than 90% of an administered dose is eliminated from the body within 72 hours.

▪ There is no evidence that glyphosate or AMPA cause birth defects, nerve damage, cancer, or DNA damage.

▪ The EPA has classified glyphosate as a Class E carcinogen (no evidence of carcinogenicity for humans).

Wildlife Effects

▪ Based on laboratory and field studies, **Roundup** and **Accord** are classified as practically non-toxic to birds and honeybees.

▪ While glyphosate ranges from slightly to practically non-toxic to fish, surfactants used in **Roundup Pro** may be toxic to fish and aquatic macroinvertebrates. As a result, **Roundup Pro** is not approved for use in or near water. **Accord Concentrate** is approved for use in and around water because it is formulated without surfactants. However, certain uses may specify the addition of surfactants.

▪ Glyphosate is not expected to bioaccumulate in wildlife.

Environmental Fate

▪ Glyphosate is stable in water and stable to breakdown by sunlight. It is degraded by aquatic microorganisms and has a half-life of 14 to 21 days in pond water. It will accumulate in sediments where it is bound.

▪ The half-life of glyphosate in soil ranges from 2 to 174 days with a typical half-life of 47 days. AMPA has a typical half-life of 118 days (71 to 165 days) in soil. For right-of-way vegetation management, glyphosate is usually applied at higher rates and is expected to be much more persistent.

- Despite being highly water soluble, glyphosate and its primary metabolite, AMPA, adsorb readily to organic materials in soils. Therefore, they are unlikely to move through soils and contaminate ground or surface water.

Risk Assessment

- The EPA has evaluated use practices, environmental fate, potential exposure routes, and toxicity of glyphosate and has set a Reference Dose (RfD) for glyphosate of 2.0 mg/kg/day. A 70 kg (154 lb) person would have an RfD of 140 mg/day. The RfD is the amount of daily pesticide exposure judged to pose no appreciable risk over a 70-year lifetime. The RfD for glyphosate is based on the results of the most sensitive animal studies (rabbit) and includes built-in safety measures.

- EPA has determined that the expected exposure associated with glyphosate in forestry use will not result in adverse health effects. However, you should take reasonable precautions to avoid exposure. Do not walk through freshly-sprayed vegetation. Do not eat berries, mushrooms, or other edibles, or drink the water from newly-treated areas. If you are concerned about exposure, consult the resources listed in **Additional Information**.

References

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- U.S. Department of Health and Human Services. 1992. NTP Technical Report on Toxicity Studies of Glyphosate. National Toxicology Program. Toxicity Report Series. Number 16. Research Triangle Park, NC.

- U.S. Environmental Protection Agency. 1988. Health Advisory. Glyphosate. Office of Drinking Water. Washington, D.C.

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- U.S. Environmental Protection Agency. 1995. Integrated Risk Information System (IRIS). Environmental Criteria and Assessment Office. Cincinnati, OH.

- U.S. Forest Service. 1984. Pesticide Background Statements. Vol. 1. Herbicides. Agriculture Handbook Number 633. U.S. Department of Agriculture. Washington, D.C.

- Vogue, P.A., E.A. Kerle, and J.J. Jenkins. 1994. OSU Extension Pesticide Properties Database. Department of Agricultural Chemistry. Oregon State University. Corvallis, OR.

Additional Information: Oregon

- Oregon State University Extension Environmental Chemistry and Toxicology Program
  1-541-737-5993 Extension Specialist

- Oregon Poison Control
  1-800-222-1222 (National)
  1-503-494-8968 (Portland)
  1-800-452-7165 (Outside Portland)

- Oregon Department of Agriculture
  1-503-986-4550
  1-503-986-4635 (Pesticide Division)

- Oregon Health Division Pesticide Analytical Response Center
  1-503-731-4025 (8 a.m.-5 p.m., M-F)

Washington

- Poison Control Center
  1-800-222-1222 (National)
  1-206-526-2121 (Seattle)
  1-800-732-6985 (Outside Seattle)

- Washington Dept. of Agriculture, Pesticide Management Division
  1-877-301-4555 (toll free)
  1-360-902-2040 (Olympia)
  1-509-576-3064 (Yakima)

- Washington State University Food and Environmental Quality Laboratory
  100 Sprout Road
  Richland, WA 99352-1643
  1-509-372-7462 (phone)
  1-509-372-7460 (fax)

- Washington Department of Health
  1-800-525-0127
  1-360-236-3360 (Pesticide Division)
  1-888-586-9427 (toll free)

Nationwide

- National Pesticide Information Center
  1-800-858-PEST (7378)
  http://npic.orst.edu/

- Extension Toxicology Network (EXTOXNET)
  http://ace.orst.edu/info/extoxnet/

- DuPont Agricultural Products
  P.O. Box 80038 Wilmington, DE 19880-0038
  1-800-441-7515
  1-800-441-3637 (emergency phone)
  1-302-992-2276 (fax)

Compiled by D. Buchwalter, J. Jenkins, N. Kerkvliet, P. Thompson 12/96
Updated by W. Trevathan 11/02

Appendix I

City of Tillamook

CAPITOL IMPROVEMENTS ASSESSMENT

WATER LINE INVENTORY

					Pipes with 0 yrs of life			Pipes with < 10 yrs of life		Pipes with < 20 yrs of life	
								2014 ENR = 9870			
NO.	LOCATION	DIA	MATERIAL	LENGTH	DATE	INIT. VALUE	LIFE	ENR INDEX	REM VALUE	REM LIFE	REPL. $ 2014
1	11th Street, Elm to Stillwell	4	CI	770	1918	$702	100	189	$28	4	$36,660
2	Elm Street, 11th to 12th	4	CI	210	1918	$181	100	189	$7	4	$9,452
3	1st Street, Park east	1.5	GI	240	1920	$161	40	251	$0	(54)	$6,331
4	4th Street, Grove to Stillwell	4	CI	300	1920	$363	100	251	$22	6	$14,274
6	5th Street, Elm to Grove	4	STL	540	1924	$560	40	215	$0	(50)	$25,708
7	5th Street, Grove to Stillwell	4	STL	270	1924	$280	40	215	$0	(50)	$12,854
9	6th Street, Main to Pacific	8	STL	50	1925	$68	40	207	$0	(49)	$3,242
10	1st Street, Douglas to Elm	6	CI	265	1927	$341	100	206	$44	13	$16,338
11	Douglas Avenue, Front to 1st	6	CI	265	1927	$341	100	206	$44	13	$16,338
12	4th Street, Stillwell to Ivy	6	CI	320	1930	$406	100	203	$65	16	$19,740
13	4th Street, Ivy to Main	6	CI	265	1930	$336	100	203	$54	16	$16,337
14	4th Street, Main to Laurel	6	CI	470	1930	$596	100	203	$95	16	$28,978
15	4th Street, Laurel to Madrona	6	CI	270	1930	$343	100	203	$55	16	$16,677
16	4th Street, Madrona to Nestucca	4	CI	255	1930	$250	100	203	$40	16	$12,155
17	10th Street, Main to Pacific	6	CI	160	1930	$203	100	203	$32	16	$9,870
18	10th Street, Pacific to Laurel	6	CI	270	1930	$343	100	203	$55	16	$16,677
19	10th Street, Laurel to Nestucca	6	CI	530	1930	$672	100	203	$108	16	$32,673
20	Laurel Avenue, 3rd to 4th	6	CI	260	1930	$330	100	203	$53	16	$16,045
21	Laurel Avenue, 4th to 5th	6	CI	270	1930	$343	100	203	$55	16	$16,677
22	Laurel Avenue, 5th to 7th	6	CI	540	1930	$385	100	203	$62	16	$18,719
23	Laurel Avenue, 7th to 8th	6	CI	260	1930	$330	100	203	$53	16	$16,045
24	Laurel Avenue, 8th to 10th	6	CI	535	1930	$679	100	203	$109	16	$33,013
25	Main Avenue, 1st to 2nd	6	CI	275	1930	$349	100	203	$56	16	$16,969
26	Main Avenue, 2nd to 3rd	6	CI	260	1930	$330	100	203	$53	16	$16,045
27	Main Avenue, 3rd to 4th	6	CI	265	1930	$336	100	203	$54	16	$16,337
28	3rd Street, Ash west	6	CI	400	1931	$453	100	181	$77	17	$24,702
29	3rd Street, Ash to Birch	6	CI	265	1931	$300	100	181	$51	17	$16,359
30	3rd Street, Birch to Cedar	6	CI	270	1931	$305	100	181	$52	17	$16,632
31	3rd Street, Cedar to Elm	6	CI	540	1931	$611	100	181	$104	17	$33,318
32	3rd Street, Elm to Stillwell	6	CI	805	1931	$911	100	181	$155	17	$49,677
33	12th Street, Stillwell to Ivy	6	CI	280	1932	$275	100	157	$50	18	$17,288
34	Main Avenue, Front to 1st	6	CI	340	1932	$335	100	157	$60	18	$21,060
35	Stillwell Avenue, 3rd to 4th	6	CI	270	1932	$265	100	157	$48	18	$16,660
36	Stillwell Avenue, 4th to 5th	6	CI	270	1932	$265	100	157	$48	18	$16,660
37	Stillwell Avenue, 5th to 6th	6	CI	270	1932	$265	100	157	$48	18	$16,660
38	Stillwell Avenue, 6th to 8th	6	CI	725	1932	$711	100	157	$128	18	$44,698
39	Stillwell Avenue, 8th to 9th	6	CI	265	1932	$260	100	157	$47	18	$16,345
40	Stillwell Avenue, 9th to 10th	6	CI	265	1932	$260	100	157	$47	18	$16,345
41	Stillwell Avenue, 10th to 11th	6	CI	280	1932	$275	100	157	$50	18	$17,288
42	Stillwell Avenue, 11th to 12th	6	CI	270	1932	$265	100	157	$48	18	$16,660
43	Stillwell Avenue, north 12th to south 12th	6	CI	110	1932	$108	100	157	$19	18	$6,790

City of Tillamook

CAPITOL IMPROVEMENTS ASSESSMENT

WATER LINE INVENTORY

						Pipes with 0 yrs of life		Pipes with < 10 yrs of life		Pipes with < 20 yrs of life	
								2014 ENR = 9870			
NO.	LOCATION	DIA	MATERIAL	LENGTH	DATE	INIT. VALUE	LIFE	ENR INDEX	REM VALUE	REM LIFE	REPL. $ 2014
44	**5th Street, Birch to Cedar**	**4**	**CI**	**285**	**1933**	**$234**	**100**	**170**	**$44**	**19**	**$13,586**
45	**5th Street, Main to Pacific**	**6**	**CI**	**210**	**1933**	**$223**	**100**	**170**	**$42**	**19**	**$12,947**
46	**5th Street, Birch west**	**2**	**GI**	**570**	**1936**	**$461**	**40**	**206**	**$0**	**(38)**	**$22,088**
47	**Transmission Line @ POTB**	**16**	**STL**	**4,450**	**1937**	**$11,204**	**40**	**235**	**$0**	**(37)**	**$470,568**
48	1st Street, Ivy to Main	6	CI	250	1938	$369	100	236	$89	24	$15,432
49	2nd Street, Ivy to Main	6	CI	265	1938	$391	100	236	$94	24	$16,352
50	4th Street, Miller east	2	CI	150	1938	$139	100	236	$33	24	$5,813
51	5th Street, Cedar to Douglas	6	CI	265	1938	$391	100	236	$94	24	$16,352
52	5th Street, Douglas to Elm	6	CI	270	1938	$398	100	236	$96	24	$16,645
53	**5th Street, terminus to railroad**	**4**	**Stl**	**315**	**1938**	**$340**	**40**	**236**	**$0**	**(37)**	**$14,219**
54	6th Street, Pacific east	6	CI	70	1938	$103	100	236	$25	24	$4,308
55	6th Street, Miller to Park	6	CI	520	1938	$767	100	236	$184	24	$32,078
56	6th Street, Park to east of Del Monte	6	CI	480	1938	$708	100	236	$170	24	$29,610
57	Douglas Avenue, 5th to 6th	2	CI	400	1938	$371	100	236	$89	24	$15,516
58	Elm Avenue, 3rd to 4th	6	CI	270	1938	$398	100	236	$96	24	$16,645
59	Elm Avenue, 4th to 5th	6	CI	270	1938	$398	100	236	$96	24	$16,645
60	Madrona Avenue, 1st to 3rd	4	CI	385	1938	$438	100	236	$105	24	$18,318
61	Miller Avenue, 1st to 3rd	6	CI	310	1938	$457	100	236	$110	24	$19,113
62	Miller Avenue, 3rd to 4th	6	CI	260	1938	$384	100	236	$92	24	$16,060
63	Miller Avenue, 4th to 5th	6	CI	270	1938	$398	100	236	$96	24	$16,645
64	Miller Avenue, 5th to 6th	6	CI	270	1938	$398	100	236	$96	24	$16,645
65	Miller Avenue, 6th to 7th	6	CI	270	1938	$398	100	236	$96	24	$16,645
66	Miller Avenue, 7th to 8th	6	CI	265	1938	$391	100	236	$94	24	$16,352
66	Miller Avenue, 8th to 9th	6	CI	230	1938	$339	100	236	$81	24	$14,178
67	1st Street, Birch to Cedar	6	CI	265	1939	$391	100	236	$98	25	$16,352
68	1st Street, Cedar to Douglas	6	CI	270	1939	$398	100	236	$100	25	$16,645
69	1st Street, Stillwell to Ivy	6	CI	270	1939	$398	100	236	$100	25	$16,645
70	10th Street, Grove to Stillwell	6	CI	270	1939	$398	100	236	$100	25	$16,645
71	10th Street, Nestucca to Miller	6	CI	450	1939	$664	100	236	$166	25	$27,770
72	Birch Avenue, 1st to 2nd	6	CI	280	1939	$413	100	236	$103	25	$17,273
73	Cedar Avenue, 5th to 6th	6	CI	430	1939	$634	100	236	$159	25	$26,515
74	Stillwell Avenue, 1st to 2nd	6	CI	280	1939	$413	100	236	$103	25	$17,273
75	Stillwell Avenue, 2nd to 3rd	6	CI	260	1939	$384	100	236	$96	25	$16,060
76	4th Street, Birch to Meadowlark	6	CI	1,150	1940	$1,739	100	242	$452	26	$70,925
77	5th Street, Miller to Park	6	CJ	520	1940	$787	100	242	$205	26	$32,098
78	5th Street, Park to De Monte	6	CI	250	1940	$378	100	242	$98	26	$15,417
79	5th Street, Del Monte east	6	CI	352	1940	$532	100	242	$138	26	$21,698
80	**5th Street terminus, north**	**1.5**	**GI**	**230**	**1940**	**$250**	**40**	**242**	**$0**	**(35)**	**$10,196**
81	10th Street, Grove west	6	CI	440	1940	$666	100	242	$173	26	$27,163
82	Park Avenue, 5th to 6th	6	CI	270	1940	$408	100	242	$106	26	$16,640
83	**Transmission Line @ POTB**	**12**	**STL**	**7,700**	**1942**	**$17,837**	**40**	**276**	**$0**	**(32)**	**$637,867**

City of Tillamook

CAPITOL IMPROVEMENTS ASSESSMENT

WATER LINE INVENTORY

NO.	LOCATION	DIA	MATERIAL	LENGTH	DATE	INIT. VALUE	LIFE	ENR INDEX	REM VALUE	REM LIFE	REPL. $ 2014
						Pipes with 0 yrs of life		Pipes with < 10 yrs of life		Pipes with < 20 yrs of life	
								2014 ENR = 9870			
84	**Transmission Line @ POTB**	**16**	**STL**	**7,000**	**1942**	**$20,700**	**40**	**276**	**$0**	**(32)**	**$740,250**
85	6th Street, Cottonwood to Ash	4	CI	300	1943	$419	100	290	$122	29	$14,260
86	6th Street, Ash to Birch	4	CI	300	1943	$419	100	290	$122	29	$14,260
87	6th Street, Birch to Cedar	6	CI	270	1943	$489	100	290	$142	29	$16,643
88	9th Street, Chestnut to Elm	6	CI	600	1943	$1,088	100	290	$316	29	$37,030
89	9th Street, Elm to Manor Place	2	CI	180	1943	$205	100	290	$59	29	$6,977
90	10th Street, Elm east	6	CI	80	1943	$145	100	290	$42	29	$4,935
91	Cedar Avenue, 6th to 9th	6	CI	540	1943	$979	100	290	$284	29	$33,320
92	Elm Avenue, 5th to Manor Place	6	CI	650	1943	$1,178	100	290	$342	29	$40,093
93	Elm Avenue, Manor Place to 9th	6	CI	380	1943	$689	100	290	$200	29	$23,450
94	Elm Avenue, 9th to 10th	6	CI	385	1943	$698	100	290	$202	29	$23,756
95	Manor Place	2	CI	680	1943	$775	100	290	$225	29	$26,377
96	7th Street, Laurel west	6	CI	60	1949	$179	100	477	$63	35	$3,704
97	7th Street, Miller to Park	2	CI	525	1949	$984	100	477	$344	35	$20,361
98	**7th Street, Park east**	**2**	**GI**	**450**	**1949**	**$843**	**40**	**477**	**$0**	**(25)**	**$17,443**
99	9th Street, Main to Pacific	6	CI	160	1949	$477	100	477	$167	35	$9,870
100	9th Street, Pacific east	6	CI	52	1949	$149	100	477	$52	35	$3,083
101	11th Street, Main to Pacific	6	CI	160	1949	$477	100	477	$167	35	$9,870
102	**Birch Avenue, 6th north**	**2**	**GI**	**250**	**1949**	**$468**	**40**	**477**	**$0**	**(25)**	**$9,684**
103	Pacific Avenue, 5th to 6th	6	CI	270	1949	$805	100	477	$282	35	$16,657
104	Pacific Avenue, 6th to 7th	6	CI	270	1949	$805	100	477	$282	35	$16,657
105	Pacific Avenue, 7th to 8th	6	CI	260	1949	$775	100	477	$271	35	$16,036
106	Pacific Avenue, 8th to 9th	6	CI	270	1949	$805	100	477	$282	35	$16,657
107	Pacific Avenue, 9th to 10th	6	CI	265	1949	$790	100	477	$277	35	$16,347
108	Pacific Avenue, 10th to 11th	6	CI	270	1949	$805	100	477	$282	35	$16,657
109	**Transmission Line from south city to POTB**	**14**	**STL**	**10,500**	**1949**	**$49,191**	**40**	**477**	**$0**	**(25)**	**$1,017,852**
110	**Alder Lane, west of Williams to Schools**	**6**	**STL**	**650**	**1950**	**$2,072**	**40**	**510**	**$0**	**(24)**	**$40,099**
111	12th Street, Elm to Stillwell	6	CI	750	1953	$2,813	100	600	$1,097	39	$46,274
112	**12th Street, Fir to Stillwell**	**1**	**GI**	**550**	**1953**	**$770**	**40**	**600**	**$0**	**(22)**	**$12,667**
113	Fir Avenue, 11th to 12th	2	CI	270	1953	$636	100	600	$248	39	$10,462
114	**Ivy Avenue, 12th south**	**18**	**STL**	**1,000**	**1953**	**$7,714**	**40**	**600**	**$0**	**(21)**	**$126,895**
115	**Transission Line from south city to POTB**	**18**	**STL**	**10,300**	**1953**	**$79,457**	**40**	**600**	**$0**	**(21)**	**$1,307,068**
116	1st Street, Main to Laurel	6	CI	480	1954	$1,884	100	628	$754	40	$29,610
117	1st Street, Laurel to Madrona	6	CI	280	1954	$1,099	100	628	$440	40	$17,273
118	1st Street, Madrona to Miller	6	CI	730	1954	$2,865	100	628	$1,146	40	$45,028
119	2nd Street, Main to Laurel	6	CI	470	1954	$1,845	100	628	$738	40	$28,997
120	3rd Street, Ivy to Main	6	CI	265	1954	$1,040	100	628	$416	40	$16,345
121	3rd Street, Main to Laurel	6	CI	475	1954	$1,865	100	628	$746	40	$29,311
122	3rd Street, Laurel to Madrona	6	CI	270	1954	$1,060	100	628	$424	40	$16,660
123	3rd Street, Madrona to Miller	6	CI	740	1954	$2,905	100	628	$1,162	40	$45,657
124	8th Street, Ivy to Main	6	CI	270	1954	$1,060	100	628	$424	40	$16,660

City of Tillamook
CAPITOL IMPROVEMENTS ASSESSMENT
WATER LINE INVENTORY

					Pipes with 0 yrs of life			Pipes with < 10 yrs of life		Pipes with < 20 yrs of life	
								2014 ENR = 9870			
NO.	LOCATION	DIA	MATERIAL	LENGTH	DATE	INIT. VALUE	LIFE	ENR INDEX	REM VALUE	REM LIFE	REPL. $ 2014
125	10th Street, Ivy to Main	6	CI	270	1954	$1,060	100	628	$424	40	$16,660
126	Laurel Avenue, 1st to 2nd	6	CI	175	1954	$687	100	628	$275	40	$10,797
127	3rd Street, Miller to Park	6	CI	510	1955	$2,104	100	660	$863	41	$31,464
128	3rd Street, Park to Del Monte	6	CI	250	1955	$1,032	100	660	$423	41	$15,433
129	3rd Street, Del Monte to railroad	6	CI	550	1955	$2,269	100	660	$930	41	$33,932
130	3rd Street, Railroad to Evergreen	6	CI	1,160	1955	$4,785	100	660	$1,962	41	$71,558
131	4th Street, Birch to Cedar	6	CI	280	1955	$1,155	100	660	$474	41	$17,273
132	4th Street, Cedar to Elm	6	CI	535	1955	$2,207	100	660	$905	41	$33,005
133	4th Street, Elm to Grove	6	CI	505	1955	$2,083	100	660	$854	41	$31,150
134	5th Street, Laurel to Madrona	6	CJ	265	1955	$1,093	100	660	$448	41	$16,345
135	5th Street, Madrona to Nestucca	6	CI	270	1955	$1,114	100	660	$457	41	$16,659
136	5th Street, Main west	6	CI	260	1955	$1,073	100	660	$440	41	$16,046
137	5th Street, Nestucca to Miller	6	CI	435	1955	$1,794	100	660	$736	41	$26,828
138	5th Street, Pacific to Laurel	6	CI	265	1955	$1,093	100	660	$448	41	$16,345
139	Cedar Avenue, 3rd to 4th	6	CI	270	1955	$1,114	100	660	$457	41	$16,659
140	Cedar Avenue, 4th to 5th	6	CI	270	1955	$1,114	100	660	$457	41	$16,659
141	Hemlock Avenue, 3rd to terminus to Alder	6	CI	800	1955	$3,300	100	660	$1,353	41	$49,350
142	Madrona Avenue, 3rd to 4th	4	CI	210	1955	$668	100	660	$274	41	$9,990
143	Madrona Avenue, 4th to 5th	4	CI	270	1955	$859	100	660	$352	41	$12,846
144	Meadow Avenue, 3rd to Apple	6	CI	220	1955	$908	100	660	$372	41	$13,579
145	Meadow Avenue, Apple to Beech	4	CI	240	1955	$764	100	660	$313	41	$11,425
146	Nestucca Avenue, 5th (N) to 5th (S)	4	CI	505	1955	$1,607	100	660	$659	41	$24,032
147	Nestucca Avenue, 5th to 7th	6	CI	90	1955	$371	100	660	$152	41	$5,548
148	Nestucca Avenue, 7th to 8th	4	CI	295	1955	$939	100	660	$385	41	$14,042
149	1st Street, Elm to Fir	6	CI	270	1956	$1,168	100	692	$491	42	$16,659
150	1st Street, Fir to Grove	6	CI	270	1956	$1,168	100	692	$491	42	$16,659
151	1st Street, Grove to Stillwell	6	CI	270	1956	$1,168	100	692	$491	42	$16,659
152	1st Street, Miller to Park	4	CI	510	1956	$1,702	100	692	$715	42	$24,276
153	8th Street, Main to Pacific	6	CI	160	1956	$692	100	692	$291	42	$9,870
154	8th Street, Pacific to Laurel	6	CI	265	1956	$1,146	100	692	$481	42	$16,345
155	8th Street, Laurel to Madrona	6	CI	300	1956	$1,298	100	692	$545	42	$18,513
156	8th Street, Madrona to Nestucca	6	CI	240	1956	$1,038	100	692	$436	42	$14,805
157	8th Street, Nestucca to Miller	6	CI	470	1956	$2,033	100	692	$854	42	$28,997
158	8th Street, Miller to Park	6	CI	525	1956	$2,271	100	692	$954	42	$32,391
159	Del Monte Avenue, 3rd to 5th	4	CI	530	1956	$1,768	100	692	$743	42	$25,217
160	Fir Avenue, Front to 1st	4	CI	250	1956	$834	100	692	$350	42	$11,895
161	Grove Avenue, Front to 1st	4	CI	300	1956	$1,001	100	692	$420	42	$14,277
162	Grove Avenue, 11th to 12th	2	CI	250	1956	$600	100	692	$252	42	$8,558
163	Park Avenue, 1st to 3rd	4	CI	270	1956	$901	100	692	$378	42	$12,851
164	Park Avenue, 6th to 7th	4	CI	270	1956	$901	100	692	$378	42	$12,851
165	Park Avenue, 7th to 8th	4	CI	260	1956	$867	100	692	$364	42	$12,366

City of Tillamook

CAPITOL IMPROVEMENTS ASSESSMENT

WATER LINE INVENTORY

					Pipes with 0 yrs of life		Pipes with < 10 yrs of life		Pipes with < 20 yrs of life		
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NO.	LOCATION	DIA	MATERIAL	LENGTH	DATE	INIT. VALUE	LIFE	ENR INDEX	REM VALUE	REM LIFE	REPL. $ 2014
166	**Transmission line from Killam intake north**	**18**	**STL**	**5,300**	**1957**	**$54,310**	**40**	**797**	**$0**	**(15)**	**$672,572**
167	Elmwood Street	2	CI	350	1960	$1,133	100	824	$521	46	$13,571
168	**Miller Street, 12th south**	**10**	**STL**	**1,600**	**1960**	**$9,653**	**40**	**824**	**$0**	**(14)**	**$115,625**
169	Meadow Avenue, Dogwood to Elmwood	6	CI	290	1966	$1,847	100	1,019	$960	52	$17,890
170	**4th Street, Miller west**	**1**	**CI**	**160**	**1967**	**$368**	**40**	**1,074**	**$0**	**(7)**	**$3,382**
171	**4th Street, Miller west**	**0.75**	**CU**	**60**	**1967**	**$115**	**40**	**1,074**	**$0**	**(7)**	**$1,057**
172	Filbert Street	2	CI	460	1967	$1,941	100	1,074	$1,029	53	$17,838
173	Ginkgo Street	2	CI	460	1967	$1,941	100	1,074	$1,029	53	$17,838
174	Green Street	2	CI	410	1967	$1,730	100	1,074	$917	53	$15,899
175	Meadow Avenue, Elmwood to Filbert	6	CI	260	1967	$1,745	100	1,074	$925	53	$16,036
176	Meadow Avenue, Filbert to Ginkgo	6	CI	250	1967	$1,678	100	1,074	$889	53	$15,421
177	Meadow Avenue, Ginkgo to Green	6	CI	250	1967	$1,678	100	1,074	$889	53	$15,421
178	Meadow Avenue, Green south	2	CI	120	1967	$506	100	1,074	$268	53	$4,650
179	**Transmission line within POTB**	**24**	**STL**	**5,600**	**1971**	**$142,290**	**40**	**1,581**	**$0**	**(3)**	**$888,300**
180	**11th Street, Pacific to Laurel**	**6**	**PVC**	**270**	**1977**	**$4,347**	**50**	**2,576**	**$1,130**	**13**	**$16,656**
181	**11th Street, Laural to Nestucca**	**6**	**PVC**	**540**	**1977**	**$6,694**	**50**	**2,576**	**$1,740**	**13**	**$25,648**
182	**11th Street, Nestucca to Miller**	**6**	**PVC**	**420**	**1977**	**$6,762**	**50**	**2,576**	**$1,758**	**13**	**$25,909**
183	**9th Street, Beachwood to Cottonwood**	**6**	**PVC**	**400**	**1977**	**$6,440**	**50**	**2,576**	**$1,674**	**13**	**$24,675**
184	**9th Street, Cottonwood to Cedar**	**6**	**PVC**	**800**	**1977**	**$12,860**	**50**	**2,576**	**$3,344**	**13**	**$49,273**
185	**Ash Avenue, 6th to 9th**	**6**	**PVC**	**600**	**1977**	**$9,660**	**50**	**2,576**	**$2,512**	**13**	**$37,013**
186	**Beachwood Avenue, 7th to 9th**	**6**	**PVC**	**220**	**1977**	**$3,545**	**50**	**2,576**	**$922**	**13**	**$13,583**
187	**Cottonwood Avenue, 6th to 9th**	**6**	**PVC**	**600**	**1977**	**$9,660**	**50**	**2,576**	**$2,512**	**13**	**$37,013**
188	**Nestucca Avenue, 9th to 10th**	**6**	**PVC**	**200**	**1977**	**$3,220**	**50**	**2,576**	**$837**	**13**	**$12,338**
189	**4th Street, Meadowlark, west**	**8**	**PVC**	**200**	**1978**	**$3,668**	**50**	**2,776**	**$1,027**	**14**	**$13,041**
190	**Hawthorne Avenue, Evergreen to Williams**	**10**	**PVC**	**1,320**	**1978**	**$26,828**	**50**	**2,776**	**$7,512**	**14**	**$95,386**
191	**Maple Lane, Evergreen to Williams**	**10**	**PVC**	**1,500**	**1978**	**$30,486**	**50**	**2,776**	**$8,536**	**14**	**$108,392**
192	**Madrona Avenue, 8th to 9th**	**6**	**PVC**	**275**	**1979**	**$3,545**	**50**	**2,776**	**$993**	**14**	**$12,604**
193	**Walnut Avenue, Evergreen to Hawthorne**	**8**	**PVC**	**1,400**	**1979**	**$27,778**	**50**	**3,003**	**$8,333**	**15**	**$91,298**
194	**8th Street, Park east**	**6**	**PVC**	**400**	**1980**	**$8,093**	**50**	**3,237**	**$2,590**	**16**	**$24,677**
195	Hwy. 101, Trask River crossing	18	DI	225	1980	$9,364	100	3,237	$6,180	66	$28,552
196	**Pine Avenue, 3rd to Alder**	**6**	**PVC**	**620**	**1980**	**$12,543**	**50**	**3,237**	**$4,014**	**16**	**$38,245**
197	**Alder Avenue, School Dist. easmt to Williams**	**12**	**PVC**	**215**	**1981**	**$6,380**	**50**	**3,535**	**$2,169**	**17**	**$17,813**
198	**Front Street, Ivy to Hwy. 101**	**12**	**PVC**	**200**	**1981**	**$5,934**	**50**	**3,535**	**$2,018**	**17**	**$16,568**
199	**Hadley Road, east**	**2**	**PVC**	**600**	**1981**	**$8,333**	**50**	**3,535**	**$2,833**	**17**	**$23,266**
200	**Hawthorne Avenue, Williams west**	**12**	**PVC**	**250**	**1981**	**$7,417**	**50**	**3,535**	**$2,522**	**17**	**$20,709**
201	**Hwy. 101, line to east, south of Hadley**	**8**	**PVC**	**400**	**1981**	**$8,838**	**50**	**3,535**	**$3,005**	**17**	**$24,676**
202	**Hwy. 101, Hadley north**	**12**	**PVC**	**4,100**	**1981**	**$121,642**	**50**	**3,535**	**$41,358**	**17**	**$339,634**
203	Hwy. 101, Front to north side Hoquarton Sl.	12	DI	325	1981	$9,642	100	3,535	$6,460	67	$26,921
204	**Hwy. 101, west side, Hadley north**	**8**	**PVC**	**200**	**1981**	**$4,670**	**50**	**3,535**	**$1,588**	**17**	**$13,039**
205	**Hwy. 101, Hadley south**	**8**	**PVC**	**1,100**	**1981**	**$25,695**	**50**	**2,576**	**$8,736**	**17**	**$98,451**
206	**Hwy. 101, Werner north**	**8**	**PVC**	**3,200**	**1981**	**$74,740**	**50**	**3,535**	**$25,412**	**17**	**$208,680**

City of Tillamook
CAPITOL IMPROVEMENTS ASSESSMENT
WATER LINE INVENTORY

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207	**Hwy. 101, east side, Hoquarton Sl. to Hadley**	**12**	**PVC**	**1,525**	**1981**	**$45,245**	**50**	**3,535**	**$15,383**	**17**	**$126,328**
208	Ivy Avenue, Front north	12	DI	80	1981	$2,374	100	3,535	$1,591	67	$6,628
209	**Larson Road, east**	**2**	**PVC**	**350**	**1981**	**$4,861**	**50**	**3,535**	**$1,653**	**17**	**$13,572**
210	**Main Avenue, 4th to 12th**	**10**	**PVC**	**2,500**	**1981**	**$64,703**	**50**	**3,535**	**$21,999**	**17**	**$180,656**
211	**Main Avenue, 12th south**	**10**	**PVC**	**300**	**1981**	**$7,764**	**50**	**3,535**	**$2,640**	**17**	**$21,678**
212	**School District Easement Well #2**	**10**	**PVC**	**40**	**1981**	**$1,035**	**50**	**3,535**	**$352**	**17**	**$2,890**
213	**School District Easement Well #2**	**12**	**PVC**	**700**	**1981**	**$20,768**	**50**	**3,535**	**$7,061**	**17**	**$57,986**
214	**Williams Avenue, Alder to Maple**	**12**	**PVC**	**670**	**1981**	**$19,878**	**50**	**3,535**	**$6,759**	**17**	**$55,501**
215	**Williams Avenue, Maple to Hawthorne**	**12**	**PVC**	**575**	**1981**	**$17,060**	**50**	**3,535**	**$5,800**	**17**	**$47,633**
216	**12th Street, Miller to High School**	**12**	**PVC**	**975**	**1982**	**$28,930**	**50**	**3,825**	**$10,415**	**18**	**$74,651**
217	**Alder Lane, Well No. 2 line to Dogwood**	**12**	**PVC**	**800**	**1983**	**$27,300**	**50**	**4,066**	**$10,374**	**19**	**$66,269**
218	**Cypress Street**	**2**	**PVC**	**450**	**1983**	**$7,188**	**50**	**4,066**	**$2,731**	**19**	**$17,448**
219	**Dogwood Street, east**	**2**	**PVC**	**200**	**1983**	**$3,195**	**50**	**4,066**	**$1,214**	**19**	**$7,756**
220	**Dogwood Street, west**	**6**	**PVC**	**400**	**1983**	**$10,165**	**50**	**4,066**	**$3,863**	**19**	**$24,675**
221	**Linden Avenue, Alder to Pine Ave. Apts.**	**6**	**PVC**	**260**	**1983**	**$6,607**	**50**	**4,066**	**$2,511**	**19**	**$16,038**
222	**Linden Avenue, Pine Ave. Apts, north**	**2**	**PVC**	**290**	**1983**	**$4,632**	**50**	**4,066**	**$1,760**	**19**	**$11,244**
223	**Pine Avenue Apartments, Pine to Linden**	**6**	**PVC**	**520**	**1983**	**$13,215**	**50**	**4,066**	**$5,022**	**19**	**$32,079**
224	11th Street, Stillwell to Ivy	6	PVC	270	1985	$7,079	50	4,195	$2,973	21	$16,655
225	Apple Street	2	PVC	550	1985	$9,064	50	4,195	$3,807	21	$21,326
226	Beech Street, Meadow west	2	PVC	200	1985	$3,296	50	4,195	$1,384	21	$7,755
227	Donald Place, Elm east	2	PVC	280	1986	$4,725	50	4,295	$2,079	22	$10,858
228	Meadow Avenue, Beech to Cypress	6	PVC	245	1986	$6,577	50	4,295	$2,894	22	$15,114
229	Meadow Avenue, Cypress to Dogwood	6	PVC	200	1986	$5,369	50	4,295	$2,362	22	$12,338
230	Front Street, Douglas to Elm	6	PVC	400	1988	$11,298	50	4,519	$5,423	24	$24,676
231	Meadowlark Lane	2	PVC	700	1989	$12,667	50	4,606	$6,334	25	$27,144
232	Williams Avenue, Hawthorne, south	12	PVC	200	1989	$7,732	50	4,606	$3,866	25	$16,569
233	Williams Avenue, Hawthorne, south & east	6	PVC	1,200	1989	$34,545	50	4,606	$17,273	25	$74,025
234	1st Street, Del Monte east	2	PVC	150	1990	$2,789	50	4,732	$1,450	26	$5,817
235	3rd Street, hospital west	6	PVC	600	1990	$17,745	50	4,732	$9,227	26	$37,013
236	3rd Street, Stillwell to Ivy	16	DI	265	1990	$13,436	100	4,732	$10,211	76	$28,025
237	5th Street, Stillwell to Ivy	6	DI	190	1990	$5,619	100	4,732	$4,270	76	$11,720
238	6th Street, Stillwell to Ivy	6	DI	300	1990	$8,873	100	4,732	$6,743	76	$18,507
239	6th Street, Ivy to Main	6	DI	270	1990	$7,985	100	4,732	$6,069	76	$16,655
240	7th Street, Stillwell to Ivy	16	DI	300	1990	$15,210	100	4,732	$11,560	76	$31,725
241	8th Street, Stillwell to Ivy	6	PVC	250	1990	$7,394	50	4,732	$1,922	26	$15,422
242	11th Street, Ivy to Main	12	DI	200	1990	$7,943	100	4,732	$6,037	76	$16,568
243	Beech Avenue, east	6	PVC	280	1990	$8,281	50	4,732	$4,306	26	$17,273
244	Ivy Avenue, Front to 1st	12	DI	270	1990	$10,723	100	4,732	$8,149	76	$22,366
245	Ivy Avenue, 1st to 2nd	16	DI	280	1990	$14,196	100	4,732	$10,789	76	$29,610
246	Ivy Avenue, 2nd to 3rd	16	DI	260	1990	$13,182	100	4,732	$10,018	76	$27,495
247	Ivy Avenue, 7th to 8th	16	DI	260	1990	$13,182	100	4,732	$10,018	76	$27,495

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248	Ivy Avenue, 8th to 9th	16	DI	270	1990	$13,689	100	4,732	$10,404	76	$28,553
249	Ivy Avenue, 9th to 10th	16	DI	260	1990	$13,182	100	4,732	$10,018	76	$27,495
250	Ivy Avenue, 10th to 11th	16	DI	280	1990	$14,196	100	4,732	$10,789	76	$29,610
251	Ivy Avenue, 11th to 12th	16	DI	390	1990	$19,773	100	4,732	$15,027	76	$41,243
252	Stillwell Avenue, 3rd to 6th	16	DI	1,100	1990	$55,770	100	4,732	$42,385	76	$116,325
253	11th Street, Main to Miller	12	PVC	1,400	1991	$56,811	50	4,835	$30,678	27	$115,972
254	12th Street, High School to railroad	12	PVC	425	1991	$17,246	50	4,835	$9,313	27	$35,205
255	12th Street, railroad to Evergreen	12	PVC	1,080	1991	$43,826	50	4,835	$23,666	27	$89,465
256	Evergreen Avenue, Maple to Walnut	12	PVC	370	1991	$15,014	50	4,835	$8,108	27	$30,649
257	Evergreen Avenue, Walnut to Hawthorne	12	PVC	205	1991	$8,319	50	4,835	$4,492	27	$16,982
258	Evergreen Avenue, Hawthorne to 12th	12	PVC	610	1991	$24,753	50	4,835	$13,367	27	$50,530
259	Miller Avenue, 11th to 12th	12	PVC	390	1991	$15,826	50	4,835	$8,546	27	$32,307
260	Well No. 3 to Alder	8	DI	580	1991	$18,528	100	4,835	$14,267	77	$37,822
261	Alder Lane, Well No. 3 to Williams	12	DI	400	1991	$16,232	100	4,835	$12,499	77	$33,135
262	Nestucca Avenue, 8th to 9th	6	PVC	270	1993	$8,792	50	5,210	$5,099	29	$16,656
263	Nestucca Avenue, 10th to 11th	6	PVC	240	1993	$7,815	50	5,210	$4,533	29	$14,805
264	W.T.P. to Brick Yard Road	24	DI	2,700	1993	$428,500	100	5,210	$338,515	79	$811,765
265	5th Street, Beechwood west	2	PVC	650	1994	$13,807	50	5,407	$8,284	30	$25,203
266	7th Street, Beechwood to Cottonwood	2	PVC	200	1994	$4,250	50	5,407	$2,550	30	$7,758
267	9th Street, Miller east	2	PVC	470	1994	$9,984	50	5,407	$5,990	30	$18,225
268	Beech Street, Meadow to Marolf Loop	6	PVC	400	1994	$13,518	50	5,407	$8,111	30	$24,676
269	Domingo Court, Evergreen Ave. east	8	PVC	250	1994	$8,931	50	5,407	$5,359	30	$16,303
270	Killam Creek Raw Waterline - W.T.P to intake	12	PVC	4,500	1994	$296,900	50	5,407	$178,140	30	$541,965
271	Larson Road, south	2	PVC	400	1994	$8,497	50	5,407	$5,098	30	$15,511
272	Wilson River Loop	6	PVC	400	1994	$13,518	50	5,447	$8,111	30	$24,495
273	Fred Meyer loop	8	PVC	1,350	1995	$48,523	50	5,440	$30,084	31	$88,037
274	Wilson River Loop - Hwy 101 west	8	PVC	500	1995	$17,971	50	5,440	$11,142	31	$32,605
275	7th Street, Ivy to Main	6	PVC	200	1996	$6,800	50	5,440	$4,352	32	$12,338
276	Beechwood Avenue, 5th to 8th	6	PVC	700	1996	$23,800	50	5,440	$15,232	32	$43,181
277	Domingo Court, extension east end	8	PVC	200	1996	$7,189	50	5,440	$4,601	32	$13,043
278	2nd Street, Stillwell to Ivy	12	DI	270	1997	$13,230	100	5825	$10,981	83	$22,417
279	2nd Street, Grove to Stillwell	12	DI	270	1997	$13,230	100	5825	$10,981	83	$22,417
280	2nd Street, Fir to Grove	12	DI	270	1997	$13,230	100	5825	$10,981	83	$22,417
281	2nd Street, Elm to Fir	12	DI	270	1997	$13,230	100	5825	$10,981	83	$22,417
282	2nd Street, Douglas to Elm	12	DI	270	1997	$13,230	100	5825	$10,981	83	$22,417
283	2nd Street, Cedar to Douglas	12	DI	270	1997	$13,230	100	5825	$10,981	83	$22,417
284	2nd Street, Birch to Cedar	12	DI	270	1997	$13,230	100	5825	$10,981	83	$22,417
285	Birch Avenue, 2nd to 3rd	12	DI	295	1997	$14,455	100	5825	$11,998	83	$24,493
286	Cedar Avenue, 1st to Front	6	DI	270	1997	$9,855	100	5825	$8,180	83	$16,699
287	Cedar Avenue, 2nd to 1st	6	DI	275	1997	$10,038	100	5825	$8,332	83	$17,009
288	Elm Avenue, 1st to 2nd	6	DI	275	1997	$10,038	100	5825	$8,332	83	$17,009

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289	Alder Lane, Evergreen to Well #3	8	DI	1,000	1998	$39,180	100	5920	$32,911	84	$65,322
290	Evergreen Drive, 3rd to Alder	12	DI	595	1998	$29,578	100	5920	$24,846	84	$49,313
291	Evergreen Drive, Alder to Maple	12	DI	675	1998	$33,555	100	5920	$28,186	84	$55,944
292	Pine Street extension, Alder south to Linden	6	C900	345	1998	$12,765	100	5920	$10,723	84	$21,282
293	3rd Street, west end & south to 4th	6	C900	460	1999	$17,425	50	6060	$12,198	35	$28,380
294	9th Street, Madrona to Nestucca	6	C900	285	1999	$10,795	100	6060	$9,176	85	$17,582
295	Del Monte Avenue, 1st to 3rd	6	C900	375	1999	$14,205	100	6060	$12,074	85	$23,136
296	Linden Drive	6	C900	710	2000	$27,606	100	6221	$23,741	86	$43,799
297	12th Street, Evergreen east	12	C900	700	2001	$37,260	100	6342	$32,416	87	$57,987
298	7th Street, Laurel to Nestuca	6	C900	295	2002	$11,725	100	6358	$10,318	88	$18,202
299	7th Street, Nestucca east	2	PVC	235	2002	$6,060	50	6358	$4,484	37	$9,407
300	Front Street, Elm to Fir	10	DI	280	2002	$12,880	100	6358	$11,334	88	$19,995
301	Front Street, Fir to Grove	10	DI	280	2002	$12,880	100	6358	$11,334	88	$19,995
302	Front Street, Grove to Stillwell	10	DI	285	2002	$13,110	100	6358	$11,537	88	$20,352
303	Front Street, Stillwell to Ivy	10	DI	248	2002	$11,410	100	6358	$10,041	88	$17,713
304	Madrona Avenue, 7th to 8th	6	C900	290	2002	$11,525	100	6358	$10,142	88	$17,891
305	Laurel Avenue, 10th to 11th	6	C900	270	2003	$11,300	100	6695	$10,057	89	$16,659
306	Madrona Avenue, 11th north	6	C900	175	2003	$7,325	100	6695	$6,519	89	$10,799
307	Grove Avenue, 5th south	6	C900	320	2004	$13,750	100	7115	$12,375	90	$19,074
308	6th Street, east of Elm	6	DI	300	2010	$24,275	100	8799	$23,304	96	$27,230
308	Miller Avenue, 9th to 11th	12	DI	450	2010	$52,850	100	8799	$50,736	96	$59,283
309	2nd Street, Ash to Birch	12	DI	265	2012	$32,065	100	9299	$31,424	98	$34,034
310	Ash Avenue, 2nd to 3rd	12	DI	275	2012	$33,275	100	9299	$32,610	98	$35,318
311	Birch Avenue, 1st to 2nd	12	DI	272	2012	$32,912	100	9299	$32,254	98	$34,933
312	3rd Street, Evergreen to Marolf	12	DI	3680	2013	$471,060	100	9545	$466,349	99	$487,099
313	East POTB Transmission Line w/cross tie	14 & 24	DI	34 & 58	2014	$40,000	100	9870	$40,000	100	$40,000
314	West POTB Transmission Line w/cross tie	24	DI	141	2014	$60,000	100	9870	$60,000	100	$60,000

Appendix J

RESOLUTION

RESOLUTION NO. 82-2

A RESOLUTION REGARDING THE POTENTIAL CONTAMINATION OF CITY WATER SUPPLY

The Tillamook Water Commission does hereby resolve to amend its rules and regulations for the conduct and operation of Tillamook City Water Commission as follows:

Section 19. Contamination of Water Supply.

(a) No owner of property or user of City water shall introduce or permit the introduction of pollution or contamination of any kind into the City water supply system. Whenever a condition is found which present the possibility of contamination or pollution, the water supply to such premises and/or other such premises as is necessary shall be discontinued immediately by physical break until such condition is remedied.

(b) No owner of property or user of city water shall cause or allow a connection of the Tillamook City Water System with any other water system. Such cross-connections and the water supply to such premises shall be discontinued immediately until such cross-connections are eliminated. The control of cross-connections shall be in accordance with the manuals of standard practice pertaining to cross-connection control approved by the Tillamook Water Commission any requirements set forth by the "Safe Drinking Water Act" Public Law 93-523 and subsequent applicable legislation.

(c) If the Tillamook Water Commission determines that a permanent physical separation from the City water system is not practicable or necessary or adequate inspection for cross-connections cannot be made, the Tillamook Water Commission may require the owner of property or the user of City water to install and maintain a backflow prevention devise to prevent pollution or contamination of the City water supply.

(d) If a backflow prevention devise is required by the Tillamook Water Commission, the Commission shall prescribe the pattern, design and size of such devise as it believes is reasonably adequate to prevent contamination. The Commission shall also regulate the location, installation and testing of such devises. Any corrective measure or change required to a premises shall be at the sole expense of the owner of the property or the user of the City water. The cost of any change required in the City water system up to the property line or between the property line and the meter, as well as cut-off or disconnection costs shall be added to the charge for water against the premise or premises necessitating the expense.

Section 20. Penalties for Violations.

In addition to any remedies herein before provided by these rules and regulations, any person violating any of the provisions of these shall, upon conviction thereof, be puncished by a fine not exceeding $500.00 or by imprisonment in the county jail not exceeding 60 days, or by both such fines and imprisonment in the discretion of the Municipal Judge.

RESOLVED, this 18th day of March, 1982.

Michael Shellnutt
President

Secretary
Frank O. Willett

Carl Colleborn

Thomas A. Laud

Charles L. Lowell

PREMISES REQUIRING CROSS-CONNECTION PROTECTION		
Owner / Company Name	**Service Location**	**Device Serial # & Location**
2nd Street Market	205 Main Avenue	330770 -- NW corner of basement on W wall-Lower Unit
		330773 -- NW corner of basement on W wall-Upper Unit
		V0407020PW-NW corner of basement on fire line
Ashley Inn of Tillamook	1722 Makinster Road	U0997 -- First Floor Lobby-Ice Machine
		59931 -- Vault on West NW side of bldg near pool offset
		143585 -- Pool Maintenance Room-N end of bldg
		DO3646 -- Vault on SW side of bldg near W driveway - by FDC (fire line)
		688519 -- Next to vault @ meter SW corner of bldg between W driveway & sidewalk
		674207 -- Vault at SW corner of bldg next to W driveway-by FDC (fire line)
		AO3983 - W. parking lot at RV dump station (cleanout faucet)
		A21255 - SW corner of property by FDC/vault in irrigation box (domestic)
Atlas Tillamook, LLC	2230 N Main Street	1HA96189 -- N side of bldg in landscaping-irrigation **shut off ltr 1/6/14**
Bizeau Dr. Dave	2103 10th Street	AH9239 --In Front of office
GBMO, LLC & GBMW, LLC / Burger King	2220 N Main Street	2434501 - Sidewalk at building lawn sprinklers
Coastal Plaza	2207 N Main Street	445557 -- North of sign
		395115 -- North of sign
		188465 -- By meter North side of bldg
Coastwide Ready Mix	10 Elm Avenue	77600 -- South end of water tank **Late ltr 1/8/14**
Columbia Bank	1806 3rd Street	2969249 -- NW corner of landscaping-corner of Eagles Bldg
Debbie D's	2210 N Main Street	Z1283 -- Utility room at rear of bldg-inside
E & E Auto Body	3509 3rd Street	11388 -- Upstairs beside hot water heater (tester's Ser. # A11988)
		06509 -- In vault East of bldg
		911261 -- In vault East of bldg
EIG Productions; Ted Bump - Coliseum	310 Main Avenue	256913 - Under Popcorn **shut off ltr 1/6/14**
Elite Car Wash	1920 N Main Street	A07970 -- East wall of utility room
Evergreen Gardens	3810 12th Street	U4950 -- Irrigation control vault near water mtr center area (V 4950)
		T1500 -- Vault in center area near meter

PREMISES REQUIRING CROSS-CONNECTION PROTECTION		
Company Name	**Service Location**	**Device Serial # & Location**
Five Rivers Community	3500 12th Street	108141332 -- Mechanical room
		A3925 -- Mechanical room
		45146 -- Vault East side of West driveway
		148080 -- Large line in vault S side of bldg
		01444 -- Fire line vault E side of W driveway
Fred Meyer, Inc.	2500 N Main Street	3FK0759 -- SW wall of storeroom
		54058 -- At water meter by fire hydrant, S end of parking lot across from Denny's
		05603 -- Mechanical room-second level-near thermo store
		046538 - Seafood area on soap mixing machines
		349788 -- Under pop Machine in deli
		101006 -- Mechanical room-second level (10106) **This device was removed with new plumbing**
		42729 --Hose bib-meat dept near two compartment sink
		77781 -- On soap dispenser to right of dairy cooler door
		06552 - Mechanical room - between storage tanks **FAILED 1/8/14**
		B02373 - Stockroom-W wall - bypass on fire protection device
		46122 - produce department
Goodwill Industries	2600 N Main Ave	12372 -- E Wall Back Storage-Anti Loop
		M10050 -- E Wall Back Storage - Fire line
		27336 -- E Wall Back Storage - Det. CK.
		117748 -- At Meter - East - Irrigation
		112031 -- At Meter - East Side - Dom. Water (112011?)
David Gobel owner Ahn, Dr. Jin	2503 N Main Street	14290 - Mechanical room
		103822 - Mechanical room
		103824 - under sink in lab
Haberlach Building/ John Tuthill	2406 3rd Street	H253560 -- NE side of bldg-irrigation (PVBA) **Frozen-to be removed**

PREMISES REQUIRING CROSS-CONNECTION PROTECTION		
Company Name	**Service Location**	**Device Serial # & Location**
Hampton Lumber Co.	2900 12th Street	10804 -- 12th Street meter house
		10919 --12th Street meter house
		185955 - Water softener room, NW corner;
Hogan, Dave Misty Meadow Dairy	2614 1st Street	90093 -- Next to water meter
Jenck Dairy, Tim	3555 Gienger Road	200595 -- Dairy parlor-overhead
Josi, Todd & Susan New Age Car Wash	1865 N Main Street	165333--At meter beside hwy-Carwash
		165344--At meter beside hwy
Kilchis House	4212 Marolf Place	3GJ0340 -- Mechanical room, fire line
		AL1043 -- Irrigation, by light pole
		AL0599 --Irrigation box in island by sidewalk
		01303 -- Mechanical room - Domestic water
		08394 -- In wall behind Jacuzzi tub-Top #1
		24632 -- Mechanical room - fire line bypass
		18416 -- In wall behind Jacuzzi tub-lower one
LaMexicana	2203 3rd Street	60472 -- NE corner of basement
		04282 -- Basement fire system
Lindsey' s Latte	2910 N Main St "A"	62270 -- By back door
Long, Dr. Lee	1503 3rd Street	20575 -- Dental office storeroom
Malsbury, Dr. Gary **Bob Riggert was going to tell us if he rents to a dentist**	805 Ivy Avenue B	J-7993 -- South exam room
		J-8028 -- North exam room
		35799 -- South side of bldg-center-inside above ground box-805 Ivy Ave Ste B
Marie Mills Center	810 Madrona Ave	04617 -- fire sprinkler
		3C00023 -- fire sprinkler
		47357 -- fire sprinkler
McDonalds Restaurant	1855 N Main Street	G8091 -- behind soda rack
		AC8577 -- Near water meter NW of lot (Ser # not listed)
Meadow Glen Apartments	4210 Marolf Place	110413 -- Vault near meter (04011) - irrigation

PREMISES REQUIRING CROSS-CONNECTION PROTECTION		
Company Name	**Service Location**	**Device Serial # & Location**
Nazarene Church	2611 3rd Street	00837--Fire system/closet in Aaron's office
		1HA14121 -- At meter 3rd St-Lawn sprinkler
		345282 -- At boiler -boiler room west wall
		EK0389 -- Fire system/Aaron's office
Ocean Breeze Baptist Church	2500 Nielsen Road	06415 - Riser room, fire line **Late ltr 1/8/14**
		135658 -- Rm #2 next to fire doors **2013 REPORTS NOT RECVD UNTIL 1/22/14, FAILED 12/27/13**
		38690 -- Rear of bldg-above ground vault-NE side of "D" wing
Pelican Brewing Company	4 Stillwell Avenue	09373 -- Mop closet
		006349 - Main water input
		14809 -- Boiler room
Pepsi-Cola Bottling Co.	715 Main Avenue	03029 -- Stockroom - next to water heater-South Unit
		03032 -- Stockroom-near water heater-North Unit
Pine Avenue Apartments	403 Pine Avenue	T7731 -- E end of complex-@ W window of #25
		T7791 -- At meter-in front of #15
Pioneer Veterinary Hospital	801 Main Avenue	G2744 --At back sink on water intake line
Pizza Hut	1605 N Main Street	53356 -- Next to ice machine
Port of Tillamook Bay	4000 Blimp Blvd	X25009 -- Intersection 101 & LP Rd, at mtr in vault
		27843 -- Bypass on fire supply
		MJ-4043 --Fire supply in pump room
		9708081436 -- Port meter house behind digester
		V33971 -- In vault, on T-Hanger fire suppression line **- Didn't receive these reports until 1.31.14**
		3653669XLD -- In vault, on T-hanger fire suppression line **- Didn't receive these reports until 1.31.14**
Rawe Body & Collision Center	1910 5th Street	897394 -- Under Sean's Desk
Arthur & Janet Riedel	1109 Main Avenue	009 6810 -- SW Front corner of Bldg (RPBA) **Schedule annual inspection/check not needed unless vet. practice is resumed**

PREMISES REQUIRING CROSS-CONNECTION PROTECTION		
Company Name	**Service Location**	**Device Serial # & Location**
Richardson, Byron Blue Star Espresso	1101 Main Avenue	91165 -- At meter
Roby's Furniture (Robt. Magid)	1126 Main Avenue	06288 -- SW corner of storeroom
		TK230 -- SW corner of storeroom
Sacred Heart High School	2411 5th Street	440885 -- In boiler room on fire line
Old Grade School	2410 5th Street	24060 -- Basement - Fire line
		M4741 -- Basement Boiler
Safeway, Inc., #2723	1815 4th Street	05256 -- Back room-in fenced area near produce
		283462 - In Starbucks under counter near ice machine
		53426 - In can return closet
		W00547 -- Deli dept. on rack left of wok stove
		306133 -- Deli dept. on rack left of wok stove
		308472 -- Deli dept. on rack left of wok stove
		A77257 -- Deli dept. on rack left of wok stove
		A77248--deli dept, left of stove
		A15053 -- Bakery next to hand wash sink
		237047 -- Bakery dept, in ceiling space, above oven
		A02491 -- Meat Dept next to hand wash sink
		A15022 -- Near ceiling produce cooler
		2754544 -- Produce dept on wall near prep sink
		10135 -- Produce room South wall
		308422 - - Meat dept on wall near 3 compartment sink
		A15018 -- Deli dept. on rack left of wok stove
		0A-2273 -- Back room-in fenced area near produce
Sandcreek Dental LLC	1115 Main Avenue	61653 -- West side of bldg/in front of office
SDA Church	2610 First Street	000105103 -- Mechanical room
		178220 -- SW corner outside on wall

PREMISES REQUIRING CROSS-CONNECTION PROTECTION		
Company Name	**Service Location**	**Device Serial # & Location**
Seaholm, Dr. Brian	1103 3rd Street	221801 -- In front yard behind fence in above ground vault
Sheldon Oil Co.	15 Main Street	IY5272A2 -under coffee
Sheridan Square	895 3rd Street	KB907- west side yard sprinklers **(KB307)**
		132583 -- Vault East side of driveway
		17723 -- Vault West side of driveway
		132582 -- Vault West side
		17726 --Vault left side of driveway
		K6859 eastside lawn sprinklers **(KBA59)**
Shilo Inn	2515 N Main Street	0805D5 --Service room N side of mini-mart
		69284 -- Swim pool area
		01416 -- Fire hose - kitchen
		U4561 -- Off Laundry Room - Irrigation
		106852 -- Service room N side of mini-mart
		91401 -- Equip room SE corner of annex bldg (off Wilson River Loop)
		W91351 -- Equip room SW corner of annex bldg (off Wilson River Loop)
Splash & Dash	2200 Wilson River Loop	127802 -- Service & equipment room
Taco Time	2211 N Main Street	08078 -- Near drink dispenser in drive thru service area
		335870 -- Back room
Tillamook Apartments	218 Pacific Ave	273961 -- Basement @ fire riser
Tillamook Bay Dental	2110 9th Street, Ste B	104974 -- Mechanical room - water service
Tillamook Bowling Lanes	3705 3rd Street	10749 -- Storeroom-NE corner of bldg
Tillamook Wastewater Treatment Plant	710 5th Street	3130064 -- Behind WWTP office-North assembly
		3128061XLTCU -- Behind WWTP office-Middle Assembly
		3131050 -- Behind WWTP office by water meter - South Assembly
		436914 -- Solids bldg/boiler makeup line
Tillamook Country Smoker	1510 Front Street	227517 -- Warehouse office water service

PREMISES REQUIRING CROSS-CONNECTION PROTECTION		
Company Name	**Service Location**	**Device Serial # & Location**
Tillamook County Courthouse	201 Laurel Avenue	98074 -- N lobby-pop machine
		080582 -- Furnace room-basement
		CO489 -- Furnace room-basement-SE corner
Tillamook County Creamery Association	10 Ivy Avenue	L029 --SW corner, warehouse
		5646885 -- SW corner, warehouse
		A000794 -- 10 Ivy Ave-Valve room - E side of bldg
		9606241354 -- 10 Ivy Ave - Valve room, east side bldg.
Tillamook Co. Health Dept.	800 Pacific Avenue	308148 -- 801 Pacific, in hot box approx 15' from meter
Tillamook County Library	1716 3rd Street	06621 -- Attached to 4" Ames GF-0374
		GF-0374 -- In fire sprinkler room on fire line
		192707 -- 2nd floor boiler room behind door
		A02867 -- In fire sprinkler room
		A01495 -- Upstairs mop room
		A09898 -- In fire sprinkler room on main water
Tillamook County Pioneer Museum	2106 2nd Street	97703 -- East end yard-7ft from meter-irrigation **WTR OFF/LINE BROKEN (PVBA)**
		1636323 -- Behind water meter N side of bldg
Tillamook County Transportation District	3600 3rd St, Ste A	H08670 --Mechanical room-bus wash line
Tillamook Co. Transit Center	204 Laurel Avenue	1817254--Next to meter on 2nd **Late ltr 1/8/14**
Tillamook DHIA	2306 10th Street	8920 --S wall near hot water heater (OA920)
Tillamook Farmers Co-op	1920 N Main Street	116734 -- Utility Room Fire line
		20941 -- Utility Room Fire line
Tillamook Meat Co.	405 Park Avenue	AF1708-Corner of cutting room
Tillamook Motor Co.	501 Main Avenue	31952--N end of service dept. fire line closet
		1274170603 --N end of service dept. fire line closet

PREMISES REQUIRING CROSS-CONNECTION PROTECTION		
Company Name	**Service Location**	**Device Serial # & Location**
Tillamook PUD	1115 Pacific Avenue	U-7585 -- Vault near NW corner of truck repair shop (main bldg. Fire line)
		50068 -- Vault near water meter-N side of lot-W of center driveway
		B4373 -- Vault near NW corner of truck repair shop (shop fire line)
		B1003 -Vault near water meter-N side of lot-W of center driveway (Main bldg. Fire Line)
		67220 -- Vault n planter strip-NE corner of office bldg (irrigation)
		67167 -- Vault in planter strip-west of office bldg (irrigation)
		196934 -- Utility room-center wing of bldg
		TJ100 -- N wall of warehouse - Warehouse fire line
Tillamook Regional Medical Center - Hospital	1000 3rd Street	A005202 -- Vault - NE parking lot
		H01142 --N. of fire hydrant 6' on 2nd, next to vault
		A151202 -- Roof air conditioning
		BK0492 -- Gift shop (MRI room)
		BK0522 -- Basement storeroom
		9708191332 -- Meter vault at 2nd & Ash
		4255 -- Basement mechanical room
		09308 -- Basement mechanical room - E wall (9303)
		09306 -- Basement mechanical room - E wall
		05511--Dialysis Center
		224392 -- In boiler room NE corner on hot laundry & dialysis
		FH2010 In boiler room, NE corner on hot laundry & dialysis
		4EN1637 -- 1st floor mop room near emergency room
		A00207 -- in sanitation room
		A00225 -- in sanitation room
		65062 -- Room #324, 3rd floor under sink in cabinet
		104189 -- OR #1 **Newly discovered 2011**
		104966 -- OR #3 **Newly discovered 2012**

PREMISES REQUIRING CROSS-CONNECTION PROTECTION		
Company Name	**Service Location**	**Device Serial # & Location**
Tillamook Regional Medical Center - Plaza	1100 3rd Street	324384 -- S Side of bldg, Mechanical room, bottom device
		324389 -- S Side of bldg, Mechanical room, top device
		H39157 -- SE Corner in yard box
		368552 -- Riser room on 4" device
		P06692 -- Riser room
Tillamook Regional Medical Center - Dr. Offices	1011 3rd Street	05208 -- 2nd Floor-Facing 3rd Street-computer room
TLC Federal Credit Union	1403 3rd Street	1HB72982 -- 3rd & Douglas-parking lot irrigation
TLC Federal Credit Union	1510 3rd Street	1HB72917 -- S side of bldg-landscaping
Liberty Elementary School	814 Stillwell Ave	53840 -- Behind Water Meter-E side of bldg
South Prairie Elementary	6855 South Prairie Rd	5881 -- Custodial & Equipment room
Tillamook High School	2605 12th Street	53848 - football field
		A004040 -- AG room
Tillamook Jr. High School	3906 Alder Lane	04499 -- Above ground vault SW corner of bldg behind water meter
Wilson Elementary School	2515 3rd Street	5212 -- Health room-left of main entrance-inside closet
Tillamook Veterinary Hospital	1095 N Main Street	13985 -- West Wall of food storage room
United Methodist Church	3808 12th Street	B7705 -- Storeroom off kitchen - utility room, water service
Waud, Tom	2513 4th Street	(Not readable) -- East side of house
Waud's Funeral Home	1414 3rd Street	AK1546 -- Above ground vault-patio-rear of bldg
Wells Fargo Bank	2006 4th Street	HA76101-by drive through window-west side irrigation
Werner Gourmet Meat Snacks	2715 5th Street	104018T2 -S side of main gate (meter)
Windsor Apts.	605 Main Avenue	13444 -- below sidewalk on NW corner of bldg on 6th St.
Woodward Retirement Center-NOAH	2411 4th Street	303592 -- Basement-under stairs (Riser room in basement)
YMCA	610 Stillwell Avenue	141364 -- Chlorination room-new pool
		U0607020PW -- Riser Room/Fire line
		17082 -- Riser Room/Fire line

OREGON ADMINISTRATIVE RULES

OREGON HEALTH AUTHORITY, PUBLIC HEALTH DIVISION

DIVISION 61
PUBLIC WATER SYSTEMS

333-061-0070
Cross Connection Control Requirements
(1) Water suppliers shall undertake cross connection control programs to protect the public water systems from pollution and contamination.

(2) The water supplier's responsibility for cross connection control shall begin at the water supply source, include all public treatment, storage, and distribution facilities under the water supplier's control, and end at the point of delivery to the water user's premise.

(3) Water suppliers shall develop and implement cross connection control programs that meet the minimum requirements set forth in these rules.

(4) Water suppliers shall develop a procedure to coordinate cross connection control requirements with the appropriate local administrative authority having jurisdiction.

(5) The water supplier shall ensure that inspections of approved air gaps, approved devices, and inspections and tests of approved backflow prevention assemblies protecting the public water system are conducted:

(a) At the time of installation, any repair or relocation;
(b) At least annually;
(c) More frequently than annually for approved backflow prevention assemblies that repeatedly fail, or are protecting health hazard cross connections, as determined by the water supplier;
(d) After a backflow incident; or
(e) After an approved air gap is re-plumbed.

(6) Approved air gaps, approved devices, or approved backflow prevention assemblies, found not to be functioning properly shall be repaired, replaced or re-plumbed by the water user or premise owner, as defined in the water supplier's local ordinance or enabling authority, or the water supplier may take action in accordance with subsection (9)(a) of these rules.

(7) A water user or premise owner who obtains water from a water supplier must notify the water supplier if they add any chemical or substance to the water.

(8) Premise isolation requirements:

(a) For service connections to premises listed or defined in Table 48 (Premises Requiring Isolation), the water supplier shall ensure an approved backflow prevention assembly or an approved air gap is installed; [Table not included. See ED. NOTE.]

(A) Premises with cross connections not listed or defined in Table 48 (Premises Requiring Isolation), shall be individually evaluated. The water supplier shall require the installation of an approved backflow prevention assembly or an approved air gap commensurate with the degree of hazard on the premise, as defined in Table 49 (Backflow Prevention Methods); [Table not included. See ED. NOTE.]

(B) In lieu of premise isolation, the water supplier may accept an in-premise approved backflow prevention assembly as protection for the public water system when the approved backflow prevention assembly is installed, maintained and tested in accordance with these rules.

(b) Where premise isolation is used to protect against a cross connection, the following requirements apply;

(A) The water supplier shall:

(i) Ensure the approved backflow prevention assembly is installed at a location adjacent to the service connection or point of delivery;

(ii) Ensure any alternate location used must be with the approval of the water supplier and must meet the water supplier's cross connection control requirements; and

(iii) Notify the premise owner and water user, in writing, of thermal expansion concerns.

(B) The premise owner shall:

(i) Ensure no cross connections exist between the point of delivery from the public water system and the approved backflow prevention assemblies, when these are installed in an alternate location; and

(ii) Assume responsibility for testing, maintenance, and repair of the installed approved backflow prevention assembly to protect against the hazard.

(c) Where unique conditions exist, but not limited to, extreme terrain or pipe elevation changes, or structures greater than three stories in height, even with no actual or potential health hazard, an approved backflow prevention assembly may be installed at the point of delivery; and

(d) Where the water supplier chooses to use premise isolation by the installation of an approved backflow prevention assembly on a one- or two-family dwelling under the jurisdiction of the Oregon Plumbing Specialty Code and there is no actual or potential cross connection, the water supplier shall:

(A) Install the approved backflow prevention assembly at the point of delivery;

(B) Notify the premise owner and water user in writing of thermal expansion concerns; and

(C) Take responsibility for testing, maintenance and repair of the installed approved backflow prevention assembly.

(9) In community water systems, water suppliers shall implement a cross connection control program directly, or by written agreement with another agency experienced in cross connection control. The local cross connection program shall consist of the following elements:

(a) Local ordinance or enabling authority that authorizes discontinuing water service to premises for:

(A) Failure to remove or eliminate an existing unprotected or potential cross connection;

(B) Failure to install a required approved backflow prevention assembly;

(C) Failure to maintain an approved backflow prevention assembly; or

(D) Failure to conduct the required testing of an approved backflow prevention assembly.

(b) A written program plan for community water systems with 300 or more service connections shall include the following:

(A) A list of premises where health hazard cross connections exist, including, but not limited to, those listed in Table 48 (Premises Requiring Isolation); [Table not included. See ED. NOTE.]
(B) A current list of certified cross connection control staff members;
(C) Procedures for evaluating the degree of hazard posed by a water user's premise;
(D) A procedure for notifying the water user if a non-health hazard or health hazard is identified, and for informing the water user of any corrective action required;
(E) The type of protection required to prevent backflow into the public water supply, commensurate with the degree of hazard that exists on the water user's premise, as defined in Table 49 (Backflow Prevention Methods); [Table not included. See ED. NOTE.]
(F) A description of what corrective actions will be taken if a water user fails to comply with the water supplier's cross connection control requirements;
(G) Current records of approved backflow prevention assemblies installed, inspections completed, backflow prevention assembly test results on backflow prevention assemblies and verification of current Backflow Assembly Tester certification; and
(H) A public education program about cross connection control.

(c) The water supplier shall prepare and submit a cross connection control Annual Summary Report to the Authority, on forms provided by the Authority, before the last working day of March each year.

(d) In community water systems having 300 or more service connections, water suppliers shall ensure at least one person is certified as a Cross Connection Control Specialist, unless specifically exempted from this requirement by the Authority.

(10) Fees: Community water systems shall submit to the Authority an annual cross connection program implementation fee, based on the number of service connections, as follows:
Service Connections — Fee:
15-99 — $30.
100-999 — $75.
1,000-9,999 — $200.
10,000 or more — $350.

(a) Billing invoices will be mailed to water systems in the first week of November each year and are due by January first of the following year;
(b) Fees are payable to Oregon Health Authority by check or money order;
(c) A late fee of 50 percent of the original amount will be added to the total amount due and will be assessed after January 31 of each year.

(11) In transient or non-transient non-community water systems, the water supplier that owns and/or operates the system shall:

(a) Ensure no cross connections exist, or are isolated from the potable water system with an approved backflow prevention assembly, as required in section (12) of this rule;
(b) Ensure approved backflow prevention assemblies are installed at, or near, the cross connection; and
(c) Conduct an annual cross connection survey and inspection to ensure compliance with these rules, and test all backflow assemblies annually. All building permits and related inspections are to be made by the Department of Consumer and Business Services, Building Codes Division, as required by ORS 447.020.

(12) Approved backflow prevention assemblies and devices required under these rules shall be approved by the University of Southern California, Foundation for Cross-Connection Control and Hydraulic Research, or other equivalent testing laboratories approved by the Authority.

(13) Backflow prevention assemblies installed before the effective date of these rules that were approved at the time of installation, but are not currently approved, shall be permitted to remain in service provided the assemblies are not moved, the piping systems are not significantly remodeled or modified, the assemblies are properly maintained, and they are commensurate with the degree of hazard they were installed to protect. The assemblies must be tested at least annually and perform satisfactorily to the testing procedures set forth in these rules.

(14) Tests performed by Authority-certified Backflow Assembly Testers shall be in conformance with procedures established by the University of Southern California, Foundation for Cross Connection Control and Hydraulic Research, Manual of Cross-Connection Control, 10th Edition, or other equivalent testing procedures approved by the Authority.

(15) Backflow prevention assemblies shall be tested by Authority-certified Backflow Assembly Testers, except as otherwise provided for journeyman plumbers or apprentice plumbers in OAR 333-061-0072 of these rules (Backflow Assembly Tester Certification). The Backflow Assembly Tester must produce three copies of all test reports. One copy must be maintained in the Tester's permanent records, one copy must be provided to the water user or property owner, and one copy must be provided to the water supplier.

(a) Test reports must be provided within 10 working days; and

(b) The test reports must be in a manner and form acceptable to the water supplier.

(16) All approved backflow prevention assemblies subject to these rules shall be installed in accordance with OAR 333-061-0071 and the Oregon Plumbing Specialty Code.

(17) The Authority shall establish an advisory board for cross connection control issues consisting of not more than nine members, and including representation from the following:

(a) Oregon licensed Plumbers;

(b) Authority certified Backflow Assembly Testers;

(c) Authority certified Cross Connection Specialists;

(d) Water Suppliers;

(e) The general public;

(f) Authority certified Instructors of Backflow Assembly Testers or Cross Connection Specialists;

(g) Backflow assembly manufacturers or authorized representatives;

(h) Engineers experienced in water systems, cross connection control and/or backflow prevention; and

(i) Oregon certified Plumbing Inspectors.

[ED. NOTE: Tables referenced are not included in rule text.]
[Publications: Publications referenced are available from the agency.]
Stat. Auth.: ORS 448.131
Stats. Implemented: ORS 431.110, 431.150, 448.131, 448.150, 448.268, 448.271, 448.273, 448.278, 448.279, 448.295 & 448.300
Hist.: HD 106, f. & ef. 2-6-76; HD 17-1981(Temp), f. & ef. 8-28-81; HD 4-1982, f. & ef. 2-26-82; Renumbered from 333-042-0230, HD 2-1983, f. & ef. 2-23-83; HD 20-1983, f. 10-20-83, ef. 11-1-83; HD 30-1985, f. & ef. 12-4-85; HD 3-1987, f. & ef. 2-17-87; HD 1-1988, f. & cert. ef. 1-6-88; HD 9-1989, f. & cert. ef. 11-13-89; HD 26-1990, f. 12-26-90, cert. ef. 12-29-90; HD 1-1994, f. & cert. ef. 1-7-94; HD 1-1996, f. 1-2-96, cert. ef. 1-2-96; OHD 4-1999, f. 7-14-99, cert. ef. 7-15-99; PH 34-2004, f. & cert. ef. 11-2-04; PH 2-2006, f. & cert. ef. 1-31-06; PH 2-2008, f. & cert. ef. 2-15-08; PH 4-2009, f. & cert. ef. 5-18-09; PH 7-2010, f. & cert. ef. 4-19-10; PH 3-2013, f. & cert. ef. 1-25-13

333-061-0070
Cross Connection Control Requirements

TABLE 48 PREMISES REQUIRING ISOLATION* BY AN APPROVED AIR GAP *OR* REDUCED PRESSURE PRINCIPLE TYPE OF ASSEMBLY HEALTH HAZARD
1. Agricultural (e.g. farms, dairies)
2. Beverage bottling plants**
3. Car washes
4. Chemical plants
5. Commercial laundries and dry cleaners
6. Premises where both reclaimed and potable water are used
7. Film processing plants
8. Food processing plants
9. Medical centers (e.g., hospitals, medical clinics, nursing homes, veterinary clinics, dental clinics, blood plasma centers)
10. Premises with irrigation systems that use the water supplier's water with chemical additions (e.g., parks, playgrounds, golf courses, cemeteries, housing estates)
11. Laboratories
12. Metal plating industries
13. Mortuaries
14. Petroleum processing or storage plants
15. Piers and docks
16. Radioactive material processing plants and nuclear reactors
17. Wastewater lift stations and pumping stations
18. Wastewater treatment plants
19. Premises with piping under pressure for conveying liquids other than potable water and the piping is installed in proximity to potable water piping
20. Premises with an auxiliary water supply that is connected to a potable water supply
21. Premises where the water supplier is denied access or restricted access for survey
22. Premises where the water is being treated by the addition of chemical or other additives

* Refer to OAR 333-061-0070(8) premise Isolation Requirements.

** A Double Check Valve Backflow Prevention Assembly could be used if the water supplier determines there is only a non-health hazard at a beverage bottling plant.

TABLE 49 BACKFLOW PREVENTION METHODS USED FOR PREMISE ISOLATION	
DEGREE OF IDENTIFIED HAZARD	
Non-Health Hazard (Pollutant)	Health Hazard (Contaminant)
BACKSIPHONAGE OR BACKPRESSURE	BACKSIPHONAGE OR BACKPRESSURE
Air Gap (AG)	Air Gap (AG)
Reduced Pressure Principle Backflow Prevention Assembly (RP)	Reduced Pressure Principle Backflow Prevention Assembly (RP)
Reduced Pressure Principle-Detector Backflow Prevention Assembly (RPDA)	Reduced Pressure Principle-Detector Backflow Prevention Assembly (RPDA)
Double Check Valve Backflow Prevention Assembly (DC)	
Double Check-Detector Backflow Prevention Assembly (DCDA)	

Appendix K

Scenario: Base
Steady State Analysis
Pipe Report

Label	Open?	Length (ft)	Diam (in)	Material	Hazen-Williams C	Control Status	Discharge (gpm)	Dwnstrm Calc Press (psi)	Upstrm Struct Hyd Grd (ft)	Pressu Pipe Hdloss (ft)	Dwnstrm Strc Hyd Grade (ft)	Headloss Gradient (ft/1000ft)	Velocity (ft/s)
P-1	true	300.00	10.0	PVC	150.0	Open	703.67	81.65	221.47	0.74	220.73	2.47	2.87
P-2	true	930.00	12.0	PVC	150.0	Open	-703.67	81.65	219.78	0.94	220.73	1.01	2.00
P-3	true	630.00	12.0	PVC	150.0	Open	93.07	82.53	219.77	0.02	219.75	0.02	0.26
P-4	true	400.00	6.0	PVC	150.0	Open	92.76	77.65	219.75	0.28	219.48	0.70	1.05
P-5	true	100.00	12.0	PVC	150.0	Open	246.00	79.08	219.78	0.01	219.77	0.14	0.70
P-6	true	275.00	12.0	PVC	150.0	Open	-457.36	79.51	219.66	0.13	219.78	0.46	1.30
P-7	true	525.00	12.0	PVC	150.0	Open	-428.62	79.12	219.66	0.21	219.87	0.40	1.22
P-8	true	50.00	8.0	Ductile Iron	135.0	Open	-413.31	79.12	219.71	0.17	219.87	3.32	2.64
P-10	true	240.00	8.0	Ductile Iron	135.0	Open	-413.01	79.05	218.91	0.79	219.71	3.31	2.64
P-12	true	860.00	6.0	Cast iron	135.0	Open	-152.63	79.08	217.94	1.83	219.77	2.13	1.73
P-13	true	940.00	12.0	Ductile Iron	150.0	Open	56.09	75.26	217.95	0.01	217.94	0.01	0.16
P-14	true	450.00	4.0	Cast iron	135.0	Open	62.71	75.26	219.28	1.33	217.95	2.95	1.60
P-15	true	480.00	6.0	PVC	150.0	Open	70.07	76.27	219.48	0.20	219.28	0.41	0.80
P-16	true	1,155.00	12.0	Ductile Iron	150.0	Open	-206.89	75.26	217.82	0.12	217.94	0.11	0.59
P-17	true	520.00	12.0	Ductile Iron	150.0	Open	-199.57	76.50	217.77	0.05	217.82	0.10	0.57
P-18	true	205.00	12.0	Ductile Iron	130.0	Open	-299.73	76.91	217.71	0.06	217.77	0.27	0.85
P-19	true	350.00	6.0	PVC	150.0	Open	103.63	76.91	218.07	0.30	217.77	0.85	1.18
P-20	true	265.00	6.0	PVC	150.0	Open	-10.36	79.64	218.06	0.00	218.07	0.01	0.12
P-21	true	550.00	6.0	PVC	150.0	Open	117.67	79.64	218.66	0.59	218.07	1.08	1.34
P-22	true	215.00	6.0	PVC	150.0	Open	122.27	79.46	218.91	0.25	218.66	1.16	1.39
P-23	true	505.00	8.0	Ductile Iron	135.0	Open	-286.14	78.70	218.06	0.85	218.91	1.68	1.83
P-24	true	205.00	8.0	Ductile Iron	135.0	Open	-291.44	78.34	217.71	0.36	218.06	1.74	1.86
P-25	true	500.00	6.0	Cast iron	130.0	Open	-254.81	76.89	214.76	2.95	217.71	5.90	2.89
P-26	true	725.00	12.0	Ductile Iron	150.0	Open	-325.81	79.05	217.53	0.18	217.71	0.24	0.92
P-27	true	1,505.00	10.0	PVC	150.0	Open	359.69	82.00	218.60	1.07	217.53	0.71	1.47
P-28	true	685.00	12.0	PVC	150.0	Open	882.91	81.17	219.66	1.06	218.60	1.54	2.50
P-29	true	535.00	12.0	PVC	150.0	Open	-512.49	81.17	218.30	0.30	218.60	0.56	1.45
P-30	true	440.00	10.0	PVC	150.0	Open	-508.51	82.77	217.70	0.59	218.30	1.35	2.08
P-31	true	1,070.00	10.0	PVC	150.0	Open	-358.54	83.37	216.95	0.76	217.70	0.71	1.46
P-32	true	200.00	8.0	PVC	150.0	Open	-146.29	83.37	217.63	0.08	217.70	0.40	0.93
P-33	true	1,065.00	8.0	PVC	150.0	Open	-141.69	81.61	217.22	0.40	217.63	0.38	0.90
P-34	true	325.00	12.0	PVC	150.0	Open	675.07	84.46	217.53	0.31	217.22	0.94	1.92
P-35	true	210.00	12.0	PVC	150.0	Open	810.63	84.78	217.22	0.28	216.95	1.32	2.30
P-36	true	635.00	12.0	PVC	150.0	Open	-1,163.35	84.78	215.31	1.63	216.95	2.57	3.30
P-37	true	1,245.00	12.0	PVC	150.0	Open	1,153.58	82.27	215.31	3.15	212.16	2.53	3.27
P-38	true	980.00	12.0	PVC	150.0	Open	1,152.97	82.07	212.16	2.48	209.68	2.53	3.27
P-39	true	345.00	12.0	PVC	150.0	Open	1,152.66	81.69	209.68	0.87	208.81	2.53	3.27
P-40	true	1,700.00	12.0	PVC	150.0	Open	-497.36	81.69	207.90	0.91	208.81	0.53	1.41
P-41	true	375.00	12.0	PVC	150.0	Open	653.77	82.84	208.81	0.33	208.47	0.89	1.85
P-42	true	40.00	12.0	PVC	150.0	Open	575.50	82.83	208.47	0.03	208.45	0.70	1.63
P-43	true	125.00	12.0	PVC	150.0	Open	124.38	81.10	208.45	0.01	208.44	0.04	0.35
P-44	true	310.00	12.0	Ductile Iron	130.0	Open	-84.63	81.10	208.43	0.01	208.44	0.03	0.24
P-45	true	235.00	6.0	Cast iron	130.0	Open	-81.26	80.66	208.27	0.17	208.43	0.71	0.92
P-46	true	530.00	6.0	Cast iron	135.0	Open	-5.97	79.72	208.26	0.00	208.27	0.01	0.07
P-47	true	275.00	6.0	Cast iron	130.0	Open	-22.75	79.72	208.25	0.02	208.27	0.07	0.26
P-48	true	490.00	6.0	Cast iron	135.0	Open	-47.63	79.72	208.15	0.12	208.27	0.25	0.54
P-49	true	275.00	4.0	Cast iron	135.0	Open	-3.83	81.02	208.26	0.00	208.26	0.02	0.10
P-50	true	260.00	4.0	Cast iron	135.0	Open	1.08	79.29	208.26	0.00	208.26	0.00	0.03
P-51	true	275.00	6.0	Cast iron	70.0	Open	19.00	77.56	208.30	0.04	208.26	0.15	0.22
P-52	true	525.00	6.0	Cast iron	70.0	Open	-9.73	77.56	208.24	0.02	208.26	0.04	0.11
P-53	true	525.00	6.0	Cast iron	70.0	Open	19.64	77.11	208.30	0.08	208.22	0.16	0.22
P-54	true	260.00	6.0	Cast iron	70.0	Open	42.32	77.58	208.48	0.17	208.30	0.67	0.48
P-55	true	265.00	4.0	Cast iron	135.0	Open	46.99	78.08	208.93	0.46	208.48	1.73	1.20

Scenario: Base
Steady State Analysis
Pipe Report

Label	Open?	Length (ft)	Diam (in)	Material	Hazen-Williams C	Control Status	Discharge (gpm)	Dwnstrm Calc Press (psi)	Upstrm Struct Hyd Grd (ft)	Pressu Pipe Hdloss (ft)	Dwnstrm Strc Hyd Grade (ft)	Headloss Gradient (ft/1000ft)	Velocity (ft/s)
P-57	true	365.00	6.0	Cast iron	130.0	Open	206.97	77.20	210.91	1.46	209.44	4.01	2.35
P-58	true	435.00	6.0	Cast iron	130.0	Open	210.93	78.27	212.72	1.81	210.91	4.15	2.39
P-59	true	475.00	6.0	Cast iron	130.0	Open	215.14	77.32	214.76	2.05	212.72	4.31	2.44
P-60	true	265.00	6.0	Cast iron	130.0	Open	-156.24	77.20	208.81	0.63	209.44	2.38	1.77
P-61	true	295.00	4.0	Cast iron	135.0	Open	-49.02	77.36	208.26	0.55	208.81	1.87	1.25
P-62	true	520.00	6.0	Cast iron	130.0	Open	-104.90	77.36	208.22	0.59	208.81	1.14	1.19
P-63	true	515.00	4.0	Cast iron	135.0	Open	-17.69	76.26	208.12	0.15	208.26	0.28	0.45
P-64	true	255.00	6.0	Cast iron	70.0	Open	32.71	77.06	208.22	0.11	208.12	0.41	0.37
P-65	true	300.00	6.0	Cast iron	135.0	Open	-48.07	77.06	208.04	0.08	208.12	0.25	0.55
P-66	true	245.00	6.0	Cast iron	135.0	Open	-61.73	77.54	208.12	0.10	208.22	0.40	0.70
P-67	true	270.00	6.0	Cast iron	130.0	Open	-8.32	77.54	208.22	0.00	208.22	0.01	0.09
P-68	true	270.00	6.0	Cast iron	130.0	Open	-4.82	77.54	208.22	0.00	208.22	0.00	0.05
P-69	true	435.00	6.0	Cast iron	135.0	Open	-44.87	77.11	208.12	0.10	208.22	0.22	0.51
P-70	true	270.00	6.0	Cast iron	130.0	Open	23.90	77.11	208.24	0.02	208.22	0.07	0.27
P-71	true	260.00	6.0	Cast iron	130.0	Open	18.15	77.55	208.25	0.01	208.24	0.04	0.21
P-72	true	400.00	6.0	Cast iron	70.0	Open	36.63	81.01	208.44	0.20	208.24	0.51	0.42
P-73	true	435.00	12.0	PVC	150.0	Open	450.82	82.31	208.45	0.19	208.25	0.44	1.28
P-74	true	435.00	6.0	PVC	150.0	Open	78.27	82.31	208.47	0.22	208.25	0.51	0.89
P-75	true	40.00	6.0	PVC	150.0	Open	8.05	82.31	208.25	0.00	208.25	0.01	0.09
P-76	true	540.00	6.0	PVC	150.0	Open	69.91	83.08	208.25	0.22	208.03	0.41	0.79
P-77	true	270.00	12.0	PVC	150.0	Open	430.83	82.27	208.25	0.11	208.14	0.41	1.22
P-79	true	260.00	6.0	PVC	150.0	Open	68.38	82.17	208.03	0.10	207.93	0.40	0.78
P-80	true	270.00	6.0	Cast iron	150.0	Open	52.94	82.14	207.93	0.07	207.86	0.25	0.60
P-81	true	40.00	12.0	PVC	150.0	Open	404.85	82.14	207.88	0.01	207.86	0.36	1.15
P-82	true	400.00	10.0	PVC	150.0	Open	50.09	82.14	207.87	0.01	207.86	0.02	0.20
P-83	true	320.00	12.0	Ductile Iron	130.0	Open	389.20	82.08	207.86	0.14	207.72	0.44	1.10
p-84	true	270.00	10.0	PVC	150.0	Open	117.76	81.70	207.86	0.02	207.84	0.09	0.48
P-85	true	200.00	6.0	Cast iron	70.0	Open	28.56	81.70	207.90	0.06	207.84	0.32	0.32
P-86	true	250.00	10.0	PVC	150.0	Open	-81.94	81.70	207.83	0.01	207.84	0.05	0.33
P-87	true	270.00	6.0	Cast iron	135.0	Open	64.08	81.65	207.84	0.12	207.72	0.43	0.73
P-88	true	275.00	6.0	Cast iron	70.0	Open	-14.83	82.17	207.90	0.03	207.93	0.10	0.17
P-89	true	265.00	6.0	Cast iron	70.0	Open	33.72	81.30	208.02	0.12	207.90	0.44	0.38
P-90	true	270.00	6.0	Cast iron	70.0	Open	-18.77	81.30	207.86	0.04	207.90	0.15	0.21
P-91	true	270.00	6.0	Cast iron	70.0	Open	-31.27	81.39	208.02	0.10	208.12	0.38	0.35
P-92	true	265.00	6.0	Cast iron	70.0	Open	18.82	80.46	208.02	0.04	207.98	0.15	0.21
P-93	true	270.00	6.0	Cast iron	70.0	Open	-33.42	81.01	208.12	0.12	208.24	0.43	0.38
P-94	true	265.00	6.0	PVC	70.0	Open	27.27	80.97	208.24	0.08	208.16	0.30	0.31
P-95	true	235.00	6.0	PVC	150.0	Open	-26.51	82.31	208.24	0.02	208.25	0.07	0.30
P-96	true	270.00	6.0	PVC	150.0	Open	-21.79	80.97	208.15	0.01	208.16	0.05	0.25
P-97	true	310.00	4.0	Cast iron	135.0	Open	-7.39	78.81	208.13	0.02	208.15	0.06	0.19
P-98	true	290.00	6.0	Cast iron	135.0	Open	-59.27	78.81	208.04	0.11	208.15	0.37	0.67
P-99	true	250.00	6.0	Cast iron	130.0	Open	-56.51	79.62	207.95	0.09	208.04	0.36	0.64
P-100	true	145.00	4.0	Cast iron	135.0	Open	-5.24	78.80	208.12	0.00	208.13	0.03	0.13
P-101	true	260.00	4.0	Cast iron	135.0	Open	-3.32	78.80	208.12	0.00	208.12	0.01	0.08
P-102	true	100.00	4.0	Cast iron	135.0	Open	-43.52	78.80	207.97	0.15	208.12	1.50	1.11
P-103	true	270.00	6.0	Cast iron	135.0	Open	-40.81	78.73	207.92	0.05	207.97	0.18	0.46
P-104	true	270.00	6.0	Cast iron	135.0	Open	-28.92	79.14	207.89	0.03	207.92	0.10	0.33
P-105	true	270.00	6.0	Cast iron	70.0	Open	-9.17	79.14	207.91	0.01	207.92	0.04	0.10
P-106	true	270.00	6.0	Cast iron	130.0	Open	-24.12	78.27	207.89	0.02	207.91	0.07	0.27
P-107	true	260.00	6.0	Cast iron	70.0	Open	16.48	78.27	207.94	0.03	207.91	0.12	0.19
P-108	true	260.00	6.0	Cast iron	135.0	Open	59.35	78.72	208.04	0.10	207.94	0.37	0.67
P-109	true	225.00	6.0	Cast iron	135.0	Open	60.58	77.89	208.12	0.09	208.04	0.38	0.69
P-110	true	375.00	6.0	Cast iron	70.0	Open	-0.89	78.72	207.94	0.00	207.94	0.00	0.01

Scenario: Base
Steady State Analysis
Pipe Report

Label	Open?	Length (ft)	Diam (in)	Material	Hazen-Williams C	Control Status	Discharge (gpm)	Dwnstrm Calc Press (psi)	Upstrm Struct Hyd Grd (ft)	Pressu Pipe Hdloss (ft)	Dwnstrm Strc Hyd Grade (ft)	Headloss Gradient (ft/1000ft)	Velocity (ft/s)
P-111	true	270.00	6.0	Cast iron	135.0	Open	-41.06	78.72	207.89	0.05	207.94	0.19	0.47
P-112	true	450.00	6.0	Cast iron	135.0	Open	44.97	78.28	208.04	0.10	207.94	0.22	0.51
P-113	true	270.00	6.0	Cast iron	135.0	Open	-43.96	78.28	207.88	0.06	207.94	0.21	0.50
P-114	true	300.00	6.0	Cast iron	135.0	Open	-43.35	78.26	207.82	0.06	207.88	0.21	0.49
P-115	true	205.00	6.0	Cast iron	135.0	Open	-39.96	78.67	207.78	0.04	207.82	0.18	0.45
P-116	true	1,000.00	4.0	PVC	150.0	Open	-10.46	79.08	207.70	0.09	207.78	0.09	0.27
P-117	true	195.00	12.0	PVC	150.0	Open	-48.53	83.38	207.71	0.00	207.71	0.01	0.14
P-118	true	700.00	12.0	PVC	150.0	Open	-47.91	81.21	207.70	0.00	207.71	0.01	0.14
P-119	true	340.00	12.0	Ductile Iron	135.0	Open	73.59	83.38	207.72	0.01	207.71	0.02	0.21
P-120	true	260.00	6.0	Cast iron	70.0	Open	25.80	79.48	207.78	0.07	207.72	0.27	0.29
P-121	true	270.00	6.0	Cast iron	70.0	Open	-7.38	79.48	207.71	0.01	207.72	0.03	0.08
P-122	true	260.00	16.0	Ductile Iron	135.0	Open	56.09	79.48	207.72	0.00	207.72	0.00	0.09
P-123	true	255.00	10.0	PVC	150.0	Open	2.77	79.08	207.78	0.00	207.78	0.00	0.01
P-124	true	270.00	6.0	Cast iron	70.0	Open	-25.13	79.08	207.72	0.07	207.78	0.25	0.29
P-125	true	280.00	10.0	PVC	150.0	Open	23.59	79.08	207.79	0.00	207.78	0.00	0.10
P-126	true	270.00	10.0	PVC	150.0	Open	-58.83	79.05	207.71	0.01	207.72	0.02	0.24
P-127	true	280.00	16.0	Ductile Iron	135.0	Open	-90.40	79.92	207.72	0.00	207.72	0.01	0.14
P-129	true	270.00	6.0	Cast iron	135.0	Open	48.23	79.92	207.79	0.07	207.72	0.25	0.55
P-130	true	275.00	6.0	Cast iron	135.0	Open	43.98	79.52	207.84	0.06	207.79	0.21	0.50
P-131	true	205.00	6.0	Cast iron	135.0	Open	45.21	79.54	207.89	0.05	207.84	0.22	0.51
P-132	true	260.00	12.0	Ductile Iron	130.0	Open	-5.06	78.70	207.89	0.00	207.89	0.00	0.01
P-133	true	270.00	6.0	Cast iron	70.0	Open	5.74	78.70	207.89	0.00	207.89	0.02	0.07
P-134	true	270.00	6.0	Cast iron	70.0	Open	-23.26	78.70	207.83	0.06	207.89	0.22	0.26
P-135	true	210.00	6.0	Cast iron	70.0	Open	22.34	79.95	207.83	0.04	207.79	0.20	0.25
P-136	true	255.00	10.0	PVC	150.0	Open	-30.45	79.95	207.79	0.00	207.79	0.01	0.12
P-137	true	495.00	6.0	Cast iron	70.0	Open	-18.11	79.95	207.72	0.07	207.79	0.14	0.21
P-138	true	270.00	10.0	PVC	150.0	Open	27.75	79.95	207.79	0.00	207.79	0.01	0.11
P-139	true	210.00	6.0	Cast iron	70.0	Open	-29.85	79.55	207.79	0.07	207.86	0.35	0.34
P-140	true	280.00	6.0	Cast iron	70.0	Open	-0.87	79.55	207.86	0.00	207.86	0.00	0.01
P-141	true	270.00	6.0	Cast iron	135.0	Open	31.95	79.55	207.89	0.03	207.86	0.12	0.36
P-142	true	250.00	6.0	Cast iron	70.0	Open	9.91	79.13	207.91	0.01	207.89	0.05	0.11
P-143	true	255.00	6.0	Cast iron	70.0	Open	11.45	79.57	207.92	0.02	207.91	0.06	0.13
P-144	true	310.00	6.0	Cast iron	70.0	Open	14.21	79.57	207.95	0.03	207.92	0.09	0.16
P-145	true	270.00	6.0	Cast iron	70.0	Open	16.10	80.02	207.98	0.03	207.95	0.11	0.18
P-146	true	270.00	6.0	Cast iron	135.0	Open	54.53	80.41	207.95	0.09	207.86	0.32	0.62
P-147	true	265.00	6.0	Cast iron	70.0	Open	-2.81	80.41	207.86	0.00	207.86	0.00	0.03
P-148	true	215.00	6.0	Cast iron	70.0	Open	-20.05	80.85	207.83	0.04	207.86	0.17	0.23
P-149	true	210.00	6.0	Cast iron	135.0	Open	-49.20	80.41	207.81	0.05	207.86	0.26	0.56
P-150	true	260.00	6.0	Cast iron	70.0	Open	-1.59	80.41	207.86	0.00	207.86	0.00	0.02
P-151	true	275.00	6.0	Cast iron	70.0	Open	-0.05	79.98	207.86	0.00	207.86	0.00	0.00
P-152	true	275.00	10.0	PVC	150.0	Open	0.22	79.95	207.79	0.00	207.79	0.00	0.00
P-153	true	495.00	6.0	Ductile Iron	135.0	Open	-34.63	79.95	207.72	0.07	207.79	0.14	0.39
P-154	true	265.00	10.0	PVC	150.0	Open	37.90	79.95	207.79	0.00	207.79	0.01	0.15
P-155	true	270.00	10.0	PVC	150.0	Open	93.65	80.38	207.81	0.02	207.79	0.06	0.38
P-156	true	265.00	10.0	PVC	150.0	Open	100.48	80.39	207.83	0.02	207.81	0.07	0.41
P-157	true	270.00	6.0	Cast iron	135.0	Open	-54.53	80.39	207.72	0.09	207.81	0.32	0.62
P-158	true	270.00	6.0	PVC	150.0	Open	-54.21	80.38	207.72	0.07	207.79	0.26	0.62
P-159	true	270.00	16.0	Ductile Iron	135.0	Open	46.12	81.22	207.72	0.00	207.72	0.00	0.07
P-160	true	270.00	16.0	Ductile Iron	135.0	Open	-5.63	80.79	207.72	0.00	207.72	0.00	0.01
P-161	true	270.00	16.0	Ductile Iron	135.0	Open	-31.93	81.22	207.72	0.00	207.72	0.00	0.05
P-162	true	265.00	6.0	PVC	150.0	Open	-25.12	81.22	207.71	0.02	207.72	0.06	0.29
P-163	true	270.00	16.0	Ductile Iron	135.0	Open	-29.21	81.65	207.72	0.00	207.72	0.00	0.05
P-164	true	270.00	16.0	Ductile Iron	135.0	Open	-90.53	81.65	207.72	0.00	207.72	0.01	0.14

Scenario: Base
Steady State Analysis
Pipe Report

Label	Open?	Length (ft)	Diam (in)	Material	Hazen-Williams C	Control Status	Discharge (gpm)	Dwnstrm Calc Press (psi)	Upstrm Struct Hyd Grd (ft)	Pressu Pipe Hdloss (ft)	Dwnstrm Strc Hyd Grade (ft)	Headloss Gradient (ft/1000ft)	Velocity (ft/s)
P-165	true	440.00	16.0	Ductile Iron	135.0	Open	445.29	81.19	207.72	0.06	207.66	0.13	0.71
P-166	true	265.00	6.0	PVC	150.0	Open	32.12	81.64	207.72	0.03	207.69	0.10	0.36
P-167	true	265.00	12.0	Cast iron	135.0	Open	-9.67	81.19	207.66	0.00	207.66	0.00	0.03
P-168	true	165.00	12.0	Cast iron	135.0	Open	-9.67	81.63	207.66	0.00	207.66	0.00	0.03
P-169	true	270.00	6.0	Cast iron	70.0	Open	-16.41	81.64	207.66	0.03	207.69	0.12	0.19
P-170	true	270.00	6.0	Cast iron	70.0	Open	12.03	81.20	207.69	0.02	207.68	0.06	0.14
P-171	true	275.00	6.0	Cast iron	70.0	Open	-19.34	81.20	207.63	0.04	207.68	0.16	0.22
P-172	true	535.00	6.0	Cast iron	70.0	Open	14.86	81.59	207.63	0.05	207.58	0.10	0.17
P-173	true	285.00	6.0	Cast iron	70.0	Open	9.77	81.20	207.69	0.01	207.68	0.04	0.11
P-174	true	255.00	6.0	Cast iron	70.0	Open	12.10	81.20	207.71	0.02	207.69	0.07	0.14
P-175	true	810.00	6.0	Cast iron	70.0	Open	-10.71	81.21	207.66	0.04	207.71	0.05	0.12
P-176	true	230.00	16.0	Ductile Iron	135.0	Open	-45.36	81.22	207.72	0.00	207.72	0.00	0.07
P-177	true	270.00	16.0	Ductile Iron	135.0	Open	-77.54	81.22	207.72	0.00	207.72	0.01	0.12
P-178	true	275.00	16.0	Ductile Iron	135.0	Open	-74.82	81.22	207.72	0.00	207.72	0.00	0.12
P-180	true	40.00	6.0	Cast iron	70.0	Open	-26.69	80.78	207.71	0.01	207.72	0.28	0.30
P-181	true	270.00	6.0	Cast iron	70.0	Open	-19.72	80.35	207.66	0.04	207.71	0.16	0.22
P-182	true	255.00	6.0	Cast iron	70.0	Open	3.22	80.35	207.71	0.00	207.71	0.01	0.04
P-183	true	280.00	6.0	Cast iron	70.0	Open	-0.65	79.48	207.71	0.00	207.71	0.00	0.01
P-184	true	260.00	6.0	Cast iron	70.0	Open	-2.75	79.91	207.71	0.00	207.71	0.00	0.03
P-185	true	280.00	6.0	Cast iron	135.0	Open	-9.52	79.05	207.70	0.00	207.71	0.01	0.11
P-186	true	270.00	6.0	Cast iron	135.0	Open	-8.53	80.35	207.70	0.00	207.70	0.01	0.10
P-187	true	270.00	6.0	Cast iron	135.0	Open	-7.01	80.78	207.70	0.00	207.70	0.01	0.08
P-188	true	270.00	6.0	Cast iron	70.0	Open	-14.44	80.78	207.68	0.02	207.70	0.09	0.16
P-189	true	265.00	6.0	Cast iron	70.0	Open	-25.34	81.20	207.61	0.07	207.68	0.26	0.29
P-190	true	280.00	6.0	Cast iron	70.0	Open	-9.79	81.17	207.60	0.01	207.61	0.04	0.11
P-191	true	260.00	6.0	Cast iron	70.0	Open	-9.49	82.03	207.59	0.01	207.60	0.04	0.11
P-192	true	275.00	12.0	Cast iron	135.0	Open	-29.97	82.02	207.58	0.00	207.59	0.00	0.09
P-193	true	265.00	12.0	PVC	150.0	Open	-20.84	81.59	207.58	0.00	207.58	0.00	0.06
P-194	true	275.00	12.0	Ductile Iron	135.0	Open	-2.97	82.02	207.59	0.00	207.59	0.00	0.01
P-195	true	265.00	6.0	Ductile Iron	130.0	Open	-5.70	82.46	207.58	0.00	207.59	0.01	0.06
P-196	true	260.00	8.0	PVC	150.0	Open	3.64	82.46	207.59	0.00	207.59	0.00	0.02
P-197	true	250.00	12.0	Cast iron	135.0	Open	-24.02	82.46	207.58	0.00	207.59	0.00	0.07
P-198	true	270.00	6.0	Cast iron	70.0	Open	6.06	82.46	207.59	0.00	207.59	0.02	0.07
P-199	true	265.00	6.0	Cast iron	70.0	Open	8.81	82.46	207.60	0.01	207.59	0.04	0.10
P-200	true	255.00	6.0	Cast iron	70.0	Open	-5.17	82.46	207.60	0.00	207.60	0.01	0.06
P-201	true	280.00	6.0	Cast iron	70.0	Open	15.90	82.46	207.63	0.03	207.60	0.11	0.18
P-202	true	270.00	6.0	Cast iron	70.0	Open	18.22	81.61	207.67	0.04	207.63	0.14	0.21
P-203	true	270.00	6.0	Cast iron	70.0	Open	18.98	81.20	207.71	0.04	207.67	0.15	0.22
P-204	true	315.00	4.0	Cast iron	70.0	Open	-10.19	80.35	207.60	0.11	207.71	0.34	0.26
P-205	true	235.00	6.0	Cast iron	135.0	Open	-7.43	81.17	207.60	0.00	207.60	0.01	0.08
P-206	true	270.00	6.0	Cast iron	135.0	Open	-4.67	81.60	207.60	0.00	207.60	0.00	0.05
P-207	true	275.00	6.0	Cast iron	70.0	Open	6.48	82.03	207.60	0.01	207.60	0.02	0.07
P-208	true	270.00	6.0	Cast iron	135.0	Open	-13.87	82.03	207.59	0.01	207.60	0.03	0.16
P-209	true	270.00	6.0	Cast iron	135.0	Open	-11.73	82.89	207.58	0.00	207.59	0.02	0.13
P-210	true	275.00	12.0	Cast iron	135.0	Open	-16.37	82.89	207.58	0.00	207.58	0.00	0.05
P-211	true	270.00	6.0	Cast iron	70.0	Open	7.69	83.32	207.59	0.01	207.58	0.03	0.09
P-212	true	270.00	6.0	Cast iron	70.0	Open	8.91	82.89	207.60	0.01	207.59	0.04	0.10
P-213	true	535.00	6.0	Cast iron	150.0	Open	27.36	82.03	207.64	0.04	207.60	0.07	0.31
P-214	true	280.00	6.0	Cast iron	150.0	Open	29.20	81.18	207.66	0.02	207.64	0.08	0.33
P-215	true	390.00	6.0	Cast iron	70.0	Open	-10.74	82.03	207.58	0.02	207.60	0.05	0.12
P-216	true	395.00	12.0	Ductile Iron	135.0	Open	-20.01	83.32	207.58	0.00	207.58	0.00	0.06
P-217	true	270.00	4.0	Cast iron	130.0	Open	-3.13	83.32	207.58	0.00	207.58	0.01	0.08
P-218	true	300.00	2.0	Cast iron	150.0	Open	-1.90	83.75	207.55	0.03	207.58	0.11	0.19

Scenario: Base
Steady State Analysis
Pipe Report

Label	Open?	Length (ft)	Diam (in)	Material	Hazen-Williams C	Control Status	Discharge (gpm)	Dwnstrm Calc Press (psi)	Upstrm Struct Hyd Grd (ft)	Pressu Pipe Hdloss (ft)	Dwnstrm Strc Hyd Grade (ft)	Headloss Gradient (ft/1000ft)	Velocity (ft/s)
P-219	true	250.00	2.0	Cast iron	150.0	Open	-1.03	83.31	207.54	0.01	207.55	0.04	0.11
P-220	true	115.00	2.0	PVC	150.0	Open	1.69	83.74	207.55	0.01	207.54	0.09	0.17
P-221	true	750.00	6.0	PVC	150.0	Open	7.74	83.74	207.55	0.01	207.55	0.01	0.09
P-222	true	425.00	2.0	PVC	150.0	Open	-4.51	83.74	207.32	0.23	207.55	0.54	0.46
P-223	true	260.00	2.0	PVC	150.0	Open	4.19	82.77	207.44	0.12	207.32	0.47	0.43
P-224	true	210.00	2.0	PVC	150.0	Open	3.17	81.96	207.50	0.06	207.44	0.28	0.32
P-225	true	180.00	2.0	PVC	150.0	Open	1.94	81.96	207.46	0.02	207.44	0.11	0.20
P-226	true	150.00	2.0	PVC	150.0	Open	3.17	81.54	207.50	0.04	207.46	0.28	0.32
P-227	true	80.00	8.0	PVC	150.0	Open	21.53	81.99	207.50	0.00	207.50	0.01	0.14
P-228	true	60.00	8.0	PVC	150.0	Open	0.76	81.56	207.50	0.00	207.50	0.00	0.00
P-229	true	55.00	2.0	PVC	150.0	Open	-0.76	81.56	207.50	0.00	207.50	0.02	0.08
P-230	true	25.00	2.0	PVC	150.0	Open	1.38	81.56	207.50	0.00	207.50	0.06	0.14
P-231	true	550.00	6.0	Cast iron	70.0	Open	8.03	81.56	207.52	0.02	207.50	0.03	0.09
P-232	true	270.00	6.0	Cast iron	70.0	Open	13.86	81.56	207.54	0.02	207.52	0.08	0.16
P-233	true	300.00	6.0	Cast iron	70.0	Open	15.09	82.01	207.57	0.03	207.54	0.10	0.17
P-234	true	295.00	6.0	Cast iron	135.0	Open	16.93	83.32	207.58	0.01	207.57	0.04	0.19
P-235	true	205.00	6.0	PVC	150.0	Open	8.66	84.17	207.56	0.00	207.55	0.01	0.10
P-236	true	185.00	6.0	PVC	150.0	Open	-9.58	83.31	207.56	0.00	207.56	0.01	0.11
P-237	true	200.00	6.0	PVC	150.0	Open	-0.59	83.31	207.56	0.00	207.56	0.00	0.01
p-238	true	260.00	6.0	PVC	150.0	Open	11.70	83.31	207.56	0.00	207.56	0.02	0.13
P-239	true	365.00	6.0	PVC	150.0	Open	0.33	83.31	207.56	0.00	207.56	0.00	0.00
P-240	true	275.00	4.0	Cast iron	70.0	Open	-1.86	83.75	207.56	0.00	207.56	0.01	0.05
P-241	true	565.00	6.0	PVC	150.0	Open	-1.32	83.75	207.56	0.00	207.56	0.00	0.02
P-242	true	210.00	4.0	Cast iron	70.0	Open	5.03	83.75	207.58	0.02	207.56	0.09	0.13
P-243	true	260.00	6.0	Cast iron	130.0	Open	6.56	83.32	207.58	0.00	207.58	0.01	0.07
P-244	true	580.00	6.0	Cast iron	130.0	Open	11.00	81.59	207.58	0.01	207.57	0.02	0.12
P-245	true	475.00	6.0	PVC	150.0	Open	-14.97	81.59	207.56	0.01	207.57	0.02	0.17
P-246	true	480.00	6.0	Cast iron	130.0	Open	6.58	81.59	207.58	0.00	207.57	0.01	0.07
P-247	true	360.00	6.0	Cast iron	70.0	Open	1.23	80.72	207.58	0.00	207.58	0.00	0.01
P-248	true	260.00	6.0	Cast iron	70.0	Open	5.83	80.72	207.58	0.00	207.58	0.02	0.07
P-249	true	90.00	6.0	Cast iron	130.0	Open	8.42	80.72	207.58	0.00	207.58	0.01	0.10
P-250	true	290.00	6.0	Cast iron	130.0	Open	-10.57	81.59	207.58	0.00	207.58	0.02	0.12
P-251	true	650.00	8.0	PVC	150.0	Open	-9.85	84.67	207.69	0.00	207.70	0.00	0.06
P-252	true	650.00	12.0	PVC	150.0	Open	-47.30	84.67	207.70	0.00	207.70	0.01	0.13
P-253	true	400.00	12.0	PVC	150.0	Open	-46.99	84.67	207.70	0.00	207.70	0.01	0.13
P-254	true	400.00	8.0	PVC	150.0	Open	-9.55	84.67	207.69	0.00	207.69	0.00	0.06
P-255	true	500.00	8.0	PVC	150.0	Open	-8.63	84.67	207.69	0.00	207.69	0.00	0.06
P-256	true	100.00	8.0	PVC	150.0	Open	-7.10	83.80	207.69	0.00	207.69	0.00	0.05
P-257	true	500.00	12.0	PVC	150.0	Open	-43.17	85.10	207.69	0.00	207.70	0.01	0.12
P-258	true	500.00	12.0	PVC	150.0	Open	-49.66	83.80	207.69	0.00	207.69	0.01	0.14
P-259	true	250.00	12.0	PVC	150.0	Open	-48.15	83.37	207.69	0.00	207.69	0.01	0.14
P-260	true	250.00	12.0	PVC	150.0	Open	-45.86	83.37	207.69	0.00	207.69	0.01	0.13
P-261	true	100.00	8.0	PVC	135.0	Open	-31.29	83.37	207.68	0.00	207.69	0.03	0.20
P-262	true	695.00	8.0	PVC	150.0	Open	-13.65	83.37	207.68	0.00	207.69	0.00	0.09
P-263	true	690.00	12.0	PVC	150.0	Open	-30.37	83.36	207.68	0.00	207.68	0.00	0.09
P-264	true	405.00	12.0	PVC	150.0	Open	-27.75	84.66	207.68	0.00	207.68	0.00	0.08
P-265	true	530.00	8.0	PVC	150.0	Open	-13.04	84.66	207.68	0.00	207.68	0.00	0.08
P-266	true	900.00	12.0	PVC	150.0	Open	-26.22	84.66	207.68	0.00	207.68	0.00	0.07
P-267	true	100.00	12.0	PVC	135.0	Open	-22.82	83.79	207.68	0.00	207.68	0.00	0.06
P-268	true	900.00	8.0	PVC	150.0	Open	-9.67	84.66	207.68	0.00	207.68	0.00	0.06
P-269	true	490.00	8.0	PVC	150.0	Open	-17.38	83.36	207.67	0.00	207.68	0.01	0.11
P-270	true	805.00	8.0	PVC	150.0	Open	-5.64	82.50	207.67	0.00	207.67	0.00	0.04
P-271	true	810.00	8.0	PVC	150.0	Open	-14.81	83.36	207.67	0.00	207.68	0.01	0.09

Scenario: Base
Steady State Analysis
Pipe Report

Label	Open?	Length (ft)	Diam (in)	Material	Hazen-Williams C	Control Status	Discharge (gpm)	Dwnstrm Calc Press (psi)	Upstrm Struct Hyd Grd (ft)	Pressu Pipe Hdloss (ft)	Dwnstrm Strc Hyd Grade (ft)	Headloss Gradient (ft/1000ft)	Velocity (ft/s)
P-272	true	528.00	8.0	PVC	150.0	Open	-2.24	81.20	207.67	0.00	207.67	0.00	0.01
P-273	true	320.00	8.0	PVC	150.0	Open	-7.39	82.06	207.67	0.00	207.67	0.00	0.05
P-274	true	425.00	18.0	Ductile Iron	135.0	Open	-453.80	81.19	207.63	0.03	207.66	0.08	0.57
P-275	true	535.00	18.0	Ductile Iron	135.0	Open	-442.58	81.18	207.59	0.04	207.63	0.07	0.56
P-276	true	950.00	18.0	Ductile Iron	135.0	Open	-442.58	81.16	207.52	0.07	207.59	0.07	0.56
P-277	true	540.00	12.0	Ductile Iron	120.0	Open	51.24	82.15	207.88	0.01	207.87	0.01	0.15
P-278	true	800.00	12.0	Ductile Iron	120.0	Open	51.24	81.28	207.89	0.01	207.88	0.01	0.15
P-279	true	1,100.00	12.0	Ductile Iron	120.0	Open	54.61	81.29	207.90	0.01	207.89	0.01	0.15
P-280	true	1,200.00	18.0	Ductile Iron	135.0	Open	-438.29	81.13	207.44	0.09	207.52	0.07	0.55
P-281	true	1,340.00	14.0	Ductile Iron	120.0	Open	-442.75	81.30	207.49	0.41	207.90	0.31	0.92
P-282	true	700.00	18.0	Ductile Iron	135.0	Open	-434.79	81.10	207.39	0.05	207.44	0.07	0.55
P-283	true	1,100.00	18.0	Ductile Iron	135.0	Open	-432.33	81.07	207.31	0.08	207.39	0.07	0.55
P-284	true	270.00	18.0	Ductile Iron	135.0	Open	-432.33	81.04	207.29	0.02	207.31	0.07	0.55
P-285	true	2,575.00	18.0	Ductile Iron	135.0	Open	-432.33	81.03	207.11	0.18	207.29	0.07	0.55
P-286	true	290.00	6.0	PVC	150.0	Open	2.72	80.97	208.16	0.00	208.16	0.00	0.03
P-288	true	2,475.00	14.0	Ductile Iron	130.0	Open	-442.75	81.12	206.83	0.65	207.49	0.26	0.92
P-290	true	340.00	18.0	Ductile Iron	135.0	Open	-418.24	74.47	207.09	0.02	207.11	0.07	0.53
P-291	true	2,845.00	18.0	Ductile Iron	135.0	Open	-414.06	74.46	206.91	0.18	207.09	0.06	0.52
P-292	true	4,265.00	14.0	Ductile Iron	130.0	Open	433.35	82.10	206.83	1.08	205.75	0.25	0.90
P-301	true	280.00	12.0	Ductile Iron	150.0	Open	-55.55	79.91	207.71	0.00	207.71	0.01	0.16
P-302	true	265.00	12.0	Ductile Iron	150.0	Open	-53.23	81.21	207.70	0.00	207.71	0.01	0.15
P-303	true	275.00	12.0	Ductile Iron	150.0	Open	-51.29	81.21	207.70	0.00	207.70	0.01	0.15
P-304	true	260.00	6.0	Ductile Iron	150.0	Open	-8.65	81.21	207.70	0.00	207.70	0.01	0.10
P-308	true	300.00	10.0	Ductile Iron	150.0	Open	-24.46	83.38	207.71	0.00	207.71	0.00	0.10
P-309	true	315.00	10.0	Ductile Iron	150.0	Open	-23.84	83.81	207.71	0.00	207.71	0.00	0.10
P-310	true	275.00	10.0	Ductile Iron	150.0	Open	-21.19	83.37	207.70	0.00	207.71	0.00	0.09
P-311	true	270.00	10.0	Ductile Iron	150.0	Open	-16.41	84.24	207.70	0.00	207.70	0.00	0.07
P-312	true	270.00	6.0	PVC	150.0	Open	-14.90	84.24	207.70	0.01	207.70	0.02	0.17
P-314	true	300.00	4.0	Cast iron	130.0	Open	1.73	80.35	207.71	0.00	207.70	0.00	0.04
P-315	true	300.00	4.0	Cast iron	135.0	Open	2.88	80.78	207.70	0.00	207.70	0.01	0.07
P-318	true	255.00	12.0	Ductile Iron	150.0	Open	-13.87	81.17	207.61	0.00	207.61	0.00	0.04
P-319	true	280.00	6.0	Cast iron	130.0	Open	-24.37	82.03	207.59	0.02	207.61	0.08	0.28
P-336	true	285.00	6.0	Cast iron	70.0	Open	-13.36	84.67	207.68	0.02	207.70	0.08	0.15
P-338	true	275.00	4.0	Cast iron	135.0	Open	48.83	77.42	209.44	0.51	208.93	1.86	1.25
P-400	true	5,645.00	16.0	Ductile Iron	130.0	Open	428.65	72.69	205.75	0.73	205.02	0.13	0.68
P-401	true	5,645.00	12.0	Ductile Iron	130.0	Open	-386.13	82.60	204.45	2.46	206.91	0.44	1.10
P-402	true	165.00	16.0	Ductile Iron	130.0	Open	428.65	72.25	205.02	0.02	204.99	0.13	0.68
P-403	true	150.00	16.0	Ductile Iron	130.0	Open	348.29	72.01	204.45	0.01	204.44	0.09	0.56
P-404	true	850.00	16.0	Ductile Iron	130.0	Open	348.29	69.82	204.44	0.08	204.37	0.09	0.56
P-405	true	545.00	16.0	Ductile Iron	130.0	Open	428.65	71.35	204.99	0.07	204.92	0.13	0.68
P-406	true	775.00	16.0	Ductile Iron	130.0	Open	428.13	68.72	204.92	0.10	204.82	0.13	0.68
P-407	true	3,890.00	16.0	Ductile Iron	130.0	Open	404.12	53.38	204.82	0.45	204.37	0.12	0.64
P-408	true	370.00	16.0	Ductile Iron	130.0	Open	404.12	44.27	204.37	0.04	204.33	0.12	0.64
P-409	true	120.00	16.0	Ductile Iron	130.0	Open	404.12	47.73	204.33	0.01	204.31	0.12	0.64
P-410	true	740.00	24.0	Ductile Iron	130.0	Open	735.18	42.09	204.31	0.04	204.28	0.05	0.52
P-411	true	165.00	24.0	Ductile Iron	130.0	Open	735.18	39.05	204.28	0.01	204.27	0.05	0.52
P-412	true	640.00	12.0	Ductile Iron	130.0	Open	40.72	34.73	204.27	0.00	204.26	0.01	0.12
P-413	true	2,635.00	24.0	Ductile Iron	130.0	Open	694.47	36.84	204.27	0.12	204.15	0.04	0.49
P-414	true	1,800.00	24.0	Ductile Iron	130.0	Open	694.47	20.80	204.15	0.08	204.07	0.04	0.49
P-415	true	1,025.00	24.0	Ductile Iron	130.0	Open	694.47	15.59	204.07	0.05	204.03	0.04	0.49
P-416	true	575.00	24.0	Ductile Iron	130.0	Open	694.47	3.03	204.03	0.03	204.00	0.04	0.49
P-417	true	4,805.00	24.0	Ductile Iron	130.0	Open	331.06	47.73	204.37	0.05	204.31	0.01	0.23
P-419	true	40.00	6.0	Ductile Iron	70.0	Open	-23.47	79.92	207.71	0.01	207.72	0.22	0.27

Scenario: Base
Steady State Analysis
Pipe Report

Label	Open?	Length (ft)	Diam (in)	Material	Hazen-Williams C	Control Status	Discharge (gpm)	Dwnstrm Calc Press (psi)	Upstrm Struct Hyd Grd (ft)	Pressu Pipe Hdloss (ft)	Dwnstrm Strc Hyd Grade (ft)	Headloss Gradient (ft/1000ft)	Velocity (ft/s)
P-420	true	225.00	16.0	Ductile Iron	135.0	Open	42.77	79.92	207.72	0.00	207.72	0.00	0.07
P-421	true	255.00	16.0	Ductile Iron	135.0	Open	66.24	79.92	207.72	0.00	207.72	0.00	0.11
P-423	true	70.00	10.0	Galvanized i	100.0	Open	703.67	-0.16	9.00	0.37	8.63	5.22	2.87
P-424	true	20.00	8.0	Ductile Iron	150.0	Open	841.93	79.12	220.07	0.20	219.87	10.19	5.37
P-425	true	80.00	8.0	Galvanized i	150.0	Open	841.93	-0.35	-2.00	0.82	-2.82	10.19	5.37
P-426	true	260.00	6.0	Ductile Iron	130.0	Open	-25.40	82.03	207.59	0.02	207.61	0.08	0.29
P-427	true	540.00	6.0	Ductile Iron	130.0	Open	-38.35	81.21	207.61	0.10	207.70	0.18	0.44
P-428	true	595.00	12.0	Ductile Iron	130.0	Open	41.78	79.05	217.71	0.00	217.71	0.01	0.12
P-429	true	975.00	6.0	Cast iron	130.0	Open	23.83	82.43	207.58	0.07	207.51	0.07	0.27
P-430	true	185.00	6.0	PVC	150.0	Open	23.83	81.56	207.51	0.01	207.50	0.06	0.27
P-431	true	270.00	12.0	PVC	150.0	Open	428.89	82.22	208.14	0.11	208.03	0.41	1.22
P-432	true	430.00	12.0	PVC	150.0	Open	405.77	82.15	208.03	0.16	207.88	0.37	1.15
P-433	true	225.00	6.0	Ductile Iron	130.0	Open	-23.11	82.22	208.02	0.02	208.03	0.07	0.26
P-434	false	480.00	12.0	Ductile Iron	130.0	Closed	0.00	-12.55	207.91	0.00	0.00	0.00	0.00
P-435	false	310.00	12.0	Ductile Iron	130.0	Closed	0.00	77.54	0.00	0.00	208.22	0.00	0.00
P-436	false	795.00	12.0	Ductile Iron	130.0	Closed	0.00	-19.04	219.28	0.00	0.00	0.00	0.00
P-437	false	435.00	12.0	Ductile Iron	130.0	Closed	0.00	-21.20	0.00	0.00	0.00	0.00	0.00
P-438	false	255.00	12.0	Ductile Iron	130.0	Closed	0.00	83.32	207.59	0.00	207.57	0.00	0.00
P-439	false	275.00	12.0	Ductile Iron	130.0	Closed	0.00	83.75	207.57	0.00	207.58	0.00	0.00
P-440	false	395.00	12.0	Ductile Iron	130.0	Closed	0.00	83.32	207.58	0.00	207.58	0.00	0.00
P-441	false	255.00	12.0	Ductile Iron	130.0	Closed	0.00	81.64	207.58	0.00	207.69	0.00	0.00
P-442	true	800.00	4.0	Cast iron	130.0	Open	0.00	81.64	207.69	0.00	207.69	0.00	0.00
P-443	true	45.00	24.0	Ductile Iron	130.0	Open	694.47	8.22	204.00	0.00	204.00	0.04	0.49
P-445	false	4,125.00	24.0	Ductile Iron	130.0	Closed	0.00	-26.39	204.28	0.00	0.00	0.00	0.00
P-446	false	2,100.00	24.0	Ductile Iron	130.0	Closed	0.00	-21.20	0.00	0.00	0.00	0.00	0.00
P-447	false	2,600.00	24.0	Ductile Iron	130.0	Closed	0.00	-12.55	0.00	0.00	0.00	0.00	0.00
P-448	false	1,305.00	24.0	Ductile Iron	130.0	Closed	0.00	-12.11	0.00	0.00	0.00	0.00	0.00
P-449	false	5,800.00	24.0	Ductile Iron	130.0	Closed	0.00	82.10	0.00	0.00	205.75	0.00	0.00
P-450	false	2.00	24.0	Ductile Iron	130.0	Closed	0.00	82.60	205.75	0.00	206.91	0.00	0.00
P-451	false	4,470.00	18.0	Ductile Iron	130.0	Closed	0.00	81.12	207.11	0.00	207.49	0.00	0.00
P-452	false	6,160.00	12.0	Ductile Iron	130.0	Closed	0.00	-12.98	207.11	0.00	0.00	0.00	0.00
P-453	false	7,375.00	12.0	Ductile Iron	130.0	Closed	0.00	-21.63	0.00	0.00	0.00	0.00	0.00
P-454	false	1,205.00	24.0	Ductile Iron	130.0	Closed	0.00	-26.39	0.00	0.00	0.00	0.00	0.00
P-455	false	3,320.00	12.0	Ductile Iron	130.0	Closed	0.00	-21.20	0.00	0.00	0.00	0.00	0.00
P-456	false	840.00	12.0	Ductile Iron	130.0	Closed	0.00	-21.20	217.95	0.00	0.00	0.00	0.00
P-457	true	90.00	24.0	Ductile Iron	130.0	Open	0.00	2.16	247.00	0.00	247.00	0.00	0.00
P-458	false	70.00	24.0	Ductile Iron	130.0	Closed	0.00	8.22	247.00	0.00	204.00	0.00	0.00
P-459	false	490.00	12.0	Ductile Iron	130.0	Closed	0.00	-11.25	207.78	0.00	0.00	0.00	0.00
P-460	false	275.00	6.0	Ductile Iron	130.0	Closed	0.00	78.70	0.00	0.00	207.89	0.00	0.00
P-461	false	155.00	6.0	Ductile Iron	130.0	Closed	0.00	78.26	0.00	0.00	207.88	0.00	0.00
P-462	false	85.00	12.0	Ductile Iron	130.0	Closed	0.00	81.16	207.88	0.00	207.59	0.00	0.00
P-463	false	575.00	12.0	Ductile Iron	130.0	Closed	0.00	81.65	204.00	0.00	220.73	0.00	0.00
P-464	false	100.00	12.0	Ductile Iron	130.0	Closed	0.00	81.19	204.00	0.00	207.66	0.00	0.00
P-466	true	30.00	10.0	Ductile Iron	130.0	Open	0.00	88.26	204.00	0.00	204.00	0.00	0.00
P-467	false	100.00	12.0	Ductile Iron	130.0	Closed	0.00	-21.63	204.00	0.00	0.00	0.00	0.00
P-468	true	5.00	24.0	Ductile Iron	130.0	Open	-0.00	-21.63	0.00	0.00	-0.00	0.00	0.00
P-469	false	5.00	24.0	Ductile Iron	130.0	Closed	0.00	88.26	-0.00	0.00	204.00	0.00	0.00
P-470	false	815.00	6.0	Ductile Iron	130.0	Closed	0.00	0.00	215.31	0.00	0.00	0.00	0.00
P-471	false	1,265.00	6.0	Ductile Iron	130.0	Closed	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P-472	false	1,620.00	6.0	Ductile Iron	130.0	Closed	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P-473	false	1,110.00	6.0	Ductile Iron	130.0	Closed	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P-474	false	1,425.00	6.0	Ductile Iron	130.0	Closed	0.00	-19.04	0.00	0.00	0.00	0.00	0.00

Scenario: Base
Steady State Analysis
Junction Report

Label	Type	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Demand Summary
J-1	Demand	32.00	0.00	0.00	220.73	81.65	Simple
J-2	Demand	36.00	0.31	0.31	219.78	79.51	Simple
J-3	Demand	40.00	22.69	22.69	219.48	77.65	Simple
J-4	Demand	44.00	6.62	6.62	217.95	75.26	Composite
J-5	Demand	44.00	1.84	1.84	217.94	75.26	Simple
J-6	Demand	37.00	0.31	0.31	219.77	79.08	Simple
J-7	Demand	36.00	3.07	3.07	219.66	79.46	Simple
J-8	Demand	37.00	0.00	0.00	219.87	79.12	Simple
J-10	Demand	37.00	0.31	0.31	219.71	79.05	Simple
J-11	Demand	31.00	10.73	10.73	218.60	81.17	Simple
J-12	Demand	27.00	3.99	3.99	218.30	82.77	Simple
J-13	Demand	25.00	3.68	3.68	217.70	83.37	Simple
J-14	Demand	29.00	4.60	4.60	217.63	81.61	Simple
J-15	Demand	22.00	6.13	6.13	217.22	84.46	Simple
J-16	Demand	21.00	5.83	5.83	216.95	84.78	Simple
J-17	Demand	28.00	10.42	10.42	217.53	82.00	Simple
J-18	Demand	37.00	4.60	4.60	218.91	78.70	Simple
J-19	Demand	37.00	5.06	5.06	218.06	78.34	Composite
J-20	Demand	41.00	7.32	7.32	217.82	76.50	Composite
J-21	Demand	40.00	3.47	3.47	217.77	76.91	Composite
J-22	Demand	35.00	7.41	7.41	217.71	79.05	Composite
J-23	Demand	40.00	3.13	3.13	217.71	76.89	Simple
J-24	Demand	26.00	9.77	9.77	215.31	81.91	Composite
J-25	Demand	22.00	0.61	0.61	212.16	82.27	Simple
J-26	Demand	20.00	0.31	0.31	209.68	82.07	Simple
J-27	Demand	20.00	1.53	1.53	208.81	81.69	Composite
J-28	Demand	17.00	0.00	0.00	208.47	82.84	Simple
J-29	Demand	17.00	0.31	0.31	208.45	82.83	Simple
J-30	Demand	21.00	3.11	3.11	208.44	81.10	Composite
J-31	Demand	21.00	2.45	2.45	208.24	81.01	Simple
J-32	Demand	18.00	1.53	1.53	208.25	82.31	Simple
J-33	Demand	16.00	1.53	1.53	208.03	83.08	Composite
J-34	Demand	18.00	0.61	0.61	207.93	82.17	Simple
J-35	Demand	18.00	0.92	0.92	207.88	82.15	Simple
J-36	Demand	22.00	3.37	3.37	208.43	80.66	Simple
J-37	Demand	24.00	4.91	4.91	208.27	79.72	Simple
J-38	Demand	21.00	2.15	2.15	208.26	81.02	Simple
J-39	Demand	25.00	4.91	4.91	208.26	79.29	Simple
J-40	Demand	28.00	4.60	4.60	208.25	77.98	Simple
J-41	Demand	29.00	8.19	8.19	208.26	77.56	Composite
J-42	Demand	29.00	3.99	3.99	208.24	77.55	Simple
J-43	Demand	26.00	2.76	2.76	208.15	78.81	Simple
J-44	Demand	21.00	2.76	2.76	208.16	80.97	Simple
J-45	Demand	26.00	2.15	2.15	208.13	78.80	Simple
J-46	Demand	26.00	1.92	1.92	208.12	78.80	Composite
J-47	Demand	26.00	4.67	4.67	208.12	78.80	Composite
J-48	Demand	26.00	2.71	2.71	207.97	78.73	Composite
J-49	Demand	30.00	3.49	3.49	208.22	77.11	Composite
J-50	Demand	29.00	3.68	3.68	208.30	77.58	Simple
J-51	Demand	28.00	4.67	4.67	208.48	78.08	Composite
J-52	Demand	30.00	1.84	1.84	208.93	77.42	Simple
J-53	Demand	31.00	1.90	1.90	209.44	77.20	Composite
J-54	Demand	30.00	3.96	3.96	210.91	78.27	Simple
J-55	Demand	34.00	4.21	4.21	212.72	77.32	Composite

Scenario: Base
Steady State Analysis
Junction Report

Label	Type	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Demand Summary
J-56	Demand	38.00	39.67	39.67	214.76	76.48	Simple
J-57	Demand	30.00	2.32	2.32	208.81	77.36	Composite
J-58	Demand	32.00	31.33	31.33	208.26	76.26	Composite
J-59	Demand	30.00	2.33	2.33	208.12	77.06	Composite
J-60	Demand	29.00	2.15	2.15	208.22	77.54	Simple
J-61	Demand	29.00	3.50	3.50	208.22	77.54	Composite
J-62	Demand	28.00	3.10	3.10	208.04	77.89	Composite
J-63	Demand	29.00	1.15	1.15	208.12	77.50	Composite
J-64	Demand	28.00	1.23	1.23	208.04	77.89	Simple
J-65	Demand	27.00	1.90	1.90	207.94	78.28	Composite
J-66	Demand	26.00	0.92	0.92	207.94	78.72	Simple
J-67	Demand	27.00	1.53	1.53	207.91	78.27	Simple
J-68	Demand	25.00	2.72	2.72	207.92	79.14	Composite
J-69	Demand	27.00	0.61	0.61	207.88	78.26	Simple
J-70	Demand	26.00	3.39	3.39	207.82	78.67	Simple
J-71	Demand	25.00	0.92	0.92	207.78	79.08	Simple
J-72	Demand	26.00	0.92	0.92	207.89	78.70	Simple
J-73	Demand	26.00	1.53	1.53	207.89	78.70	Simple
J-74	Demand	24.00	1.23	1.23	207.84	79.54	Simple
J-75	Demand	24.00	0.92	0.92	207.83	79.53	Simple
J-76	Demand	24.00	1.23	1.23	207.86	79.55	Simple
J-77	Demand	25.00	1.15	1.15	207.89	79.13	Composite
J-78	Demand	24.00	1.54	1.54	207.91	79.57	Composite
J-79	Demand	24.00	0.92	0.92	207.86	79.55	Simple
J-80	Demand	24.00	2.76	2.76	207.92	79.57	Simple
J-82	Demand	23.00	1.54	1.54	207.86	79.98	Composite
J-83	Demand	22.00	0.92	0.92	207.86	80.41	Simple
J-84	Demand	23.00	3.88	3.88	207.95	80.02	Composite
J-85	Demand	24.00	2.76	2.76	208.04	79.62	Simple
J-86	Demand	22.00	2.72	2.72	207.98	80.46	Composite
J-87	Demand	20.00	1.84	1.84	208.02	81.35	Simple
J-88	Demand	20.00	2.15	2.15	208.12	81.39	Simple
J-89	Demand	18.00	1.94	1.94	208.14	82.27	Composite
J-90	Demand	20.00	1.23	1.23	207.90	81.30	Simple
J-91	Demand	21.00	1.53	1.53	207.86	80.85	Composite
J-92	Demand	19.00	0.31	0.31	207.84	81.70	Simple
J-93	Demand	18.00	0.92	0.92	207.86	82.14	Simple
J-94	Demand	22.00	1.51	1.51	207.83	80.40	Composite
J-95	Demand	22.00	1.51	1.51	207.81	80.39	Composite
J-96	Demand	22.00	1.54	1.54	207.79	80.38	Composite
J-97	Demand	18.00	1.15	1.15	207.87	82.15	Composite
J-98	Demand	20.00	1.15	1.15	207.66	81.19	Composite
J-99	Demand	23.00	3.49	3.49	207.79	79.95	Composite
J-100	Demand	23.00	1.88	1.88	207.79	79.95	Composite
J-101	Demand	23.00	1.53	1.53	207.79	79.95	Simple
J-102	Demand	24.00	2.61	2.61	207.79	79.52	Simple
J-103	Demand	25.00	1.23	1.23	207.78	79.08	Simple
J-104	Demand	20.00	0.61	0.61	207.71	81.21	Simple
J-105	Demand	15.00	0.61	0.61	207.71	83.38	Simple
J-106	Demand	24.00	0.92	0.92	207.72	79.48	Simple
J-107	Demand	25.00	0.61	0.61	207.72	79.05	Simple
J-108	Demand	23.00	0.61	0.61	207.72	79.92	Simple
J-109	Demand	25.00	0.61	0.61	207.71	79.05	Simple
J-110	Demand	23.00	1.17	1.17	207.71	79.91	Simple

Scenario: Base
Steady State Analysis
Junction Report

Label	Type	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Demand Summary
J-111	Demand	24.00	0.61	0.61	207.71	79.48	Simple
J-112	Demand	21.00	0.00	0.00	207.72	80.78	Simple
J-113	Demand	20.00	1.23	1.23	207.66	81.19	Simple
J-114	Demand	20.00	2.72	2.72	207.72	81.22	Composite
J-115	Demand	20.00	2.45	2.45	207.72	81.22	Simple
J-116	Demand	20.00	0.76	0.76	207.72	81.22	Composite
J-117	Demand	21.00	2.45	2.45	207.72	80.79	Simple
J-118	Demand	20.00	3.11	3.11	207.72	81.22	Composite
J-119	Demand	20.00	2.32	2.32	207.71	81.21	Composite
J-120	Demand	19.00	2.72	2.72	207.72	81.65	Composite
J-121	Demand	20.00	2.33	2.33	207.69	81.20	Composite
J-122	Demand	20.00	2.45	2.45	207.68	81.20	Simple
J-123	Demand	19.00	2.76	2.76	207.72	81.65	Simple
J-124	Demand	19.00	3.68	3.68	207.69	81.64	Simple
J-125	Demand	18.00	2.32	2.32	207.72	82.08	Composite
J-126	Demand	19.00	6.74	6.74	207.66	81.63	Simple
J-127	Demand	20.00	0.00	0.00	207.66	81.19	Simple
J-132	Demand	19.00	4.48	4.48	207.63	81.61	Simple
J-133	Demand	19.00	4.29	4.29	207.58	81.59	Simple
J-134	Demand	21.00	2.15	2.15	207.58	80.72	Simple
J-136	Demand	21.00	3.07	3.07	207.58	80.72	Simple
J-137	Demand	21.00	4.60	4.60	207.58	80.72	Simple
J-138	Demand	19.00	4.91	4.91	207.58	81.59	Simple
J-139	Demand	19.00	2.61	2.61	207.57	81.59	Simple
J-140	Demand	16.00	2.45	2.45	207.58	82.89	Simple
J-141	Demand	17.00	4.60	4.60	207.56	82.45	Simple
J-142	Demand	14.00	1.84	1.84	207.56	83.75	Simple
J-143	Demand	15.00	1.53	1.53	207.58	83.32	Simple
J-144	Demand	13.00	1.53	1.53	207.56	84.18	Simple
J-145	Demand	15.00	0.92	0.92	207.56	83.31	Simple
J-146	Demand	15.00	1.53	1.53	207.56	83.31	Simple
J-147	Demand	15.00	0.92	0.92	207.56	83.31	Simple
J-148	Demand	13.00	0.92	0.92	207.55	84.17	Simple
J-150	Demand	15.00	0.92	0.92	207.58	83.32	Simple
J-151	Demand	14.00	1.23	1.23	207.58	83.75	Simple
J-152	Demand	15.00	0.87	0.87	207.55	83.31	Simple
J-153	Demand	14.00	2.72	2.72	207.54	83.74	Composite
J-154	Demand	14.00	1.54	1.54	207.55	83.74	Composite
J-155	Demand	16.00	8.70	8.70	207.32	82.77	Simple
J-156	Demand	18.00	0.92	0.92	207.44	81.96	Simple
J-158	Demand	16.00	1.23	1.23	207.59	82.89	Simple
J-159	Demand	18.00	1.23	1.23	207.60	82.03	Simple
J-160	Demand	20.00	1.84	1.84	207.64	81.18	Simple
J-161	Demand	20.00	2.76	2.76	207.60	81.17	Simple
J-162	Demand	18.00	2.45	2.45	207.60	82.03	Simple
J-163	Demand	16.00	2.15	2.15	207.59	82.89	Simple
J-164	Demand	19.00	2.76	2.76	207.60	81.60	Simple
J-165	Demand	16.00	2.45	2.45	207.58	82.89	Simple
J-166	Demand	15.00	1.84	1.84	207.57	83.32	Simple
J-167	Demand	18.00	1.23	1.23	207.54	82.01	Simple
J-168	Demand	19.00	5.83	5.83	207.52	81.56	Simple
J-169	Demand	19.00	3.49	3.49	207.50	81.56	Composite
J-170	Demand	19.00	1.23	1.23	207.46	81.54	Simple
J-171	Demand	18.00	18.36	18.36	207.50	81.99	Simple

Scenario: Base
Steady State Analysis
Junction Report

Label	Type	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Demand Summary
J-172	Demand	19.00	3.07	3.07	207.50	81.56	Simple
J-173	Demand	19.00	0.61	0.61	207.50	81.56	Simple
J-174	Demand	19.00	0.00	0.00	207.50	81.56	Simple
J-177	Demand	17.00	2.70	2.70	207.58	82.46	Composite
J-178	Demand	17.00	0.92	0.92	207.59	82.46	Simple
J-179	Demand	19.00	9.14	9.14	207.58	81.59	Simple
J-180	Demand	18.00	1.94	1.94	207.59	82.02	Composite
J-181	Demand	17.00	2.76	2.76	207.59	82.46	Simple
J-182	Demand	17.00	2.76	2.76	207.59	82.46	Simple
J-183	Demand	17.00	1.92	1.92	207.60	82.46	Composite
J-184	Demand	19.00	2.32	2.32	207.63	81.61	Composite
J-185	Demand	20.00	0.76	0.76	207.67	81.20	Composite
J-186	Demand	20.00	2.32	2.32	207.71	81.21	Composite
J-187	Demand	20.00	1.94	1.94	207.70	81.21	Composite
J-188	Demand	20.00	4.29	4.29	207.70	81.21	Composite
J-189	Demand	18.00	2.45	2.45	207.61	82.03	Simple
J-190	Demand	20.00	1.68	1.68	207.61	81.17	Composite
J-191	Demand	20.00	2.45	2.45	207.68	81.20	Simple
J-192	Demand	21.00	1.23	1.23	207.70	80.78	Simple
J-193	Demand	21.00	4.40	4.40	207.70	80.78	Simple
J-194	Demand	22.00	2.72	2.72	207.70	80.35	Composite
J-195	Demand	18.00	0.31	0.31	207.60	82.03	Simple
J-197	Demand	12.00	1.54	1.54	207.70	84.67	Composite
J-198	Demand	13.00	1.51	1.51	207.70	84.24	Composite
J-199	Demand	12.00	0.61	0.61	207.70	84.67	Simple
J-200	Demand	12.00	0.61	0.61	207.70	84.67	Simple
J-201	Demand	12.00	0.31	0.31	207.70	84.67	Simple
J-202	Demand	12.00	0.31	0.31	207.69	84.67	Simple
J-203	Demand	11.00	3.82	3.82	207.70	85.10	Composite
J-204	Demand	12.00	0.92	0.92	207.69	84.67	Simple
J-205	Demand	14.00	1.53	1.53	207.69	83.80	Composite
J-206	Demand	14.00	0.61	0.61	207.69	83.80	Simple
J-207	Demand	15.00	1.51	1.51	207.69	83.37	Composite
J-208	Demand	15.00	2.29	2.29	207.69	83.37	Composite
J-209	Demand	15.00	0.92	0.92	207.69	83.37	Simple
J-210	Demand	15.00	0.92	0.92	207.68	83.36	Simple
J-211	Demand	12.00	2.62	2.62	207.68	84.66	Composite
J-212	Demand	12.00	0.61	0.61	207.68	84.66	Simple
J-213	Demand	12.00	3.37	3.37	207.68	84.66	Simple
J-214	Demand	12.00	1.53	1.53	207.68	84.66	Simple
J-215	Demand	15.00	0.31	0.31	207.68	83.36	Simple
J-216	Demand	14.00	3.39	3.39	207.68	83.79	Simple
J-217	Demand	17.00	11.74	11.74	207.67	82.50	Simple
J-218	Demand	20.00	3.39	3.39	207.67	81.20	Simple
J-219	Demand	18.00	9.66	9.66	207.67	82.06	Simple
J-220	Demand	19.00	7.39	7.39	207.67	81.63	Composite
J-221	Demand	20.00	11.22	11.22	207.63	81.18	Simple
J-222	Demand	20.00	0.00	0.00	207.88	81.28	Simple
J-223	Demand	20.00	0.00	0.00	207.59	81.16	Simple
J-224	Demand	20.00	4.29	4.29	207.52	81.13	Simple
J-225	Demand	20.00	3.37	3.37	207.89	81.29	Simple
J-226	Demand	20.00	0.00	0.00	207.90	81.30	Simple
J-227	Demand	20.00	3.50	3.50	207.44	81.10	Composite
J-228	Demand	20.00	2.45	2.45	207.39	81.07	Simple

Scenario: Base
Steady State Analysis
Junction Report

Label	Type	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Demand Summary
J-229	Demand	20.00	0.00	0.00	207.49	81.12	Simple
J-230	Demand	20.00	0.00	0.00	207.29	81.03	Simple
J-232	Demand	35.00	14.09	14.09	207.11	74.47	Simple
J-233	Demand	35.00	9.40	9.40	206.83	74.34	Simple
J-234	Demand	35.00	4.18	4.18	207.09	74.46	Simple
J-236	Demand	16.00	4.70	4.70	205.75	82.10	Simple
J-237	Demand	16.00	27.93	27.93	206.91	82.60	Simple
J-243	Demand	20.00	0.00	0.00	207.31	81.04	Simple
J-245	Demand	29.00	0.31	0.31	219.75	82.53	Simple
J-246	Demand	43.00	7.36	7.36	219.28	76.27	Simple
J-247	Demand	34.00	3.68	3.68	218.07	79.64	Simple
J-248	Demand	35.00	4.60	4.60	218.66	79.46	Simple
J-249	Demand	22.00	0.00	0.00	207.71	80.35	Simple
J-250	Demand	18.00	0.31	0.31	208.25	82.31	Simple
J-251	Demand	14.00	0.61	0.61	207.71	83.81	Simple
J-252	Demand	15.00	0.92	0.92	207.71	83.37	Simple
J-253	Demand	13.00	1.90	1.90	207.70	84.24	Composite
J-286	Demand	21.00	2.72	2.72	208.16	80.97	Composite
J-298	Demand	37.00	0.00	0.00	205.02	72.69	Simple
J-299	Demand	37.00	37.85	37.85	204.45	72.45	Simple
J-300	Demand	38.00	0.00	0.00	204.99	72.25	Simple
J-301	Demand	38.00	0.00	0.00	204.44	72.01	Simple
J-302	Demand	43.00	17.23	17.23	204.37	69.82	Simple
J-303	Demand	40.00	0.52	0.52	204.92	71.35	Simple
J-304	Demand	46.00	24.01	24.01	204.82	68.72	Simple
J-305	Demand	81.00	0.00	0.00	204.37	53.38	Simple
J-306	Demand	102.00	0.00	0.00	204.33	44.27	Simple
J-307	Demand	94.00	0.00	0.00	204.31	47.73	Simple
J-308	Demand	107.00	0.00	0.00	204.28	42.09	Simple
J-309	Demand	114.00	0.00	0.00	204.27	39.05	Simple
J-310	Demand	124.00	40.72	40.72	204.26	34.73	Simple
J-311	Demand	119.00	0.00	0.00	204.15	36.84	Simple
J-312	Demand	156.00	0.00	0.00	204.07	20.80	Simple
J-313	Demand	168.00	0.00	0.00	204.03	15.59	Simple
J-314	Demand	197.00	0.00	0.00	204.00	3.03	Simple
J-315	Demand	23.00	0.00	0.00	207.72	79.92	Simple
J-316	Demand	17.00	0.00	0.00	207.51	82.43	Simple
J-317	Demand	18.00	0.00	0.00	208.03	82.22	Simple
J-318	Demand	29.00	0.00	0.00	0.00	-12.55	Simple
J-319	Demand	44.00	0.00	0.00	0.00	-19.04	Simple
J-320	Demand	49.00	0.00	0.00	0.00	-21.20	Simple
J-321	Demand	19.00	0.00	0.00	207.69	81.64	Simple
J-322	Demand	61.00	0.00	0.00	0.00	-26.39	Simple
J-323	Demand	49.00	0.00	0.00	0.00	-21.20	Simple
J-324	Demand	29.00	0.00	0.00	0.00	-12.55	Simple
J-325	Demand	28.00	0.00	0.00	0.00	-12.11	Simple
J-326	Demand	30.00	0.00	0.00	0.00	-12.98	Simple
J-327	Demand	50.00	0.00	0.00	0.00	-21.63	Simple
J-328	Demand	61.00	0.00	0.00	0.00	-26.39	Simple
J-329	Demand	26.00	0.00	0.00	0.00	-11.25	Simple
J-330	Demand	0.00	0.00	0.00	204.00	88.26	Simple
J-331	Demand	0.00	0.00	0.00	0.00	0.00	Simple
J-332	Demand	0.00	0.00	0.00	0.00	0.00	Simple
J-333	Demand	0.00	0.00	0.00	0.00	0.00	Simple

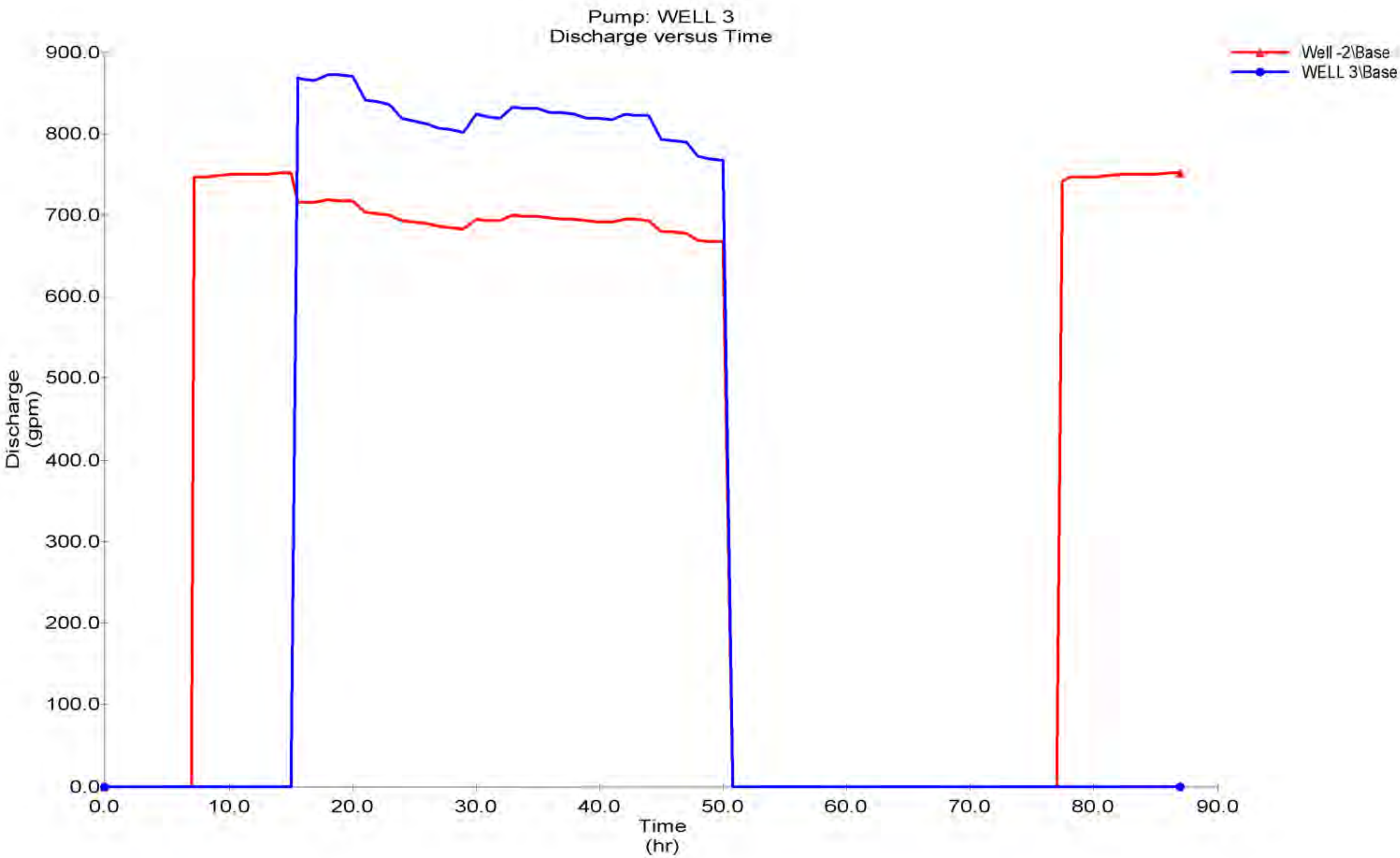
Scenario: Base
Steady State Analysis
Junction Report

Label	Type	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Demand Summary
J-334	Demand	0.00	0.00	0.00	0.00	0.00	Simple

Scenario: Base
Steady State Analysis
Pump Report

Label	Pump Definition	Elevation (ft)	Control Status	Intake Pump Grade (ft)	Discharge Pump Grade (ft)	Discharge (gpm)	Pump Head (ft)	Calculated Water Power (Hp)
Well -2	WELL 2	9.00	On	8.63	221.47	703.67	212.83	37.81
WELL 3	WELL 3 modi	-2.00	On	-2.82	220.07	841.93	222.89	47.38

Graph

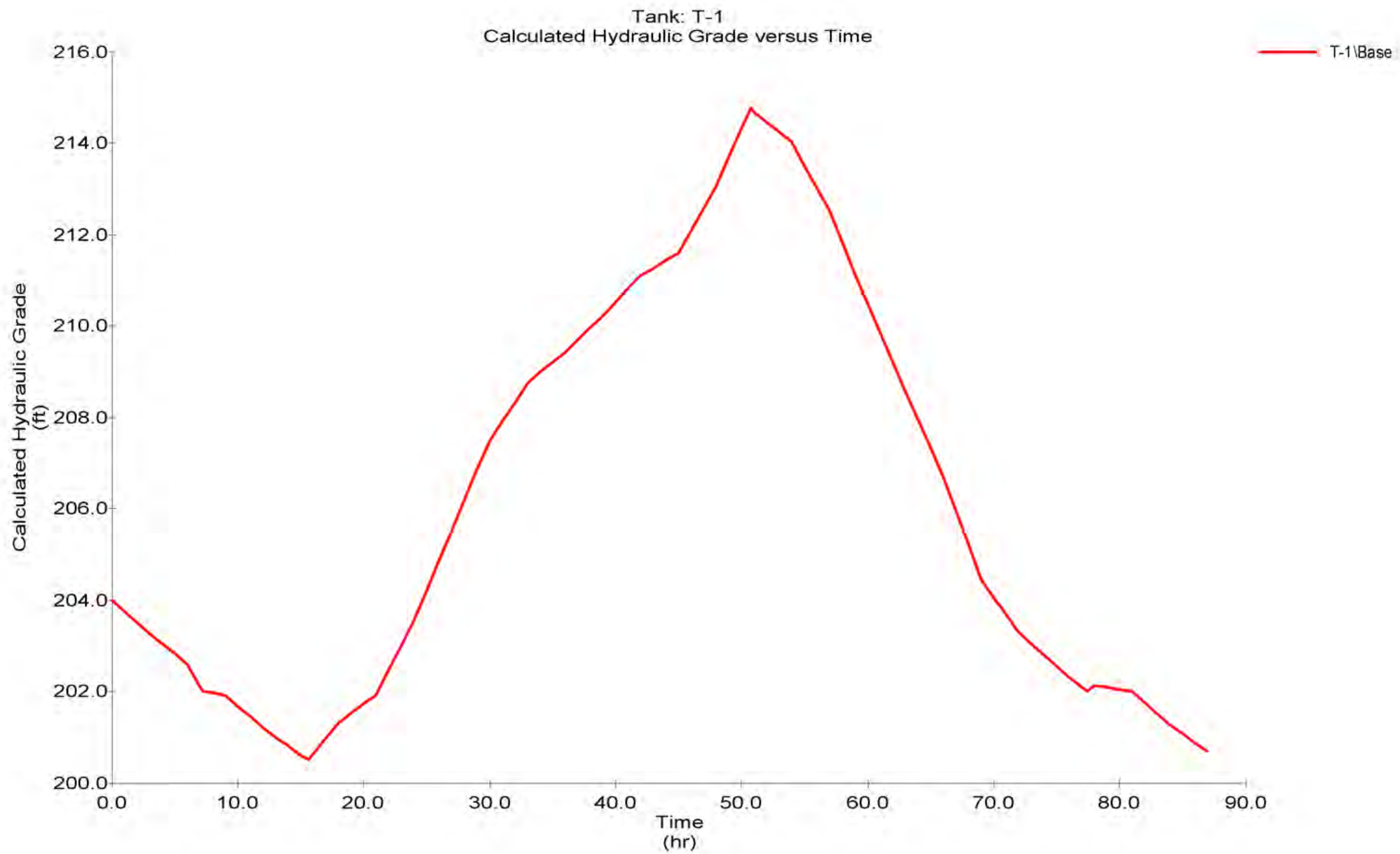


Pump: WELL 3
Discharge versus Time
Well -2\Base
WELL 3\Base
Discharge (gpm)
900.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
Time (hr)

Scenario: Base
Steady State Analysis
Tank Report

Label	Zone	Base Elevation (ft)	Minimum Elevation (ft)	Initial HGL (ft)	Maximum Elevation (ft)	Inactive Volume (gal)	Tank Diameter (ft)	Inflow (gpm)	Current Status	Calculated Hydraulic Grade (ft)	Calculated Percent Full (%)
T-1	Zone	185.00	186.00	204.00	215.00	0.00	130.47	694.47	Filling	204.00	62.1

Graph



Tank: T-1
Calculated Hydraulic Grade versus Time
T-1\Base
Calculated Hydraulic Grade (ft)
216.0
214.0
212.0
210.0
208.0
206.0
204.0
202.0
200.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
Time (hr)

Appendix L

Scenario: 2034 Peak Demand
Steady State Analysis
Pipe Report

Label	Open?	Length (ft)	Diam (in)	Material	Hazen-Williams C	Control Status	Discharge (gpm)	Dwnstrm Calc Press (psi)	Upstrm Struct Hyd Grd (ft)	Pressu Pipe Hdloss (ft)	Dwnstrm Strc Hyd Grade (ft)	Headloss Gradient (ft/1000ft)	Velocity (ft/s)
P-1	true	300.00	10.0	PVC	150.0	Open	742.29	75.74	207.87	0.82	207.05	2.72	3.03
P-2	true	930.00	12.0	PVC	150.0	Open	-501.42	75.74	206.55	0.50	207.05	0.54	1.42
P-3	true	630.00	12.0	Ductile Iron	130.0	Open	412.67	76.65	206.47	0.31	206.16	0.49	1.17
P-4	true	400.00	12.0	Ductile Iron	130.0	Open	412.28	71.81	206.16	0.20	205.97	0.49	1.17
P-5	true	100.00	12.0	Ductile Iron	130.0	Open	526.62	73.32	206.55	0.08	206.47	0.77	1.49
P-6	true	275.00	12.0	Ductile Iron	130.0	Open	25.60	73.79	206.55	0.00	206.55	0.00	0.07
P-7	true	525.00	12.0	PVC	150.0	Open	-585.35	73.52	206.55	0.38	206.93	0.72	1.66
P-8	true	50.00	8.0	Ductile Iron	135.0	Open	-333.22	73.52	206.82	0.11	206.93	2.23	2.13
P-10	true	240.00	8.0	Ductile Iron	135.0	Open	-332.82	73.47	206.29	0.53	206.82	2.22	2.12
P-12	true	860.00	6.0	Cast iron	135.0	Open	-113.55	73.32	205.42	1.06	206.47	1.23	1.29
P-13	true	940.00	12.0	Ductile Iron	150.0	Open	-48.99	69.84	205.41	0.01	205.42	0.01	0.14
P-14	true	450.00	4.0	Cast iron	135.0	Open	30.66	69.83	205.76	0.35	205.41	0.78	0.78
P-15	true	480.00	12.0	Ductile Iron	130.0	Open	382.75	70.42	205.97	0.21	205.76	0.43	1.09
P-16	true	1,155.00	12.0	Ductile Iron	150.0	Open	-62.17	69.84	205.40	0.01	205.42	0.01	0.18
P-17	true	520.00	12.0	Ductile Iron	150.0	Open	-54.85	71.13	205.40	0.00	205.40	0.01	0.16
P-18	true	205.00	12.0	Ductile Iron	130.0	Open	-159.96	71.56	205.38	0.02	205.40	0.09	0.45
P-19	true	350.00	6.0	PVC	150.0	Open	108.58	71.56	205.72	0.33	205.40	0.93	1.23
P-20	true	265.00	6.0	PVC	150.0	Open	19.54	74.30	205.73	0.01	205.72	0.04	0.22
P-21	true	550.00	6.0	PVC	150.0	Open	93.82	74.30	206.11	0.39	205.72	0.71	1.06
P-22	true	215.00	6.0	PVC	150.0	Open	99.81	74.03	206.29	0.17	206.11	0.80	1.13
P-23	true	505.00	8.0	Ductile Iron	135.0	Open	-227.03	73.24	205.73	0.55	206.29	1.09	1.45
P-24	true	205.00	8.0	Ductile Iron	135.0	Open	-202.43	73.00	205.55	0.18	205.73	0.88	1.29
P-25	true	500.00	12.0	Copper	135.0	Open	-466.15	71.55	205.09	0.29	205.38	0.57	1.32
P-26	true	725.00	12.0	Ductile Iron	150.0	Open	115.25	73.79	205.58	0.03	205.55	0.04	0.33
P-27	true	1,505.00	10.0	PVC	150.0	Open	244.65	76.83	206.10	0.52	205.58	0.35	1.00
P-28	true	685.00	12.0	PVC	150.0	Open	555.76	75.76	206.55	0.45	206.10	0.66	1.58
P-29	true	535.00	12.0	PVC	150.0	Open	-297.15	75.76	205.99	0.11	206.10	0.21	0.84
P-30	true	440.00	10.0	PVC	150.0	Open	-291.96	77.44	205.78	0.21	205.99	0.48	1.19
P-31	true	1,070.00	10.0	PVC	150.0	Open	-190.21	78.22	205.55	0.23	205.78	0.22	0.78
P-32	true	200.00	8.0	PVC	150.0	Open	-96.97	78.22	205.74	0.04	205.78	0.19	0.62
P-33	true	1,065.00	8.0	PVC	150.0	Open	-90.98	76.47	205.57	0.18	205.74	0.17	0.58
P-34	true	325.00	12.0	PVC	150.0	Open	115.83	79.42	205.58	0.01	205.57	0.04	0.33
P-35	true	210.00	12.0	PVC	150.0	Open	198.83	79.84	205.57	0.02	205.55	0.10	0.56
P-36	true	635.00	12.0	PVC	150.0	Open	-381.46	79.84	205.34	0.21	205.55	0.33	1.08
P-37	true	1,245.00	12.0	PVC	150.0	Open	451.25	79.08	205.34	0.55	204.78	0.45	1.28
P-38	true	980.00	12.0	PVC	150.0	Open	450.45	79.76	204.78	0.44	204.35	0.44	1.28
P-39	true	345.00	12.0	PVC	150.0	Open	450.05	79.69	204.35	0.15	204.20	0.44	1.28
P-40	true	1,700.00	12.0	PVC	150.0	Open	-211.96	79.69	204.01	0.19	204.20	0.11	0.60
P-41	true	375.00	12.0	PVC	150.0	Open	236.56	80.97	204.20	0.05	204.15	0.13	0.67
P-42	true	40.00	12.0	PVC	150.0	Open	203.84	80.97	204.15	0.00	204.14	0.10	0.58
P-43	true	125.00	12.0	PVC	150.0	Open	11.17	79.24	204.14	0.00	204.14	0.00	0.03
P-44	true	310.00	12.0	Ductile Iron	130.0	Open	7.59	79.24	204.14	0.00	204.14	0.00	0.02
P-45	true	235.00	12.0	Ductile Iron	130.0	Open	11.98	78.80	204.14	0.00	204.14	0.00	0.03
P-46	true	530.00	6.0	Cast iron	135.0	Open	-2.44	77.94	204.14	0.00	204.14	0.00	0.03
P-47	true	275.00	12.0	Ductile Iron	130.0	Open	49.99	77.94	204.14	0.00	204.14	0.01	0.14
P-48	true	490.00	6.0	Cast iron	135.0	Open	-29.19	77.94	204.09	0.05	204.14	0.10	0.33
P-49	true	275.00	4.0	Cast iron	135.0	Open	0.35	79.24	204.14	0.00	204.14	0.00	0.01
P-50	true	260.00	4.0	Cast iron	135.0	Open	6.74	77.51	204.15	0.01	204.14	0.05	0.17
P-51	true	275.00	6.0	Cast iron	70.0	Open	19.63	75.78	204.20	0.04	204.15	0.16	0.22
P-52	true	525.00	6.0	Cast iron	70.0	Open	-4.70	75.78	204.15	0.01	204.15	0.01	0.05
P-53	true	525.00	6.0	Cast iron	70.0	Open	14.28	75.35	204.20	0.05	204.15	0.09	0.16
P-54	true	260.00	6.0	Cast iron	70.0	Open	38.70	75.80	204.35	0.15	204.20	0.57	0.44
P-55	true	265.00	6.0	Ductile Iron	130.0	Open	43.37	76.30	204.40	0.06	204.35	0.22	0.49

Scenario: 2034 Peak Demand
Steady State Analysis
Pipe Report

Label	Open?	Length (ft)	Diam (in)	Material	Hazen-Williams C	Control Status	Discharge (gpm)	Dwnstrm Calc Press (psi)	Upstrm Struct Hyd Grd (ft)	Pressu Pipe Hdloss (ft)	Dwnstrm Strc Hyd Grade (ft)	Headloss Gradient (ft/1000ft)	Velocity (ft/s)
P-57	true	365.00	12.0	Ductile Iron	130.0	Open	405.16	75.05	204.65	0.17	204.47	0.48	1.15
P-58	true	435.00	12.0	Ductile Iron	130.0	Open	410.31	75.56	204.86	0.21	204.65	0.49	1.16
P-59	true	475.00	12.0	Ductile Iron	130.0	Open	414.52	73.92	205.09	0.24	204.86	0.50	1.18
P-60	true	265.00	12.0	Ductile Iron	130.0	Open	-357.49	75.05	204.37	0.10	204.47	0.38	1.01
P-61	true	295.00	4.0	Cast iron	135.0	Open	-32.09	75.44	204.12	0.25	204.37	0.85	0.82
P-62	true	520.00	12.0	Ductile Iron	130.0	Open	-323.08	75.44	204.21	0.16	204.37	0.31	0.92
P-63	true	515.00	4.0	Cast iron	135.0	Open	-0.76	74.47	204.12	0.00	204.12	0.00	0.02
P-64	true	255.00	6.0	Cast iron	70.0	Open	29.94	75.33	204.21	0.09	204.12	0.35	0.34
P-65	true	300.00	6.0	Cast iron	135.0	Open	-28.37	75.33	204.09	0.03	204.12	0.09	0.32
P-66	true	245.00	6.0	Cast iron	135.0	Open	-41.59	75.80	204.16	0.05	204.21	0.19	0.47
P-67	true	270.00	12.0	Ductile Iron	130.0	Open	-248.76	75.80	204.16	0.05	204.21	0.19	0.71
P-68	true	270.00	12.0	Ductile Iron	130.0	Open	-74.78	75.78	204.15	0.01	204.16	0.02	0.21
P-69	true	435.00	6.0	Cast iron	135.0	Open	-29.11	75.35	204.11	0.04	204.15	0.10	0.33
P-70	true	270.00	12.0	Ductile Iron	130.0	Open	-56.47	75.35	204.15	0.00	204.15	0.01	0.16
P-71	true	260.00	12.0	Ductile Iron	130.0	Open	-55.98	75.78	204.14	0.00	204.15	0.01	0.16
P-72	true	400.00	6.0	Cast iron	70.0	Open	15.65	79.22	204.14	0.04	204.10	0.11	0.18
P-73	true	435.00	12.0	PVC	150.0	Open	192.27	80.52	204.14	0.04	204.10	0.09	0.55
P-74	true	435.00	6.0	PVC	150.0	Open	32.72	80.52	204.15	0.04	204.10	0.10	0.37
P-75	true	40.00	6.0	PVC	150.0	Open	2.47	80.52	204.10	0.00	204.10	0.00	0.03
P-76	true	540.00	6.0	PVC	150.0	Open	29.86	81.36	204.10	0.05	204.06	0.09	0.34
P-77	true	270.00	12.0	PVC	150.0	Open	183.15	80.51	204.10	0.02	204.08	0.08	0.52
P-79	true	260.00	6.0	PVC	150.0	Open	28.33	80.49	204.06	0.02	204.04	0.08	0.32
P-80	true	270.00	6.0	Cast iron	150.0	Open	22.48	80.48	204.04	0.01	204.02	0.05	0.26
P-81	true	40.00	12.0	PVC	150.0	Open	170.52	80.48	204.03	0.00	204.02	0.07	0.48
P-82	true	400.00	10.0	PVC	150.0	Open	-49.61	80.48	204.02	0.01	204.02	0.02	0.20
P-83	true	320.00	12.0	Ductile Iron	130.0	Open	115.90	80.48	204.02	0.01	204.01	0.05	0.33
p-84	true	270.00	10.0	PVC	150.0	Open	26.30	80.05	204.02	0.00	204.02	0.01	0.11
P-85	true	200.00	6.0	Cast iron	70.0	Open	11.29	80.05	204.03	0.01	204.02	0.06	0.13
P-86	true	250.00	10.0	PVC	150.0	Open	-17.07	80.05	204.02	0.00	204.02	0.00	0.07
P-87	true	270.00	6.0	Cast iron	135.0	Open	20.12	80.04	204.02	0.01	204.01	0.05	0.23
P-88	true	275.00	6.0	Cast iron	70.0	Open	-5.05	80.49	204.03	0.00	204.04	0.01	0.06
P-89	true	265.00	6.0	Cast iron	70.0	Open	13.70	79.62	204.05	0.02	204.03	0.08	0.16
P-90	true	270.00	6.0	Cast iron	70.0	Open	-5.87	79.62	204.03	0.00	204.03	0.02	0.07
P-91	true	270.00	6.0	Cast iron	70.0	Open	-12.37	79.64	204.05	0.02	204.07	0.07	0.14
P-92	true	265.00	6.0	Cast iron	70.0	Open	5.77	78.76	204.05	0.00	204.05	0.02	0.07
P-93	true	270.00	6.0	Cast iron	70.0	Open	-15.16	79.22	204.07	0.03	204.10	0.10	0.17
P-94	true	265.00	6.0	PVC	70.0	Open	6.89	79.22	204.10	0.01	204.09	0.02	0.08
P-95	true	235.00	6.0	PVC	150.0	Open	-9.60	80.52	204.10	0.00	204.10	0.01	0.11
P-96	true	270.00	6.0	PVC	150.0	Open	-0.58	79.22	204.09	0.00	204.09	0.00	0.01
P-97	true	310.00	4.0	Cast iron	135.0	Open	1.57	77.05	204.09	0.00	204.09	0.00	0.04
P-98	true	290.00	6.0	Cast iron	135.0	Open	-27.75	77.05	204.07	0.03	204.09	0.09	0.31
P-99	true	250.00	6.0	Cast iron	130.0	Open	-24.16	77.91	204.05	0.02	204.07	0.08	0.27
P-100	true	145.00	4.0	Cast iron	135.0	Open	4.36	77.05	204.10	0.00	204.09	0.02	0.11
P-101	true	260.00	4.0	Cast iron	135.0	Open	6.28	77.05	204.11	0.01	204.10	0.04	0.16
P-102	true	100.00	4.0	Cast iron	135.0	Open	-18.16	77.06	204.08	0.03	204.11	0.30	0.46
P-103	true	270.00	6.0	Cast iron	135.0	Open	-15.45	77.05	204.07	0.01	204.08	0.03	0.18
P-104	true	270.00	6.0	Cast iron	135.0	Open	-22.10	77.48	204.05	0.02	204.07	0.06	0.25
P-105	true	270.00	6.0	Cast iron	70.0	Open	9.37	77.48	204.08	0.01	204.07	0.04	0.11
P-106	true	270.00	12.0	Ductile Iron	130.0	Open	-153.53	76.61	204.06	0.02	204.08	0.08	0.44
P-107	true	260.00	6.0	Cast iron	70.0	Open	-5.58	76.61	204.08	0.00	204.08	0.02	0.06
P-108	true	260.00	6.0	Cast iron	135.0	Open	38.84	77.05	204.12	0.04	204.08	0.17	0.44
P-109	true	225.00	6.0	Cast iron	135.0	Open	40.44	76.20	204.16	0.04	204.12	0.18	0.46
P-110	true	375.00	6.0	Cast iron	70.0	Open	-10.96	77.05	204.06	0.02	204.08	0.05	0.12

Scenario: 2034 Peak Demand
Steady State Analysis
Pipe Report

Label	Open?	Length (ft)	Diam (in)	Material	Hazen-Williams C	Control Status	Discharge (gpm)	Dwnstrm Calc Press (psi)	Upstrm Struct Hyd Grd (ft)	Pressu Pipe Hdloss (ft)	Dwnstrm Strc Hyd Grade (ft)	Headloss Gradient (ft/1000ft)	Velocity (ft/s)
P-111	true	270.00	6.0	Cast iron	135.0	Open	-32.27	77.05	204.05	0.03	204.08	0.12	0.37
P-112	true	450.00	6.0	Cast iron	135.0	Open	25.27	76.60	204.09	0.03	204.06	0.08	0.29
P-113	true	270.00	6.0	Ductile Iron	130.0	Open	-34.33	76.60	204.02	0.04	204.06	0.14	0.39
P-114	true	300.00	6.0	Ductile Iron	130.0	Open	-14.87	76.59	204.01	0.01	204.02	0.03	0.17
P-115	true	205.00	6.0	Ductile Iron	130.0	Open	-10.45	77.02	204.01	0.00	204.01	0.02	0.12
P-116	true	1,000.00	4.0	PVC	150.0	Open	-8.77	77.45	203.94	0.06	204.01	0.06	0.22
P-117	true	195.00	12.0	PVC	150.0	Open	-86.93	81.77	203.98	0.00	203.99	0.02	0.25
P-118	true	700.00	12.0	PVC	150.0	Open	-86.13	79.60	203.97	0.01	203.98	0.02	0.24
P-119	true	340.00	12.0	Ductile Iron	135.0	Open	102.14	81.77	204.00	0.01	203.99	0.03	0.29
P-120	true	260.00	6.0	Ductile Iron	130.0	Open	11.63	77.88	204.01	0.01	204.00	0.02	0.13
P-121	true	270.00	6.0	Cast iron	70.0	Open	-7.57	77.88	203.99	0.01	204.00	0.03	0.09
P-122	true	260.00	16.0	Ductile Iron	135.0	Open	99.28	77.88	204.00	0.00	204.00	0.01	0.16
P-123	true	255.00	10.0	PVC	150.0	Open	-11.14	77.45	204.01	0.00	204.01	0.00	0.05
P-124	true	270.00	12.0	Ductile Iron	130.0	Open	-55.51	77.45	204.00	0.00	204.01	0.01	0.16
P-125	true	280.00	6.0	Ductile Iron	130.0	Open	17.81	77.45	204.02	0.01	204.01	0.04	0.20
P-126	true	270.00	12.0	Ductile Iron	130.0	Open	-77.09	77.45	204.00	0.01	204.00	0.02	0.22
P-127	true	280.00	16.0	Ductile Iron	135.0	Open	-121.65	78.31	204.00	0.00	204.01	0.01	0.19
P-129	true	270.00	12.0	Ductile Iron	130.0	Open	112.14	78.31	204.02	0.01	204.01	0.04	0.32
P-130	true	275.00	12.0	Ductile Iron	130.0	Open	127.93	77.89	204.03	0.02	204.02	0.06	0.36
P-131	true	205.00	12.0	Ductile Iron	130.0	Open	129.53	77.89	204.05	0.01	204.03	0.06	0.37
P-132	true	260.00	12.0	Ductile Iron	130.0	Open	-130.22	77.04	204.05	0.02	204.06	0.06	0.37
P-133	true	270.00	6.0	Cast iron	70.0	Open	-6.61	77.04	204.05	0.01	204.06	0.02	0.08
P-134	true	270.00	6.0	Cast iron	70.0	Open	-14.69	77.04	204.03	0.03	204.06	0.09	0.17
P-135	true	210.00	6.0	Cast iron	70.0	Open	13.50	78.32	204.03	0.02	204.02	0.08	0.15
P-136	true	255.00	10.0	PVC	150.0	Open	-5.41	78.32	204.02	0.00	204.02	0.00	0.02
P-137	true	495.00	6.0	Cast iron	70.0	Open	-6.99	78.32	204.01	0.01	204.02	0.02	0.08
P-138	true	270.00	10.0	PVC	150.0	Open	0.90	78.32	204.02	0.00	204.02	0.00	0.00
P-139	true	210.00	6.0	Cast iron	70.0	Open	-14.98	77.89	204.02	0.02	204.04	0.10	0.17
P-140	true	280.00	6.0	Cast iron	70.0	Open	-5.51	77.89	204.03	0.00	204.04	0.02	0.06
P-141	true	270.00	6.0	Cast iron	135.0	Open	22.09	77.89	204.05	0.02	204.04	0.06	0.25
P-142	true	250.00	6.0	Cast iron	70.0	Open	-5.47	77.47	204.05	0.00	204.05	0.02	0.06
P-143	true	255.00	6.0	Cast iron	70.0	Open	-3.93	77.90	204.05	0.00	204.05	0.01	0.04
P-144	true	310.00	6.0	Cast iron	70.0	Open	-0.34	77.90	204.05	0.00	204.05	0.00	0.00
P-145	true	270.00	6.0	Cast iron	70.0	Open	3.05	78.33	204.05	0.00	204.05	0.01	0.03
P-146	true	270.00	6.0	Cast iron	135.0	Open	23.68	78.76	204.05	0.02	204.03	0.07	0.27
P-147	true	265.00	6.0	Cast iron	70.0	Open	-4.27	78.76	204.03	0.00	204.03	0.01	0.05
P-148	true	215.00	6.0	Cast iron	70.0	Open	-8.62	79.19	204.02	0.01	204.03	0.04	0.10
P-149	true	210.00	6.0	Cast iron	135.0	Open	-20.99	78.76	204.02	0.01	204.03	0.05	0.24
P-150	true	260.00	6.0	Cast iron	70.0	Open	2.78	78.76	204.03	0.00	204.03	0.00	0.03
P-151	true	275.00	6.0	Cast iron	70.0	Open	4.32	78.32	204.03	0.00	204.03	0.01	0.05
P-152	true	275.00	10.0	PVC	150.0	Open	12.20	78.32	204.02	0.00	204.02	0.00	0.05
P-153	true	495.00	6.0	Ductile Iron	135.0	Open	-12.81	78.32	204.01	0.01	204.02	0.02	0.15
P-154	true	265.00	10.0	PVC	150.0	Open	4.10	78.32	204.02	0.00	204.02	0.00	0.02
P-155	true	270.00	10.0	PVC	150.0	Open	25.02	78.75	204.02	0.00	204.02	0.01	0.10
P-156	true	265.00	10.0	PVC	150.0	Open	24.17	78.75	204.02	0.00	204.02	0.00	0.10
P-157	true	270.00	6.0	Cast iron	135.0	Open	-18.62	78.75	204.01	0.01	204.02	0.04	0.21
P-158	true	270.00	6.0	PVC	150.0	Open	-19.38	78.75	204.01	0.01	204.02	0.04	0.22
P-159	true	270.00	16.0	Ductile Iron	135.0	Open	29.12	79.61	204.01	0.00	204.01	0.00	0.05
P-160	true	270.00	16.0	Ductile Iron	135.0	Open	12.93	79.18	204.01	0.00	204.01	0.00	0.02
P-161	true	270.00	16.0	Ductile Iron	135.0	Open	11.56	79.61	204.01	0.00	204.01	0.00	0.02
P-162	true	265.00	6.0	PVC	150.0	Open	-14.13	79.61	204.00	0.01	204.01	0.02	0.16
P-163	true	270.00	16.0	Ductile Iron	135.0	Open	14.28	80.04	204.01	0.00	204.01	0.00	0.02
P-164	true	270.00	16.0	Ductile Iron	135.0	Open	-2.25	80.04	204.01	0.00	204.01	0.00	0.00

Scenario: 2034 Peak Demand
Steady State Analysis
Pipe Report

Label	Open?	Length (ft)	Diam (in)	Material	Hazen-Williams C	Control Status	Discharge (gpm)	Dwnstrm Calc Press (psi)	Upstrm Struct Hyd Grd (ft)	Pressu Pipe Hdloss (ft)	Dwnstrm Strc Hyd Grade (ft)	Headloss Gradient (ft/1000ft)	Velocity (ft/s)
P-165	true	440.00	16.0	Ductile Iron	135.0	Open	37.58	79.61	204.01	0.00	204.01	0.00	0.06
P-166	true	265.00	12.0	Ductile Iron	130.0	Open	78.25	80.04	204.01	0.01	204.00	0.02	0.22
P-167	true	265.00	12.0	Cast iron	135.0	Open	75.02	79.61	204.01	0.01	204.00	0.02	0.21
P-168	true	165.00	12.0	Cast iron	135.0	Open	9.74	80.04	204.00	0.00	204.00	0.00	0.03
P-169	true	270.00	6.0	Cast iron	70.0	Open	0.96	80.04	204.00	0.00	204.00	0.00	0.01
P-170	true	270.00	6.0	Cast iron	70.0	Open	7.45	79.61	204.00	0.01	203.99	0.03	0.08
P-171	true	275.00	6.0	Cast iron	70.0	Open	-8.25	79.61	203.99	0.01	203.99	0.03	0.09
P-172	true	535.00	6.0	Cast iron	70.0	Open	2.42	80.03	203.99	0.00	203.98	0.00	0.03
P-173	true	285.00	6.0	Cast iron	70.0	Open	4.00	79.61	204.00	0.00	203.99	0.01	0.05
P-174	true	255.00	6.0	Cast iron	70.0	Open	6.33	79.61	204.00	0.01	204.00	0.02	0.07
P-175	true	810.00	6.0	Cast iron	70.0	Open	-5.48	79.61	203.99	0.01	204.00	0.02	0.06
P-176	true	230.00	16.0	Ductile Iron	135.0	Open	-28.36	79.61	204.01	0.00	204.01	0.00	0.05
P-177	true	270.00	16.0	Ductile Iron	135.0	Open	-37.98	79.61	204.01	0.00	204.01	0.00	0.06
P-178	true	275.00	16.0	Ductile Iron	135.0	Open	-35.26	79.61	204.01	0.00	204.01	0.00	0.06
P-180	true	40.00	6.0	Cast iron	70.0	Open	-16.02	79.18	204.00	0.00	204.01	0.11	0.18
P-181	true	270.00	6.0	Cast iron	70.0	Open	-9.96	78.74	203.99	0.01	204.00	0.05	0.11
P-182	true	255.00	6.0	Cast iron	70.0	Open	-0.85	78.74	204.00	0.00	204.00	0.00	0.01
P-183	true	280.00	6.0	Cast iron	70.0	Open	-5.92	77.88	204.00	0.00	204.00	0.02	0.07
P-184	true	260.00	6.0	Cast iron	70.0	Open	-5.22	78.31	203.99	0.00	204.00	0.01	0.06
P-185	true	280.00	6.0	Cast iron	135.0	Open	-11.99	77.44	203.99	0.01	203.99	0.02	0.14
P-186	true	270.00	6.0	Cast iron	135.0	Open	-8.58	78.74	203.98	0.00	203.99	0.01	0.10
P-187	true	270.00	6.0	Cast iron	135.0	Open	-5.38	79.17	203.98	0.00	203.98	0.00	0.06
P-188	true	270.00	6.0	Cast iron	70.0	Open	-4.53	79.17	203.98	0.00	203.98	0.01	0.05
P-189	true	265.00	6.0	Cast iron	70.0	Open	-6.97	79.60	203.97	0.01	203.98	0.02	0.08
P-190	true	280.00	6.0	Cast iron	70.0	Open	-3.47	79.60	203.97	0.00	203.97	0.01	0.04
P-191	true	260.00	6.0	Cast iron	70.0	Open	-3.07	80.46	203.97	0.00	203.97	0.01	0.03
P-192	true	275.00	12.0	Cast iron	135.0	Open	-33.04	80.46	203.97	0.00	203.97	0.00	0.09
P-193	true	265.00	12.0	PVC	150.0	Open	-21.15	80.03	203.97	0.00	203.97	0.00	0.06
P-194	true	275.00	12.0	Ductile Iron	135.0	Open	-24.09	80.46	203.97	0.00	203.97	0.00	0.07
P-195	true	265.00	6.0	Ductile Iron	130.0	Open	-4.61	80.89	203.97	0.00	203.97	0.00	0.05
P-196	true	260.00	8.0	PVC	150.0	Open	0.93	80.89	203.97	0.00	203.97	0.00	0.01
P-197	true	250.00	12.0	Cast iron	135.0	Open	-3.94	80.89	203.97	0.00	203.97	0.00	0.01
P-198	true	270.00	6.0	Cast iron	70.0	Open	-1.15	80.89	203.97	0.00	203.97	0.00	0.01
P-199	true	265.00	6.0	Cast iron	70.0	Open	2.44	80.89	203.97	0.00	203.97	0.00	0.03
P-200	true	255.00	6.0	Cast iron	70.0	Open	-2.61	80.89	203.97	0.00	203.97	0.00	0.03
P-201	true	280.00	6.0	Cast iron	70.0	Open	6.97	80.89	203.98	0.01	203.97	0.02	0.08
P-202	true	270.00	6.0	Cast iron	70.0	Open	9.29	80.03	203.99	0.01	203.98	0.04	0.11
P-203	true	270.00	6.0	Cast iron	70.0	Open	10.05	79.60	204.00	0.01	203.99	0.05	0.11
P-204	true	315.00	4.0	Cast iron	70.0	Open	-5.20	78.74	203.97	0.03	204.00	0.10	0.13
P-205	true	235.00	6.0	Cast iron	135.0	Open	-1.61	79.60	203.97	0.00	203.97	0.00	0.02
P-206	true	270.00	6.0	Cast iron	135.0	Open	1.98	80.03	203.97	0.00	203.97	0.00	0.02
P-207	true	275.00	6.0	Cast iron	70.0	Open	2.82	80.46	203.97	0.00	203.97	0.00	0.03
P-208	true	270.00	6.0	Cast iron	135.0	Open	-0.26	80.46	203.97	0.00	203.97	0.00	0.00
P-209	true	270.00	6.0	Cast iron	135.0	Open	2.53	81.33	203.97	0.00	203.97	0.00	0.03
P-210	true	275.00	12.0	Cast iron	135.0	Open	4.71	81.33	203.97	0.00	203.97	0.00	0.01
P-211	true	270.00	6.0	Cast iron	70.0	Open	0.69	81.76	203.97	0.00	203.97	0.00	0.01
P-212	true	270.00	6.0	Cast iron	70.0	Open	2.29	81.33	203.97	0.00	203.97	0.00	0.03
P-213	true	535.00	6.0	Ductile Iron	130.0	Open	11.45	80.46	203.98	0.01	203.97	0.02	0.13
P-214	true	280.00	6.0	Ductile Iron	130.0	Open	13.85	79.60	203.99	0.01	203.98	0.03	0.16
P-215	true	390.00	6.0	Cast iron	70.0	Open	-4.74	80.46	203.97	0.00	203.97	0.01	0.05
P-216	true	395.00	12.0	Ductile Iron	135.0	Open	8.53	81.76	203.97	0.00	203.97	0.00	0.02
P-217	true	270.00	6.0	Cast iron	130.0	Open	-3.32	81.76	203.97	0.00	203.97	0.00	0.04
P-218	true	300.00	6.0	Cast iron	150.0	Open	-17.67	82.19	203.96	0.01	203.97	0.03	0.20

Scenario: 2034 Peak Demand
Steady State Analysis
Pipe Report

Label	Open?	Length (ft)	Diam (in)	Material	Hazen-Williams C	Control Status	Discharge (gpm)	Dwnstrm Calc Press (psi)	Upstrm Struct Hyd Grd (ft)	Pressu Pipe Hdloss (ft)	Dwnstrm Strc Hyd Grade (ft)	Headloss Gradient (ft/1000ft)	Velocity (ft/s)
P-219	true	250.00	6.0	Cast iron	150.0	Open	-16.54	81.75	203.95	0.01	203.96	0.03	0.19
P-220	true	115.00	6.0	Cast iron	130.0	Open	-13.82	82.18	203.95	0.00	203.95	0.03	0.16
P-221	true	750.00	6.0	Cast iron	130.0	Open	4.88	82.18	203.95	0.00	203.95	0.00	0.06
P-222	true	425.00	6.0	Cast iron	130.0	Open	-17.16	82.18	203.93	0.02	203.95	0.04	0.19
P-223	true	260.00	6.0	Cast iron	130.0	Open	-5.83	81.31	203.93	0.00	203.93	0.01	0.07
P-224	true	210.00	2.0	PVC	150.0	Open	-2.57	80.44	203.89	0.04	203.93	0.19	0.26
P-225	true	180.00	2.0	PVC	150.0	Open	-2.07	80.44	203.91	0.02	203.93	0.13	0.21
P-226	true	150.00	2.0	PVC	150.0	Open	-0.47	80.00	203.91	0.00	203.91	0.01	0.05
P-227	true	80.00	8.0	PVC	150.0	Open	21.33	80.43	203.89	0.00	203.89	0.01	0.14
P-228	true	60.00	8.0	PVC	150.0	Open	2.26	79.99	203.89	0.00	203.89	0.00	0.01
P-229	true	55.00	2.0	PVC	150.0	Open	-2.26	80.00	203.89	0.01	203.90	0.15	0.23
P-230	true	25.00	2.0	PVC	150.0	Open	3.06	80.00	203.91	0.01	203.90	0.26	0.31
P-231	true	550.00	6.0	Cast iron	70.0	Open	6.08	80.00	203.92	0.01	203.91	0.02	0.07
P-232	true	270.00	6.0	Cast iron	70.0	Open	13.66	80.01	203.94	0.02	203.92	0.08	0.15
P-233	true	300.00	6.0	Cast iron	70.0	Open	15.25	80.45	203.97	0.03	203.94	0.10	0.17
P-234	true	295.00	6.0	Cast iron	135.0	Open	2.92	81.76	203.97	0.00	203.97	0.00	0.03
P-235	true	205.00	6.0	PVC	150.0	Open	6.07	82.62	203.95	0.00	203.95	0.00	0.07
P-236	true	185.00	6.0	PVC	150.0	Open	-7.27	81.75	203.95	0.00	203.96	0.01	0.08
P-237	true	200.00	6.0	PVC	150.0	Open	-1.50	81.75	203.96	0.00	203.96	0.00	0.02
p-238	true	260.00	6.0	PVC	150.0	Open	10.76	81.75	203.96	0.00	203.96	0.01	0.12
P-239	true	365.00	6.0	PVC	150.0	Open	-0.30	81.75	203.96	0.00	203.96	0.00	0.00
P-240	true	275.00	4.0	Cast iron	70.0	Open	-1.69	82.19	203.96	0.00	203.96	0.01	0.04
P-241	true	565.00	6.0	PVC	150.0	Open	0.26	82.19	203.96	0.00	203.96	0.00	0.00
P-242	true	210.00	4.0	Cast iron	70.0	Open	3.83	82.19	203.97	0.01	203.96	0.06	0.10
P-243	true	260.00	12.0	Cast iron	130.0	Open	17.28	81.76	203.97	0.00	203.97	0.00	0.05
P-244	true	580.00	12.0	Cast iron	130.0	Open	-29.00	80.03	203.97	0.00	203.97	0.00	0.08
P-245	true	475.00	6.0	PVC	150.0	Open	-17.00	80.03	203.96	0.01	203.97	0.03	0.19
P-246	true	480.00	12.0	Cast iron	130.0	Open	49.40	80.03	203.98	0.00	203.97	0.01	0.14
P-247	true	360.00	6.0	Cast iron	70.0	Open	-7.63	79.17	203.97	0.01	203.98	0.03	0.09
P-248	true	260.00	6.0	Cast iron	70.0	Open	-1.64	79.16	203.97	0.00	203.97	0.00	0.02
P-249	true	90.00	12.0	Cast iron	130.0	Open	61.01	79.17	203.98	0.00	203.98	0.01	0.17
P-250	true	290.00	12.0	Cast iron	130.0	Open	-63.81	80.03	203.98	0.00	203.98	0.02	0.18
P-251	true	650.00	8.0	PVC	150.0	Open	-7.97	83.04	203.94	0.00	203.94	0.00	0.05
P-252	true	650.00	12.0	PVC	150.0	Open	-85.33	83.06	203.96	0.01	203.97	0.02	0.24
P-253	true	400.00	12.0	PVC	150.0	Open	-84.94	83.05	203.95	0.01	203.96	0.02	0.24
P-254	true	400.00	8.0	PVC	150.0	Open	-7.57	83.04	203.94	0.00	203.94	0.00	0.05
P-255	true	500.00	8.0	PVC	150.0	Open	-6.38	83.04	203.94	0.00	203.94	0.00	0.04
P-256	true	100.00	8.0	PVC	150.0	Open	-4.85	82.18	203.94	0.00	203.94	0.00	0.03
P-257	true	500.00	12.0	PVC	150.0	Open	-81.12	83.48	203.94	0.01	203.95	0.02	0.23
P-258	true	500.00	12.0	PVC	150.0	Open	-85.17	82.18	203.93	0.01	203.94	0.02	0.24
P-259	true	250.00	12.0	PVC	150.0	Open	-83.66	81.74	203.92	0.00	203.93	0.02	0.24
P-260	true	250.00	12.0	PVC	150.0	Open	-81.37	81.74	203.92	0.00	203.92	0.02	0.23
P-261	true	100.00	8.0	PVC	135.0	Open	-55.92	81.74	203.91	0.01	203.92	0.08	0.36
P-262	true	695.00	8.0	PVC	150.0	Open	-24.25	81.74	203.91	0.01	203.92	0.01	0.15
P-263	true	690.00	12.0	PVC	150.0	Open	-54.73	81.73	203.91	0.01	203.91	0.01	0.16
P-264	true	405.00	12.0	PVC	150.0	Open	-52.11	83.03	203.90	0.00	203.91	0.01	0.15
P-265	true	530.00	8.0	PVC	150.0	Open	-23.45	83.03	203.90	0.01	203.91	0.01	0.15
P-266	true	900.00	12.0	PVC	150.0	Open	-50.12	83.03	203.90	0.01	203.90	0.01	0.14
P-267	true	100.00	12.0	PVC	135.0	Open	-45.70	82.16	203.89	0.00	203.90	0.01	0.13
P-268	true	900.00	8.0	PVC	150.0	Open	-19.06	83.03	203.89	0.01	203.90	0.01	0.12
P-269	true	490.00	8.0	PVC	150.0	Open	-35.39	81.73	203.88	0.01	203.89	0.03	0.23
P-270	true	805.00	8.0	PVC	150.0	Open	-8.62	80.85	203.88	0.00	203.88	0.00	0.05
P-271	true	810.00	8.0	PVC	150.0	Open	-28.97	81.73	203.88	0.02	203.89	0.02	0.18

Scenario: 2034 Peak Demand
Steady State Analysis
Pipe Report

Label	Open?	Length (ft)	Diam (in)	Material	Hazen-Williams C	Control Status	Discharge (gpm)	Dwnstrm Calc Press (psi)	Upstrm Struct Hyd Grd (ft)	Pressu Pipe Hdloss (ft)	Dwnstrm Strc Hyd Grade (ft)	Headloss Gradient (ft/1000ft)	Velocity (ft/s)
P-272	true	528.00	8.0	PVC	150.0	Open	-4.20	79.56	203.88	0.00	203.88	0.00	0.03
P-273	true	320.00	8.0	PVC	150.0	Open	-20.60	80.42	203.88	0.00	203.88	0.01	0.13
P-274	true	425.00	18.0	Ductile Iron	135.0	Open	38.59	79.61	204.01	0.00	204.01	0.00	0.05
P-275	true	535.00	18.0	Ductile Iron	135.0	Open	53.20	79.61	204.01	0.00	204.01	0.00	0.07
P-276	true	950.00	12.0	Ductile Iron	135.0	Open	-12.28	79.61	204.01	0.00	204.01	0.00	0.03
P-277	true	540.00	12.0	Ductile Iron	120.0	Open	-48.46	80.48	204.01	0.01	204.02	0.01	0.14
P-278	true	800.00	18.0	Ductile Iron	120.0	Open	17.02	79.61	204.01	0.00	204.01	0.00	0.02
P-279	true	1,100.00	18.0	Ductile Iron	120.0	Open	21.41	79.61	204.01	0.00	204.01	0.00	0.03
P-280	true	1,200.00	12.0	Ductile Iron	135.0	Open	-6.69	79.61	204.01	0.00	204.01	0.00	0.02
P-281	true	1,340.00	24.0	Ductile Iron	120.0	Open	-190.55	79.61	204.00	0.01	204.01	0.00	0.14
P-282	true	700.00	10.0	Ductile Iron	135.0	Open	-3.19	79.61	204.01	0.00	204.01	0.00	0.01
P-283	true	1,100.00	8.0	Ductile Iron	135.0	Open	0.00	79.61	204.01	0.00	204.01	0.00	0.00
P-284	false	270.00	18.0	Ductile Iron	135.0	Closed	0.00	79.61	0.00	0.00	204.01	0.00	0.00
P-285	false	2,575.00	18.0	Ductile Iron	135.0	Closed	0.00	-8.65	203.99	0.00	0.00	0.00	0.00
P-286	true	290.00	6.0	PVC	150.0	Open	2.72	79.22	204.09	0.00	204.09	0.00	0.03
P-288	false	2,475.00	14.0	Ductile Iron	130.0	Closed	0.00	79.61	203.90	0.00	204.00	0.00	0.00
P-290	true	340.00	24.0	Ductile Iron	135.0	Open	-156.79	73.11	203.99	0.00	203.99	0.00	0.11
P-291	true	2,845.00	24.0	Ductile Iron	135.0	Open	-151.36	73.11	203.98	0.01	203.99	0.00	0.11
P-292	true	4,265.00	10.0	Ductile Iron	130.0	Open	-43.88	81.33	203.90	0.08	203.98	0.02	0.18
P-301	true	280.00	12.0	Ductile Iron	150.0	Open	-76.28	78.31	203.99	0.00	204.00	0.02	0.22
P-302	true	265.00	12.0	Ductile Iron	150.0	Open	-73.96	79.60	203.99	0.00	203.99	0.02	0.21
P-303	true	275.00	12.0	Ductile Iron	150.0	Open	-72.02	79.60	203.98	0.00	203.99	0.01	0.20
P-304	true	260.00	6.0	Ductile Iron	150.0	Open	-0.75	79.60	203.98	0.00	203.98	0.00	0.01
P-308	true	300.00	10.0	Ductile Iron	150.0	Open	-14.41	81.77	203.99	0.00	203.99	0.00	0.06
P-309	true	315.00	10.0	Ductile Iron	150.0	Open	-13.62	82.20	203.99	0.00	203.99	0.00	0.06
P-310	true	275.00	10.0	Ductile Iron	150.0	Open	-13.11	81.77	203.99	0.00	203.99	0.00	0.05
P-311	true	270.00	10.0	Ductile Iron	150.0	Open	-8.68	82.63	203.99	0.00	203.99	0.00	0.04
P-312	true	270.00	6.0	PVC	150.0	Open	-7.17	82.63	203.99	0.00	203.99	0.01	0.08
P-314	true	300.00	6.0	Ductile Iron	130.0	Open	-0.69	78.74	203.99	0.00	203.99	0.00	0.01
P-315	true	300.00	4.0	Cast iron	135.0	Open	2.53	79.17	203.99	0.00	203.98	0.01	0.06
P-318	true	255.00	12.0	Ductile Iron	150.0	Open	-1.81	79.60	203.97	0.00	203.97	0.00	0.01
P-319	true	280.00	6.0	Cast iron	130.0	Open	-9.61	80.46	203.97	0.00	203.97	0.01	0.11
P-336	true	285.00	6.0	Cast iron	70.0	Open	-5.63	83.06	203.98	0.00	203.99	0.02	0.06
P-338	true	275.00	6.0	Ductile Iron	130.0	Open	45.77	75.46	204.47	0.07	204.40	0.25	0.52
P-400	false	5,645.00	16.0	Ductile Iron	130.0	Closed	0.00	-16.01	203.98	0.00	0.00	0.00	0.00
P-401	false	5,645.00	12.0	Ductile Iron	130.0	Closed	0.00	81.33	203.97	0.00	203.98	0.00	0.00
P-402	false	165.00	16.0	Ductile Iron	130.0	Closed	0.00	-16.44	0.00	0.00	0.00	0.00	0.00
P-403	true	150.00	16.0	Ductile Iron	130.0	Open	-49.25	71.81	203.97	0.00	203.97	0.00	0.08
P-404	true	850.00	16.0	Ductile Iron	130.0	Open	-49.25	69.65	203.97	0.00	203.98	0.00	0.08
P-405	false	545.00	16.0	Ductile Iron	130.0	Closed	0.00	70.94	0.00	0.00	203.97	0.00	0.00
P-406	true	775.00	16.0	Ductile Iron	130.0	Open	-0.68	68.35	203.97	0.00	203.97	0.00	0.00
P-407	true	3,890.00	16.0	Ductile Iron	130.0	Open	-31.93	53.21	203.97	0.00	203.98	0.00	0.05
P-408	true	370.00	16.0	Ductile Iron	130.0	Open	-31.93	44.12	203.98	0.00	203.98	0.00	0.05
P-409	true	120.00	16.0	Ductile Iron	130.0	Open	-31.93	47.58	203.98	0.00	203.98	0.00	0.05
P-410	true	740.00	24.0	Ductile Iron	130.0	Open	-103.60	41.96	203.98	0.00	203.98	0.00	0.07
P-411	true	165.00	24.0	Ductile Iron	130.0	Open	-114.50	38.93	203.98	0.00	203.98	0.00	0.08
P-412	true	640.00	12.0	Ductile Iron	130.0	Open	52.99	34.60	203.98	0.01	203.97	0.01	0.15
P-413	true	2,635.00	24.0	Ductile Iron	130.0	Open	-167.49	36.77	203.98	0.01	203.99	0.00	0.12
P-414	true	1,800.00	24.0	Ductile Iron	130.0	Open	-167.49	20.77	203.99	0.01	203.99	0.00	0.12
P-415	true	1,025.00	24.0	Ductile Iron	130.0	Open	-167.49	15.57	203.99	0.00	204.00	0.00	0.12
P-416	true	575.00	24.0	Ductile Iron	130.0	Open	-167.49	3.03	204.00	0.00	204.00	0.00	0.12
P-417	true	4,805.00	24.0	Ductile Iron	130.0	Open	-71.67	47.58	203.98	0.00	203.98	0.00	0.05
P-419	true	40.00	6.0	Ductile Iron	70.0	Open	-15.92	78.31	204.00	0.00	204.01	0.11	0.18

Scenario: 2034 Peak Demand
Steady State Analysis
Pipe Report

Label	Open?	Length (ft)	Diam (in)	Material	Hazen-Williams C	Control Status	Discharge (gpm)	Dwnstrm Calc Press (psi)	Upstrm Struct Hyd Grd (ft)	Pressu Pipe Hdloss (ft)	Dwnstrm Strc Hyd Grade (ft)	Headloss Gradient (ft/1000ft)	Velocity (ft/s)
P-420	true	225.00	16.0	Ductile Iron	135.0	Open	10.31	78.31	204.01	0.00	204.01	0.00	0.02
P-421	true	255.00	16.0	Ductile Iron	135.0	Open	26.23	78.31	204.01	0.00	204.01	0.00	0.04
P-423	true	70.00	10.0	Galvanized i	100.0	Open	742.29	-0.17	9.00	0.40	8.60	5.77	3.03
P-424	true	20.00	8.0	Ductile Iron	150.0	Open	918.57	73.52	207.17	0.24	206.93	11.97	5.86
P-425	true	80.00	8.0	Galvanized i	150.0	Open	918.57	-0.41	-2.00	0.96	-2.96	11.97	5.86
P-426	true	260.00	12.0	Ductile Iron	130.0	Open	-55.99	80.46	203.97	0.00	203.97	0.01	0.16
P-427	true	540.00	12.0	Ductile Iron	130.0	Open	-66.99	79.60	203.97	0.01	203.98	0.02	0.19
P-428	true	595.00	12.0	Ductile Iron	130.0	Open	-310.27	73.79	205.38	0.17	205.55	0.29	0.88
P-429	true	975.00	6.0	Cast iron	130.0	Open	23.06	80.86	203.97	0.07	203.90	0.07	0.26
P-430	true	185.00	6.0	PVC	150.0	Open	23.06	79.99	203.90	0.01	203.89	0.05	0.26
P-431	true	270.00	12.0	PVC	150.0	Open	181.21	80.50	204.08	0.02	204.06	0.08	0.51
P-432	true	430.00	12.0	PVC	150.0	Open	171.71	80.48	204.06	0.03	204.03	0.07	0.49
P-433	true	225.00	6.0	Ductile Iron	130.0	Open	-9.50	80.50	204.05	0.00	204.06	0.01	0.11
P-434	true	480.00	12.0	Ductile Iron	130.0	Open	-170.48	75.77	204.08	0.05	204.13	0.10	0.48
P-435	true	310.00	12.0	Ductile Iron	130.0	Open	-170.48	75.78	204.13	0.03	204.16	0.10	0.48
P-436	true	795.00	12.0	Ductile Iron	130.0	Open	342.51	69.87	205.76	0.28	205.48	0.35	0.97
P-437	true	435.00	12.0	Ductile Iron	130.0	Open	262.95	67.66	205.48	0.09	205.39	0.21	0.75
P-438	true	255.00	12.0	Ductile Iron	130.0	Open	19.21	81.76	203.97	0.00	203.97	0.00	0.05
P-439	true	275.00	12.0	Ductile Iron	130.0	Open	4.49	82.19	203.97	0.00	203.97	0.00	0.01
P-440	true	395.00	12.0	Ductile Iron	130.0	Open	-11.45	81.76	203.97	0.00	203.97	0.00	0.03
P-441	true	255.00	12.0	Ductile Iron	130.0	Open	-66.97	80.04	203.98	0.00	203.99	0.02	0.19
P-442	true	800.00	12.0	Ductile Iron	130.0	Open	-66.97	80.04	203.99	0.01	204.00	0.02	0.19
P-443	true	45.00	24.0	Ductile Iron	130.0	Open	-167.49	8.22	204.00	0.00	204.00	0.00	0.12
P-445	true	4,125.00	24.0	Ductile Iron	130.0	Open	10.91	61.86	203.98	0.00	203.98	0.00	0.01
P-446	true	2,100.00	24.0	Ductile Iron	130.0	Open	1.97	67.05	203.98	0.00	203.98	0.00	0.00
P-447	true	2,600.00	24.0	Ductile Iron	130.0	Open	-6.96	75.71	203.98	0.00	203.98	0.00	0.00
P-448	true	1,305.00	24.0	Ductile Iron	130.0	Open	-20.36	76.14	203.98	0.00	203.98	0.00	0.01
P-449	true	5,800.00	24.0	Ductile Iron	130.0	Open	-65.01	81.33	203.98	0.00	203.98	0.00	0.05
P-450	true	2.00	24.0	Ductile Iron	130.0	Open	-115.01	81.33	203.98	0.00	203.98	0.00	0.08
P-451	true	4,470.00	24.0	Ductile Iron	130.0	Open	-153.33	79.61	203.99	0.01	204.00	0.00	0.11
P-452	true	6,160.00	12.0	Ductile Iron	130.0	Open	-65.97	75.32	203.99	0.10	204.09	0.02	0.19
P-453	true	7,375.00	12.0	Ductile Iron	130.0	Open	-124.08	66.84	204.09	0.39	204.49	0.05	0.35
P-454	true	1,205.00	24.0	Ductile Iron	130.0	Open	-258.58	62.08	204.49	0.01	204.49	0.01	0.18
P-455	true	3,320.00	12.0	Ductile Iron	130.0	Open	-298.77	67.66	204.49	0.90	205.39	0.27	0.85
P-456	true	840.00	12.0	Ductile Iron	130.0	Open	73.03	67.66	205.41	0.02	205.39	0.02	0.21
P-457	true	90.00	24.0	Ductile Iron	130.0	Open	0.00	2.16	247.00	0.00	247.00	0.00	0.00
P-458	false	70.00	24.0	Ductile Iron	130.0	Closed	0.00	8.22	247.00	0.00	204.00	0.00	0.00
P-459	true	490.00	12.0	Ductile Iron	130.0	Open	-50.44	77.02	204.01	0.00	204.01	0.01	0.14
P-460	true	275.00	6.0	Ductile Iron	130.0	Open	-31.77	77.03	204.01	0.03	204.05	0.12	0.36
P-461	true	155.00	6.0	Ductile Iron	130.0	Open	-18.67	76.59	204.01	0.01	204.02	0.05	0.21
P-462	true	85.00	12.0	Ductile Iron	130.0	Open	65.48	79.61	204.01	0.00	204.01	0.02	0.19
P-463	true	575.00	6.0	Ductile Iron	130.0	Open	-240.87	75.74	204.00	3.05	207.05	5.31	2.73
P-464	true	100.00	12.0	Ductile Iron	130.0	Open	-65.29	79.61	204.00	0.00	204.00	0.02	0.19
P-466	true	30.00	6.0	Ductile Iron	130.0	Open	-392.82	88.43	204.00	0.39	204.39	13.14	4.46
P-467	true	100.00	6.0	Ductile Iron	130.0	Open	-92.82	66.84	204.39	0.09	204.49	0.91	1.05
P-468	true	5.00	6.0	Ductile Iron	130.0	Open	300.00	106.85	247.00	0.04	246.96	7.98	3.40
P-469	true	5.00	6.0	Ductile Iron	130.0	Open	300.00	88.43	204.43	0.04	204.39	7.98	3.40
P-470	true	815.00	12.0	Ductile Iron	130.0	Open	-79.56	74.57	205.34	0.02	205.36	0.02	0.23
P-471	true	1,265.00	12.0	Ductile Iron	130.0	Open	-79.56	71.56	205.36	0.03	205.39	0.02	0.23
P-472	true	1,620.00	12.0	Ductile Iron	130.0	Open	-79.56	69.84	205.39	0.04	205.43	0.02	0.23
P-473	true	1,110.00	12.0	Ductile Iron	130.0	Open	-79.56	70.72	205.43	0.03	205.45	0.02	0.23
P-474	true	1,425.00	12.0	Ductile Iron	130.0	Open	-79.56	69.87	205.45	0.03	205.48	0.02	0.23

Scenario: 2034 Peak Demand
Steady State Analysis
Junction Report

Label	Type	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Demand Summary
J-1	Demand	32.00	0.00	0.00	207.05	75.74	Simple
J-2	Demand	36.00	0.40	0.40	206.55	73.79	Simple
J-3	Demand	40.00	29.53	29.53	205.97	71.81	Simple
J-4	Demand	44.00	6.62	6.62	205.41	69.83	Composite
J-5	Demand	44.00	2.40	2.40	205.42	69.84	Simple
J-6	Demand	37.00	0.40	0.40	206.47	73.32	Simple
J-7	Demand	36.00	3.99	3.99	206.55	73.79	Simple
J-8	Demand	37.00	0.00	0.00	206.93	73.52	Simple
J-10	Demand	37.00	0.40	0.40	206.82	73.47	Simple
J-11	Demand	31.00	13.96	13.96	206.10	75.76	Simple
J-12	Demand	27.00	5.19	5.19	205.99	77.44	Simple
J-13	Demand	25.00	4.79	4.79	205.78	78.22	Simple
J-14	Demand	29.00	5.98	5.98	205.74	76.47	Simple
J-15	Demand	22.00	7.98	7.98	205.57	79.42	Simple
J-16	Demand	21.00	7.58	7.58	205.55	79.84	Simple
J-17	Demand	28.00	13.57	13.57	205.58	76.83	Simple
J-18	Demand	37.00	5.98	5.98	206.29	73.24	Simple
J-19	Demand	37.00	5.06	5.06	205.73	73.00	Composite
J-20	Demand	41.00	7.32	7.32	205.40	71.13	Composite
J-21	Demand	40.00	3.47	3.47	205.40	71.56	Composite
J-22	Demand	35.00	7.41	7.41	205.55	73.79	Composite
J-23	Demand	40.00	4.08	4.08	205.38	71.55	Simple
J-24	Demand	26.00	9.77	9.77	205.34	77.59	Composite
J-25	Demand	22.00	0.80	0.80	204.78	79.08	Simple
J-26	Demand	20.00	0.40	0.40	204.35	79.76	Simple
J-27	Demand	20.00	1.53	1.53	204.20	79.69	Composite
J-28	Demand	17.00	0.00	0.00	204.15	80.97	Simple
J-29	Demand	17.00	0.40	0.40	204.14	80.97	Simple
J-30	Demand	21.00	3.11	3.11	204.14	79.24	Composite
J-31	Demand	21.00	3.19	3.19	204.10	79.22	Simple
J-32	Demand	18.00	1.99	1.99	204.10	80.52	Simple
J-33	Demand	16.00	1.53	1.53	204.06	81.36	Composite
J-34	Demand	18.00	0.80	0.80	204.04	80.49	Simple
J-35	Demand	18.00	1.19	1.19	204.03	80.48	Simple
J-36	Demand	22.00	4.39	4.39	204.14	78.80	Simple
J-37	Demand	24.00	6.38	6.38	204.14	77.94	Simple
J-38	Demand	21.00	2.79	2.79	204.14	79.24	Simple
J-39	Demand	25.00	6.38	6.38	204.14	77.51	Simple
J-40	Demand	28.00	5.98	5.98	204.14	76.21	Simple
J-41	Demand	29.00	8.19	8.19	204.15	75.78	Composite
J-42	Demand	29.00	5.19	5.19	204.15	75.78	Simple
J-43	Demand	26.00	3.59	3.59	204.09	77.05	Simple
J-44	Demand	21.00	3.59	3.59	204.09	79.22	Simple
J-45	Demand	26.00	2.79	2.79	204.09	77.05	Simple
J-46	Demand	26.00	1.92	1.92	204.10	77.05	Composite
J-47	Demand	26.00	4.67	4.67	204.11	77.06	Composite
J-48	Demand	26.00	2.71	2.71	204.08	77.05	Composite
J-49	Demand	30.00	3.49	3.49	204.15	75.35	Composite
J-50	Demand	29.00	4.79	4.79	204.20	75.80	Simple
J-51	Demand	28.00	4.67	4.67	204.35	76.30	Composite
J-52	Demand	30.00	2.40	2.40	204.40	75.46	Simple
J-53	Demand	31.00	1.90	1.90	204.47	75.05	Composite
J-54	Demand	30.00	5.15	5.15	204.65	75.56	Simple
J-55	Demand	34.00	4.21	4.21	204.86	73.92	Composite

Scenario: 2034 Peak Demand
Steady State Analysis
Junction Report

Label	Type	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Demand Summary
J-56	Demand	38.00	51.63	51.63	205.09	72.29	Simple
J-57	Demand	30.00	2.32	2.32	204.37	75.44	Composite
J-58	Demand	32.00	31.33	31.33	204.12	74.47	Composite
J-59	Demand	30.00	2.33	2.33	204.12	75.33	Composite
J-60	Demand	29.00	2.79	2.79	204.21	75.80	Simple
J-61	Demand	29.00	3.50	3.50	204.16	75.78	Composite
J-62	Demand	28.00	3.10	3.10	204.09	76.19	Composite
J-63	Demand	29.00	1.15	1.15	204.16	75.78	Composite
J-64	Demand	28.00	1.60	1.60	204.12	76.20	Simple
J-65	Demand	27.00	1.90	1.90	204.06	76.60	Composite
J-66	Demand	26.00	1.19	1.19	204.08	77.05	Simple
J-67	Demand	27.00	1.99	1.99	204.08	76.61	Simple
J-68	Demand	25.00	2.72	2.72	204.07	77.48	Composite
J-69	Demand	27.00	0.80	0.80	204.02	76.59	Simple
J-70	Demand	26.00	4.42	4.42	204.01	77.02	Simple
J-71	Demand	25.00	1.19	1.19	204.01	77.45	Simple
J-72	Demand	26.00	1.19	1.19	204.05	77.03	Simple
J-73	Demand	26.00	1.99	1.99	204.06	77.04	Simple
J-74	Demand	24.00	1.60	1.60	204.03	77.89	Simple
J-75	Demand	24.00	1.19	1.19	204.03	77.89	Simple
J-76	Demand	24.00	1.60	1.60	204.04	77.89	Simple
J-77	Demand	25.00	1.15	1.15	204.05	77.47	Composite
J-78	Demand	24.00	1.54	1.54	204.05	77.90	Composite
J-79	Demand	24.00	1.19	1.19	204.03	77.89	Simple
J-80	Demand	24.00	3.59	3.59	204.05	77.90	Simple
J-82	Demand	23.00	1.54	1.54	204.03	78.32	Composite
J-83	Demand	22.00	1.19	1.19	204.03	78.76	Simple
J-84	Demand	23.00	3.88	3.88	204.05	78.33	Composite
J-85	Demand	24.00	3.59	3.59	204.07	77.91	Simple
J-86	Demand	22.00	2.72	2.72	204.05	78.76	Composite
J-87	Demand	20.00	2.40	2.40	204.05	79.63	Simple
J-88	Demand	20.00	2.79	2.79	204.07	79.64	Simple
J-89	Demand	18.00	1.94	1.94	204.08	80.51	Composite
J-90	Demand	20.00	1.60	1.60	204.03	79.62	Simple
J-91	Demand	21.00	1.53	1.53	204.03	79.19	Composite
J-92	Demand	19.00	0.40	0.40	204.02	80.05	Simple
J-93	Demand	18.00	1.19	1.19	204.02	80.48	Simple
J-94	Demand	22.00	1.51	1.51	204.02	78.75	Composite
J-95	Demand	22.00	1.51	1.51	204.02	78.75	Composite
J-96	Demand	22.00	1.54	1.54	204.02	78.75	Composite
J-97	Demand	18.00	1.15	1.15	204.02	80.48	Composite
J-98	Demand	20.00	1.15	1.15	204.01	79.61	Composite
J-99	Demand	23.00	3.49	3.49	204.02	78.32	Composite
J-100	Demand	23.00	1.88	1.88	204.02	78.32	Composite
J-101	Demand	23.00	1.99	1.99	204.02	78.32	Simple
J-102	Demand	24.00	3.40	3.40	204.02	77.89	Simple
J-103	Demand	25.00	1.60	1.60	204.01	77.45	Simple
J-104	Demand	20.00	0.80	0.80	203.98	79.60	Simple
J-105	Demand	15.00	0.80	0.80	203.99	81.77	Simple
J-106	Demand	24.00	1.19	1.19	204.00	77.88	Simple
J-107	Demand	25.00	0.80	0.80	204.00	77.45	Simple
J-108	Demand	23.00	0.79	0.79	204.01	78.31	Simple
J-109	Demand	25.00	0.80	0.80	203.99	77.44	Simple
J-110	Demand	23.00	1.52	1.52	204.00	78.31	Simple

Scenario: 2034 Peak Demand
Steady State Analysis
Junction Report

Label	Type	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Demand Summary
J-111	Demand	24.00	0.80	0.80	204.00	77.88	Simple
J-112	Demand	21.00	0.00	0.00	204.01	79.18	Simple
J-113	Demand	20.00	1.60	1.60	203.99	79.60	Simple
J-114	Demand	20.00	2.72	2.72	204.01	79.61	Composite
J-115	Demand	20.00	3.19	3.19	204.01	79.61	Simple
J-116	Demand	20.00	0.76	0.76	204.01	79.61	Composite
J-117	Demand	21.00	3.19	3.19	204.01	79.18	Simple
J-118	Demand	20.00	3.11	3.11	204.01	79.61	Composite
J-119	Demand	20.00	2.32	2.32	204.00	79.61	Composite
J-120	Demand	19.00	2.72	2.72	204.01	80.04	Composite
J-121	Demand	20.00	2.33	2.33	204.00	79.61	Composite
J-122	Demand	20.00	3.19	3.19	203.99	79.61	Simple
J-123	Demand	19.00	3.59	3.59	204.01	80.04	Simple
J-124	Demand	19.00	4.79	4.79	204.00	80.04	Simple
J-125	Demand	18.00	2.32	2.32	204.01	80.48	Composite
J-126	Demand	19.00	8.78	8.78	204.00	80.04	Simple
J-127	Demand	20.00	0.00	0.00	204.00	79.61	Simple
J-132	Demand	19.00	5.83	5.83	203.99	80.03	Simple
J-133	Demand	19.00	5.59	5.59	203.98	80.03	Simple
J-134	Demand	21.00	2.79	2.79	203.98	79.17	Simple
J-136	Demand	21.00	3.99	3.99	203.98	79.17	Simple
J-137	Demand	21.00	5.98	5.98	203.97	79.16	Simple
J-138	Demand	19.00	6.39	6.39	203.97	80.03	Simple
J-139	Demand	19.00	3.40	3.40	203.97	80.03	Simple
J-140	Demand	16.00	3.19	3.19	203.97	81.33	Simple
J-141	Demand	17.00	5.98	5.98	203.96	80.89	Simple
J-142	Demand	14.00	2.40	2.40	203.96	82.19	Simple
J-143	Demand	15.00	1.99	1.99	203.97	81.76	Simple
J-144	Demand	13.00	1.99	1.99	203.96	82.62	Simple
J-145	Demand	15.00	1.19	1.19	203.96	81.75	Simple
J-146	Demand	15.00	1.99	1.99	203.96	81.75	Simple
J-147	Demand	15.00	1.19	1.19	203.95	81.75	Simple
J-148	Demand	13.00	1.19	1.19	203.95	82.62	Simple
J-150	Demand	15.00	1.19	1.19	203.97	81.76	Simple
J-151	Demand	14.00	1.60	1.60	203.97	82.19	Simple
J-152	Demand	15.00	1.13	1.13	203.96	81.75	Simple
J-153	Demand	14.00	2.72	2.72	203.95	82.18	Composite
J-154	Demand	14.00	1.54	1.54	203.95	82.18	Composite
J-155	Demand	16.00	11.33	11.33	203.93	81.31	Simple
J-156	Demand	18.00	1.19	1.19	203.93	80.44	Simple
J-158	Demand	16.00	1.60	1.60	203.97	81.33	Simple
J-159	Demand	18.00	1.60	1.60	203.97	80.46	Simple
J-160	Demand	20.00	2.40	2.40	203.98	79.60	Simple
J-161	Demand	20.00	3.59	3.59	203.97	79.60	Simple
J-162	Demand	18.00	3.19	3.19	203.97	80.46	Simple
J-163	Demand	16.00	2.79	2.79	203.97	81.33	Simple
J-164	Demand	19.00	3.59	3.59	203.97	80.03	Simple
J-165	Demand	16.00	3.19	3.19	203.97	81.33	Simple
J-166	Demand	15.00	2.40	2.40	203.97	81.76	Simple
J-167	Demand	18.00	1.60	1.60	203.94	80.45	Simple
J-168	Demand	19.00	7.58	7.58	203.92	80.01	Simple
J-169	Demand	19.00	3.49	3.49	203.91	80.00	Composite
J-170	Demand	19.00	1.60	1.60	203.91	80.00	Simple
J-171	Demand	18.00	23.90	23.90	203.89	80.43	Simple

Scenario: 2034 Peak Demand
Steady State Analysis
Junction Report

Label	Type	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Demand Summary
J-172	Demand	19.00	3.99	3.99	203.89	79.99	Simple
J-173	Demand	19.00	0.80	0.80	203.90	80.00	Simple
J-174	Demand	19.00	0.00	0.00	203.89	79.99	Simple
J-177	Demand	17.00	2.70	2.70	203.97	80.89	Composite
J-178	Demand	17.00	1.19	1.19	203.97	80.89	Simple
J-179	Demand	19.00	11.89	11.89	203.97	80.03	Simple
J-180	Demand	18.00	1.94	1.94	203.97	80.46	Composite
J-181	Demand	17.00	3.59	3.59	203.97	80.89	Simple
J-182	Demand	17.00	3.59	3.59	203.97	80.89	Simple
J-183	Demand	17.00	1.92	1.92	203.97	80.89	Composite
J-184	Demand	19.00	2.32	2.32	203.98	80.03	Composite
J-185	Demand	20.00	0.76	0.76	203.99	79.60	Composite
J-186	Demand	20.00	2.32	2.32	203.99	79.60	Composite
J-187	Demand	20.00	1.94	1.94	203.99	79.60	Composite
J-188	Demand	20.00	4.29	4.29	203.98	79.60	Composite
J-189	Demand	18.00	3.19	3.19	203.97	80.46	Simple
J-190	Demand	20.00	1.68	1.68	203.97	79.60	Composite
J-191	Demand	20.00	3.19	3.19	203.98	79.60	Simple
J-192	Demand	21.00	1.60	1.60	203.98	79.17	Simple
J-193	Demand	21.00	5.73	5.73	203.98	79.17	Simple
J-194	Demand	22.00	2.72	2.72	203.99	78.74	Composite
J-195	Demand	18.00	0.40	0.40	203.97	80.46	Simple
J-197	Demand	12.00	1.54	1.54	203.99	83.06	Composite
J-198	Demand	13.00	1.51	1.51	203.99	82.63	Composite
J-199	Demand	12.00	0.80	0.80	203.97	83.06	Simple
J-200	Demand	12.00	0.80	0.80	203.94	83.04	Simple
J-201	Demand	12.00	0.40	0.40	203.96	83.05	Simple
J-202	Demand	12.00	0.40	0.40	203.94	83.04	Simple
J-203	Demand	11.00	3.82	3.82	203.95	83.48	Composite
J-204	Demand	12.00	1.19	1.19	203.94	83.04	Simple
J-205	Demand	14.00	1.53	1.53	203.94	82.18	Composite
J-206	Demand	14.00	0.80	0.80	203.94	82.18	Simple
J-207	Demand	15.00	1.51	1.51	203.93	81.74	Composite
J-208	Demand	15.00	2.29	2.29	203.92	81.74	Composite
J-209	Demand	15.00	1.19	1.19	203.92	81.74	Simple
J-210	Demand	15.00	1.19	1.19	203.91	81.73	Simple
J-211	Demand	12.00	2.62	2.62	203.91	83.03	Composite
J-212	Demand	12.00	0.80	0.80	203.91	83.03	Simple
J-213	Demand	12.00	4.39	4.39	203.90	83.03	Simple
J-214	Demand	12.00	1.99	1.99	203.90	83.03	Simple
J-215	Demand	15.00	0.40	0.40	203.89	81.73	Simple
J-216	Demand	14.00	4.42	4.42	203.90	82.16	Simple
J-217	Demand	17.00	26.78	26.78	203.88	80.85	Composite
J-218	Demand	20.00	4.42	4.42	203.88	79.56	Simple
J-219	Demand	18.00	12.57	12.57	203.88	80.42	Simple
J-220	Demand	19.00	20.60	20.60	203.88	79.99	Composite
J-221	Demand	20.00	14.61	14.61	204.01	79.61	Simple
J-222	Demand	20.00	0.00	0.00	204.01	79.61	Simple
J-223	Demand	20.00	0.00	0.00	204.01	79.61	Simple
J-224	Demand	20.00	5.59	5.59	204.01	79.61	Simple
J-225	Demand	20.00	4.39	4.39	204.01	79.61	Simple
J-226	Demand	20.00	0.00	0.00	204.01	79.61	Simple
J-227	Demand	20.00	3.50	3.50	204.01	79.61	Composite
J-228	Demand	20.00	3.19	3.19	204.01	79.61	Simple

Scenario: 2034 Peak Demand
Steady State Analysis
Junction Report

Label	Type	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Demand Summary
J-229	Demand	20.00	37.22	37.22	204.00	79.61	Simple
J-230	Demand	20.00	0.00	0.00	0.00	-8.65	Simple
J-232	Demand	35.00	62.51	62.51	203.99	73.11	Composite
J-233	Demand	35.00	43.88	43.88	203.90	73.08	Composite
J-234	Demand	35.00	5.43	5.43	203.99	73.11	Simple
J-236	Demand	16.00	6.11	6.11	203.98	81.33	Simple
J-237	Demand	16.00	36.34	36.35	203.98	81.33	Simple
J-243	Demand	20.00	0.00	0.00	204.01	79.61	Simple
J-245	Demand	29.00	0.40	0.40	206.16	76.65	Simple
J-246	Demand	43.00	9.57	9.57	205.76	70.42	Simple
J-247	Demand	34.00	4.79	4.79	205.72	74.30	Simple
J-248	Demand	35.00	5.98	5.98	206.11	74.03	Simple
J-249	Demand	22.00	0.00	0.00	204.00	78.74	Simple
J-250	Demand	18.00	0.40	0.40	204.10	80.52	Simple
J-251	Demand	14.00	0.80	0.80	203.99	82.20	Simple
J-252	Demand	15.00	1.19	1.19	203.99	81.77	Simple
J-253	Demand	13.00	1.90	1.90	203.99	82.63	Composite
J-286	Demand	21.00	2.72	2.72	204.09	79.22	Composite
J-298	Demand	37.00	0.00	0.00	0.00	-16.01	Simple
J-299	Demand	37.00	49.25	49.25	203.97	72.24	Simple
J-300	Demand	38.00	0.00	0.00	0.00	-16.44	Simple
J-301	Demand	38.00	0.00	0.00	203.97	71.81	Simple
J-302	Demand	43.00	22.42	22.42	203.98	69.65	Simple
J-303	Demand	40.00	0.68	0.68	203.97	70.94	Simple
J-304	Demand	46.00	31.25	31.25	203.97	68.35	Simple
J-305	Demand	81.00	0.00	0.00	203.98	53.21	Simple
J-306	Demand	102.00	0.00	0.00	203.98	44.12	Simple
J-307	Demand	94.00	0.00	0.00	203.98	47.58	Simple
J-308	Demand	107.00	0.00	0.00	203.98	41.96	Simple
J-309	Demand	114.00	0.00	0.00	203.98	38.93	Simple
J-310	Demand	124.00	52.99	52.99	203.97	34.60	Simple
J-311	Demand	119.00	0.00	0.00	203.99	36.77	Simple
J-312	Demand	156.00	0.00	0.00	203.99	20.77	Simple
J-313	Demand	168.00	0.00	0.00	204.00	15.57	Simple
J-314	Demand	197.00	0.00	0.00	204.00	3.03	Simple
J-315	Demand	23.00	0.00	0.00	204.01	78.31	Simple
J-316	Demand	17.00	0.00	0.00	203.90	80.86	Simple
J-317	Demand	18.00	0.00	0.00	204.06	80.50	Simple
J-318	Demand	29.00	0.00	0.00	204.13	75.77	Simple
J-319	Demand	44.00	0.00	0.00	205.48	69.87	Simple
J-320	Demand	49.00	37.21	37.21	205.39	67.66	Simple
J-321	Demand	19.00	0.00	0.00	203.99	80.04	Simple
J-322	Demand	61.00	8.94	8.94	203.98	61.86	Simple
J-323	Demand	49.00	8.94	8.94	203.98	67.05	Simple
J-324	Demand	29.00	13.40	13.40	203.98	75.71	Simple
J-325	Demand	28.00	44.65	44.65	203.98	76.14	Simple
J-326	Demand	30.00	58.11	58.11	204.09	75.32	Composite
J-327	Demand	50.00	41.68	41.68	204.49	66.84	Simple
J-328	Demand	61.00	40.19	40.19	204.49	62.08	Simple
J-329	Demand	26.00	0.00	0.00	204.01	77.02	Simple
J-330	Demand	0.00	0.00	0.00	204.39	88.43	Simple
J-331	Demand	33.00	0.00	0.00	205.36	74.57	Simple
J-332	Demand	40.00	0.00	0.00	205.39	71.56	Simple
J-333	Demand	44.00	0.00	0.00	205.43	69.84	Simple

Scenario: 2034 Peak Demand
Steady State Analysis
Junction Report

Label	Type	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Demand Summary
J-334	Demand	42.00	0.00	0.00	205.45	70.72	Simple

Scenario: 2034 Peak Demand
Steady State Analysis
Tank Report

Label		Base Elevation (ft)	Zone	Minimum Elevation (ft)	Initial HGL (ft)	Maximum Elevation (ft)	Inactive Volume (gal)	Tank Diameter (ft)	Inflow (gpm)	Current Status	Calculated Hydraulic Grade (ft)	Calculated Percent Full (%)
T-1	**@ WATER PLANT**	185.00	Zone	186.00	204.00	215.00	0.00	132.70	-167.06	Draining	204.00	62.1
T-2	**BY WELL #2**	185.00	Zone	186.00	204.00	215.00	0.00	10.00	242.89	Filling	204.00	62.1
T-3	**NEAR 12TH & STILLWELL**	185.00	Zone	186.00	204.00	215.00	0.00	10.00	53.04	Filling	204.00	62.1
T-4	**N & E OF McCORMICK LP**	185.00	Zone	186.00	204.00	215.00	0.00	10.00	402.21	Filling	204.00	62.1

Scenario: 2034 Peak Demand
Steady State Analysis
Pump Report

Label	Pump Definition	Elevation (ft)	Control Status	Intake Pump Grade (ft)	Discharge Pump Grade (ft)	Discharge (gpm)	Pump Head (ft)	Calculated Water Power (Hp)
Well -2	WELL 2	9.00	On	8.60	207.92	742.15	199.32	37.35
WELL 3	WELL 3 modi	-2.00	On	-2.96	207.22	918.28	210.18	48.73

New Well East	300.00