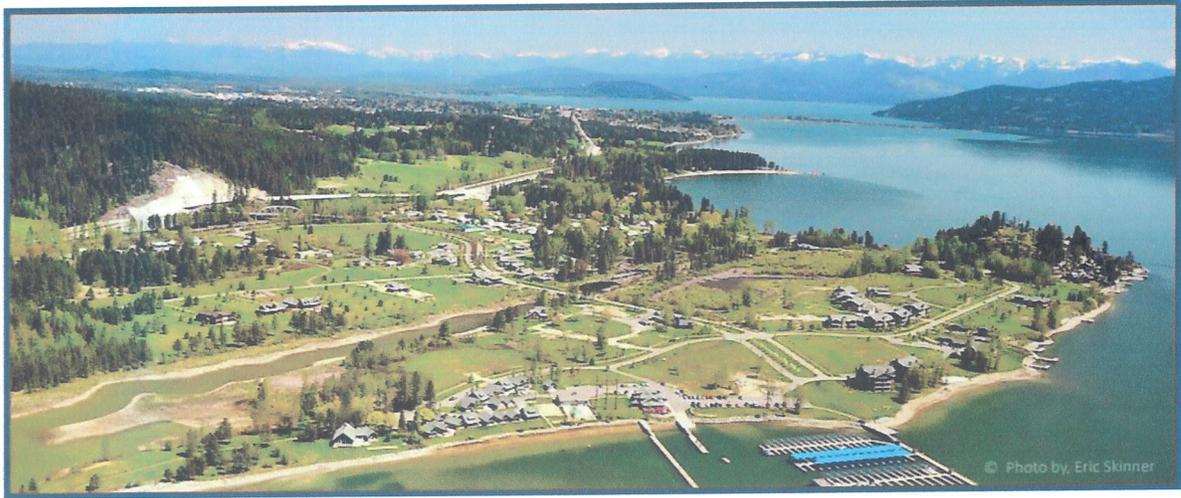


City of Dover



Water Facilities Plan

Revised
February 2018

Adopted by Council July 12, 2018
Resolution No. 138

Prepared By:



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City of Dover



Final Water Facilities Plan

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1. Introduction

1.1. Purpose and Need

The purpose of this report is to review and evaluate the City of Dover's Public drinking water system (PWS #ID1090193) and develop alternatives to resolve any problems and meet the long-term needs of the community. The primary focus of this report is to develop a long-term plan that ensures compliance with Idaho Department of Environmental Quality (IDEQ) Rules, preserve the health of the public, and result in an overall benefit to the community. This plan is meant to update and supplement the City of Dover Water System Facility Plan prepared by Tate Engineering Inc., dated February 2014.

1.2. Plan of Study

This facilities plan identifies alternatives to address deficiencies found with the existing water supply, treatment and distribution system and provides guidance for future projects to accommodate growth. It has been prepared utilizing the IDEQ Facility Plan Outline and Checklist and covers the following items which are broken down in the table of contents:

- Existing Conditions
- Existing Water System
- Future Conditions
- Development and Screening of Alternatives
- Selected Plan Description and Implementation

This facilities plan will also investigate the feasibility of Dover selling water to the Syringa Heights Water District (SHWD), which currently purchases its water from the City of Sandpoint. SHWD is currently conducting their own Facilities Planning Process, with the help of James A. Sewell and Associates (JAS). This report will refer to the SHWD Draft Water Facilities Plan (JAS 2016) for all information related to the SHWD.

1.3. Background

The City of Dover was incorporated in 1988 to facilitate improvements to the water system that served the unincorporated community of Dover. The City of Dover's water system now serves approximately 265 equivalent residential units (ERUs), including

129 ERUs within its original boundaries (Non-Dover Bay) and 136 ERUs within the Dover Bay Development. SHWD currently serves 185 ERUs.

The water source for the City of Dover is the Pend Oreille River. The majority of the City's current water infrastructure was constructed in 1991, including a raw water intake, slow sand filtration system (two filter bays), and water storage reservoir. In 1998 the water system was expanded to serve the 25-lot Cedar Ridge development, which is considered part of the Non-Dover Bay area. This expansion included two (2) water booster stations and a 43,000 gallon reservoir. In 2007 two (2) additional filter bays, doubling the treatment capacity, were added to the slow sand filtration system. In 2009 the City's reservoir was expanded to 354,000 gallons with the addition of baffling. These upgrades were triggered by the Dover Bay Development, a planned unit development within the City of Dover. Sanitary restrictions for the lots in the Dover Bay Development were implemented to minimize the effects of rapid development on existing customers. Sanitary restrictions on the water system were partially lifted in May 2013, when IDEQ agreed that the treatment capacity of the existing system could serve up to 95 ERUs in Non-Dover Bay plus up to 482 ERUs in the Dover Bay Development. The 2014 Water System Facility plan recommended a new water intake, expansion of the slow sand filtration facility, increased water storage, new transmission piping and standby power to serve an estimated build-out of 1100 ERUs.

In 2015, the City applied for a FY16 Drinking Water Planning Grant to update the Water System Facility Plan that was completed in 2014.

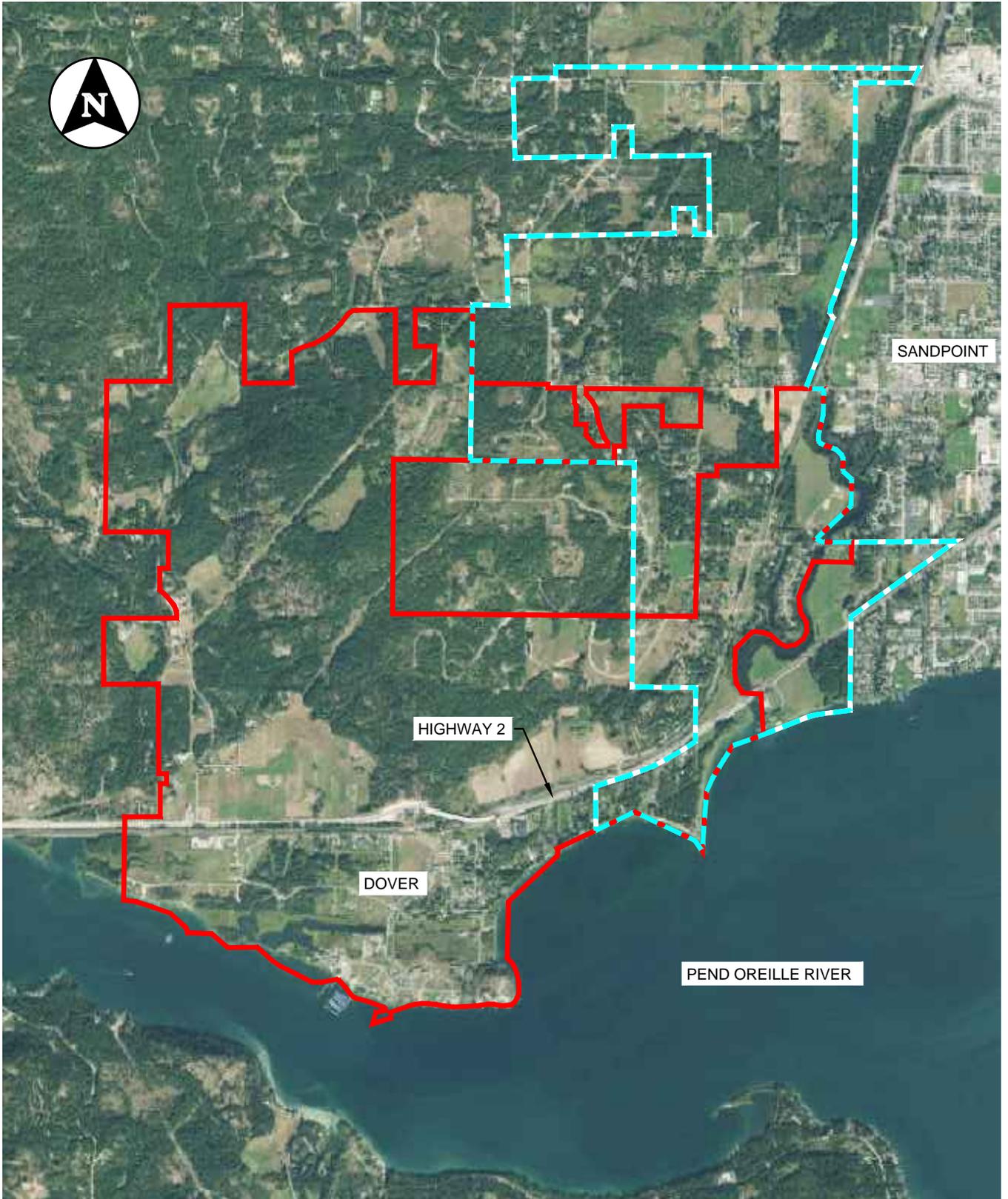
2. Existing Conditions

2.1. Planning and Project Area Boundaries

The planning and project area includes the Dover City limits, which encompass an area of approximately four (4) square miles. The City of Dover is located approximately 3 miles west of Sandpoint along the Pend Oreille River, near the outlet of Lake Pend Oreille, in Bonner County, Idaho. The project and planning area also includes the Syringa Heights Water District (SHWD) boundary, portions of which overlap the Dover City limits. See **Figure 2-1** for a map showing the project and planning area boundaries.

J:\1502003_AcadwgjSheets\Exhibits\16.02.11_1502003-Figure 2-1_Protect and Planning Area Map.dwg , 2/16/2016 8:45:58 AM , Schrader, Kyle, DWG To PDF.pcs
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FIGURE 2-1: PROJECT AND PLANNING AREA MAP



SCALE: N.T.S.

LEGEND:

-  EXISTING SYRINGA HEIGHTS WATER DISTRICT BOUNDARY
-  DOVER CITY LIMITS



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2.2. Existing Environmental Conditions

2.2.1. Physiography, Topography, Geology, and Soils

The project and planning area sits along the north shore of the Pend Oreille River along State Highway 200. The City is located within parts of Sections 19, 20, 21, 28, 29, 30, 31 and 32, Township 57 North, Range 2 West. The SHWD is located in parts of Sections 16, 17, 20, 21, 28 and 29, Township 57 North, Range 2 West (JAS 2016).

The majority of the City and SHWD, between SH-2 and the river is relatively flat. North of SH-2 there is more mountainous topography, especially in the Cedar Ridge and Syringa Heights areas. Elevations within the planning area range from 2060 feet at the Pend Oreille River shoreline to 2515 feet at the upper end of Cedar Ridge.

The Natural Resource Conservation Service (NRCS) Web Soil Survey maps and soil descriptions indicate that the majority of the planning area consists of Pend Oreille Silt Loam (approximately 50%) and Mission Silt Loam (approximately 30%). The Pend Oreille soils dominate the more upland areas north of SH-2 and were formed in glacial till from granitic and metamorphic rock. The Mission soils dominate the lowland areas along the river and were formed in glacial lake laid sediment derived from volcanic ash and loess. The mountainous areas include Pend Oreille and Treble Rock Outcrop associations.

2.2.2. Surface and Ground Water Hydrology

The City of Dover sits on the shores of the Pend Oreille River, which also serves as the source of the City's water. The river in this area is controlled by the Albeni Falls Dam, located approximately 23 miles downstream. River elevation is controlled by the dam and ranges between a winter low of 2051 feet and a normal full pool of 2062.5 feet. There are currently draft Total Maximum Daily Loads (TMDLs) in the Idaho portion of the river for both Temperature and Total Dissolved Gas (TDG). The Washington State Department of Ecology lists the Pend Oreille River on its 1998 list of impaired water bodies (303(d) List) for Temperature and TDG.

Syringa Creek runs through SHWD and discharges to the Pend Oreille River on the east edge of the City of Dover. Hornby Creek runs along the west edge of the City of Dover, also discharging to the Pend Oreille River.

The City of Dover has an NPDES permit (ID-002769-3) for discharge of treated effluent from their wastewater treatment facility to the Pend Oreille River. The outfall is located approximately two miles downstream of the City's drinking water system raw water intake.

2.2.3. *Fauna, Flora, and Natural Communities*

A USFWS IPAC Trust Resource Report has been generated for the planning area. This report lists Bull Trout (threatened) as the only threatened or endangered species in the planning area. There are no critical habitats or refuges listed in the planning area. A total of 13 migratory birds of conservation concern are listed including the Bald Eagle, Black Swift, and Cassin's Finch among others.

2.2.4. *Housing, Industrial and Commercial Development*

Historically, housing growth in the City was limited and sporadic. With the Dover Bay development, housing growth has been more rapid, with the development nearly tripling the size of the original City. Commercial development in Dover is limited, with 31 water connections classified as commercial. About half of these are condominium associations. There is one industrial water user in the City; Thorne Research a manufacturer of vitamins and supplements, which employs approximately 120 people.

2.2.5. *Utility Use*

The City of Dover is the water and sewer provider for the majority of the planning area. The Syringa Heights area is on City of Dover sewer but is provided water by the SHWD, which currently buys its water from the City of Sandpoint. Power and gas in the project planning area are supplied by Avista and telephone service is provided by Frontier Communications.

2.2.6. *Floodplains/Wetlands*

According to the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory, wetlands that exist within the City and SHWD boundaries include freshwater emergent, freshwater forested shrub, freshwater pond and open water. A wetland delineation plan has been created for the City of Dover and approved by the U.S. Army Corps of Engineers (USACE). This plan, prepared by James A. Sewell and Associates will be used in conjunction with any proposed improvements.

2.2.7. *Wild/Scenic Rivers*

Congress established the National Wild and Scenic Rivers System in 1968, as a method and standard through which rivers in the United States may be identified and protected [Wild and Scenic Rivers Act (16 USC 1271-1287)]. According to the National Wild and Scenic Rivers website none of the designated rivers are near the project planning area. The nearest river designated as Wild and Scenic is the St. Joe River, located south of Coeur d'Alene (NWSRA 2015).

The Idaho Department of Lands regulates activities that encroach on the shores of Lake Pend Oreille (<http://www.idl.idaho.gov/lakes-rivers/lake-protection/>) through the Idaho Lake Protection Act. Any encroachment below Ordinary High Water Mark (OHWM) will require an encroachment permit from the Idaho Department of Lands which is obtained through a US Corps of Engineers Joint Application 404 Permit, as well as Idaho Department of Water Resources approvals.

2.2.8. Public Health and Water Quality Considerations

Protection of the Pend Oreille River, as the source water for the City of Dover, will be considered during construction of any proposed improvements. Protection of existing water mains and other water infrastructure from contamination during construction will also be considered. Construction practices including flushing, disinfection and bacteriological testing of new water mains and facilities will be implemented.

2.2.9. Proximity to Sole Source Aquifer

A sole source aquifer (SSA), as defined by EPA, is the principal or sole source of groundwater for the area which overlays the designated aquifer and supplies at least 50 percent of the drinking water consumed in a specified area. These designated areas (SSAs) may also have no alternative source of drinking water available for groundwater withdrawals. The SSA designation is authorized by section 1424(e) of the Safe Drinking Water Act of 1974 (Public Law 93-523, 42 U.S.C. 300 et seq.). The EPA has designated 14 SSAs in Region 10, a region which includes the states of Alaska, Idaho, Oregon, and Washington. The Spokane Valley/Rathdrum Prairie SSA northern boundary is located approximately 12 miles south of the Dover project planning area and therefore is not located in close proximity to the project site.

2.2.10. Land Use and Development

There are five (5) zoning districts within the City of Dover. These include mostly Agricultural and Rural north of the SH-2 corridor, with the exception of the Syringa Heights area which is zoned Suburban. All of the area south of SH-2 is zoned Residential, except for a Commercial corridor 220' either side of SH-2, from the west edge of Dover Tracts east to the 29/30 Section line.

2.2.11. Precipitation, Temperature and Prevailing Winds

Weather data from the Sandpoint Experiment Station, located about 3 miles northeast of Dover lists average annual precipitation at 32.0 inches and average annual snowfall at 70.3 inches. The lowest average minimum temperature of 20.2 degrees F occurs in January and the highest average maximum temperature of 82.1 degrees F occurs in July. Prevailing winds are most often out of the southwest with a typical range of 0-13 mph.

2.3. Existing Water System

2.3.1. *Water Source*

The source of water for the City of Dover is the Pend Oreille River. The City's raw water intake is located approximately 1900 feet from the shoreline at a depth of approximately 56 feet at summer pool level. The intake consists of a stainless steel well screen connected to approximately 1560 feet of 6-inch HDPE pipeline. The pipeline is connected to two 8-inch PVC pump sleeves each with a 5 HP submersible intake pump. The pumps are approximately 293 feet from the pump control vault, which is located on the shoreline above the high water mark. The pumps have approximately 12 feet of submergence at summer pool elevation (2061') and can operate at their full rated capacity of 185 gallons per minute (gpm) each. The pumps only have 2.5 feet of submergence at low lake level (2051.5') during the winter, limiting capacity to approximately 100 gpm each.

The City installed flow meters inside the pump control vault for each pump during March and April of 2015. Pressure gauges were also installed on each pump discharge line. The City replaced Pump #2 in April 2015 when the existing pump impeller was found to be damaged.

IDEQ's Sanitary Survey report dated October 3, 2012 mentioned that raw water pump replacement has been an ongoing problem and may be attributed to pump cavitation during periods of low lake levels. This apparent problem was remedied in the past by throttling the gate valve in the pump vault down to about 60 gpm in the winter. T-O completed an analysis of the intake system during April of 2015. This analysis concluded that there is adequate Net Positive Suction Head (NPSH) available at the pump at the low lake level even at full pumping capacity, so cavitation should not be occurring. However, vortexing (drawing air into the pump) at low lake levels may be occurring. The pumps should have approximately 4 feet of submergence to avoid vortexing at their full rated capacity. With 2.5 feet of submergence available at low lake levels, the pumps must be throttled to about 100 gpm to avoid vortexing.

On June 30, 2016 the State of Idaho Division of Building Safety (DBS) issued a technical memorandum entitled The Permanent Installation of Directly Connected Submersible Well Pumps in Bodies of Water. The DBS has enacted new policy requirements applicable to submersible well pumps installed in open water bodies due to concerns with the hazards associated with utilizing these pumps in a method not intended by the pump manufacturers. This policy is considered interim until a negotiated rulemaking process can be completed. The interim policy includes numerous provisions related to electrical equipment and transformers; location of

service equipment; electrical connections; wiring methods; submersible equipment power connections; and ground-fault circuit-interrupter (GFCI) protection. A copy of the policy can be found in **Appendix A**. Whether these types of installations will even be allowed long term is yet to be determined as the State of Idaho goes through the rulemaking process.

2.3.2. Water Treatment Facility

Water treatment consists of slow sand filtration followed by chlorination. The slow sand filter consists of four (4) filter bays. The two (2) original filter bays, at 672 SF each, were constructed in 1992 and re-sanded in 2007. Two (2) new filter bays, at 697 SF each, were constructed in 2007. Filter flow rate is manually controlled by butterfly valves on the effluent side of each filter, which discharge to two (2) clear wells. In accordance with IDEQ's Rules for Public Drinking Water Systems, the maximum filtration rate cannot exceed 0.1 gpm/sf for each individual bed. Thus the design capacity of the existing system with one (1) filter off line is 204 gpm or 293,760 gallons per day (gpd).

Following filtration, water is transported from each clear well to the storage reservoir using two (2) 15 HP pumps, rated at approximately 200 gpm each. A spare 7.5 HP pump is also available as a backup. Sodium hypochlorite solution injection occurs at each pump discharge using two (2) Pulsatron flow-regulated metering pumps. IDEQ's Sanitary Survey report, dated December 7, 2016 discusses appropriate contact time for disinfection reporting and disinfection monitoring for free residual chlorine, pH and temperature. A revised Plan of Correction (POC), prepared by the City, was submitted to DEQ in March 2017 with proposed upgrades to meet these requirements. A copy of the Revised POC can be seen in **Appendix G**.

IDEQ's 2012 Sanitary Survey report recommended a more accurate method of measuring filtration rates at the plant. Flow through each filter is currently estimated using the piezometers on the clear wells with a flow test methodology that includes isolating the clear well and filter bay being tested, monitoring the fill rate of the clear well, calculating the flow, then throttling the filter discharge valve to achieve the desired flow. While accurate, this method is labor intensive. Other IDEQ recommendations included security improvements at the treatment facility and raw water turbidity monitoring.

2.3.3. Distribution System

2.3.3.1. Storage Reservoirs

Water from the treatment plant is pumped to a 354,000 gallon concrete storage reservoir at an elevation of approximately 2250 feet, or 180 feet above the treatment

plant. The reservoir was expanded to its present size in 2009, with baffling added to the inside. A second reservoir, which serves the Cedar Ridge area, is fed from the main reservoir by booster pumps. The Cedar Ridge reservoir has a volume of 43,000 gallons at sits at an elevation of approximately 2510 feet. Currently there are manual valves in place that allow the Cedar Ridge reservoir to back feed to the City's main reservoir, providing a total available storage volume of 397,000 gallons.

IDEQ's 2012 and 2016 Sanitary Survey reports expressed concern that there is no check valve on the supply main to the 43,000 gallon Cedar Ridge reservoir. In the event of a line break, there would be no mechanism to prevent the draining of the reservoir. Placement of a check valve would however eliminate the ability to manually back feed the main reservoir, so a new bypass back feed connection would be required.

The SHWD is served from a 1.7 million gallon reservoir owned by the City of Sandpoint. This reservoir sits at an elevation of approximately 2256 feet. Approximately 54 ERUs are served by gravity from this reservoir (lower pressure tier) and 131 ERUs (upper pressure tier) are served from a booster station, owned by SHWD (JAS 2016).

2.3.3.2. Water Mains

The main transmission line feeding the system is an 8-inch PVC pipe extending 8,000 feet from the main reservoir down to the Non-Dover Bay section of town. The majority of water mains in the Non-Dover Bay section of town are 6-inch, constructed under lower fire flow requirements than the Dover Bay section of town, which is served by 8-inch water mains. Static pressure in the City is reported to be about 78 psi (IDEQ Drinking Water Supply Report, September 2012). The 2014 Water System Facility Plan identified the 8-inch main transmission line from the reservoir as under sized to achieve fire flow requirements as set forth by the Fire District for the Dover Bay development.

Water mains in the SHWD are primarily 6-inch, 4-inch and 2 inch PVC, with the majority of these mains installed in 1968 (JAS 2016). Due to the insufficient size of their existing water mains, SHWD does not provide fire flow capacity, and there are no immediate plans for expansion to provide fire flow (JAS 2016).

2.3.3.3. Pumping Stations

The Cedar Ridge reservoir is supplied from a booster pump station located next to the City's main reservoir. The booster station is equipped with two (2) 10 HP pumps rated for 87 gpm each at 280 feet, Total Dynamic Head (TDH). The booster pumps are controlled by on-off floats in the Cedar Ridge reservoir. There is currently no method of remotely monitoring this booster station and the alarm system is not incorporated into the main auto-dialer system.

There is a second booster pump station located at the Cedar Ridge reservoir to serve the lots adjacent to and above the reservoir. This booster station has one (1) 3 HP pump on a variable frequency drive (VFD). IDEQ's 2016 Sanitary Survey includes redundancy requirements for the Cedar Ridge Booster Station. The City's revised POC proposes keeping a replacement pump on-hand for quick substitution in the event of a pump failure.

The SHWD booster pump station provides water from Sandpoint's reservoir to the upper tier lots. This station includes two (2) 20 HP pumps rated for 250 gpm each at 85 psi (JAS 2016).

2.3.3.4. Water Meters

The City currently has an ongoing program to replace broken and/or out dated meters. The Dover Bay Development and SHWD both have newer auto-read meters in place, but Non-Dover Bay does not.

2.3.4. Water Demand

An analysis of meter data provided by the City for the years 2012 through 2015 has been completed and is included in **Appendix B**. Previous analysis relied on pumping data from the water treatment plant, which has been determined to be un-reliable, since a pump control issue was found in 2015, which was causing the treated water pumps to overflow the large reservoir, causing an overflow situation. The previous data analysis also included a period of time where the City was selling large quantities of water to the contractor working on the highway project through Dover. There was also a period of unaccounted for water loss in excess of 40% occurring between the main reservoir and Cedar Ridge reservoir, which has since been reduced to less than 10%. For these reasons, a new analysis has been completed utilizing actual meter readings from system users. Since readings are collected on a monthly basis, Maximum Day Demands (MDD) and Peak Hour Demands (PHD) have been estimated based on procedures set forth in the Washington State Department of Health (WSDOH) Water System Design Manual Sections 5.2.1 and 5.2.4. An additional 10% has been added to all demands for assumed system losses. The following **Table 2-1** summarizes water system unit demand data.

Table 2-1 - City of Dover Water System Unit Demand Summary

| Demand | Non-Dover Bay | | Dover Bay Development | | Combined | |
|---------------------|---------------|-----------|-----------------------|-----------|-----------|-----------|
| | (gpd/ERU) | (gpm/ERU) | (gpd/ERU) | (gpm/ERU) | (gpd/ERU) | (gpm/ERU) |
| Average Day | 194 | 0.135 | 75 | 0.052 | 117 | 0.081 |
| Maximum Day | 436 | 0.303 | 165 | 0.115 | 279 | 0.194 |
| Peak Hour | 1341 | 0.931 | 572 | 0.397 | 718 | 0.498 |
| Fire Flow | 1,000 gpm | | 2,000 gpm | | | |
| Current Connections | 129 ERUs | | 136 ERUs | | 265 ERUs | |

The City conducted an analysis of water loss for the time period from June 1 through October 31, 2014 by tracking all water use including:

- Metered water use (residential and commercial)
- Estimated fire hydrant water usage
- Estimated water usage for sand bed cleaning

This time period represents the months during 2014 that water meters could be read. This water usage during this period totaled 5,650,591 gallons. During this same time period, the City’s water treatment plant produced 6,113,938 gallons of water. This represented 7.6% water loss for the time period, hence 10% has been assumed in estimating water demand.

Based on data provided by James A. Sewall and Associates (May 2017), unit demands for the Syringa Heights Water District (SHWD) is estimated as summarized in the following **Table 2-2**.

Table 2-2 - SHWD Water System Unit Demand Summary

| Demand | SHWD | |
|---------------------|-----------|-----------|
| | (gpd/ERU) | (gpm/ERU) |
| Average Day | 251 | 0.174 |
| Maximum Day | 689 | 0.478 |
| Peak Hour | 1798 | 1.249 |
| Fire Flow | N/A | |
| Current Connections | 185 ERUs | |

2.3.5. Water Quality

Daily monitoring at the slow sand filtration plant includes turbidity, pH, temperature and chlorine residual. Turbidity levels are monitored continuously using a Hach 1720E turbidimeter. Turbidity levels are required to be maintained at or below 1.0 NTU. If levels exceed 1.0 NTU then weekly total coliform sampling is required. A review of IDEQ records shows no positive Total Coliform results and no water quality violations over the previous year.

All community drinking water systems must provide customers with an annual report of drinking water quality. A copy of the Report on Quality of Drinking Water in 2014 can be found in **Appendix C**.

2.3.6. Sanitary Survey

The last sanitary survey completed by IDEQ for the City of Dover's water system was conducted during December 2016. A previous survey conducted in September 2012 was also completed by IDEQ. These surveys listed a number of rule requirements and recommendations as outlined in Drinking Water Supply Reports dated October 3, 2012 and December 7, 2016. A number of the recommendations from both sanitary surveys are considered and addressed in this Facilities Plan. Copies of these Water Supply Reports can be found in **Appendix D**.

2.3.7. Hydraulic Analysis

A hydraulic analysis was completed for the City of Dover water system by Tate Engineering as part of the 2014 Water System Facility Plan. This analysis concluded that the existing 8-inch water main from the main reservoir down to Railroad Avenue is undersized to meet the 2,000 gpm fire flow requirement for the Dover Bay development. The analysis concluded that construction of a new 12-inch main parallel to the existing 8-inch main was the best alternative, and would bring everything within the Dover Bay Development past the 2,000 gpm required flow (Tate, 2014).

2.3.8. User Charges and Budget

The City of Dover charges a monthly base rate of \$25.21 per ERU plus an additional charge of \$0.0037 for every gallon used. The current one-time connection fee for new water connections is \$5,392 per ERU.

The City's FY 2015-2016 water budget projects \$150,500 in total water revenues. Projected expenses for operation and maintenance are \$70,746, with total projected expenses at \$114,504. This excludes capitalization projects, depreciation and capital carry over. The City water fund currently has approximately \$26,000 in savings; a note receivable from the Dover Urban Renewal Agency (DURA) for approximately \$617,000; and approximately \$227,000 in outstanding debt.

2.3.9. Violations of Safe Drinking Water Act and Idaho Water Rules for Public Drinking Water Systems

There have been no known violations of the Safe Drinking Water Act or Idaho Rules for Public Drinking Water Systems by the City of Dover.

2.3.10. List and Status of Defects or Deficiencies

Following is a list of treatment and distribution system deficiencies identified in previous sections. Problems identified with the existing system include:

- The raw water pumps at the existing intake are limited in capacity during the winter months due to low water levels in the river. Frequent pump replacement has been an ongoing problem due to possible cavitation, vortexing and/or debris getting into the pumps. Manual throttling of the pumps is currently necessary to adjust flows to meet demands and/or reduce vortexing in the winter.
- Low lake levels can expose the raw water pump discharge lines, leaving them susceptible to freezing.
- The electrical and control equipment at the raw water pump station is out dated and in need of upgrades.
- The existing raw water pumping system does not meet the new DBS Policy for Use of Submersible Well Pumps in Bodies of Water.
- An improved mechanism for monitoring flow rate and water levels in the slow sand filters is needed.
- Additional security measures are needed at the treatment facility and reservoirs.
- The water system is controlled by a series of floats and relays which have proven unreliable at times. There is also currently no method of monitoring the multiple reservoirs and pumping systems from one centralized location.
- The 8-inch main transmission line from the reservoir as under sized to achieve fire flow requirements as set forth by the Fire District for the Dover Bay Development (Water System Facility Plan, Tate Engineering, 2014).
- Back feeding from the Cedar Ridge reservoir to the main reservoir is manual, and there is no check valve in place to prevent draining of the Cedar Ridge reservoir in the event of a break in the feed pipe.
- Many of the water meters in the Non-Dover Bay section of the planning area are out dated and/or in disrepair and should be upgraded to auto-read for consistency with other parts of the planning area.
- Upgrades to supply, storage and booster pumping facilities will be required to serve the City of Dover plus SHWD.

As part of a project started in 2017 to add a flow meter to the outlet of the City's main reservoir, deficiencies with the design and construction of the main reservoir were discovered as follows:

- The existing inlet and outlet piping arrangement did not allow the two tanks (original and expanded) to operate in series. It was discovered that the tanks were operating in parallel and not achieving the previously assumed chlorine contact time.
- Several potential cross connection points were discovered with the current piping configuration, where short circuiting could occur, causing water that has not achieved full chlorine contact time to reach the distribution system.
- The arrangement of the existing piping could cause water stagnation in sections of the piping under certain operating conditions.

In January 2018, the City completed a project to modify the exterior piping to allow the tanks to operate in series. The City is currently working with DEQ on a plan and timeline to address the cross connection and water stagnation issues, with repairs to be self-funded through the City's operation and maintenance budget. Costs for these corrections are not included in the analysis of alternatives in this Facilities Plan.

3. Future Conditions

3.1. Projected Growth

Projected build-out for the Dover Bay Development is 556 ERUs. This is less than the 600 ERUs projected in the 2014 Water System Facility Plan, and is based on an updated projection provided by the developer. Estimated build-out of the remaining areas covered by Dover corporate City limits is 373 ERUs based on current lots and zoning. Thus projected total build-out is 929 ERUs.

The Dover Bay Development is projected to reach build-out within 30 years, which equates to a projected growth rate of 14 ERUs per year. This exceeds the historic Dover Bay growth rate, which has averaged about 12 ERUs per year. Growth rate for Non-Dover Bay is projected based on United States Census Bureau data for Bonner County, which shows an 11% population change from 2000 to 2010. This amounts to an annual growth rate of approximately 1.04%. Therefore 20 year projected growth for Non-Dover Bay is to 159 ERUs.

Growth within the SHWD service area is projected to reach 222 ERUs within the next 20 years and 265 ERUs within the next 40 years (JAS 2016).

3.2. Forecast of Demand (20-year period)

Forecast of demand for a 20-year period considers a projected 20-year population of 159 ERUs for Non-Dover Bay; a projected 20-year population of 416 ERUs for Dover Bay, and a projected 20-year population of 222 ERUs for SHWD. The following **Table 3-1** provides a summary of projected design flows based on this 20-year forecast.

Table 3-1 - City of Dover Projected Water Demands (20-year period)

| Description | Projected ERUs | Average Day Demand (gpd) | Average Day Demand (gpm) | Maximum Day Demand (gpd) | Maximum Day Demand (gpm) | Peak Hour Demand (gpm) |
|-----------------------|----------------|--------------------------|--------------------------|--------------------------|--------------------------|------------------------|
| Non-Dover Bay | 159 | 30,906 | 21.5 | 69,324 | 48.1 | 148.1 |
| Dover Bay Development | 416 | 31,332 | 21.8 | 68,640 | 47.7 | 165.4 |
| SUBTOTAL | 575 | 62,238 | 43.2 | 137,964 | 95.8 | 313.4 |
| SHWD | 222 | 55,722 | 38.7 | 152,958 | 106.2 | 277.2 |
| TOTAL | 797 | 117,960 | 81.9 | 290,922 | 202.0 | 590.6 |

3.3. Drinking Water Facilities Needed (20-year Period)

Projected supply, treatment and distribution system capacity is estimated utilizing the water system unit demands summarized in **Tables 2-1 and 2-2** and projected total demands presented in **Table 3-1**.

Each of the two (2) existing raw water intake pumps have a summer pumping capacity of 185 gpm. To account for redundancy only the capacity of a single pump is considered, which amounts to 266,400 gpd. As shown in **Table 3**, estimated maximum day demand (MDD) for buildout of Non-Dover Bay and the Dover Bay Development is 137,964 gpd. With the addition of SHWD, estimated MDD increases to 290,922 gpd. Thus, the existing raw water intake has adequate capacity for projected 20-year flows for Dover, but would require upgrades to serve SHWD. Estimated capacity of the 6" raw water line from the intake to the treatment plant is 600 gpm or 864,000 gpd.

During the winter months, at low river levels, each of the two (2) existing raw water intake pumps have a pumping capacity of approximately 100 gpm. This provides a winter pumping capacity of 144,000 gpd with a single pump running. Since winter meter reading data is not available, MDD during the month of May is considered which amounts to an estimated winter MDD, 20-years out, of 62,316 gpd for the City of Dover. Thus it is projected that the existing intake has adequate winter capacity for projected 20-year flows for Dover.

The existing slow sand filter treatment facility has a capacity of 293,760 gpd, with one (1) filter bay off-line. Based on the projected flows summarized in **Table 3-1**, the existing treatment facility has adequate capacity for 20-year projected flows for the City of Dover plus SHWD.

An analysis of reservoir sizing can be found in **Appendix E**. The analysis considers operational storage, equalization storage, standby storage and fire storage requirements for different scenarios. The analysis shows that the existing reservoirs have adequate capacity for the City of Dover. SHWD does not require fire storage, but the Cedar Ridge development has hydrants with some fire storage. A letter from Selkirk Fire, Rescue and EMS confirming adequate fire capacity in the Cedar Ridge development can be seen in **Appendix H**.

To provide adequate source capacity from the main reservoir to the Cedar Ridge reservoir for supplying SHWD, upgrades to the existing booster station will be required.

The following **Table 3-2** summarizes the required and available capacities of the various water facilities under a number of scenarios from serving existing connections in Dover only through the 20-year projection for Dover and SHWD.

Table 3-2 - Drinking Water Facility Needs (20 year)

| Scenario | Required Reservoir Capacity (gal.) | Required Treatment Capacity (gal.) | Required Intake Capacity (gal.) |
|-----------------------------------|---|---|--|
| Dover Existing Connections | 284,430 | 76,684 | 76,684 |
| Dover + SHWD Existing Connections | 314,681 | 206,149 | 206,149 |
| Dover 20-year | 293,403 | 137,964 | 137,964 |
| Dover + SHWD 20-year | 334,673 | 290,922 | 290,922 |
| | Available | Available | Available |
| Existing Available Capacity | 397,000 | 293,760 | 266,400 |

3.4. Forecast of Demand (Build-out)

For consideration of longer term implications of serving SHWD, a forecast of build-out demand is also considered. Forecast of demand for build-out considers the projected build-out of 556 ERUs for the Dover Bay Development; a projected build-out of 373 ERUs for Non-Dover Bay; and the projected 40-year population of 265 ERUs for SHWD. The following **Table 3-3** provides a summary of projected design flows based on this build-out forecast.

Table 3-3 - City of Dover Projected Water Demands (Build-out)

| Description | Build-out ERUs | Average Day Demand (gpd) | Average Day Demand (gpm) | Maximum Day Demand (gpd) | Maximum Day Demand (gpm) | Peak Hour Demand (gpm) |
|-----------------------|----------------|--------------------------|--------------------------|--------------------------|--------------------------|------------------------|
| Non-Dover Bay | 373 | 72,502 | 50.3 | 162,628 | 112.9 | 347.3 |
| Dover Bay Development | 556 | 41,876 | 29.1 | 91,740 | 63.7 | 221.0 |
| SUBTOTAL | 929 | 114,378 | 79.4 | 254,368 | 176.6 | 568.3 |
| SHWD | 265 | 66,515 | 46.2 | 182,585 | 126.8 | 330.9 |
| TOTAL | 1194 | 180,893 | 125.6 | 436,953 | 303.4 | 899.2 |

3.5. Drinking Water Facilities Needed (Build-out)

Projected supply, treatment and distribution system capacity for build-out is estimated utilizing the water system unit demands summarized in **Tables 2-1 and 2-2** and projected total demands presented in **Table 3-3**.

The following **Table 3-4** summarizes the required and available capacities of the various water facilities under a number of scenarios from serving build-out of Dover only to serving build-out for both Dover and SHWD. It is important to note that projected build-out for Dover does not require expansion of the slow sand filter or reservoir storage, but expansion is required to serve projected build-out of Dover plus SHWD.

Table 3-4 - Drinking Water Facility Needs (Build-out)

| Scenario | Required Reservoir Capacity (gal.) | Required Treatment Capacity (gal.) | Required Intake Capacity (gal.) |
|-----------------------------|------------------------------------|------------------------------------|---------------------------------|
| Dover Build-out | 345,759 | 254,368 | 254,368 |
| Dover + SHWD Build-out | 412,540 | 436,953 | 436,953 |
| Existing Available Capacity | Available 397,000 | Available 293,760 | Available 266,400 |

3.6. Future Conditions without the Proposed Project

The City of Dover water system is in adequate working condition and provides a safe source of drinking water at acceptable pressure and demands to its customers. The system has sufficient capacity to serve projected growth within the City limits; however there are a number of deficiencies that have been identified that should be address to improve system safety, reliability and ease of operation. In order to provide service to SHWD, some expansion would be required to serve projected future growth of the combined service areas.

4. Development and Screening of Alternatives

4.1. Development of Alternatives

The alternatives presented below consider upgrades necessary to serve the 20-year projected growth for the City of Dover as well as upgrades necessary to serve the 20-year projection for the City of Dover plus SHWD. Costs shown in Section 4 do not include financing.

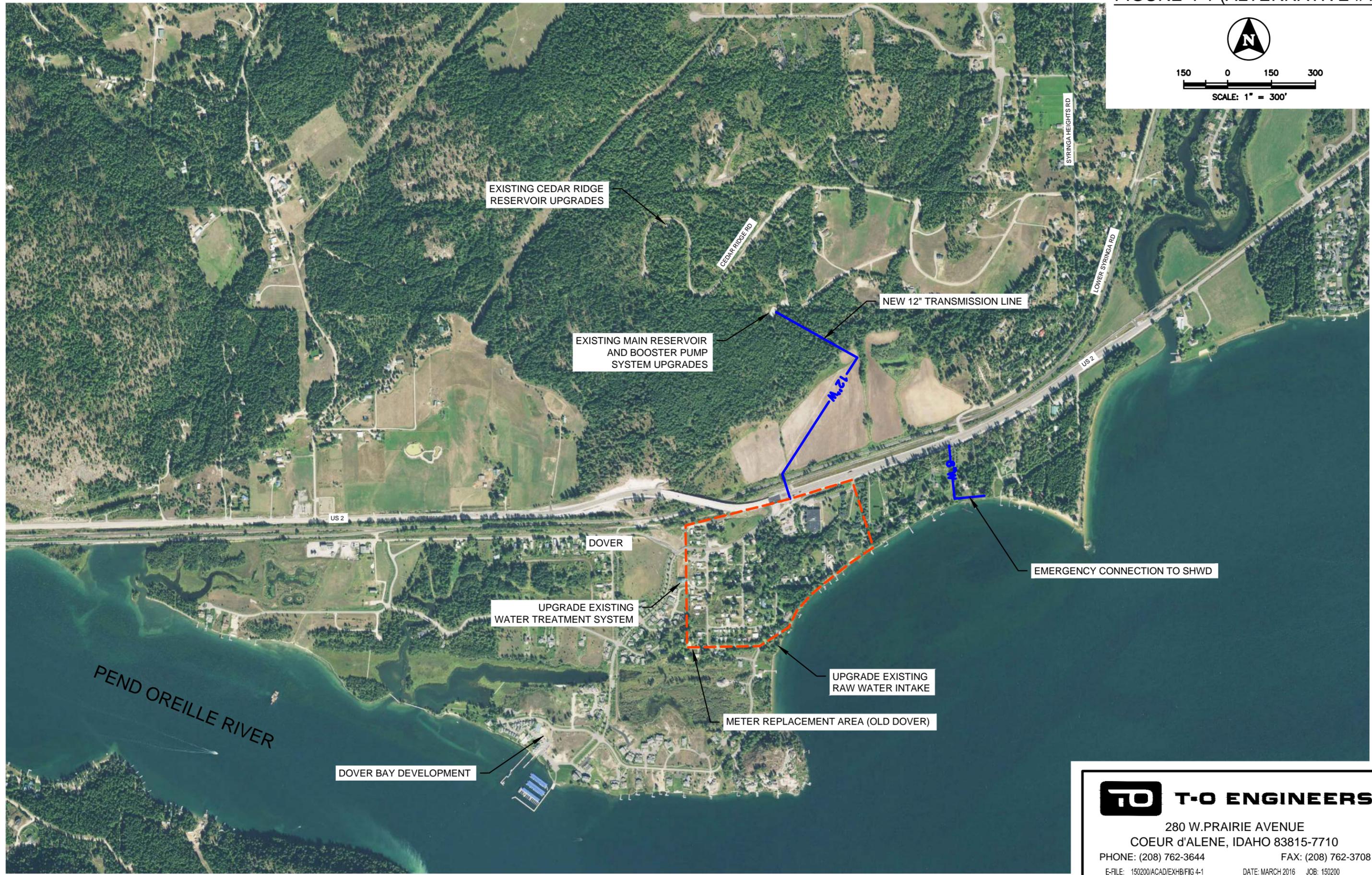
4.1.1. Alternative #1 – No Service to SHWD; Upgrade Existing Intake.

This alternative involves upgrades to serve the City of Dover without service to SHWD. As discussed in Section 3.4, the existing system has sufficient capacity to serve the projected 20-year growth within the City limits, but there are a number of deficiencies that should be addressed. This alternative proposes to address these deficiencies as follows:

- Provide an integrated supervisory control and data acquisition (SCADA) system for centralized monitoring and control of all water system components including pumping, treatment and storage facilities.
- Upgrade the existing raw water intake including variable speed pumps; providing additional depth and flattening out the intake pipe; installing air/vacuum valves; updating the electrical/control equipment including meeting DBS interim policy; and SCADA integration.
- Upgrade the water treatment system including sand filter flow and water level monitoring; variable speed pumps for feeding the reservoir; improved chlorine and turbidity monitoring; increased security measures including video surveillance; and SCADA integration.
- Upgrade the water storage system including improved level monitoring and control; increased security measures including video surveillance; adding a check valve at the Cedar Ridge reservoir inlet; back feed from the Cedar Ridge reservoir to the main reservoir; and SCADA integration.
- Upgrade the existing booster pumping facilities including SCADA integration. Install new flow meters at the booster station next to the main reservoir, for remote monitoring.
- Install a new 12-inch transmission line from the main reservoir to the existing 12-inch main on Railroad Avenue.
- Install emergency backup connection with SHWD at the service area interface near the river.
- Replace all of the older water service meters in the City of Dover with new auto-read meters.

J:\15020003_Acadddwg\Sheets\Exhibits\16.03.02_150200-Figure 4-1_Alternative #1.dwg 3/3/2016 7:59:12 AM - Schrader, Kyle - DWG To PDF.pc3
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FIGURE 4-1 (ALTERNATIVE #1)



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See **Figure 4-1** for an overview of this alternative. Estimated total cost for this alternative is \$1,140,379. An Engineer's preliminary opinion of construction cost can be found in **Appendix F**.

4.1.2. Alternative #2 – No Service to SHWD; Construct New Raw Water Intake.

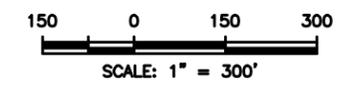
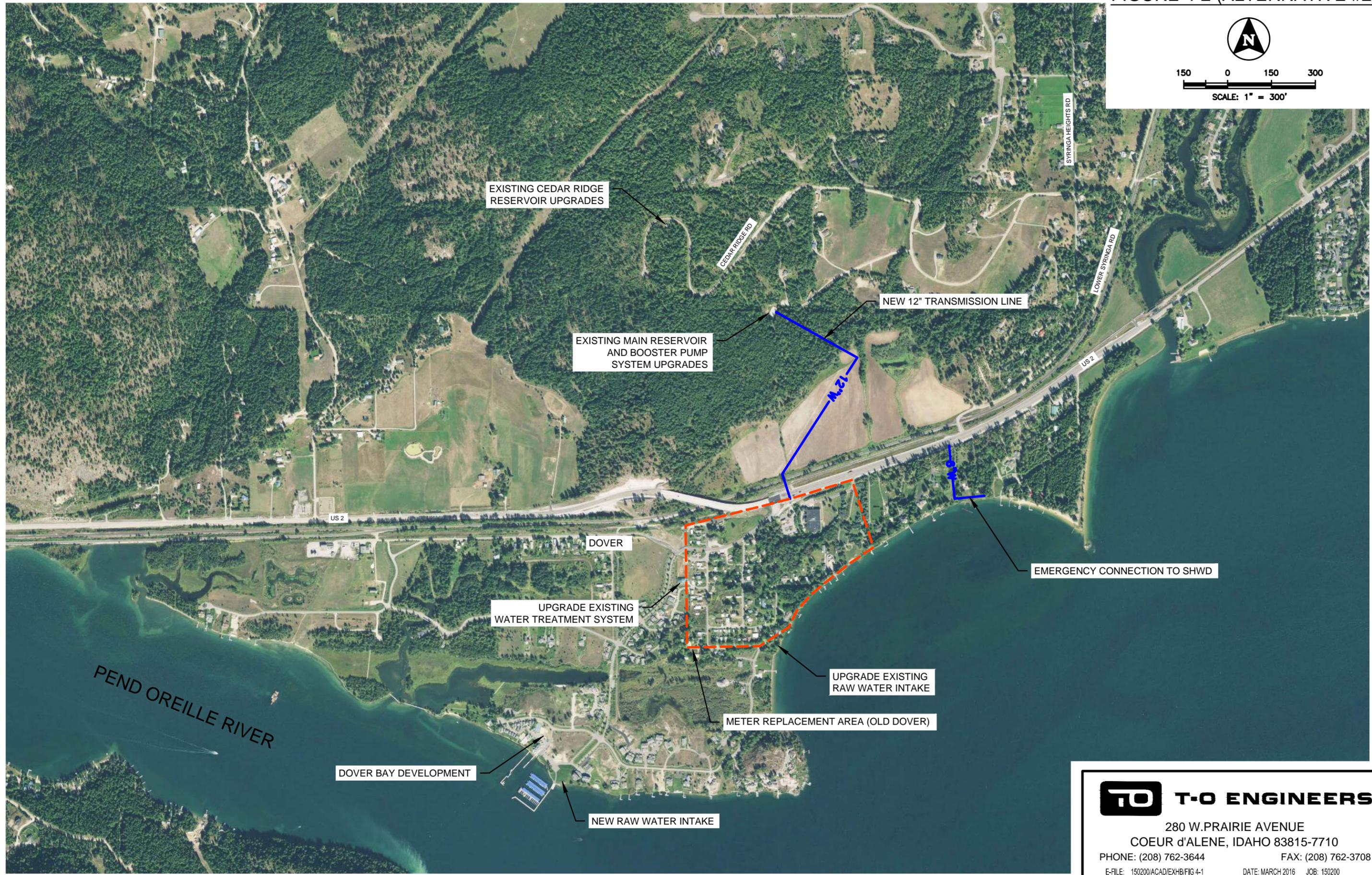
This alternative also involves upgrades to serve the projected 20-year growth in the City of Dover without service to SHWD. The primary difference with this alternative is that a new raw water intake, with a land based pumping system, would be constructed and less significant upgrades to the existing intake would occur. This alternative proposes to address the identified system deficiencies as follows:

- Provide an integrated supervisory control and data acquisition (SCADA) system for centralized monitoring and control of all water system components including pumping, treatment and storage facilities.
- Construct a new raw water intake system, with a land based pumping system, south of the existing intake.
- Keep the existing intake as a backup system, with minor upgrades including updating the electrical/control equipment; addressing DBS interim policy requirements; and SCADA integration.
- Upgrade the water treatment system including sand filter flow and water level monitoring; variable speed pumps for feeding the reservoir; improved chlorine and turbidity monitoring; increased security measures including video surveillance; and SCADA integration.
- Upgrade the water storage system including improved level monitoring and control; increased security measures including video surveillance; adding a check valve at the Cedar Ridge reservoir inlet; back feed from the Cedar Ridge reservoir to the main reservoir; and SCADA integration.
- Upgrade the existing booster pumping facilities including SCADA integration. Install new flow meters at the booster station next to the main reservoir, for remote monitoring.
- Install a new 12-inch transmission line from the main reservoir to the existing 12-inch main on Railroad Avenue.
- Install emergency backup connection with SHWD at the service area interface near the river.
- Replace all of the older water service meters in the City of Dover with new auto-read meters.

See **Figure 4-2** for an overview of this alternative. Estimated total cost for this alternative is \$1,586,993. An Engineer's preliminary opinion of construction cost can be found in **Appendix F**.

J:\150200\3_Acaddwg\Sheets\Exhibits\16.03.02_150200-Figure 4-2_Alternative #2.dwg , 3/3/2016 7:46:03 AM, Schraeder, Kyle, DWG To PDF.pc3
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FIGURE 4-2 (ALTERNATIVE #2)



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The difference between Alternatives #1 and #2 is the construction of a new raw water intake versus simply upgrading the existing intake. Constructing a new intake has the following benefits and disadvantages:

Benefits-

- Eliminates the reduction in winter source capacity
- Eliminates the need to adjust winter pumping rates through throttling.
- Provides two (2) intakes, increasing system redundancy.
- May eliminate frequent pump replacements at the existing intake.
- Provides a land-based pumping system to alleviate DBS concerns with the use of submersible well pumps in open bodies of water.

Disadvantages-

- Higher construction cost than upgrading the existing intake.
- Two (2) intake systems to maintain instead of one (1).
- New intake not necessary for capacity without service to SHWD.

4.1.3. Alternative #3 – Service to SHWD

This alternative involves upgrades and expansion necessary to serve the projected 20-year growth for the City of Dover plus SHWD, as well as address deficiencies identified with the existing system. This alternative proposes upgrades and expansion as follows:

- Provide an integrated supervisory control and data acquisition (SCADA) system for centralized monitoring and control of all water system components including pumping, treatment and storage facilities.
- Construct a new water intake system, with a land based pumping system, south of the existing intake.
- Keep the existing intake as a backup system, with minor upgrades including updating the electrical/control equipment; addressing DBS interim policy requirements; and SCADA integration.
- Upgrade the water treatment system including sand filter flow and water level monitoring; variable speed pumps for feeding the reservoir; improved chlorine and turbidity monitoring; increased security measures including video surveillance; and SCADA integration.
- Upgrade the existing booster pump station next to the City's main reservoir to provide two (2) pumps, each capable of providing 150 gpm (relocated from SHWD). Add standby power and Install new flow meters for remote monitoring.
- Connect the City of Dover water system to the SHWD system by installing approximately 880 LF of water main extending from the Cedar Ridge Development to the SHWD water main in Syringa Heights Road.

- Upgrade the water storage system including improved level monitoring and control; increased security measures including video surveillance; adding a check valve at the Cedar Ridge reservoir inlet; back feed from the Cedar Ridge reservoir to the main reservoir; and SCADA integration.
- Install a new 12-inch transmission line from the main reservoir to the existing 12-inch main on Railroad Avenue.
- Replace all of the older water service meters in the City of Dover with new auto-read meters.
- Install emergency backup connection with SHWD at the service area interface near the river. This alternative proposes maintaining the SHWD connection to the Sandpoint reservoir, to provide an emergency backup connection to the City of Sandpoint for both Dover and SHWD.

See **Figure 4-3** for an overview of this alternative. Estimated total cost for this alternative is \$1,787,684. An Engineer’s preliminary opinion of construction cost can be found in **Appendix F**.

The following are the benefits and disadvantages of the proposed upgrades needed to provide service to SHWD:

Benefits-

- Immediate increase in available revenue for operation and maintenance.
- Immediate increase in demand, easing maintenance of required minimum flows through the slow sand filters.
- Aforementioned benefits of having a new raw water intake.

Disadvantages-

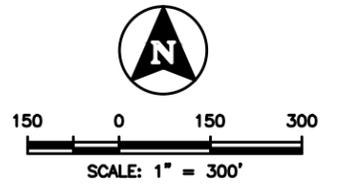
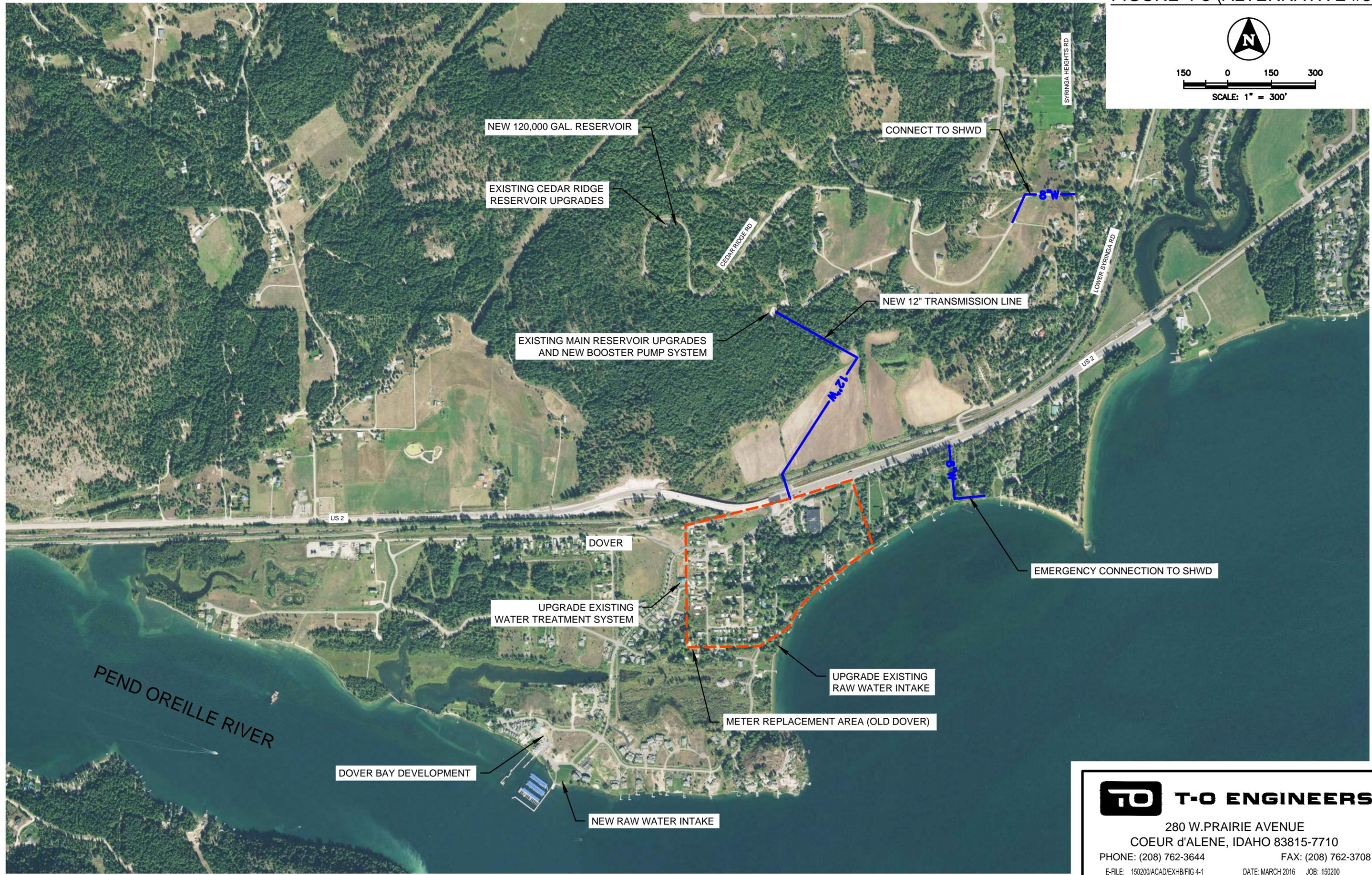
- Higher up front capital costs.
- More significant facility upgrades needed.
- May require slow sand filter facility expansion beyond the 20-year projection.
- Reduces the available reserve capacity of the existing system components.

4.1.4. Alternative #4 (“No Action” Alternative)

As discussed previously upgrades to the existing water supply, treatment and collection system are necessary to improve system safety, reliability and ease of operation. With the addition of SHWD, water supply, pumping and storage components will reach capacity prior to reaching projected combined 20-year demand for the City and SHWD.

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FIGURE 4-3 (ALTERNATIVE #3)



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4.2. Evaluation of Costs

Preliminary cost estimates have been developed for the alternatives and are provided in **Appendix F**. Estimates are based on the most current available cost data.

4.2.1. Capital Costs

Capital cost is the one time “setup” or initial cost to construct the proposed facility improvements, and excludes operation and maintenance. The estimated capital cost of each alternative including engineering, administration and an added contingency amount is summarized in the following **Table 4-1**.

Table 4-1 Capital Cost of Alternatives

| Alternative 1 | Cost |
|---|--------------------|
| Construction | \$844,725 |
| Engineering/Admin. | \$168,945 |
| Contingency | \$126,709 |
| Total | \$1,140,379 |
| Alternative 2 | Cost |
| Construction | \$1,175,550 |
| Engineering/Admin. | \$235,110 |
| Contingency | \$176,333 |
| Total | \$1,586,993 |
| Alternative 3 | Cost |
| Construction | \$1,324,240 |
| Engineering/Admin. | \$264,842 |
| Contingency | \$198,632 |
| Total | \$1,787,684 |
| *Note: The costs provided above do not include financing costs. | |

4.2.2. Operation and Maintenance Costs

Operation and Maintenance costs (O&M) were developed based on the existing O&M costs plus the added costs for each alternative projected to the 20-year demand. O&M costs are the total of the individual costs associated with each component of the proposed alternatives and are summarized in the following **Table 4-2**. Additional O&M costs for Alternative 3 would be offset by additional revenue collected from SHWD.

Table 4-2 Operation and Maintenance Cost Summary

| O&M Expense Description | Alternative 1 | Alternative 2 | Alternative 3 |
|------------------------------------|----------------------|----------------------|----------------------|
| Admin./Accounting | \$12,500 | \$12,500 | \$16,500 |
| Legal Services | \$5,000 | \$5,000 | \$7,500 |
| Engineering Services | \$10,000 | \$10,000 | \$10,000 |
| Maintenance, Repairs and Supplies | \$10,000 | \$12,500 | \$18,000 |
| Licensed Operator and Consulting | \$36,000 | \$38,000 | \$42,000 |
| Testing | \$2,000 | \$2,000 | \$2,000 |
| Utilities | \$15,000 | \$15,000 | \$25,000 |
| Security Monitoring Services | \$2,400 | \$3,200 | \$3,200 |
| Capital Reserves | \$50,000 | \$55,000 | \$65,000 |
| Totals | \$142,900 | \$153,200 | \$189,200 |

4.2.3. Present Worth Analysis

A present worth analysis was performed on the three (3) alternatives. Present worth is used to compare dissimilar alternatives and should not be confused with capital cost. This assumes an interest/discounting rate of 3% which can be compared to an inflation rate in this application. The present worth for each alternative includes the capital cost plus the O&M costs over a 20-year period. No salvage or return values were assumed for this analysis. The results are summarized in **Table 4-3**.

Table 4-3 Present Worth Analysis

| Alternatives | Capital Cost | O&M | Present Worth (20-yr) |
|----------------------|---------------------|------------------|------------------------------|
| Alternative 1 | \$1,140,379 | \$142,900 | \$3,266,370 |
| Alternative 2 | \$1,586,993 | \$153,200 | \$3,866,222 |
| Alternative 3 | \$1,787,684 | \$189,200 | \$4,602,502 |

4.3. Reliability of Alternatives

All three of the Alternatives rely on continued use of the slow sand filtration system, which is a proven treatment technology that is relatively simple, reliable and inexpensive to operate. It is a process that the City and City’s operators are familiar with and has served the City well for over 25 years. Alternatives #2 and #3 provide a more reliable raw water intake system at a new location, as well as the redundancy provided with two intake systems. All three alternatives improve system reliability with centralized SCADA monitoring and more automated control of all water system components. The emergency connection with SHWD, proposed with all three alternatives, provides added reliability in the event of a source contamination or upset in the Dover treatment facility.

4.4. Regionalization

Alternative #3 considers regionalization through supplying water to SHWD, which lies adjacent to and partially within the Dover City limits. Due to the 40+ year age of SHWD's distribution piping it is recommended that the City only supply water to SHWD, and not take ownership and operation of SHWD's infrastructure. Based on preliminary discussions with SHWD, this arrangement appears to be their preference.

4.5. Un-serviced Areas in and around the Community

The majority of the City limits, north of SH-2, are not currently served by the City's water system. This area consists mostly of larger parcels, with agricultural or rural zoning and very low density. Developed parcels in this area are served by individual domestic wells. Due to the low density, it is not cost effective to extend water infrastructure to serve these areas, however, re-zoning and future planned developments could make expansion of water service to these areas feasible. It is anticipated that expansion of water service into these areas will be paid for by new development.

4.6. City Council Input

The Draft Facilities Plan was presented to the Dover City council during their meeting on April 14, 2016. Follow-up meetings were held with SHWD for preliminary discussion of supplying them with water. At a subsequent City Council meeting on October 13, 2016 the Council directed T-O Engineers to proceed with Alternative 3 as the selected alternative.

5. Selected Plan Description and Implementation Arrangements

5.1. Justification and Description of Selected Plan

Following review of the alternatives and discussion with SHWD, the City Council directed T-O engineers to complete and submit the Draft facilities plan to IDEQ, with Alternative 3 as the selected alternative. Negotiations with SHWD are still ongoing, but the Council has elected to move forward with planning for Alternative 3. This selected alternative provides the necessary upgrades to serve the City of Dover and to allow for supply of water to SHWD. Providing service to SHWD is advantageous to the City because it will spread operating costs over a larger customer base and it allows the City to utilize more of the treated water necessary to keep minimum flows through the slow sand filters.

5.2. Preliminary Design of Selected Plan

As discussed in Section 4, the selected alternative involves upgrades and expansion necessary to serve the projected 20-year growth for the City of Dover plus SHWD, as well as address deficiencies identified within the existing system. An integrated supervisory control and data acquisition (SCADA) system for centralized monitoring and control of all water system components including pumping, treatment and storage facilities is included with this alternative, along with specific upgrades as follows.

5.2.1. Water Source and Treatment Facilities

Due to the limitations of the existing intake, the selected alternative proposes construction of a new raw water intake system. The new intake is anticipated to be at or near the location shown on the construction plans approved by DEQ in January 2013. A land based system including wet well and submersible pumps located on the shoreline is proposed, with a piped connection to the river. This will provide easier access to the pumps for maintenance and repair, and eliminate the uncertainty related to the use of submersible pumps in open bodies of water. The existing intake will be kept in place as a backup system, with minor upgrades including updating the electrical/control equipment; addressing DBS interim policy requirements; and SCADA integration.

Proposed upgrades to the water treatment system include sand filter flow and water level monitoring; variable speed pumps for feeding the reservoir; improved chlorine and turbidity monitoring; increased security measures including video surveillance; and SCADA integration.

5.2.2. Water Storage and Distribution Facilities

Service to SHWD will require upgrades to the City of Dover's main booster pump station located next to the City's large reservoir. This booster station feeds the Cedar Ridge reservoir, which will supply SHWD. Two (2) booster pumps, each capable of providing 150 gpm, will be relocated from SHWD's existing booster station. SHWD will no longer need their booster station, since Dover has the capability to feed all of SHWD by gravity. The addition of standby power and the installation of new flow meters for remote monitoring will also be included in the upgrades at the City's main booster station.

Connection to the SHWD system will require approximately 880 LF of water main extending from the Cedar Ridge Development to the SHWD water main in Syringa Heights Road.

Proposed upgrades to Dover’s existing reservoirs include improved level monitoring and control; increased security measures including video surveillance; adding a check valve at the Cedar Ridge reservoir inlet; back feed from the Cedar Ridge reservoir to the main reservoir; and SCADA integration. Improved level monitoring and control should eliminate water loss that has occurred previously due to overfilling of the reservoirs.

Additional proposed upgrades to the distribution system include the installation of a new 12-inch transmission line from the main reservoir to the existing 12-inch main in Railroad Avenue to improve fire flow capacity at the Dover Bay development; replacement of all of the older water service meters in the City of Dover with new auto-read meters; and the installation of an emergency backup connection with SHWD at the service area interface near the river. This alternative proposes maintaining the SHWD connection to the Sandpoint reservoir, to provide an emergency backup connection to the City of Sandpoint for both Dover and SHWD, and will need to be negotiated with SHWD and the City of Sandpoint.

5.2.4. Construction Phasing

Prioritized construction of improvements over two (2) or more phases is proposed to spread out the costs and break the project into more manageable portions. The highest priority improvements should be completed during Phase I including the IDEQ sanitary survey recommendations and improved monitoring and control. Upgrades to serve SHWD would then occur during Phase II. Recommend Phasing is broken down as follows, but may be adjusted depending on timing and agreement with SHWD.

Phase I Construction – Estimated Cost \$980,000

- SCADA System
- Upgrade Existing Raw Water Intake
- New Raw Water Intake
- Water Treatment System Control and Monitoring Upgrades
- Upgrade Existing Water Storage Level Control and Piping
- Standby Power at Main Reservoir Booster Station

Phase II and Beyond – Estimated Cost \$809,000

- Upgraded Main Reservoir Booster Pump Station
- Pipe Connection to SHWD
- New 12” Transmission Line from Main Reservoir
- Emergency Backup Connection to SHWD
- Water Meter Replacements

5.3. Implementation

5.3.1. *Inter-municipal Service Agreements*

The City of Dover will need to enter into an agreement with SHWD for supplying them with water. Based on preliminary discussions with SHWD, this agreement will include the sale of water to SHWD based on a negotiated usage rate per 1,000 gallons. The usage rate will be calculated based on SHWD paying an equal share of the supply, treatment, and storage costs. SHWD would continue to own, operate and maintain their distribution system, and would be billed as a single customer. SHWD will decommission their booster station and provide the pumps to Dover, and SHWD will install the necessary pressure reducing stations within their distribution system.

5.3.2. *Financing Arrangements*

Financing for the proposed improvements will be through the Dover Urban Renewal Agency (DURA) and/or self-funded.

5.3.3. *Operation and Maintenance Requirements*

O&M costs for Alternative #3 are summarized in Section 4.2.2. The estimated total annual O&M cost is \$189,200. Operation requirements will be similar to those for the existing system, but efficiency should improve with the implementation of SCADA and other proposed monitoring and control system upgrades. Current Water System Classifications and Operator Licensing requirements are not anticipated to change with the proposed improvements.

5.3.4. *Project Schedule*

- | | |
|--|--------------------------|
| • Submit Draft Facilities Plan to IDEQ | October, 2016 |
| • IDEQ Comments on Draft Report | April, 2017 |
| • Submit Final Facilities Plan to IDEQ | July, 2017 |
| • Submit Revised Final Facilities Plan to IDEQ | February, 2018 |
| • IDEQ Final Facilities Plan Approval | March, 2018 |
| • Phase I Project Design and Review | March, 2018 – July, 2018 |
| • Advertisement for Phase I Bids | August, 2018 |
| • Begin Phase I Construction | September, 2018 |

APPENDIX A

**DBS Memo
Use of Submersible Well Pumps in Bodies of Water**

Issue: Use of Submersible Well Pumps in Bodies of Water

Background:

The 2016 Idaho Legislature enacted House Bill 634, and the Governor signed that bill on Tuesday, April 5, which changes the regulatory backdrop for the installation of submersible well pumps in lakes and other bodies of water in Idaho.

Policy:

Pending the results of the rulemaking process mandated in House Bill 643 the following interim provisions shall apply to the installations of submersible well pumps employed in lakes, rivers, ponds, and streams in Idaho, and shall supplement the requirements traditionally imposed on such installations:

Submersible well pumps may continue to be installed and utilized in the lakes, rivers, streams and ponds of Idaho subject to the following restrictions:

1. All provisions of article 682 shall apply to bodies of water where swimming and marine activities do not take place.
2. In bodies of water where swimming or marine activities take place all provisions of 682 excluding 682.10 relating to the specific use of pumps shall apply.
3. Submersible well pumps located in Idaho's swimming and marine areas shall be considered directly connected.
4. In bodies of water where swimming or marine activities take place submersible well pumps shall be installed or repaired in accordance with, [*The Permanent Installation of Directly Connected Submersible Well Pumps in Bodies of Water*](#), policy submitted to the Idaho Electrical board by a collaborative effort, dated 6/30/2016.

Date: 6/30/2016

Issue: The Permanent Installation of Directly Connected Submersible Well Pumps in Bodies of Water.

Background:

The 2016 Idaho Legislature enacted House Bill 643, and the Governor signed that bill on Tuesday, April 5, which changes the regulatory backdrop for the installation of submersible well pumps in lakes and other bodies of water in Idaho. A collaborative effort, between the Division of Building Safety, the Idaho Electrical Board, pump manufacturers, installers, end users, Department of Lands and other interested parties, began on April 15, 2016. This collaborative is tasked with providing rules for the safe installation of submersible well pumps within the State of Idaho.

Policy:

It has been the duty of the submersible pump collaborative, to identify and propose standardized practices with the regard to new installations, and repair and replacement of existing installations, of submersible well pumps employed in lakes, rivers, ponds, and streams in Idaho, and shall supplement, or improve upon, the requirements imposed by authority having jurisdiction (AHJ), and/or the requirements of adopted National Electrical Code (NEC), NFPA 70.

This policy, as proposed by the collaborative, amends NEC Article 682, for both new installations, and for repair and replacement installations. Existing submersible well pump installations located in bodies of water, shall not be repaired without applying for an electrical permit. Permitted repairs shall comply with all of the requirements of NEC Article 682 and any Idaho State adopted amendments.

This policy is proposed as follows:

NEC Article 682 as Amended for New Installations/Repair and Replacement

682 Part I. General. *All aspects still apply.*

682 Part II. Installation

682.10 Electrical Equipment and Transformers. **Electrical equipment and transformers, including their enclosures, shall be specifically approved for the intended location. No portion of an enclosure for electrical equipment not identified for operation while submerged shall be located below the electrical datum plane.**

Add New: Exception. All submersible well pumps used in bodies of water, must be labeled and listed in compliance with any one of the following - UL778, UL1004, UL2111 or other AHJ approved standard, until the use of submersible well pump motors are listed and

approved for use in bodies of water at a future date.

682.11 Location of Service Equipment. On land, the service equipment for floating structures and submersible electrical equipment shall be located no closer than 1.5 m (5ft) horizontally from the shoreline and live parts shall be elevated a minimum of 300 mm (12 in.) above the electrical datum plane. Service equipment shall disconnect when the water level reaches the height of the established electrical datum plane.

Add New: Exception. This rule shall not apply to service equipment that is located on or at the dwelling unit and is not susceptible to flooding.

682.12 Electrical Connections. All electrical connections not intended for operation while submerged shall be located at least 300 mm (12 in.) above the deck of a floating or fixed structure, but not below the electrical datum plane.

682.13 Wiring Methods and Installation. Liquidtight flexible metal conduit or liquidtight flexible nonmetallic conduit with approved fittings shall be permitted for feeders and where flexible connections are required for services. Extra-hard usage portable power cable listed for both wet locations and sunlight resistance shall be permitted for a feeder or a branch circuit where flexibility is required. Other wiring methods suitable for the location shall be permitted to be installed where flexibility is not required. Temporary wiring in accordance with 590.4 shall be permitted.

Add New: Exception No 1. Wiring methods such as HDPE schedule 80 electrical conduit or its equivalent or greater, and clearly marked at a minimum "Caution Electrical" to indicate that it contains electrical conductors shall be approved. It shall be buried whenever practical, and in accordance with other regulatory agency policies. The use of gray HDPE water pipe rated at 250 PSI (eg. SIDR-7 or DR-9) is suitable for use as a chase only when the following conditions are met:

- A. When internal conductors are jacketed submersible pump cable.*
- B. When used in continuous lengths, directly buried, or secured on a shoreline above and below the water line.*
- C. When submersible pump wiring terminations in the body of water according to 682.13 Exception No. 2 are met.*

Add New: Exception No 2. Any listed and approved splices required to be made at the submersible well pump itself, outside of a recognized submersed pump sleeve or housing, when wires are too large to be housed inside said sleeve, shall be covered with a non-metallic, impact resistant material, no less than .25 inches thick, such as heavy duty heat shrink or other equivalent method approved by the AHJ. (Eg. install a heat shrink over the sleeve or housing that the submersible well pump is installed in, and then recover (apply heat) the heat shrink over both the HDPE and the water line). At least 6" shall be over the sleeve and at least 12" over the HDPE and

water line.

Add New: Exception No. 3. Pipe, conduit, PVC well casing, or other electrically unlisted tubing may be used as a chase (not as a raceway) to protect conductors or cables from physical damage. Conductors or cables within a chase shall be rated for the location.

682.14 Submersible or Floating Equipment Power Connections.

Submersible or floating equipment shall be cord – and plug-connected, using extra-hard usage cord, as designated in Table 400.4, and listed with a “W” suffix. The plug and receptacle combination shall be arranged to be suitable for the location while in use. Disconnecting means shall be provided to isolate each submersible or floating electrical equipment from its supply connection(s) without requiring the plug to be removed from the receptacle.

Existing Exception No. 1: Equipment listed for direct connection and equipment anchored in place and incapable of routine movement cause by water current or wind shall be permitted to be connected using wiring methods covered in 682.13.

Add New: Exception No. 2. Submersible well pumps shall be considered directly connected and shall be anchored in place. Ballast is an acceptable form of anchoring.

A. Type and Marking. The disconnecting means shall consist of a circuit breaker, a switch, or both, or a molded case switch, and shall be specifically marked to designate which receptacle or other outlet it controls.

Add New: Exception No. 1. Motor controller circuits (remotely located stop pushbutton, disconnect, relay, switch) in a non-metallic enclosure shall be accepted as a required disconnecting means when a controller location is not practical, or where terrain or other obstacle(s) prevent installation of actual operating motor controller in this location, and shall be placed no closer than five feet from but within sight of the shoreline, and marked at a minimum “Emergency Pump Stop”, or “Emergency Stop” with other obvious indication on the visible side of the enclosure, that it is for a pump. It shall be elevated not less than 12” above the datum plane.

Add New: Exception No. 2. An equipotential plane is not required for disconnecting means with non-metallic enclosures.

B. Location. The disconnecting means shall be readily accessible on land, located not more than 750 mm (30 in.) from the receptacle it controls, and shall be located in the supply circuit ahead of the receptacle. The disconnecting means shall be located within sight of but not closer than 1.5 m (5 ft) from the shoreline and shall be elevated not less than 300 mm (12 in.) above the datum plane.

Add New: Exception. Motor controller circuits (remotely located stop pushbutton, disconnect, relay, switch) in a non-metallic enclosure shall be accepted as a required

disconnecting means when it installation is not practical, or where terrain or other obstacle(s) prevent installation of actual operating motor controller in this location, and shall be placed no closer than five feet from but within sight of the shoreline, and marked at a minimum “Emergency Pump Stop”, or “Emergency Stop” with other obvious indication on the visible side of the enclosure, that it is for a pump. It shall be elevated not less than 12” above the datum plane.

682.15 Ground-Fault Circuit-Interrupter (GFCI) Protection. Fifteen (15) and twenty (20) ampere single-phase, 125 volt through 250 volt receptacles installed outdoors and in or on floating buildings or structures within the electrical datum plane area that are used for storage, maintenance, or repair where portable electric hand tools, electrical diagnostic equipment, or portable lighting equipment are to be used shall be provided with GFCI protection. The GFCI protection device shall be located not less than 300 mm (12 in.) above the established electrical datum plane.

Add New: Exception No. 1. For submersible pumps located in bodies of water, and are rated 60 amperes maximum, 250 volts maximum, shall have GFCI or Ground Fault Equipment Protection designed to trip at a maximum of 30 milliamps or less, protected by means selected by a licensed installer, meeting listing or labeling requirements, and inspected by the AHJ prior to submersion in bodies of water.

Add New: Exception No. 2. For installations or repair and replacement of submersible pumps located in bodies of water, that are rated over 60 amperes, and rated at any voltage, shall be evaluated by a qualified designer (Experienced Licensed Contractor), or involve Engineering or be engineered, for each specific application, with the utmost goal of public safety. Whenever possible, GFCI or Ground Fault Equipment Protection designed to trip at a maximum of 30 milliamps or less, meeting listing or labeling requirements, shall be installed, then inspected by the AHJ prior to submersion in bodies of water.

682 Part III.

682.30 Grounding. *All aspects still apply.*

682.31 Equipment Grounding Conductors.

A. Type. Equipment grounding conductors shall be insulated copper conductors sized in accordance with 250.122 but not smaller than 12 AWG.

B. *All aspects still apply.*

C. *All aspects still apply.*

D. *All aspects still apply.*

682.33 Bonding of Non-Current-Carrying Metal Parts. *All aspects still apply.*

682.33 Equipotential Planes and Bonding of Equipotential Planes. An equipotential

plane shall be installed where required in this section to mitigate step and touch voltages at electrical equipment.

A. Areas Requiring Equipotential Planes. Equipotential planes shall be installed adjacent to all outdoor service equipment or disconnecting means that control equipment in or on water, that have a metallic enclosure and controls accessible to personnel, and that are likely to become energized. The equipotential plane shall encompass the area around the equipment and shall extend out not less than 900 mm (36 in.) in all directions from which a person would be able to stand and come in contact with the equipment.

Add New: Exception. Submersible pump control panels and remote control circuit panels used to disconnect submersible pumps, and that are enclosed in non-metallic enclosures, do not require equipotential planes.

B. Areas Not Requiring Equipotential Planes. Equipotential planes shall not be required for the controlled equipment supplied by the service equipment or disconnecting means.

Add New: Exception. All circuits rated 60 amperes maximum and 110-250 volts, any phase, shall contain ground fault protection, in accordance with 682.15, for the motor leads that are located in a body of water, at a minimum.

C. Bonding. Equipotential planes shall be bonded to the electrical grounding system. The bonding conductor shall be solid copper, insulated, covered or bare, and not smaller than 8 AWG. Connections shall be made by exothermic welding or by listed pressure connectors or clamps that are labeled as being suitable for the purpose and are of stainless steel, brass, copper, or copper alloy.

Other articles and sections of the adopted National Electric Code not specifically addressed by House Bill 643 may apply.

This submersible pump collaborative acknowledges and accepts the reality of the hazards associated with electrical equipment in water. During the organizing and discussion of the collaborative concerns, it remains evident that all parties want to ensure the safe installation of submersible well pumps.

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Idaho Submersible Pump Collaborative
Sandpoint Pump & Power
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APPENDIX B

Meter Data and Demand Calculations

**CITY OF DOVER WATER SYSTEM
METER DATA SUMMARY**

| | | OLD DOVER WATER DATA | | | DOVER BAY DEVELOPMENT DATA | | | COMBINED DATA | | | | | | |
|------|---------------------------------|---------------------------------------|---------------------------------------|---------------------|---|---|---|--------------------------------------|------------------|-------------------------|-----------------|------------------------|-------------|--|
| | | Residential | Commercial | All | Residential | Commercial | All | CALCULATED ERU's OD and DBD Combined | City Charge ERUs | Water Source Production | Monthly Balance | | | |
| | | Total City of Old Dover Metered Usage | Total City of Old Dover Metered Usage | Total Metered Usage | Total Dover Bay Development Metered Usage | Total Dover Bay Development Metered Usage | Total Dover Bay Development Metered Usage | | | | | | | |
| 2015 | Nov-April | 1,427,980 | 619,780 | 2,047,760 | 629,810 | 521,880 | 1,151,690 | 3,199,450 | | 4,167,000 | 967,550 | *10 Months of records. | 1.302411352 | |
| | May | 427,550 | 102,470 | 530,020 | 107,890 | 126,450 | 234,340 | 764,360 | | 1,068,000 | 303,640 | *10 Months of records. | 1.39724737 | |
| | June | 617,520 | 139,220 | 756,740 | 134,502 | 179,280 | 313,782 | 1,070,522 | | 1,567,000 | 496,478 | | 1.46377188 | |
| | July | 949,226 | 213,560 | 1,162,786 | 249,094 | 225,747 | 474,841 | 1,637,627 | | 1,983,000 | 345,373 | | 1.210898452 | |
| | August | 775,553 | 403,730 | 1,179,283 | 246,314 | 279,787 | 526,101 | 1,705,384 | | 1,842,000 | 136,616 | | 1.080108644 | |
| | September | 518,178 | 215,060 | 733,238 | 257,877 | 160,890 | 418,767 | 1,152,005 | | 1,091,000 | -61,005 | | 0.947044501 | |
| | October | 341,456 | 184,760 | 526,216 | 117,724 | 102,344 | 220,068 | 746,284 | | 961,000 | 214,716 | | 1.287713525 | |
| | ERU's | 87 | 38 | 125 | 62 | 96 | 158 | 282 | 287 | 282 | | | | |
| | Max Month | 949,226 | 403,730 | 1,179,283 | 257,877 | 279,787 | 526,101 | 1,705,384 | 1,694,390 | 1,726,000 | | | | |
| | Max Month Average Day (gpd/eru) | 351.96 | 344.44 | 304.79 | 134.17 | 94.50 | 107.75 | 194.86 | 190.78 | 197.22 | | | | |
| | Max Day (gpd/ERU) | 457.54 | 447.77 | 435.85 | 174.42 | 122.85 | 154.08 | 278.65 | 248.01 | 256.38 | | | | |
| | Monthly Average | 421,455 | 156,548 | 578,004 | 145,268 | 133,032 | 278,299 | | | | | | | |
| | Yearly Total (12 months) | 5,057,463 | 1,878,580 | 6,936,043 | 1,743,211 | 1,596,378 | 3,339,589 | 10,275,632 | | 12,679,000 | 2,403,368 | 1.233890042 | | |
| | Average Day Total | 13,818 | 5,133 | 18,951 | 4,763 | 4,362 | 9,125 | 28,075 | | | | | | |
| | Avg. Day (gpd/ERU) | 158.83 | 135.75 | 167.02 | 76.82 | 45.67 | 63.73 | 109.39 | | | | | | |

| | | OLD DOVER WATER DATA | | | DOVER BAY DEVELOPMENT DATA | | | COMBINED DATA | | | | | | |
|------|---------------------------------|---------------------------------------|---------------------------------------|---------------------|---|---|---|--------------------------------------|------------------|-------------------------|-----------------|------------------------|-------------|--|
| | | Residential | Commercial | All | Residential | Commercial | All | CALCULATED ERU's OD and DBD Combined | City Charge ERUs | Water Source Production | Monthly Balance | | | |
| | | Total City of Old Dover Metered Usage | Total City of Old Dover Metered Usage | Total Metered Usage | Total Dover Bay Development Metered Usage | Total Dover Bay Development Metered Usage | Total Dover Bay Development Metered Usage | | | | | | | |
| 2014 | May | 326,240 | 165,260 | 491,500 | 142,640 | 165,960 | 308,600 | 800,100 | | 152,000 | | *10 Months of records. | 0.189976253 | |
| | June | 412,200 | 158,660 | 570,860 | 107,958 | 213,660 | 321,618 | 892,478 | | 1,078,000 | 185,522 | | 1.207872911 | |
| | July | 608,560 | 193,090 | 801,650 | 194,602 | 254,940 | 449,542 | 1,251,192 | | 1,356,800 | 105,608 | | 1.084405911 | |
| | August | 686,230 | 439,170 | 1,125,400 | 271,220 | 297,770 | 568,990 | 1,694,390 | | 1,726,000 | 31,610 | | 1.018655681 | |
| | September | 405,570 | 220,860 | 626,430 | 146,910 | 148,410 | 295,320 | 921,750 | | 962,000 | 40,250 | | 1.043666938 | |
| | October | 259,970 | 165,380 | 425,350 | 93,960 | 71,120 | 165,080 | 590,430 | | 778,000 | 187,570 | | 1.317683722 | |
| | ERU's | 87 | 48 | 135 | 56 | 103 | 159 | 294 | 287 | 287 | | | | |
| | Max Month | 686,230 | 439,170 | 1,125,400 | 271,220 | 297,770 | 568,990 | 1,694,390 | 1,694,390 | 1,726,000 | | | | |
| | Max Month Average Day (gpd/eru) | 254.44 | 292.28 | 267.98 | 156.23 | 93.41 | 115.56 | 185.72 | 190.78 | 194.34 | | | | |
| | Max Day (gpd/ERU) | 330.77 | 379.96 | 383.21 | 203.10 | 121.44 | 165.25 | 265.58 | 248.01 | 252.64 | | | | |
| | Monthly Average | 449,795 | 223,737 | 673,532 | 159,548 | 191,977 | 351,525 | | | | | | | |
| | Yearly Total (Only 6 months) | 2,698,770 | 1,342,420 | 4,041,190 | 957,290 | 1,151,860 | 2,109,150 | 5,350,240 | | 5,900,800 | 550,560 | 1.102903795 | | |
| | Average Day Total | 14,510 | 7,217 | 21,727 | 5,147 | 6,193 | 11,340 | 28,765 | | | | | | |
| | Avg. Day (gpd/ERU) | 166.78 | 148.90 | 176.42 | 91.91 | 60.22 | 78.53 | 107.51 | | | | | | |

**CITY OF DOVER WATER SYSTEM
METER DATA SUMMARY**

| | OLD DOVER WATER DATA | | | DOVER BAY DEVELOPMENT DATA | | | COMBINED DATA | CITY CHARGE ERUs | WATER SOURCE PRODUCTION | MONTHLY BALANCE |
|------|---------------------------------------|--------------------------------------|---------------------|---|---|---------------------|---------------|------------------|-------------------------|-----------------|
| | Residential | Commercial | All | Residential | Commercial | All | | | | |
| | Total City of Old Dover Metered Usage | Total City of Old Dover Meterd Usage | Total Metered Usage | Total Dover Bay Development Metered Usage | Total Dover Bay Development Metered Usage | Total Metered Usage | | | | |
| 2013 | Nov - April | 1,585,439 | 205,580 | 1,791,019 | 479,560 | 553,530 | 1,033,090 | 2,824,109 | | |
| | May | 369,150 | 163,250 | 532,400 | 93,878 | 118,800 | 212,678 | 745,078 | | |
| | June | 493,390 | 176,930 | 670,320 | 96,788 | 191,040 | 287,828 | 958,148 | | |
| | July | 736,431 | 186,820 | 923,251 | 158,870 | 215,179 | 374,049 | 1,297,300 | | |
| | August | 741,099 | 199,189 | 940,288 | 234,290 | 297,760 | 532,050 | 1,472,338 | | |
| | September | 588,430 | 220,080 | 808,510 | 142,570 | 234,880 | 377,450 | 1,185,960 | | |
| | October | 304,000 | 158,550 | 462,550 | 87,520 | 91,790 | 179,310 | 641,860 | | |
| | ERU's (See Note for DBD Residential) | 85 | 39 | 124 | 53 | 104 | 157 | 281 | 280 | |
| | Max Month | 741,099 | 220,080 | 940,288 | 234,290 | 297,760 | 532,050 | 1,472,338 | 1,472,338 | |
| | Max Month Average Day (gpd/eru) | 281.25 | 186.03 | 243.76 | 142.60 | 93 | 110 | 169 | 170 | |
| | Max Day (gpd/ERU) | 365.63 | 241.84 | 348.58 | 185.38 | 120 | 156.61 | 241.57 | 221 | |
| | Monthly Average | 401,495 | 172,675 | 574,170 | 107,790 | 152,715 | 260,505 | | | |
| | Yearly Total (12 months) | 4,817,938 | 2,072,099 | 6,890,037 | 1,293,475 | 1,832,579 | 3,126,054 | 9,473,791 | | |
| | Average Day Total | 13,200 | 5,677 | 18,877 | 3,544 | 5,021 | 8,565 | 25,956 | | |
| | Avg. Day (gpd/ERU) | 155.29 | 143.96 | 166.87 | 66.86 | 48.41 | 60.12 | 101.55 | | |

| | OLD DOVER WATER DATA | | | DOVER BAY DEVELOPMENT DATA | | | COMBINED DATA | CITY CHARGE ERUs | WATER SOURCE PRODUCTION | MONTHLY BALANCE |
|------|---------------------------------------|--------------------------------------|---------------------|---|---|---------------------|---------------|------------------|-------------------------|-----------------|
| | Residential | Commercial | All | Residential | Commercial | All | | | | |
| | Total City of Old Dover Metered Usage | Total City of Old Dover Meterd Usage | Total Metered Usage | Total Dover Bay Development Metered Usage | Total Dover Bay Development Metered Usage | Total Metered Usage | | | | |
| 2012 | May | 355,650 | 164,150 | 519,800 | 77,477 | 505,040 | 582,517 | 1,102,317 | | |
| | June | 403,910 | 125,550 | 529,460 | 130,628 | 140,560 | 271,188 | 800,648 | | |
| | July | 503,190 | 161,220 | 664,410 | 175,719 | 236,540 | 412,259 | 1,076,669 | | |
| | August | 807,450 | 210,310 | 1,017,760 | 196,800 | 294,080 | 490,880 | 1,508,640 | | |
| | September | 707,390 | 204,970 | 912,360 | 109,560 | 180,570 | 290,130 | 1,202,490 | | |
| | October | 422,021 | 131,220 | 553,241 | 70,889 | 93,070 | 163,959 | 717,200 | | |
| | ERU's (See Note for DBD Residential) | 82 | 25 | 107 | 47 | 100 | 147 | 254 | 273 | |
| | Max Month | 807,450 | 210,310 | 1,017,760 | 196,800 | 505,040 | 582,517 | 1,600,277 | 1,600,277 | |
| | Max Month Average Day (gpd/eru) | 317.64 | 276.75 | 305.89 | 135.07 | 162.79 | 128 | 203 | 189 | |
| | Max Day (gpd/ERU) | 412.94 | 359.78 | 437.42 | 175.59 | 211.63 | 182.70 | 290.16 | 246 | |
| | Monthly Average | 533,268 | 266,237 | 799,505 | 126,846 | 278,643 | 405,489 | | | |
| | Yearly Total (Only 6 months) | 3,199,610 | 1,597,420 | 4,797,030 | 761,073 | 1,671,860 | 2,432,933 | 6,407,964 | | |
| | Average Day Total | 17,389 | 8,682 | 26,071 | 4,136 | 9,086 | 13,222 | 34,826 | | |
| | Avg. Day (gpd/ERU) | 212.06 | 342.73 | 267.19 | 88.01 | 90.79 | 98.89 | 150.58 | | |

- Notes:
1. 2012 and 2013 Parkside Bungalows meter data was compromised so 2014 data was used for all three years.
 2. Average Day Demand includes an additional 10% for assumed system losses.
 3. Maximum Day Demands estimated based on Washington State Department of Health (WSDOH) Water System Design Manual Section 5.2.1 MDD to MMAD peaking factor of 1.3 plus an additional 10% for system losses.

APPENDIX C

Drinking Water Quality Report

DOVER, THE CITY OF

PWS #ID1090193

Report on Quality of Drinking Water in 2014

The federal Safe Drinking Water Act requires that all community drinking water systems must provide customers an annual report of the quality of their drinking water. This report is a summary of the quality of the City of Dover's water for calendar year 2014. Included are details about where the water comes from, what it contains, and how it compares to EPA and Idaho standards. All City of Dover drinking water facilities are operated under the direction of the City Council. Bob Hansen of Water Systems Management, Inc. operates our drinking water system. For further information about your water system (PWS #ID1090193), call Bob Hansen at (208) 265-4270 or Email: wsmibob@aol.com.

The City Council meets regularly at 6:00 pm on the 2nd & 4th Thursday of each month. Official Agendas are posted at City Hall, 699 Lakeshore Ave., Dover, Idaho 83825, prior to the meeting. Copies are available or if you have any questions please call Jacquie Albright at (208)265-8339. Please feel free to participate in these meetings.

Your water is a Surface Water Source that comes from Pend Oreille River, and is then filtered through a slow sand filter and is then disinfected at our water treatment plant prior to distribution.

Last year, we conducted tests for 2,4-D, Arsenic (1005), Bacteria, Disinfection By-Products, Inorganic Chemical (IOC)–Sodium and Nitrate. We had detects of some contaminants, which are listed in the tables on page four and five.

Definitions and abbreviations used are listed below:

-Action Level: The concentration of a contaminant, which if exceeded, triggers treatment, or other requirements which a water system must follow.

-Initial Distribution System Evaluation (IDSE): IDSE is an important part of the Stage 2 Disinfection By-Products Rule (DBPR). The IDSE is a one-time study conducted by some water systems, providing disinfection or chlorination, to identify distribution system locations with concentrations of trihalomethanes (THMs) and haloacetic acids (HAAs). Water systems will use results from the IDSE, in conjunction with their Stage 1 DBPR compliance monitoring data, to select monitoring locations for Stage 2 DBPR. Not all water systems were required to perform an IDSE.

-Maximum Contamination Level (MCL): The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

-Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

-Maximum Residual Disinfectant Level (MRDL): The highest level of disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

-Maximum Residual Disinfectant Level Goal (MRDLG): The Level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLG's do not reflect the benefits of the use of disinfectants to control microbial contamination.

-n/a: not applicable.

-nd: not detectable at testing limit.

-ppb: parts per billion or micrograms per liter.

-ppm: parts per million or milligrams per liter.

-pCi/l: Pico curies per liter (a measure of radiation).

-Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immune-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/Centers for Disease Control and Prevention (CDC) guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline 1-800-426-4791 or <http://www.epa.gov/safewater/hotline/>.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline 1-800-426-4791 or <http://www.epa.gov/safewater/hotline/>.

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

In order to ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. Food and Drug Administration (FDA) regulations establish limits for contaminants in bottled water which must provide the same protection for public health.

Contaminants that may be present in source water before we treat it include:

Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.

Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial, or domestic wastewater discharges, oil and gas production, mining, or farming.

Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.

Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, and septic systems.

Radioactive contaminants, which can be naturally-occurring or be the result of oil and gas production and mining activities.

Lead Informational Statement (Health effects and ways to reduce exposure) If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. BeeLine Water Association, Inc. is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components.

When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your drinking water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline 1-800-426-4791 or <http://www.epa.gov/safewater/hotline/>.

Water Quality Monitoring has been conducted on a regular basis in compliance with all Federal, State, and Local monitoring requirements.

The Department of Environmental Quality (DEQ) continues to maintain a waiver program for Inorganic Chemical (IOC), Volatile Organic (VOC), and Synthetic Organic (SOC) compounds monitoring. These waivers help to reduce some of the financial burden placed on public water suppliers by testing which would normally be required by the Safe Drinking Water Act. The DEQ has performed numerous risk analyses to determine the potential for various chemical contaminants to be present in Idaho. The DEQ office has determined that few of these chemicals pose a risk of being present in drinking water sources in the northern region of the state and that waivers would be appropriate.

The State of Idaho Department of Environmental Quality has completed the **Source Water Assessment Report** for the City of Dover Water. The Water System received a moderate susceptibility score for potential contamination. A **Drinking Water Protection Plan** is available on the City of Dover's website; <http://www.doveridaho.org>. For additional information or a copy of the Source Water Assessment Report, please feel free to contact, Bob Hansen at (208) 265-4270 or Email: wsmibob@aol.com.

DRINKING WATER NOTICE

Monitoring requirements not met for The City of Dover

We violated a drinking water standard. Even though this was not an emergency, as our customers, you have a right to know what happened and what we are doing to correct this situation.

We are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not our drinking water meets health standards. During the month of February, 2015 we did not monitor for Coliform Bacteria and therefore cannot be sure of the quality of our drinking water during that time.

What This Means

There is nothing you need to do at this time. The table below lists the contaminant we did not properly test for, how often we are supposed to sample (frequency) and how many samples we are supposed to take, how many samples we took, when samples should have been taken, and the date on which follow-up samples were (or will be) taken.

| Contaminant | Required sampling frequency | Number of samples taken | When sample should have been taken | When samples will be taken |
|-------------|-----------------------------|-------------------------|------------------------------------|----------------------------|
| Coliform | Monthly | 0 | 2/1 – 2/28/2015 | Each Month |

Steps We Are Taking

We have since taken the required samples, as described in the last column of the table above. The samples showed we are meeting drinking water standards. For more information, please contact Bob Hansen of Water Systems Management, Inc. at (208) 265-4270.

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

State Water System ID#: ID1090193. Date distributed: June 30, 2015.

| |
|---|
| CITY OF DOVER PWS #ID1090193 WATER QUALITY DATA FOR 2014 |
|---|

Microbiological Contaminants

| | Highest # Positive In a Month | MCL | MCLG | Violation (Y/N) | Possible Source of Contamination |
|----------------|-------------------------------|-----|------|-----------------|--------------------------------------|
| Total Coliform | 0 | >1 | 0 | N | Naturally present in the environment |

* Unless otherwise noted, the data presented in this water quality table is from testing done between January 1 – December 31, 2014.

Disinfection By Products

| Contaminant | MCL | MCLG | Our System Range Average | Range | Sample Year | Violation Y/N | Typical Source of Contamination |
|-------------------------|-----|------|--------------------------|-------|-------------|---------------|---|
| Total Trihalomethanes | 80 | N/A | 14.7 | N/A | 2014 | N | By product of drinking water disinfection |
| Haloacetic Acids (HAA5) | 60 | N/A | 11.3 | N/A | 2014 | N | By product of drinking water disinfection |

Maximum Residual Disinfectant Level

| Contaminant | Violation (Y/N) | MCL | MCLG | Highest Level Detected: | Running Annual Average | Sample Date | Typical Source of Contamination |
|-------------|-----------------|----------|-----------|-------------------------|------------------------|-------------|---|
| Chlorine | N | MRDL = 4 | MRDLG = 4 | 1.4 | 0.75 | Monthly | Water Additive used to control microbes |

CITY OF DOVER
PWS #ID1090193
WATER QUALITY DATA FOR 2014

Lead/Copper

| Contaminant | Date(s) Collected | 90 th Percentile | Action Level | MCLG | #of sites above Action Level | Violation Y/N | Possible Source of Contamination |
|--------------|-------------------|-----------------------------|--------------|------|------------------------------|---------------|---|
| Lead (ppb) | 2011 6 samples | 3 | 15 | 0 | 0 | N | Corrosion of household plumbing systems: Erosion of natural deposits. |
| Copper (ppm) | 2011 6 samples | 0.166 | 1.3 | 1.3 | 0 | N | Corrosion of household plumbing systems: Erosion of natural deposits. |

* Unless otherwise noted, the data presented in this water quality table is from testing done between January 1 – December 31, 2014.

Turbidity

| Turbidity/Units | MCL/TT | MCLG | Level Found | Range | Sample Date | Violation Y/N | Typical Source |
|---|----------------------------|------|-------------|-------|-------------|---------------|----------------|
| Turbidity (NTU) | TT = 5.0 NTU | 0 | 0.98 | N/A | 06/16/14 | N | Soil runoff |
| | TT = % of samples <1.0 NTU | | 100 | N/A | Daily | N | Soil runoff |
| Turbidity is a measure of the cloudiness of the water. We monitor it because it is a good indicator of water quality. | | | | | | | |

APPENDIX D

DEQ Drinking Water Supply Reports



STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

2110 Ironwood Parkway, Coeur d'Alene, ID 83814 (208) 769-1422

C. L. "Butch" Otter, Governor
John H. Tippetts, Director

January 5, 2017

The Honorable Annie Shaha
Mayor of Dover
PO Box 115
Dover, ID 83825
ashaha@dovercityhall.com

Subject: Sanitary Survey for City of Dover, ID1090193
Survey Date: December 7, 2016 Last Survey Date: September 5, 2012

Dear Mayor Shaha:

I thank Bob Hansen and Mike Wade for assisting me in the field inspection for the Sanitary Survey that is normally required every three years for this public water supply system. The purpose of the Sanitary Survey is to document a detailed record of the water system, evaluate current operating procedures, provide recommendations, and identify deficiencies that require correction. The Sanitary Survey Report is enclosed for your files consisting of 18 pages of narrative description including this cover letter and 16 pages of photographic documentation.

Requirements and recommendations are listed on page(s) 17-18 in order to protect public health, prevent future problems, minimize contamination potential, maximize safety, and promote effective system operation. The water system is advised to implement solutions to these noted deficiencies as soon as practical. **Discuss the report findings and submit a written Plan of Correction to the local office of the Idaho Department of Environmental Quality (DEQ) within 45 days after the date of this report.**

With the exception of noted deficiencies, the water system appears to be substantially in compliance with DEQ requirements and Idaho Rules for Public Drinking Water Systems (Rules).

Sincerely,

A handwritten signature in blue ink that reads "Jim Williamson".

Jim Williamson
Drinking Water Analyst
Jim.Williamson@deq.idaho.gov

c: Anna Moody, Drinking Water Program Supervisor, Anna.Moody@deq.idaho.gov
Bob Hansen, Responsible Charge Operator, wsmibob@aol.com
TRIM file: ID1090193, City of Dover

DRINKING WATER SUPPLY REPORT

IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY

System: City of Dover **PWS #:** ID1090193 **County:** Bonner
Surveyor(s): Jim Williamson **Survey Date:** December 7, 2016
Surface Water Source: Pend Oreille River
PWS Type: Community **Population:** 573 **Connections:** 246

AERIAL VICINITY MAP



- | | |
|-----------------------------|--------------------------------|
| 1 RIVER INTAKE | 5 UPPER STORAGE TANK #2 |
| 2 INTAKE PUMP VAULT | 5 BOOSTER PUMP STATION #3 |
| 3 SSF WATER TREATMENT PLANT | 6 CITY HALL, 699 LAKESHORE AVE |
| 3 TRANSFER PUMP STATION #1 | 7 WWTP, 855 RAILROAD AVE |
| 4 LOWER STORAGE TANK #1 | 8 CEDAR RIDGE RESIDENCES |
| 4 TRANSFER PUMP STATION #2 | 9 WESTSIDE FPD, DOVER STATION |

OVERALL SYSTEM FACILITIES

The City of Dover (water system) was originally incorporated as a municipality on July 26, 1988, and it is the ownership entity of the public drinking water system with a mayor and city council form of government. The drinking water system is supplied by one surface water intake. Surface water treatment includes slow sand filtration (SSF) and hypochlorite disinfection. There are two water storage facilities, and one also serves as a disinfection contact chamber. Multiple

pressure zones are controlled by storage tank elevations and booster pump stations. Distribution mains include PVC pipe. In general, the water system infrastructure dates from the early 1990s with significant improvements in the late 1990s and late 2000s.

WATER SYSTEM HISTORY

The water system is located in the center of Bonner County approximately three air miles southwest of Sandpoint, Idaho. The water system service area includes the residences and businesses surrounding the incorporated City of Dover.

Dover is an old mill town, and the mill owned and operated the original water system. When the mill closed, the water system fell into disrepair. Leaks and low water pressure characterized the water system in the 1970s, and by the mid-1980s DEQ determined the water was not reliably safe to drink and violated several state drinking water regulations. For six years until 1991, water users boiled their drinking water.

The following is reported in the Draft City of Dover Water Facilities Plan (October 2016): “The majority of the City’s current water infrastructure was constructed in 1991, including a raw water intake, slow sand filtration system (two filter bays), and water storage reservoir. In 1998 the water system was expanded to serve the 25-lot Cedar Ridge development, which is considered part of the Non-Dover Bay area. This expansion included two (2) water booster stations and a 43,000 gallon reservoir. In 2007 two (2) additional filter bays, doubling the treatment capacity, were added to the slow sand filtration system. In 2009 the City’s reservoir was expanded to 354,000 gallons with the addition of baffling. These upgrades were triggered by the Dover Bay Development, a 600 unit planned development within the City of Dover. Sanitary restrictions for the lots in the Dover Bay Development were implemented to minimize the effects of rapid development on existing customers. Sanitary restrictions on the water system were partially lifted in May 2013, when DEQ agreed that the treatment capacity of the existing system could serve up to 95 ERUs in Non-Dover Bay plus up to 482 ERUs in the Dover Bay Development. The 2014 Water System Facility plan recommended a new water intake, expansion of the slow sand filtration facility, increased water storage, new transmission piping and standby power to serve an estimated build-out of 1,100 ERUs.”

SYSTEM CHANGES SINCE LAST SANITARY SURVEY

The water system reported few changes since the last sanitary survey in 2012:

Source

- 1) A new flow meter and pressure gauge were installed on each river intake line within the intake pump vault in April 2015.

Storage

- 1) Hillside sloughing in the vicinity of the Lower Storage Tank #1 and the transmission main to the Upper Storage Tank #2 was abated with a retaining wall.

- 2) Engineering calculations determined the Lower Storage Tank #1 overflow pipe capacity is adequate.
- 3) A security fence was installed around Lower Storage Tank #1.

Management

- 1) Population and service connection increases were documented in September 2016. For the first time, the water system served a population exceeding 500. New monitoring and licensed operator requirements were triggered as a result of the population increase.
- 2) A draft facility plan update was prepared by T-O Engineers and submitted to DEQ for review and approval in October 2016. The plan addressed existing deficiencies and investigated the feasibility of a consecutive connection to ID1090136 Syringa Heights Water District.

Operation

- 1) Bob Hansen of Water Systems Management, Inc. (WSMI) replaced Hal Overland as responsible charge operator.

SOURCE FACILITIES

Pend Oreille River Intake

Original Construction Date: approximately 1989-1991

Intake Lat / Long: 48.244224 / - **TRS:** T57N R2W S27

Pump: 5HP duplex submersible pumps

The water system holds Water Right No. 96-85927 with a priority date of March 15, 1990 and a total diversion rate of 0.23 CFS (103 gpm) and an unspecified volume from the Pend Oreille River. The water system also holds Water Right No. 96-9543 with a priority date of May 13, 2014 and a total diversion rate of 1.34 CFS (601 gpm) with an unspecified volume from the Pend Oreille River. The water rights are for use within the service area of the City of Dover's municipal water supply system.

The Pend Oreille River adjacent to the City of Dover is controlled by Albeni Falls Dam (located approximately 23 miles downstream), and river elevation is controlled between an approximate winter low pool of 2,051 feet and a summer full pool of 2,062.5 feet. The raw water intake is located approximately 1,700 lineal feet from the shoreline at a 60-degree angle from the control vault. The depth is approximately 1,995 feet above mean sea level, or approximately 56 feet deep at maximum lake level. The intake consists of a 5-foot vertical Johnson stainless well screen connected to 1,560 linear feet of 6-inch HDPE pipeline. The 6-inch line connects with two 8-inch PVC pump casings approximately 320 feet from a pump control vault located on shore above the high water line. Two 5 HP intake pumps with a maximum flow of 185 gpm each are installed within the 8-inch PVC pump casings. These intake pumps transport water, via 3-inch HDPE pipe to the control vault where the pipes manifold to a common 6-inch PVC pipe and discharges to each of the four SSF basins. The water system has an easement for the raw water line to the plant.

The intake pumps run alternately and are controlled by float switches in the slow sand filter supernatant basins with secondary flow cut-off switches provided as a failsafe mechanism in the control vault (i.e. floats call for water, pump turns on; if flow switch does not sense water flow, it will turn off the pump and switch to the other). When an intake pump shuts down, the water from the control vault to the intake pump drains back to the river to prevent the possibility of freezing in the lines. The transmission line from the control vault to the treatment plant is 6-inch class 160 PVC.

As documented in the Draft City of Dover Water Facilities Plan (October 2016), intake pumps historically have required ongoing replacements and T-O Engineers completed an analysis of the intake system in April 2015 with the following conclusions:

- 1) The intake pumps are located close to shore where submergence depth is significantly shallower during winter pool (i.e., 2.5 feet) than during summer pool (i.e., 12 feet).
- 2) Damage from pump cavitation should not be occurring due to the availability of adequate net positive suction head at the pumps during winter pool and at full pumping capacity (i.e., 185 gpm).
- 3) Damage from vortexing (drawing air into the pump) may be occurring due to the availability of less than 4 feet of submergence during winter pool at the full pumping capacity. The existing 5 HP Pumps can avoid vortexing by valve-throttling flows to less than 100 gpm during low winter pool.

Source recommendations were noted at the time of inspection:

Some installations of submersible pumps in surface water bodies may pose an electrical shock hazard to water recreation. Evaluate the submersible pump's conformance to electrical code, and replace or improve the pump facility as necessary according to the findings and as code-compliant pump models become available. If deficiencies are discovered, consider posting the area with hazard warnings or take other actions as necessary until the pump installation can be improved.

Periodically inspect and clean the submerged portions of the intake structure. Ensure firm anchorage and that the intake structure or screen have not been compromised.

Evaluate the need to periodically remove sediments from the intake line. Avoid removal methods that will discharge the sediments back into the lake.

TREATMENT FACILITIES

The surface water treatment plant consists of one structure with four SSF basins and a control room with equipment for chemical feed, process monitoring, and transfer pumping.

Original 1991 SSF Bays

The original filter bays each have dimensions of 36 feet in length by 18 feet in width according to DEQ record drawings for a total surface area of 648 ft². Maximum flow rates through each

filter must not exceed 64 gallons per minute. An optimized flow rate designed to minimize the frequency of scraping intervals is 48 gallons per minute.

Record drawings indicate the total filter bay depth of 10 feet. The lower foot consists of washed rock, overlain by 4 feet of sand. Information on the piping configuration of the under drain was not located. Drawings indicate a keyway consisting of a continuous groove in the concrete walls was constructed as an indicator of when sand depth had reached a minimum of 24 inches.

The original sand filters were re-sanded in 2007 to the original design depth of 48 inches with sand obtained from the Emerald Creek Garnet Mine in Fernwood, Idaho. Documentation indicates new sand was incorporated into the sand bed utilizing the optimal trenching and throw-over process. For reference, maximum sand level depth is directly below the supernatant drain.

2007 SSF Bays

The two filter bays constructed in 2007 each have dimensions of 37 feet in length by 19 feet in width according to DEQ-approved record drawings for a total surface area of 703 ft². Maximum flow rates through each filter must not exceed 70 gpm. An optimized flow rate designed to minimize the frequency of scraping intervals is 53 gpm per filter.

Maximum sand depth design calls for 44 inches of filter sand. Sand is underlain by 4 inches of coarse sand, underlain by 12 inches of pea gravel which also provides for under drain bedding. The filter under drain consists of four sticks of 4-inch PVC spaced 3-feet-9-inches apart. Record drawings indicate that maximum sand depth is 2 inches below the pipe penetration for the supernatant fill line. Record drawings indicate a keyway consisting of a continuous groove in the concrete walls was constructed as an indicator of when sand depth had reached a minimum of 24 inches. Record drawings indicate the total filter bay depth of 10 feet.

SSF Operation

The scraping frequency of the filter bays is dependent on raw water quality, which will vary with seasonality, demand and lake levels. In order to scrape the schmutzdecke, water is drawn down to a level below the sand and the beds are scraped. After the removal of the top ¼- to ½-inch layer of schmutzdecke is completed through scraping, the bed is filled with filtered and disinfected water from the designated pipeline between the clear well and the baffled reservoir. Once water levels have risen sufficiently above the sand, inflow to the filter from the raw water line is opened. Filters must be allowed to discharge to waste for a minimum of 48 hours prior to being brought on line for potable use.

Supernatant equalization valves are provided between the filter bays. The beds are also equipped with overflow and supernatant drains. Effluent butterfly valves on the filter effluent discharge to the clear wells regulate filtration rates.

After filtration, water from the original filter beds enters into the 2,000 gallon clear well located in the original control room of the treatment plant. Water from the 2007 filters enters into the 3,100 gallon clear well located in the control room building addition. The point of entry

discharges above the overflow to prevent dewatering of the filters in the event of excessive system demand. Water is transported from each clear well to the storage reservoir via two alternating Grundfos CR45 12 HP booster pumps controlled by float switches in the reservoir. The booster pumps are protected by low flow cut off (float) devices installed in the clear wells. Sensus 4-inch instantaneous and totalizing flow meters are installed on the discharge line from each clear well, which then discharge to the designated 8-inch PVC main, which ultimately conveys water to the baffled Lower Storage Tank #1.

Slow Sand Filtration Operation and Maintenance

Slow sand filtration maintenance requires a physical removal of the schmutzdecke (dirt blanket) when head loss becomes apparent through a decrease in flow rates. Removal may be achieved through raking (harrowing) or scraping of the schmutzdecke. Scraping is preferred by DEQ as it must be conducted on a less frequent basis and does not present the risk of driving the schmutzdecke deeper into the filter bed. The frequency of scraping is dependent on several factors including raw water turbidities and rate of flow through the filter bed. Low raw water turbidity combined with a low rate of flow and the highest possible water level above the filter bed generally will provide for the lowest frequency of scraping of the filter bed.

Both filter beds are equipped with a supernatant drain that may be used to rapidly drain the bed from above the sand layer. The drain should be used prior to scraping of the schmutzdecke, or if the filter bed were to plug off.

In order to scrape the schmutzdecke layer, the water level must be lowered to below the sand surface. This level should be low enough to allow for the operator to walk on top of the sand with minimal disturbance. In order to maintain good microbial activity in the upper layer of sand, the water level should not be lower than necessary (approximately 8 inches below sand surface) to stand on/gain access to the filter.

After the schmutzdecke has been scraped off, the filter must be slowly filled from the bottom under drain in order to remove air bubbles that may have become trapped in the filter. Once water levels above sand are sufficient to prevent scouring of the sand bed, the operator resumes operational discharge of raw water above the sand filter bed.

Following scraping the filter bed must be allowed to flow to waste in order to ensure the filter has an opportunity to biologically recover. At a minimum, 48 hours is necessary. The operator should also monitor filtered turbidity levels during the filter to waste cycle to ensure filtered turbidity levels return to normal operating levels prior to being utilized for potable use. The filter beds will be discharged to waste for a minimum of 48 hours in order to ensure the filter reaches biological maturity prior to bringing each filter bed on line to supply for potable use.

Surface Water Disinfection:

There are two injection points for sodium hypochlorite (12.5%, certified to ANSI / NSF 60 standards) after filtration. Each injection point features a chemical mixing tank where hypochlorite is diluted with filtered water. Each disinfection chemical metering pump (Pulsatron

LC54SA-VTC1-U03) is rated for 30 GPD and 80 psi. Flow switches (McDonald & Miller FS-251) will stop the chemical feed if flow is not detected.

After disinfectant chemical injection, flows are conveyed through an 8-inch transmission main for approximately 3,500 lineal feet to the Lower Storage Tank #1. Baffles in Storage Tank #1 provide contact time, and flows are then routed to either an 8-inch main serving the majority of the Dover service area or to the Upper Storage Tank #2 and Cedar Ridge connections.

Surface Water Treatment Monitoring & Reporting:

Daily monitoring and monthly reporting of treatment process parameters is conducted to satisfy filtration and disinfection requirements in the Rules. Each day the system is in operation, the water system must measure filtered turbidity and determine the disinfectant inactivation of *Giardia* (minimum 90.0% or 1.0-log) and viruses (minimum 99.99%, 4-log). Evidence of these measurements and determinations are submitted to DEQ in monthly operating reports (MOR) no later than the 10th of the month following the reporting period. Failure to submit the reports by the deadline is a monitoring violation.

Monitoring for finished effluent turbidity is accomplished through continuous monitoring from a manifold representing both clearwells with a Hach 1720E and a chart recorder. Finished effluent water turbidity results are reported to be within a typical range of 0.05 to 0.3 NTU.

Monitoring for chlorine residual is accomplished through continuous monitoring at the treatment plant with a Hach CL17 and a chart recorder. Chlorine residual results are reported to be within a typical range of 0.5 to 1.4 mg/L.

Monitoring for pH is accomplished through grab sample at the treatment plant using a Hach HI38 electronic handheld meter. Results for pH are reported to be within a typical range of 7.1 to 7.8 throughout the operating season.

Monitoring for temperature is accomplished through grab sample at the treatment plant. Temperature results are reported to be within a typical range of 2 to 21 C throughout the operating season.

Surface Water Disinfection Contact Time:

Contact time calculations were reviewed and approved by DEQ in January 2013. As documented in DEQ files and in communications with the water system, a total contact time of 434 minutes was calculated between the water treatment plant and the first service in distribution. DEQ records indicate this value was utilized in monthly disinfection reports until June 2014.

It is important to note that the first service connection in Dover is the most limiting condition compared to the first service connection in Cedar Ridge. In addition, the disinfection compliance sample point is the water treatment plant at a service tap that is after contact time and downstream from the first service in distribution. Disinfection compliance monitoring must not be conducted at taps or locations before contact time.

$$\text{Contact Time (minutes)} = [\text{Volume (gallons)}] \times [\text{Baffle Factor}] \div [\text{Contact Flow Rate (gpm)}]$$

UPDATED CONTACT TIME

| | <u>8-inch Pipe to Lower Storage Tank #1</u> | <u>Lower Storage Tank #1 (353,410 Gallons)</u> | <u>8-inch Pipe to First Service Connection</u> |
|--------------------|---|--|--|
| Contact Flow Rate: | Transfer Pump Capacity 230 gpm | Peak Hour Demand 340 gpm + 72 gpm (Dover + Booster Pump) | Peak Hour Demand 340 gpm (Dover) |
| Lowest Volume: | 3,500 feet / 9,142 gallons | 260,105 gallons | 2,000 feet / 5,223 gallons |
| Baffle Factor: | 100% | 60% | 100% |
| Contact Volume: | 9,142 gallons | 156,063 gallons | 5,223 gallons |
| Contact Time: | 40 minutes | 379 minutes | 15 minutes |

Treatment requirements were noted at the time of inspection:

As documented in DEQ files, utilize a maximum contact time of 434 minutes for disinfection reporting. TRIM Record 2013ACA319

Disinfection monitoring for free residual chlorine, pH, and temperature must be conducted after contact time at the compliance sample point. IDAPA 58.01.08(300)(04) and *DEQ SWTR Guidance* (1996)

Treatment recommendations were noted at the time of inspection:

Complete a project-specific operation and maintenance manual that addresses all water system facilities, and submit it to DEQ for review and approval.

Monitor and report raw water turbidity on a routine basis (e.g., daily or weekly) from the existing tap that is available in the treatment plant control room.

FINISHED WATER STORAGE FACILITIES

Lower Storage Tank #1

Original Construction Date: 1989 and 2009 **Total Capacity:** 353,410 gallons

Type: Partially-Buried Concrete

Lower Storage Tank #1 is located adjacent to Lot 15 of the Cedar Ridge subdivision, which is above the majority of the service area. Road access to the storage tank site provides year-round access. The site features perimeter security measures.

Lower Storage Tank #1 was originally constructed in 1989 with a total volume of 75,000 gallons and baffles. In 2009, the facility was modified with an additional 278,410 gallons of storage baffles.

Lower Storage Tank #1 features partially-buried rectangular concrete construction, and due to this construction, the majority of the tank is not readily accessible for inspection and a complete visible assessment of the general condition. Dimensions are approximately 60 feet by 100 feet with a reported lowest capacity of 206,105 gallons at the 9-foot, pump on level.

Additional features include four hatches with overlapping shoe-box style lids, multiple roof vents with downturned screened elbows, and a screened overflow line. Interior floats control pumping in Pump Station #1 located at the water treatment plant. Minor cracking and the appearance of patching was evident in the tank roof. The surrounding finished grade appears to direct runoff away from the storage tank.

Upper Storage Tank #2

Original Construction Date: 1998 **Total Capacity:** 44,870 gallons
Type: Partially-Buried Concrete

Upper Storage Tank #2 is located adjacent to Lot 18 of the Cedar Ridge subdivision, which is at the highest elevation of the service area. Road access to the storage tank site provides year-round access. The site does not features perimeter security measures.

Upper Storage Tank #2 features partially-buried round concrete construction and no internal baffle walls. Dimensions are approximately 32 feet in diameter with a reported lowest capacity of 30,000 gallons at the 5.5-foot, pump on level. Additional features include one hatch with an overlapping shoe-box style lid, a roof vent with downturned screened elbow, and two screened overflow lines. Interior floats control pumping in Pump Station #2 located near the Lower Storage Tank #1.

Cracking with efflorescence is evident in the tank walls. The surrounding finished grade appears to direct runoff away from the storage tank.

Storage recommendations were noted at the time of inspection:

Install a check valve with bypass capability in the transmission main between Pump Station #2 and the Upper Storage Tank #2.

Ensure the roof vent and overflows do not freeze over from condensation in winter.

Inspect the visible exterior features of the storage facility quarterly. Inspect the interior features and clean the storage facilities every five years or more frequently as necessary. Utilize different inspection strategies to evaluate both below the water line and above the water line. Repair corroded surfaces and other defects as they are identified.

PUMPS AND CONTROL FACILITIES

There are multiple pressure zones in the water system, and multiple mechanisms are utilized to maintain water pressure. Pumping facilities include two transfer pump stations and one booster pump station.

Transfer Pump Station #1

Pump Station #1 is located within the water treatment plant control room. The facility was constructed in the two phases of SSF construction to transfer finished water from the water treatment plant clearwells through a transmission main into the Lower Storage Tank #1 at an elevation above the treatment plant. The facility features two alternating Grundfos CR45 12 HP vertical multistage centrifugal single speed pumps rated for 230 gpm each, and one 7.5 HP single speed backup centrifugal pump. Floats in the Lower Storage Tank #1 control pump activation with a low-level cutoff switch.

Transfer Pump Station #2

Pump Station #2 is located within a structure adjacent to the Lower Storage Tank Facility #1. The facility was constructed in 2009 to transfer finished water from the Lower Storage Tank #1 through a transmission main into the Upper Storage Tank #2 at the highest elevation above the service area. The facility features two alternating Grundfos CR16 10 HP vertical multistage centrifugal single speed pumps rated for 87 gpm each. Floats in the Upper Storage Tank #2 control pump activation with a low-level cutoff switch. An alarm light is provided outside the pump building, but it is not connected to telemetry.

Booster Pump Station #3

Pump Station #3 is located within a structure adjacent to the Upper Storage Tank Facility #2. The facility was constructed in 1998 to boost pressure in service connections at the highest elevations adjacent to the storage facility. The facility features one Grundfos CR8 3 HP vertical multistage centrifugal variable speed pump and controller. A pressure transducer and one captive air (bladder) tank control pump activation with a low-level cutoff pressure switch.

No Cedar Ridge subdivision lots in this pressure zone have been developed, and this facility has not been put into active service to connected water users. As documented in the previous 2012 sanitary survey, inspection by DEQ is required prior to the booster station serving connections.

Emergency Power and Telemetry

The water system does not feature backup emergency power or fully-integrated telemetry.

Pumps and control requirements were noted at the time of inspection:

Booster Pump Station #3 does not feature duplex pump redundancy, and some services in the pressure zone would depressurize to less than 20 psi in the event of a pump failure. When the

pump facility is placed into active service to connected water users, this condition will be a defect in design and operation that meets the definition in Rule of a Significant Deficiency. Before the pump facility is placed into active service, the condition must be addressed by ensuring adequate operation with not less than two pumps with capacities such that peak hour demand can be satisfied with any pump out of service. Coordinate with DEQ for review and approval requirements prior to design or construction. IDAPA 58.01.08(541)(04)(c)

Pumps and control recommendations were noted at the time of inspection:

Integrate system facilities with centralized control and communications, telemetry, and system alarms.

Provide backup emergency power at pumping facilities.

DISTRIBUTION FACILITIES

The distribution service area includes residential and commercial properties associated with the City of Dover, Idaho. At present, the water system serves approximately 265 equivalent residential units (ERUs), including 129 ERUs within the original boundaries (non-Dover Bay) and 136 ERUs within the Dover Bay Development.

Fires in the water system service area are responded to by the Westside Fire Protection District. Analysis conducted in the City of Dover Water System Facility Plan (2014) concluded that the existing 8-inch water main from the Lower Storage Tank #1 down to Railroad Avenue is undersized to meet the 2,000 gpm fire flow requirement for the Dover Bay development. In addition, at least two existing fire hydrants in the upper Cedar Ridge subdivision pressure zone are not capable of providing adequate fire flows.

The drinking water distribution system is primarily looped with line sizes ranging from 4-inch to 8-inch PVC. The main transmission line feeding the system is an 8-inch PVC pipe extending approximately 8,000 feet from the main reservoir down to the Non-Dover Bay section of town. The majority of water mains in the Non-Dover Bay section of town are 6-inch, constructed under lower fire flow requirements than the Dover Bay section of town, which is served by 8-inch water mains. Static pressure in the city is reported to be about 78 psi. All dead end mains on the system are equipped with adequate flushing hydrants; and the operator flushes dead ends at a minimum of twice per year as required.

The Dover Bay Development portion of the distribution system receives its irrigation supply from a secondary system drawn from the Pend Oreille River. Components of the secondary irrigation system are below grade and there is no discharge to any frost free hydrants. In order to prevent contamination of the potable main through a potential cross connection, reduced pressure principle assemblies are required by the water system to be provided on all main service lines as well as the marina and stores.

MONITORING, REPORTING, AND DATA VERIFICATION

Monitoring Schedule

This water system is classified as a community public water system with a population of 3,300 or less. EPA's current standard monitoring framework is within the Third Cycle (2011-2019) and the Third Period (2017-2019).

Online tools for reviewing currently updated monitoring schedules are available for viewing on the web: <http://www.deq.idaho.gov/water-quality/drinking-water/pws-switchboard.aspx> Water systems are encouraged to review their monitoring schedules on a quarterly or annual basis.

It is important to note that monitoring schedules may be changed or modified by DEQ as required. Before sampling, water system operators are advised to revisit both monitoring schedule tools and review the most current requirements in order to ensure compliance.

Monitoring Violations

There was one monitoring violation on record in the past five years. In February 2015, the water system failed to monitor for total coliform bacteria. The water system has returned to compliance.

Record Keeping

The water system is reminded to maintain accurate and complete testing records, and to make these available to DEQ upon request. Per Idaho Rules for Public Water Systems and Federal CFR 141.33, records of bacteriological analyses are to be kept for not less than five years, and records of chemical analyses are to be kept for not less than ten years. The water system is advised to review all applicable statutes for additional requirements.

Monitoring requirements were noted at the time of inspection:

The water system has collected samples at only one of eight designated locations since March 2015, which is a deficiency of the Rules and requires a follow-up response. The water system must collect total coliform samples according to its written sample siting plan. IDAPA 58.01.08(100) and 40 CFR 141.853(a)

The water system has not documented the development of an updated total coliform sample siting plan, which is a deficiency of the Rules and requires a follow-up response. The water system must update the total coliform sample site plan and submit a copy to the local DEQ office within 45 days. An RTCR Sample Site Plan template is available through the DEQ PWS Switchboard website at <http://www.deq.idaho.gov/water-quality/drinking-water/revise-total-coliform-rule/>. IDAPA 58.01.08(100) and 40 CFR 141.853(a).

SYSTEM MANAGEMENT AND OPERATION

The City of Dover's website is at <http://cityofdover.id.gov/>. According to the city's website, members of the Dover City Council include Bill Strand (President, 2013-2017), Diane Brockway (2015-2019), Ruth Guthrie (2015-2019), and Susie Kubiak (2016-2017). The Mayor of Dover is Annie Shaha (2015-2019).

DEQ Fees

The water system appears to be current with drinking water program fees paid to DEQ.

Water System User Fees

According to the city's website, current water usage fees are \$25.21 base rate plus \$0.0037 per gallon per month. All water services are metered.

Cross Connection Control Program

The water system has adopted a Cross Connection Control (CCC) program ordinance to protect the water system against contamination and pollution from cross connections. At the time of the survey, Bob Hansen of WSMI reported that the city has reviewed its CCC program ordinance, but "... no further activity has been initiated in developing a formal Cross Connection Control Program." In addition to this, six backflow assembly test reports completed in 2016 were provided as evidence of partial program activity.

The following are summaries of minimum standards required of Community water systems per IDAPA 58.01.08(552)(06):

- a) An inspection program to locate cross connections and determine suitable protection;
- b) Installation and operation of adequate backflow prevention assemblies;
- c) Annual inspections and testing of installed assemblies by a licensed tester;
- d) Discontinue service where suitable protection is absent for a cross connection;
- e) Repair, replace, or isolate failed or defective assemblies within ten business days.

The water system may find these measures to be helpful in keeping the cross connection control program actively implemented:

- 1) Evaluate existing bylaws or approve new bylaws that establish legal authority to implement a cross connection control program in compliance with DEQ Rules;
- 2) Conduct an initial inventory survey that documents the presence and types of cross connection hazards for each service connection in the water service area;
- 3) Train operators to be familiar with Pacific Northwest Cross Connection Control Manual, American Water Works Association, University of Southern California, and / or Uniform Plumbing Code guidance documents;
- 4) Train operators to understand backflow prevention mechanisms and to properly identify suitable protection according to hazard classification and potential for backpressure;
- 5) Follow up and act upon issues of non-compliance;
- 6) Maintain adequate records of all program activities and results;

Safety Training

Water system operation and maintenance may require confined space entry, fall hazards, or drowning hazards in the filter structure, vaults, and storage facilities. Because of the potential safety issues, Occupational Safety and Health Administration (OSHA)-compliant training and equipment should be obtained or maintained for all involved personnel. In particular, unaccompanied entry into confined spaces should never be attempted without proper entry procedures, safety equipment, and the presence of others with proper equipment to assist with rescue.

Management requirements were noted at the time of inspection:

Since the last sanitary survey inspection, the water system has not documented adequate activity in one or more required elements of its cross connection control program. The water system must implement and enforce a cross connection control program to include, at a minimum, the elements listed in DEQ Rules. Include a response timeline in the plan of correction submittal. IDAPA 58.01.08(543) and (552)(06).

OPERATOR COMPLIANCE WITH STATE REQUIREMENTS

DEQ Rules require that all community public drinking water systems and distribution facilities be classified based on indicators of potential health risk. Criteria used to determine the potential health risks include the system's complexity, size, and source water for treatment facilities; complexity and size of distribution systems; and other criteria deemed appropriate. The Rules also require that public drinking water systems be staffed by licensed operators based on the system classification. Every five years, the water system is required to complete and submit a classification worksheet to DEQ. The water system is currently classified as a Class 1 treatment system and a Class 1 distribution system.

Water system owners are responsible for ensuring that public drinking water systems are adequately supervised by properly licensed operators, and it is the DEQ's responsibility to provide oversight. The Idaho Bureau of Occupational Licenses (IBOL) is responsible for administering the system of licensure for public drinking water operators.

DEQ database records indicate Robert Hansen is the responsible charge operator for the drinking water system, and IBOL database records indicate that Robert Hansen (License #DWT2-10694 and #DWD2-13440) is currently licensed to operate Class 2 Treatment and Class 2 Distribution drinking water systems.

OTHER ELEMENTS

Source Water Assessment Report

Source Water Assessment describes the public drinking water wells, the well recharge zones, and potential contaminant sites located inside the recharge zone boundaries for a public water supply. This assessment, taken into account with local knowledge and concerns, should be used as a planning tool to develop and implement appropriate protection measures for the public water system. The *Dover City of (PWS #1090193), Source Water Assessment Report* for Pend Oreille River was completed November 22, 2000 and updated August 16, 2016. The report is available online at the following web address: <http://www2.deq.idaho.gov/water/swaOnline/SearchSwa.aspx>.

Source Water Protection Plan

The water system has a Source Water Protection Plan prepared by DEQ through the plan period of 2013 to 2018.

Source water protection (synonymous with the term drinking water protection) is a voluntary effort a community can implement to help prevent contamination of the source water that supplies its public water system. The drinking water protection plan outlines the management tools local committees can use to protect drinking water sources, and describes the implementation of regulatory and/or non-regulatory management practices. The Drinking Water Protection Plan builds upon the work completed in the Source Water Assessment.

- 1) Regulatory tools include items such as zoning ordinances, overlay districts, or site plan review requirements;
- 2) Non-regulatory tools include items such as educational or pollution prevention activities and implementation of Best Management Practices;
- 3) Every plan should also include a public education and information component.

Other recommendations were noted at the time of inspection:

After 2018 and thereafter every five years, update the Drinking Water Protection Plan and re-certify it through DEQ. This process will provide better protection of the source and may enhance the water system's qualification for some types of funding. Contact John Jose in the Coeur d' Alene regional office at (208) 666-4620 for additional information.

RULE REQUIREMENTS

Scope: The purpose of the Idaho Rules for Public Drinking Water Systems rules is to control and regulate the design, construction, operation, maintenance, and quality control of public drinking water systems to provide a degree of assurance that such systems are protected from contamination and maintained free from contaminants which may injure the health of the consumer.

The water system is required to:

- 1) Meet with DEQ and submit a written Plan of Correction (POC) within 45 days.
- 2) Correct each deficiency as soon as practical.

Treatment:

- 1) As documented in DEQ files, utilize a maximum contact time of 434 minutes for disinfection reporting. TRIM Record 2013ACA319
- 2) Disinfection monitoring for free residual chlorine, pH, and temperature must be conducted after contact time at the compliance sample point. IDAPA 58.01.08(300)(04) and *DEQ SWTR Guidance* (1996)

Pumps and Control:

- 1) Booster Pump Station #3 does not feature duplex pump redundancy, and some services in the pressure zone would depressurize to less than 20 psi in the event of a pump failure. When the pump facility is placed into active service to connected water users, this condition will be a defect in design and operation that meets the definition in Rule of a Significant Deficiency. Before the pump facility is placed into active service, the condition must be addressed by ensuring adequate operation with not less than two pumps with capacities such that peak hour demand can be satisfied with any pump out of service. Coordinate with DEQ for review and approval requirements prior to design or construction. IDAPA 58.01.08(541)(04)(c)

Monitoring:

- 1) The water system has collected samples at only one of eight designated locations since March 2015, which is a deficiency of the Rules and requires a follow-up response. The water system must collect total coliform samples according to its written sample siting plan. IDAPA 58.01.08(100) and 40 CFR 141.853(a)
- 2) The water system has not documented the development of an updated total coliform sample siting plan, which is a deficiency of the Rules and requires a follow-up response. The water system must update the total coliform sample site plan and submit a copy to the local DEQ office within 45 days. An RTCR Sample Site Plan template is available through the DEQ PWS Switchboard website at <http://www.deq.idaho.gov/water-quality/drinking-water/revised-total-coliform-rule/>. IDAPA 58.01.08(100) and 40 CFR 141.853(a).

Management:

- 1) Since the last sanitary survey inspection, the water system has not documented adequate activity in one or more required elements of its cross connection control program. The water system must implement and enforce a cross connection control program to include,

at a minimum, the elements listed in DEQ Rules. Include a response timeline in the plan of correction submittal. IDAPA 58.01.08(543) and (552)(06).

End of Section: Rule Requirements

RECOMMENDATIONS:

Source:

- 1) Some installations of submersible pumps in surface water bodies may pose an electrical shock hazard to water recreation. Evaluate the submersible pump's conformance to electrical code, and replace or improve the pump facility as necessary according to the findings and as code-compliant pump models become available. If deficiencies are discovered, consider posting the area with hazard warnings or take other actions as necessary until the pump installation can be improved.
- 2) Periodically inspect and clean the submerged portions of the intake structure. Ensure firm anchorage and that the intake structure or screen have not been compromised.
- 3) Evaluate the need to periodically remove sediments from the intake line. Avoid removal methods that will discharge the sediments back into the lake.

Treatment:

- 1) Complete a project-specific operation and maintenance manual that addresses all water system facilities, and submit it to DEQ for review and approval.
- 2) Monitor and report raw water turbidity on a routine basis (e.g., daily or weekly) from the existing tap that is available in the treatment plant control room.

Storage:

- 1) Install a check valve with bypass capability in the transmission main between Pump Station #2 and the Upper Storage Tank #2.
- 2) Ensure the roof vent and overflows do not freeze over from condensation in winter.
- 3) Inspect the visible exterior features of the storage facility quarterly. Inspect the interior features and clean the storage facilities every five years or more frequently as necessary. Utilize different inspection strategies to evaluate both below the water line and above the water line. Repair corroded surfaces and other defects as they are identified.

Pumps and Control:

- 1) Integrate system facilities with centralized control and communications, telemetry, and system alarms.
- 2) Provide backup emergency power at pumping facilities.

Drinking Water Protection Plan:

- 1) After 2018 and thereafter every five years, update the Drinking Water Protection Plan and re-certify it through DEQ. This process will provide better protection of the source and may enhance the water system's qualification for some types of funding. Contact John Jose in the Coeur d' Alene regional office at (208) 666-4620 for additional information.

End of Section: Recommendations



October 3, 2012

Hal Overland, Designated Operator in Charge
City of Dover
PO Box 115
Dover, ID 83825

Survey: ID1090193, City of Dover, Survey Report

Dear Hal:

Thank you for taking time out of your busy schedule to spend a full day inspecting the City of Dover's water system with Jim Williamson and myself. I sincerely appreciate your time and your expertise. It was obvious throughout the inspection that not only do you take the responsibility of providing safe drinking water to the District's users seriously; you also take great pride in maintaining the infrastructure of the water system itself.

I am pleased to report that the system is currently operating in substantial compliance with the Idaho Rules for Public Drinking Water Systems.

Enclosed please find the survey narrative report which describes the findings of the inspection. The significant deficiencies listed below were identified during the course of the survey and must be addressed. A plan of correction that outlines the timelines in which these deficiencies will be addressed must be submitted to DEQ within 120 days of receipt of this letter.

Significant Deficiencies

1. An accurate mechanism to measure filtration rate must be provided.
2. The unprotected cross connection between the disinfected (finished) and filtered water lines is a significant deficiency and must be adequately addressed. Options to address this issue were discussed at the time of the survey. Alternatively, the operator may wish to consult with the Design Engineer to determine if sand filter upflow may be accomplished through unchlorinated water in the clear wells.
3. The overflow on the 2000 gallon clear well must be screened with 24 mesh.
4. A control valve located on the discharge to the reservoir (approved DEQ record drawings 2007) has been valved off from the system due to operational failure. The valve appears to have originally been installed as a mechanism to relieve excessive pressure between the clear well and reservoir. A functioning operational mechanism to relieve pressure must be provided at this location.
5. Hillside sloughing adjacent to the reservoir has attributed to the reservoir overflow screen being pried off and partially buried. The overflow screen must be repaired to prevent contamination of the finished water supply.
6. As referenced in correspondence dated February 10, 2009 and detailed in the storage section of this report, certification of the adequacy of the overflow size must be provided to the Department for review and approval.
7. Hillside sloughing appears to be compromising the water main which feeds the 45,000 gallon reservoir. Additional information which adequately addresses this concern and ensures the integrity of this main is preserved must be provided as detailed in the storage section of this report.
8. The outlets of the two air vacuum relief valves located on the Dover Bay Development distribution

system must be screened with 24-mesh and elevated above water level in the vault to prevent contamination of the distribution main.

Additional Requirements

1. Filters must be allowed to discharge to waste for a minimum of 48 hours prior to being brought on line for potable use.
2. The diffuser discharging to the supernatant basin on the furthest east filter bay should be slightly rotated to prevent the minimal amount of scouring of the bed surface.
3. Until which time peak day demand calculations and width length ratio information is provided to DEQ Engineering for review and approval, a contact time credit of 90 minutes [20879 gallons (pipeline volume)/230 gpm (booster pump rate from clear well)] must be please be utilized for contact time calculation purposes on the system's disinfection monthly operating report form.
4. A total coliform sampling which outlines five rotating sampling locations representing the entire distribution was not found in Department files. Please submit a copy of the current total coliform sampling plan to the Department for our records.

Recommendations

1. Raw water flow meters are recommended to be installed in the raw water pump control vault.
2. The alarm system for the functioning booster pump should be incorporated into the autodialer system to allow the operator adequate time to correct system issues prior to depressurization occurring.
3. The operator reports that a check valve is not provided on discharge to the 45,000 gallon reservoir. In the event of a water line break, the operator will have no mechanism in place to prevent draining of the 45,000 gallon reservoir into the rural residential area. The Department strongly recommends a remedy is provided to address this concern to prevent future possible property damage.
4. The pressure reducing valves installed on the Dover Bay Development portion of the distribution system should be maintained to ensure continued proper operation.
5. Limited security currently is provided at the treatment plant, baffled reservoir, and 45,000 gallon reservoir. It is recommended that the City research the possibility of fencing the vicinity of these sites to provide an increased measure of security.
6. It is recommended but not required that raw water turbidity levels be analyzed on a routine basis (weekly or bi-weekly) in order to establish a baseline water quality trend should the Pend Oreille River source become impacted in the future.
7. Development of an Operation and Maintenance Manual for the system is strongly recommended.
8. It is recommended that all valves be exercised at a minimum of an annual basis.

Please contact me at 208-666-4624 if you have questions or concerns regarding the findings of this report.

Sincerely,



Suzanne Scheidt

Drinking Water Program Supervisor

Enclosure

File: ID1090193 City of Dover

Drinking Water Supply Report
Idaho Department of Environmental Quality

System: City of Dover

County: Bonner

PWS #: ID1090193

Date of Survey: September 5, 2012

System Representatives Present at Survey: Hal Overland, Designated Operator in Charge

Surveyed by: Suzanne Scheidt and Jim Williamson

Available Sources: Pend Oreille River

Water System Type: Community

Population: 405

Service Connections: 162

History

The City of Dover was incorporated in 1989 to facilitate upgrades on the community's water and wastewater systems. The slow sand filtration treatment water system consisting of two slow sand filter bays was constructed in 1991 in order to comply with Surface Water Treatment Rules. In 2007, two additional slow sand filtration bays were constructed to meet future water needs. The baffled reservoir was expanded in 2009.

Location

Dover is situated along the Pend Oreille River at the outlet of Lake Pend Oreille, and is located approximately 3 miles west of Sandpoint on Route 200. The water treatment plant is located off South 4th Street on McKinley. From Route 200, turn left on South 4th street, and then turn right on McKinley Avenue. The plant is located at the end of McKinley on the right.

Source

The source of water for the system is the Pend Oreille River. The raw water intake is located approximately 1900 lineal feet from the shoreline at a 60-degree angle from the control vault. The depth is approximately 1995 feet above mean sea level, or approximately 56 feet deep at maximum lake level. The intake consists of a 5-foot vertical Johnson stainless well screen connected to 1560 linear feet of 6-inch HDPE pipeline. The 6-inch line discharges to two 8-inch PVC pump casings 320 feet from a pump control vault located on shore above the high water line. Two 5-horsepower intake pumps with a design flow of 21 gpm each are installed within the 8-inch PVC pump casings. These intake pumps transport water, via 3-inch HDPE pipe to the control vault where the pipes manifold to a common 6-inch PVC pipe and discharges to each of the four slow sand filter supernatant basins. The City of Dover has an easement for the raw water line to the plant.

The intake pumps run alternately and are controlled by float switches in the slow sand filter supernatant basins with secondary flow cut-off switches provided as a failsafe mechanism in the control vault (i.e. floats call for water, pump turns on; if flow switch does not sense water flow, it will turn off the pump and switch to the other). When an intake pump shuts down, the water from the control vault to the intake pump drains back to the river to prevent the possibility of freezing in the lines. The transmission line from the control vault to the treatment plant is 6-inch class 160 PVC.

The raw water pump replacement had been an ongoing problem; this may have been attributed to pump cavitation during periods of low lake levels. The operator has worked with pump representatives and believes

1 Replacement of Dover Intake Pump, Rob Tate correspondence 07-24-09

this issue may have been remedied by increasing back pressure at the point of discharge to the slow sand filter supernatant basins.

The operator has observed increased levels of silt in raw water during periods of low lake levels. In order to prevent accumulation in the intake piping, the operator is able to utilize valves in the pump control vault to reverse flow through each of the intake lines to scour sediment accumulations in the pipeline.



Pump control vault



discharge to manifold

Raw water flow meters are recommended to be installed in the raw water pump control vault.

Treatment

Water treatment is completed by slow sand filtration, chlorine injection, with contact time provided by the designated transmission main between the sand filter and baffled reservoir. Additional contact time will be credited from the baffled reservoir after peak day demand calculations are provided by the Design Engineer for Department review and approval. Limited security currently is provided at the treatment plant; it is recommended that the City research the possibility of fencing the vicinity of the treatment building to provide an increased measure of security.

Filtration

Water is filtered through a four-bed effluent controlled slow sand filter. Filter flow rate is controlled by butterfly valves on the effluent side of each filter. Filter design approved by the Department included the use of calibrated piezometers to determine flow rate. During the inspection of the system it was determined that the piezometers utilized on the original sand filter beds were last calibrated in 2004, and piezometers on the newer filter beds had never been calibrated. The lack of a mechanism to measure filtration rate is a significant deficiency which must be remedied. An accurate mechanism to measure filtration rate must be provided.



Original filter bays



2007 filter bays

Original filter bays

The original filter bays each have dimensions of 36 feet in length by 18 feet in width according to Department record drawings² for a total surface area of 648 ft². Maximum flow rates through each filter must not exceed 64 gallons per minute. An optimized flow rate designed to minimize the frequency of scraping intervals is 48 gallons per minute. Winter flow rates (temperatures below 5 Centigrade) should not exceed 32 gallons per minute.



Original filter bays

Record drawings indicate the total filter bay depth of 10 feet. The lower foot consists of washed rock, overlain by 4 feet of sand. Information on the piping configuration of the under drain was not located. Drawings indicate a keyway consisting of a continuous groove in the concrete walls was constructed as an indicator of when sand depth had reached a minimum of 24 inches.

The original sand filters were re-sanded in 2007 to the original design depth of 48 inches with sand obtained from the Garnet Mine in Fernwood, Idaho. Documentation indicates new sand was incorporated into the sand bed utilizing the optimal trenching and throw-over process. For reference, maximum sand level depth is directly below the supernatant drain; sand depth is currently estimated at approximately 44 inches.

Between the period of 1997 and 2003, water system operator Ron Barrett participated in a study funded by DEQ which looked at the raw water quality vs. filtered un-chlorinated water as measured by bacteria levels. Results of this study are part of the system records and are kept on file if needed for future reference.

2007 Filter Bays

The two filter bays constructed in 2007 each have dimensions of 37 feet in length by 19 feet in width according to Department approved record drawings³ for a total surface area of 703 ft². Maximum flow rates through each filter must not exceed 70 gallons per minute. An optimized flow rate designed to minimize the frequency of scraping intervals is 53 gallons per minute per filter. Winter flow rates (temperatures below 5 Centigrade) should not exceed 35 gallons per minute per filter. As previously noted, currently filtration rates are not being monitored, which is a significant deficiency. An accurate method for determining filtration rates is required. Concerns for filtration rate monitoring were addressed in the construction approval of the slow sand filtration expansion by Alan Miller, June 17, 2005.

2 Approved Gaffney PE, 3-20-92, Q-32

3 Approved Gaffney PE, 8-11-2008, Q-32



2007 filter bays

Maximum sand depth design calls for 44 inches of filter sand. Sand is underlain by 4 inches of coarse sand, underlain by 12 inches of pea gravel which also provides for under drain bedding. The filter under drain consists of four sticks of 4-inch PVC spaced 3-feet-9-inches apart. Record drawings indicate that maximum sand depth is 2 inches below the pipe penetration for the supernatant fill line. Record drawings indicate a keyway consisting of a continuous groove in the concrete walls was constructed as an indicator of when sand depth had reached a minimum of 24 inches. Record drawings indicate the total filter bay depth of 10 feet.

The diffuser located furthest east should be slightly rotated to prevent the minimal amount of scouring of the bed surface which was identified at the time of the survey.



Rotate filter diffuser

Slow Sand Filtration Operation

The scraping frequency of the filter bays is dependent on raw water quality, which will vary with seasonality, demand and lake levels. The operator, Mr. Overland reports a possible increased flow rate from the more recently constructed beds resulting in an increased level of silt sedimentation deposits in the schmutzdecke. The operator reports scraping the filter bays in the spring and summer of 2012. In order to scrape the schmutzdecke, water is drawn down to a level below the sand and the beds are scraped. After the removal of the top ¼- to ½-inch layer of schmutzdecke is completed through scraping, the bed is filled with filtered and disinfected water from the designated pipeline between the clear well and the baffled reservoir. The unprotected cross connection between the disinfected and filtered water lines is a significant deficiency and must be adequately addressed. Methods to accomplish this were discussed with the operator while on site. Once water levels have risen sufficiently above the sand, inflow to the filter from the raw water line is opened. Filters must be allowed to discharge to waste for a minimum of 48 hours prior to being brought on line for potable use.

There was no evidence of scouring from the influent raw water lines discharging to the supernatant basins with the exception of a minimal amount of scouring occurring at the eastern most filter as previously noted.

Supernatant equalization valves are provided between the filter bays. The beds are also equipped with overflow and supernatant drains.

Effluent butterfly valves on the filter effluent discharge to the clear wells regulate filtration rates.



Filter influent/overflow filter effluent and cross connection to potable clear well

After filtration, water from the original filter beds enters into the 2000 gallon clear well located in the original control room of the treatment plant. Water from the newer filters enters into the 3100 gallon clear well located in the control room building addition. The point of entry discharges above the overflow to prevent dewatering of the filters in the event of excessive system demand. The overflow on the 2000 gallon clear well must be screened with 24 mesh. Water is transported from each clear well to the storage reservoir via two alternating Berkley 15-horsepower booster pumps controlled by float switches in the reservoir. The booster pumps are protected by low flow cut off (float) devices installed in the clear wells. Flow rate from the active Berkley booster was recorded at 230 gpm at the time of the survey. Sensus 4-inch instantaneous and totalizing flow meters are installed on the discharge line from each clear well, which then discharge to the designated 8-inch PVC main, which ultimately discharges/lifts water to the baffled reservoir.



Screen clear well

A control valve located on the discharge to the reservoir (approved DEQ record drawings 2007) has been valved off from the system due to operational failure. The valve appears to have originally been installed as a mechanism to relieve excessive pressure between the clear well and reservoir. A functioning operational mechanism to relieve pressure must be provided at this location.

Slow Sand Filtration Operation and Maintenance

Slow sand filtration maintenance requires a physical removal of the schmutzdecke (dirt blanket) when head loss becomes apparent through a decrease in flow rates. Removal may be achieved through raking (harrowing) or scraping of the schmutzdecke. Scraping is preferred by DEQ as it must be conducted on a less frequent basis and does not present the risk of driving the schmutzdecke deeper into the filter bed.

The frequency of scraping is dependent on several factors including raw water turbidities and rate of flow through the filter bed. Low raw water turbidity combined with a low rate of flow and the highest possible water level above the filter bed generally will provide for the lowest frequency of scraping of the filter bed. As previously stated, maximum flow through each filter bed constructed in 1991 must not exceed 64 gpm per bed, with each filter operating at an optimized flow rate of 48 gpm and an optimized winter flow rate of 32 gpm per filter bed. Flow rate through each filter bed constructed in 2007 must not exceed 70 gpm, with each filter operating at an optimized flow rate of 52 gpm and a winter flow rate (when water temperatures fall below 5 degrees Centigrade) of 35 gpm.

Both filter beds are equipped with a supernatant drain that may be used to rapidly drain the bed from above the sand layer. The drain should be used prior to scraping of the schmutzdecke, or if the filter bed were to plug off.

In order to scrape the schmutzdecke layer, the water level must be lowered to below the sand surface. This level should be low enough to allow for the operator to walk on top of the sand with minimal disturbance. In order to maintain good microbial activity in the upper layer of sand, the water level should not be lower than necessary (approximately 8 inches below sand surface) to stand on/gain access to the filter.

After the schmutzdecke has been scraped off, the filter must be slowly filled from the bottom under drain in order to remove air bubbles that may have become trapped in the filter. According to Mr. Overland, current piping configuration allows for this to be completed with filtered and disinfected water back-fed from the 8-inch main to the baffled reservoir

As previously stated, an unprotected cross connection exists between the finished water supply and the filtered effluent from the slow sand filter. In lieu of installation of adequate backflow protection, the operator may also wish to explore with the Design Engineer the possibility of re-plumbing up-flow piping to originate from the clear wells.

Once water levels above sand are sufficient to prevent scouring of the sand bed, the operator resumes operational discharge of raw water above the sand filter bed.

Following scraping the filter bed must be allowed to flow to waste in order to ensure the filter has an opportunity to biologically recover; at a minimum, 48 hours is necessary. Mr. Overland also monitors filtered turbidity levels during the filter to waste cycle to ensure filtered turbidity levels return to normal operating levels prior to being utilized for potable use.⁴ The filter beds will be discharged to waste for a minimum of 48 hours in order to ensure the filter reaches biological maturity prior to bringing each filter bed on line to supply for potable use.

⁴ Slow Sand Filtration, ASCE 1991, p. 136, 152

Slow Sand Filtration Plant Daily Monitoring and Recording

Surface water supplies introduce a risk of microbial contamination through bacteria, protozoa, and viruses. In order to ensure these contaminants have effectively been removed through filtration and disinfection, the operator must analyze and record monitoring parameters on a daily basis. Daily monitoring parameters include: filtration rates, peak hourly flow, finished turbidity, pH, temperature, and chlorine residual levels.

It is recommended but not required that raw water turbidity levels be analyzed on a routine basis (weekly or bi-weekly) in order to establish a baseline water quality trend should the Pend Oreille River source become impacted in the future. A raw water tap is available in the filter control room for this purpose.

Daily finished turbidity levels are drawn from a manifolded line representing both clear wells, and analyzed using a Hach 1720E turbidimeter calibrated quarterly according to manufacturer's directions. As part of the calibration step, the operator ensures discharge from the unit is between 0.5 and 1.0 liter per minute. Continuous finished turbidity readings are provided on a chart recorder.

In the event filtered water exceeds 1.0 NTU, the operator must collect weekly coliform samples from the first service connection in distribution. Total coliform results must be absent in order to avoid a treatment technique violation requiring public notification to users. Filtered water levels exceeding 5.0 NTU indicate a significant lapse in treatment and consequently a significant public health threat. DEQ must be contacted immediately should turbidities exceed 5.0 NTU; and all water users must receive health advisory notification within 24 hours.

Water temperature, free chlorine residual (Hach continuous CL17) and pH are also analyzed off the finished water line to the baffled reservoir. The Department must be contacted within 24 hours if in the event free chlorine residuals entering the distribution system drop below 0.2 mg/L.

Instrumentation is well maintained and calibrated according to manufacturer's specifications. The City of Dover Water Department has an excellent history of submitting monitoring data on a timely basis. Surface water treatment monthly operating reports are consistently submitted prior to the tenth of the month.

No Operation and Maintenance Manual was located for the treatment facility in DEQ's records; development of an Operation and Maintenance Manual is strongly recommended.

Disinfection

At each clear well discharge point a .125% sodium hypochlorite solution is injected via two Pulsatron (flooded suction) flow-regulated hypochlorinators rated to pump against a maximum pressure of 80 psi with a maximum pumping volume of 30 gallons per day. At the time of the inspection the pressure gage on the discharge from the clear well measured 70 psi. Chlorine levels are continually analyzed through a Hach CL17 continuous analyzer. If chlorine levels decrease below 0.7 mg/L or increase above 2.0 mg/L the operator is notified via an autodialer alarm system.

After chlorine addition, the water is pumped to the 354,000 gallon baffled reservoir via 8-inch transmission main.

Storage, Pumping and Contact Time

Water is pumped from a plant elevation of 2070 feet through 8000 feet of dedicated 8-inch PVC line, to a baffled, flow-through 354,000 gallon concrete storage reservoir at an elevation of 2250 feet (180 ft head). Original storage consisted of a 75,000 gallon reservoir with an additional 278,000 gallons of additional storage added to the existing reservoir in 2009. Construction of the additional reservoir storage (engineering services were provided by James A. Sewell and Associates, LLC) was initiated without DEQ plan and specification approval. In gathering information for the survey, calculations completed by the design engineer detailing peak day demand and length:width ratio of the baffled reservoir were not located. In order to utilize the baffled reservoir for disinfection and contact time purposes, this information must be provided to DEQ for engineering review and approval. Until such time this is provided, a contact time credit of 90 minutes [20879 gallons (pipeline volume)/230 gpm (booster pump rate from clear well)] must be please be utilized for contact time calculation purposes on the system's disinfection monthly operating report form.



354,000 gallon reservoir



reservoir interior

As per correspondence from the Department dated February 10, 2009, RE: Water Storage Reservoir, City of Dover Water System, item 6 Tank Modifications: "Foundation drainage, soil bearing capacity for the imposed loadings, and stabilization of the slopes created by the site excavation are additional city concerns that need to be addressed to city satisfaction and reflected as appropriate on the record drawings." As noted at the time of the survey, sloughing of the hillside has begun to occur with sedimentation accumulation building on the corner of the reservoir. Of additional concern is that sloughing is occurring in the immediate vicinity of the location of the water main feeding the Cedar Ridge 45,000 gallon reservoir. The operator reports there is no check valve on the main to prevent complete drainage of the 45,000 gallon reservoir in the event of main failure. As part of the survey, additional information must be provided which adequately addresses this concern and ensures the integrity of this main is preserved.



Hillside sloughing on to reservoir lid

Hillside sloughing on the opposite side of the reservoir has been attributed to the reservoir overflow screen being pried off and partially buried. This is a significant deficiency that the operator plans to fix in the immediate future. The reservoir was found to be adequately vented with 24 mesh screen; the interior of the reservoir was found to be clean. The interior hatches were sealed and found to be water tight.

The sizing of the reservoir overflow appears to remain unaddressed. Department correspondence dated February 10, 2009 item 4 stated, “The engineer needs to reconsider the capacity of the 6-inch overflow and certify adequacy of the overflow for the ultimate rate of water supply.” No record certifying the adequacy of the overflow was found in Department records.

Distribution

The main distribution system is gravity fed through an additional 8000 feet of 8-inch PVC line, with a reported static pressure of 78 psi.

In 1998 expansion of the water system to serve an additional 25 lots (3.5- to 5-acre) serving the Cedar Ridge development was constructed. This project required a booster pump station which pumps to an upper 45,000 gallon above ground concrete reservoir located at an elevation of 2510 feet (270 ft head). This booster station is equipped with two 10 hp 87 gpm pumps (at 280 feet, TDH) operating off floats in the upper reservoir. The pumps are equipped with an automatic flow cut off. Two-inch Badger flow meters are installed on the discharge lines from the boosters; a sample tap is provided. The pump room is equipped with a floor drain and adequate heat and ventilation. An alarm light is provided outside the pump building but is not connected to telemetry. It is recommended the alarm system be incorporated into existing telemetry to allow the operator adequate time to correct system issues prior to depressurization occurring. The operator reports that a check valve is not provided on discharge to the 45,000 gallon reservoir. In the event of a water line break, the operator will have no mechanism in place to prevent draining of the 45,000 gallon reservoir into the surrounding rural residential area. The Department strongly recommends a remedy is provided to address this concern to prevent future possible property damage.



Cedar Ridge Booster Station

The 45,000 gallon upper reservoir is vented, and access lids are of an overlapping type. The reservoir vent screen was found to need minor repair; the reservoir overflow was found to be adequately screened. A booster station is located at the upper reservoir to serve the lots located adjacent to and above the upper tank. The upper booster is equipped with one 3 hp variable frequency drive (VFD) pump. The booster pump house building was not inspected at the time of the survey; inspection will be required prior to the booster station serving connections. Currently there are no users on this portion of the system; however, the operator does report flushing the water line serving this system as required by DEQ.



Cedar Ridge reservoir & booster station (not inspected) Cedar Ridge vent (minor repair needed)

The distribution system is primarily looped with line sizes ranging from 4- to 8-inch PVC. Fire hydrants are located throughout the distribution system. The system meets West Side Fire District fire flow requirements and all hydrants were rebuilt in 2003. All dead end mains on the system are equipped with adequate flushing hydrants; the operator flushes dead ends at a minimum of twice per year as required.

A total coliform sampling plan which outlines five rotating sampling locations representing the entire distribution was not found in Department files. Please submit a copy of the current total coliform sampling plan to the Department for our records.

The City has not accepted the distribution system serving the Dover Bay Development. The operator reports there are two air vacuum relief valves on this portion of the distribution system. The outlet of the valves must be screened with 24-mesh and elevated above water level in the vault to prevent contamination of the distribution main. The pressure reducing valve(s) installed on this portion of the distribution system should be maintained to ensure continued proper operation.

The City has implemented a robust, premise-isolation based cross connection control program as required in order to ensure the potable supply is protected from contamination through backflow and meets the four elements required by the Idaho Rules for Public Drinking Water Systems. The City's ordinance provides the system with the authority to inspect all premises for cross connections, requires suitable backflow protection is provided where necessary, requires annual testing of all assemblies annually by a licensed tester and provides the City the authority to disconnect service to connections where required adequate backflow protection is not provided.

The Dover Bay Development portion of the distribution system receives its irrigation supply from a secondary system drawn from the Pend Oreille River. Components of the secondary irrigation system are below grade and there is no discharge to any frost free hydrants. In order to prevent contamination of the potable main through a potential cross connection, reduced pressure principle (RP) assemblies are required and provided on all main service lines as well as the marina and stores. RP's must be tested annually by a licensed backflow tester; copies of the test reports must be provided to the water system for review. Failed assemblies must be addressed in accordance with the City's cross connection control program. Replacement parts must be approved by the manufacturer.

Three underground sprinkler systems on the original Dover distribution system are adequately protected by backflow prevention assemblies.

In the event distribution pressures drop below 20 psi in the future, it will be necessary for the system to provide notification to users and adequately flush and/or disinfect the system as needed. The operator is already aware of this requirement.

Administration

The City currently uses a four member Mayor-Council form of government. The current Mayor is Randy Curless. Water rates are \$38.50 for the first 7,000 gallons, with an additional charge of \$5.00 per additional 1,000 gallons.

Operator Certification

The City employs one direct responsible charge operator. Hal Overland is certified at the Water Treatment Class 2 level (DWT2-16228) and Distribution Class 1 level (DWD1-14727). Mr. Jeff Jordine is the acting back-up operator. Mr. Overland is highly knowledgeable regarding water system operation and was found to be very conscientious in ensuring water users receive adequately treated water.

Monitoring

Monitoring requirements from the entry point to distribution:

The water system is required to collect a nitrate and sodium sample annually. Nitrite sampling is required once per nine years. The water system has qualified, based on a combination of an excellent monitoring history and low risk of contamination, for monitoring reductions and waivers for arsenic, inorganic, synthetic organic and volatile organic contaminants. Inorganic sampling is reduced to once per nine years. Synthetic and volatile organic sampling requirements have been waived. Radiological sampling for alpha and uranium sampling is reduced to once per nine years; radium 226/228 is reduced to once per six years. The system's current monitoring requirements may be accessed at: <http://www.deq.idaho.gov/water-quality/drinking-water/pws-switchboard.aspx>

Distribution monitoring requirements:

The system is required to collect one routine total coliform sample per month. The free chlorine residual is analyzed and recorded on the coliform sample form at the time the coliform sample is collected as required. As previously mentioned, please submit a current copy of the system's coliform sampling plan for the Department's records. The plan should designate five rotating sampling locations representing the entire distribution system.

One disinfection by product sample analyzed for total trihalomethane and haloacetic acid group 5 must be collected from the point of longest retention time in the distribution system annually between the months of July 1 and September 30.

Five lead and copper samples must be collected from the same locations in the distribution system once per three years. Samples should be drawn from a cold water tap following a period in which water has stood motionless in service plumbing for at least six hours.

Long Term 2 Enhanced Surface Water Treatment Rule monitoring:

The Association has met the raw water E.coli requirements of the Long Term 2 Enhanced Surface Water Treatment Rule. This rule required bi-monthly raw water monitoring for E.coli beginning in October 2008 for one year. Results indicated that the source is not susceptible to significant fecal contamination; therefore, no additional treatment was required. Average E.coli quantitray results were 0.2 colonies/100 ml.

Conclusion

On behalf of the Department, I would like to express my sincere appreciation to Hal Overland for his dedication and conscientious efforts to ensure the community of Dover is provided with a safe and adequate supply of drinking water. I would also like to express my appreciation to the City of Dover for supporting Mr. Overland by providing him the tools necessary to successfully operate the water system currently and into the future.

Please find summarized below significant deficiencies, additional requirements and recommendations noted at the time of the field inspection. Within 30 days of receipt of this report, please contact me to discuss options for correction of issues identified below. Within 120 days of receipt of this report, please submit a written timeline in which the City intends to address these issues.

Significant Deficiencies

1. An accurate mechanism to measure filtration rate must be provided.
2. The unprotected cross connection between the disinfected (finished) and filtered water lines is a significant deficiency and must be adequately addressed. Options to address this issue were discussed at the time of the survey. Alternatively, the operator may wish to consult with the Design Engineer to determine if sand filter upflow may be accomplished through unchlorinated water in the clear wells.
3. The overflow on the 2000 gallon clear well must be screened with 24 mesh.
4. A control valve located on the discharge to the reservoir (approved DEQ record drawings 2007) has been valved off from the system due to operational failure. The valve appears to have originally been installed as a mechanism to relieve excessive pressure between the clear well and reservoir. A functioning operational mechanism to relieve pressure must be provided at this location.
5. Hillside sloughing adjacent to the reservoir has attributed to the reservoir overflow screen being pried off and partially buried. The overflow screen must be repaired to prevent contamination of the finished water supply.
6. As referenced in correspondence dated February 10, 2009 and detailed in the storage section of this report, certification of the adequacy of the overflow size must be provided to the Department for review and approval.
7. Hillside sloughing appears to be compromising the water main which feeds the 45,000 gallon reservoir. Additional information which adequately addresses this concern and ensures the integrity of this main is preserved must be provided as detailed in the storage section of this report.
8. The outlets of the two air vacuum relief valves located on the Dover Bay Development distribution system must be screened with 24-mesh and elevated above water level in the vault to prevent contamination of the distribution main.

Additional Requirements

1. Filters must be allowed to discharge to waste for a minimum of 48 hours prior to being brought on line for potable use.
2. The diffuser discharging to the supernatant basin on the furthest east filter bay should be slightly rotated to prevent the minimal amount of scouring of the bed surface.
3. Until which time peak day demand calculations and width length ratio information is provided to DEQ Engineering for review and approval, a contact time credit of 90 minutes $[20879 \text{ gallons (pipeline volume)}/230 \text{ gpm (booster pump rate from clear well)}]$ must be please be utilized for contact time calculation purposes on the system's disinfection monthly operating report form.
4. A total coliform sampling which outlines five rotating sampling locations representing the entire distribution was not found in Department files. Please submit a copy of the current total coliform sampling plan to the Department for our records.

Recommendations

1. Raw water flow meters are recommended to be installed in the raw water pump control vault.
2. The alarm system for the functioning booster pump should be incorporated into the autodialer system to allow the operator adequate time to correct system issues prior to depressurization occurring.
3. The operator reports that a check valve is not provided on discharge to the 45,000 gallon reservoir. In the event of a water line break, the operator will have no mechanism in place to prevent draining of the 45,000 gallon reservoir into the rural residential area. The Department strongly recommends a remedy is provided to address this concern to prevent future possible property damage.

4. The pressure reducing valves installed on the Dover Bay Development portion of the distribution system should be maintained to ensure continued proper operation.
5. Limited security currently is provided at the treatment plant, baffled reservoir, and 45,000 gallon reservoir. It is recommended that the City research the possibility of fencing the vicinity of these sites to provide an increased measure of security.
6. It is recommended but not required that raw water turbidity levels be analyzed on a routine basis (weekly or bi-weekly) in order to establish a baseline water quality trend should the Pend Oreille River source become impacted in the future.
7. Development of an Operation and Maintenance Manual for the system is strongly recommended.
8. It is recommended that all valves be exercised at a minimum of an annual basis.



Suzanne Scheidt, Drinking Water Program Supervisor

October 3, 2012

Date

APPENDIX E

Reservoir Sizing Analysis

City of Dover
Reservoir Sizing Analysis
6-5-2017

Main Reservoir Storage = 354,000 gal.
 Cedar Ridge Reservoir Storage = 43,000 gal.
TOTAL = 397,000 gal.

Main Reservoir OS = 19,657 gal.
 Cedar Ridge Reservoir OS = 13,000 gal.
TOTAL = 32,657 gal.

SSF Source Capacity = 204 gpm = 293,760 gpd
 Dover Fire Flow = 2000 gpm =
 Existing Booster Source Capacity = 85 gpm = 122,400 gpd
 Upgraded Booster Source Capacity = 150 gpm = 216,000 gpd (Dover + SHWD Scenarios)

Old Dover ADD = 194 gpd/ERU
 Dover Bay Development ADD = 75 gpd/ERU
 SHWD ADD = 251 gpd/ERU

Old Dover MDD = 436 gpd/ERU
 Dover Bay Development MDD = 165 gpd/ERU
 SHWD MDD = 689 gpd/ERU

OS = Operational Storage
 ES = Equalization Storage
 SS = Standby Storage
 FS = Fire Storage
 ADD = Average Day Demand
 MDD = Maximum Day Demand
 QS = Source Capacity

| Existing Connections | ERUs | ADD | MDD | QS/MDD | Factor | ES | OS | SS | FS | TOTAL |
|-----------------------|------|--------|--------|--------|--------|----|--------|--------|---------|----------------|
| Old Dover | 129 | 25,074 | 56,244 | | | | | | | |
| Dover Bay Development | 136 | 10,243 | 22,440 | | | | | | | |
| Combined | 265 | 35,318 | 78,684 | 3.73 | 0 | 0 | 32,657 | 11,773 | 240,000 | 284,430 |

| Existing Conn. Dover + SHWD | ERUs | ADD | MDD | QS/MDD | Factor | ES | OS | SS | FS | TOTAL |
|-----------------------------|------|--------|---------|--------|--------|-----|--------|--------|----|---------------|
| Cedar Ridge | 12 | 2,333 | 5,232 | | | | | | | |
| SHWD | 185 | 46,435 | 127,465 | | | | | | | |
| Combined | 197 | 48,768 | 132,697 | 1.63 | 0.18 | 995 | 13,000 | 16,256 | 0 | 30,251 |

Note: SHWD Fed from Cedar Ridge Reservoir. Existing booster pumps from main reservoir at 85 gpm, each pump.

314,681

| 20-year Dover Only | ERUs | ADD | MDD | QS/MDD | Factor | ES | OS | SS | FS | TOTAL |
|-----------------------|------|--------|---------|--------|--------|----|--------|--------|---------|----------------|
| Old Dover | 159 | 30,906 | 69,324 | | | | | | | |
| Dover Bay Development | 416 | 31,332 | 68,640 | | | | | | | |
| Combined | 575 | 62,238 | 137,964 | 2.13 | 0 | 0 | 32,657 | 20,746 | 240,000 | 293,403 |

| 20-year Dover + SHWD | ERUs | ADD | MDD | QS/MDD | Factor | ES | OS | SS | FS | TOTAL |
|----------------------|------|--------|---------|--------|--------|-------|--------|--------|----|---------------|
| Cedar Ridge | 19 | 3,693 | 8,284 | | | | | | | |
| SHWD | 222 | 55,722 | 152,958 | | | | | | | |
| Combined | 241 | 59,415 | 161,242 | 1.34 | 1.26 | 8,465 | 13,000 | 19,805 | | 41,270 |

Note: SHWD Fed from Cedar Ridge Reservoir. Upgrade booster pumps from main reservoir to 150 gpm, each pump.

334,673

| Build-out Dover Only | ERUs | ADD | MDD | QS/MDD | Factor | ES | OS | SS | FS | TOTAL |
|-----------------------|------|---------|---------|--------|--------|--------|--------|--------|---------|----------------|
| Old Dover | 373 | 72,502 | 162,628 | | | | | | | |
| Dover Bay Development | 556 | 41,876 | 91,740 | | | | | | | |
| Combined | 929 | 114,378 | 254,368 | 1.15 | 3.3 | 34,976 | 32,657 | 38,126 | 240,000 | 345,759 |

| Build-out Dover + SHWD | ERUs | ADD | MDD | QS/MDD | Factor | ES | OS | SS | FS | TOTAL |
|------------------------|------|--------|---------|--------|--------|--------|--------|--------|----|---------------|
| Cedar Ridge | 25 | 4,859 | 10,900 | | | | | | | |
| SHWD | 265 | 66,515 | 182,585 | | | | | | | |
| Combined | 290 | 71,374 | 193,485 | 1.12 | 3.72 | 29,990 | 13,000 | 23,791 | | 66,782 |

Note: SHWD Fed from Cedar Ridge Reservoir. Upgrade booster pumps from main reservoir to 150 gpm, each pump.

412,540

APPENDIX F

Preliminary Cost Estimates

CITY OF DOVER
ALTERNATIVE #1 - NO SERVICE TO SHWD; UPGRADE EXISTING INTAKE
 Engineer's Opinion of Probably Construction Cost
 April 5, 2016

| Item Description | Quantity | Units | Unit Price | Amount |
|---|----------|-------|------------------------------------|-----------------------|
| Mobilization (5%) | 1 | | \$42,236.25 | \$42,200.00 |
| SCADA System | | | | |
| SCADA Panels | 4 | EA. | \$20,000.00 | \$80,000.00 |
| Programming | 1 | LS | \$75,000.00 | \$75,000.00 |
| | | | Subtotal | \$155,000.00 |
| Upgrade Existing Raw Water Intake | | | | |
| VFD for Raw Water Pumps | 2 | EA. | \$3,000.00 | \$6,000.00 |
| Bury and Flatten Existing Intake Pipe | 250 | LF | \$15.00 | \$3,750.00 |
| Air/Vacuum Valves | 2 | EA. | \$800.00 | \$1,600.00 |
| Electrical/Control Upgrades | 1 | LS | \$50,000.00 | \$50,000.00 |
| Warning Signage and Buoys | 1 | LS | \$5,000.00 | \$5,000.00 |
| Erosion Control Measures | 1 | LS | \$3,000.00 | \$3,000.00 |
| | | | Subtotal | \$69,350.00 |
| Water Treatment System Upgrades | | | | |
| 6" Flow Meter | 2 | EA. | \$5,000.00 | \$10,000.00 |
| 6" Gate Valve | 4 | EA. | \$1,000.00 | \$4,000.00 |
| Misc. Pipe and Fittings | 1 | LS | \$3,000.00 | \$3,000.00 |
| Submersible Levellogger | 4 | EA. | \$1,500.00 | \$6,000.00 |
| Raw Water Turbidimeter System | 1 | LS | \$4,500.00 | \$4,500.00 |
| Video Surveillance System | 1 | EA. | \$1,500.00 | \$1,500.00 |
| VFD Pump Control System w/ PLC Upgrades | 1 | LS | \$50,000.00 | \$50,000.00 |
| | | | Subtotal | \$79,000.00 |
| Upgraded Water Storage System | | | | |
| Submersible Levellogger | 2 | EA. | \$1,500.00 | \$3,000.00 |
| Telemetry System | 1 | LS | \$5,000.00 | \$5,000.00 |
| Video Surveillance System | 2 | EA. | \$1,500.00 | \$3,000.00 |
| 6" Check Valve w/ Valve Vault | 1 | EA. | \$5,000.00 | \$5,000.00 |
| 6" Gate Valve | 2 | EA. | \$1,000.00 | \$2,000.00 |
| Bypass Pipe and Fittings | 1 | LS | \$4,000.00 | \$4,000.00 |
| | | | Subtotal | \$22,000.00 |
| Upgraded Main Reservoir Booster Pumping Facility | | | | |
| New Pump Control Panel and PLC | 1 | LS | \$25,000.00 | \$25,000.00 |
| 2" Flow Meter | 2 | EA. | \$1,500.00 | \$3,000.00 |
| | | | Subtotal | \$28,000.00 |
| New Transmission Line | | | | |
| 12" C900 PVC Pipe w/ Fittings | 2400 | LF | \$40.00 | \$96,000.00 |
| Trenching and Backfill | 2400 | LF | \$10.00 | \$24,000.00 |
| Imported Pipe Bedding | 2400 | LF | \$4.50 | \$10,800.00 |
| 12" Gate Valve | 4 | EA. | \$2,000.00 | \$8,000.00 |
| 24" Steel Casing | 340 | LF | \$100.00 | \$34,000.00 |
| Pipe Boring and Jacking | 340 | LF | \$400.00 | \$136,000.00 |
| Erosion Control Measures | 1 | LS | \$5,000.00 | \$5,000.00 |
| | | | Subtotal | \$313,800.00 |
| Emergency Backup Connection to SHWD (Near River) | | | | |
| 6" C900 PVC Pipe w/ Fittings | 650 | LF | \$15.00 | \$9,750.00 |
| Trenching and Backfill | 650 | LF | \$10.00 | \$6,500.00 |
| Imported Pipe Bedding | 650 | LF | \$4.50 | \$2,925.00 |
| 6" Gate Valve | 2 | EA. | \$1,000.00 | \$2,000.00 |
| Clear and Grub Pipe Corridor | 800 | SY | \$4.00 | \$3,200.00 |
| Erosion Control Measures | 1 | LS | \$2,000.00 | \$2,000.00 |
| | | | Subtotal | \$26,375.00 |
| Water Meter Replacements | | | | |
| Meter Only Replacements | 65 | EA. | \$400.00 | \$26,000.00 |
| Meter, Assembly and Box Replacements | 65 | EA. | \$1,200.00 | \$78,000.00 |
| Misc. Erosion Control and Surface Repairs | 1 | LS | \$5,000.00 | \$5,000.00 |
| | | | Subtotal | \$109,000.00 |
| | | | Subtotal Construction Costs | \$844,725.00 |
| | | | Contingency (15%) | \$126,708.75 |
| | | | Engineering/Admin. (20%) | \$168,945.00 |
| | | | Total Cost | \$1,140,378.75 |

CITY OF DOVER
ALTERNATIVE #2 - NO SERVICE TO SHWD; REPLACE EXISTING INTAKE
Engineer's Opinion of Probably Construction Cost
April 5, 2016

| Item Description | Quantity | Units | Unit Price | Amount |
|---|----------|-------------|-----------------|-----------------------|
| Mobilization (5%) | 1 | \$58,777.50 | | \$58,800.00 |
| SCADA System | | | | |
| SCADA Panels | 5 | EA. | \$20,000.00 | \$100,000.00 |
| Programming | 1 | LS | \$75,000.00 | \$75,000.00 |
| | | | Subtotal | \$175,000.00 |
| New Raw Water Intake | | | | |
| 12" HDPE Intake Pipe | 870 | LF | \$45.00 | \$39,150.00 |
| 6" Pump Discharge Pipeline | 30 | LF | \$20.00 | \$600.00 |
| 1 1/2" Backwash Line | 870 | LF | \$4.00 | \$3,480.00 |
| Trenching and Backfill | 310 | LF | \$20.00 | \$6,200.00 |
| Imported Pipe Bedding | 310 | LF | \$4.50 | \$1,395.00 |
| Intake Screen | 1 | LS | \$18,000.00 | \$18,000.00 |
| HDPE Pipe Anchors | 60 | EA. | \$200.00 | \$12,000.00 |
| Erosion Control Measures | 1 | LS | \$10,000.00 | \$10,000.00 |
| Concrete Wet Well (27' Deep) | 1 | EA. | \$45,000.00 | \$45,000.00 |
| Raw Water Pumping System | 1 | EA. | \$25,000.00 | \$25,000.00 |
| 6" Gate Valve | 5 | EA. | \$1,000.00 | \$5,000.00 |
| Misc. Cast Iron Fittings | 15 | EA. | \$450.00 | \$6,750.00 |
| Metering Vault | 1 | LS | \$18,000.00 | \$18,000.00 |
| Existing Vault Piping Modifications | 1 | LS | \$19,000.00 | \$19,000.00 |
| Metering Vault Piping | 1 | LS | \$28,000.00 | \$28,000.00 |
| Electrical/Control | 1 | LS | \$70,000.00 | \$70,000.00 |
| | | | Subtotal | \$307,575.00 |
| Upgrade Existing Raw Water Intake | | | | |
| VFD for Raw Water Pumps | 2 | EA. | \$3,000.00 | \$6,000.00 |
| Electrical/Control Upgrades | 1 | LS | \$50,000.00 | \$50,000.00 |
| | | | Subtotal | \$56,000.00 |
| Water Treatment System Upgrades | | | | |
| 6" Flow Meter | 2 | EA. | \$5,000.00 | \$10,000.00 |
| 6" Gate Valve | 4 | EA. | \$1,000.00 | \$4,000.00 |
| Misc. Pipe and Fittings | 1 | LS | \$3,000.00 | \$3,000.00 |
| Submersible Levelogger | 4 | EA. | \$1,500.00 | \$6,000.00 |
| Raw Water Turbidimeter System | 1 | LS | \$4,500.00 | \$4,500.00 |
| Video Surveillance System | 1 | EA. | \$1,500.00 | \$1,500.00 |
| VFD Pump Control System w/ PLC Upgrades | 1 | LS | \$50,000.00 | \$50,000.00 |
| | | | Subtotal | \$79,000.00 |
| Upgraded Water Storage System | | | | |
| Submersible Levelogger | 2 | EA. | \$1,500.00 | \$3,000.00 |
| Telemetry System | 1 | LS | \$5,000.00 | \$5,000.00 |
| Video Surveillance System | 2 | EA. | \$1,500.00 | \$3,000.00 |
| 6" Check Valve w/ Valve Vault | 1 | EA. | \$5,000.00 | \$5,000.00 |
| 6" Gate Valve | 2 | EA. | \$1,000.00 | \$2,000.00 |
| Bypass Pipe and Fittings | 1 | LS | \$4,000.00 | \$4,000.00 |
| | | | Subtotal | \$22,000.00 |
| Upgraded Main Reservoir Booster Pumping Facility | | | | |
| New Pump Control Panel and PLC | 1 | LS | \$25,000.00 | \$25,000.00 |
| 2" Flow Meter | 2 | EA. | \$1,500.00 | \$3,000.00 |
| | | | Subtotal | \$28,000.00 |
| New Transmission Line | | | | |
| 12" C900 PVC Pipe w/ Fittings | 2400 | LF | \$40.00 | \$96,000.00 |
| Trenching and Backfill | 2400 | LF | \$10.00 | \$24,000.00 |
| Imported Pipe Bedding | 2400 | LF | \$4.50 | \$10,800.00 |
| 12" Gate Valve | 4 | EA. | \$2,000.00 | \$8,000.00 |
| 24" Steel Casing | 340 | LF | \$100.00 | \$34,000.00 |
| Pipe Boring and Jacking | 340 | LF | \$400.00 | \$136,000.00 |
| Erosion Control Measures | 1 | LS | \$5,000.00 | \$5,000.00 |
| | | | Subtotal | \$313,800.00 |
| Emergency Backup Connection to SHWD (Near River) | | | | |
| 6" C900 PVC Pipe w/ Fittings | 650 | LF | \$15.00 | \$9,750.00 |
| Trenching and Backfill | 650 | LF | \$10.00 | \$6,500.00 |
| Imported Pipe Bedding | 650 | LF | \$4.50 | \$2,925.00 |
| 6" Gate Valve | 2 | EA. | \$1,000.00 | \$2,000.00 |
| Clear and Grub Pipe Corridor | 800 | SY | \$4.00 | \$3,200.00 |
| Erosion Control Measures | 1 | LS | \$2,000.00 | \$2,000.00 |
| | | | Subtotal | \$26,375.00 |
| Water Meter Replacements | | | | |
| Meter Only Replacements | 65 | EA. | \$400.00 | \$26,000.00 |
| Meter, Assembly and Box Replacements | 65 | EA. | \$1,200.00 | \$78,000.00 |
| Misc. Erosion Control and Surface Repairs | 1 | LS | \$5,000.00 | \$5,000.00 |
| | | | Subtotal | \$109,000.00 |
| Subtotal Construction Costs | | | | \$1,175,550.00 |
| Contingency (15%) | | | | \$176,332.50 |
| Engineering/Admin. (20%) | | | | \$235,110.00 |
| Total Cost | | | | \$1,586,992.50 |

CITY OF DOVER
 ALTERNATIVE #3 - SERVICE TO SHWD
 Engineer's Opinion of Probably Construction Cost
 June 6, 2017

| Item Description | Quantity | Units | Unit Price | Amount |
|---|----------|-------------|-----------------|---------------------|
| Mobilization (5%) | 1 | \$66,210.50 | | \$66,200.00 |
| SCADA System | | | | |
| SCADA Panels | 5 | EA. | \$20,000.00 | \$100,000.00 |
| Programming | 1 | LS | \$75,000.00 | \$75,000.00 |
| | | | Subtotal | \$175,000.00 |
| New Raw Water Intake | | | | |
| 12" HDPE Intake Pipe | 870 | LF | \$45.00 | \$39,150.00 |
| 6" Pump Discharge Pipeline | 30 | LF | \$20.00 | \$600.00 |
| 1 1/2" Backwash Line | 870 | LF | \$4.00 | \$3,480.00 |
| Trenching and Backfill | 310 | LF | \$20.00 | \$6,200.00 |
| Imported Pipe Bedding | 310 | LF | \$4.50 | \$1,395.00 |
| Intake Screen | 1 | LS | \$18,000.00 | \$18,000.00 |
| HDPE Pipe Anchors | 60 | EA. | \$200.00 | \$12,000.00 |
| Erosion Control Measures | 1 | LS | \$10,000.00 | \$10,000.00 |
| Concrete Wet Well (27' Deep) | 1 | EA. | \$45,000.00 | \$45,000.00 |
| Raw Water Pumping System | 1 | EA. | \$25,000.00 | \$25,000.00 |
| 6" Gate Valve | 5 | EA. | \$1,000.00 | \$5,000.00 |
| Misc. Cast Iron Fittings | 15 | EA. | \$450.00 | \$6,750.00 |
| Metering Vault | 1 | LS | \$18,000.00 | \$18,000.00 |
| Existing Vault Piping Modifications | 1 | LS | \$19,000.00 | \$19,000.00 |
| Metering Vault Piping | 1 | LS | \$28,000.00 | \$28,000.00 |
| Electrical/Control | 1 | LS | \$70,000.00 | \$70,000.00 |
| | | | Subtotal | \$307,575.00 |
| Upgrade Existing Raw Water Intake | | | | |
| VFD for Raw Water Pumps | 2 | EA. | \$3,000.00 | \$6,000.00 |
| Electrical/Control Upgrades | 1 | LS | \$50,000.00 | \$50,000.00 |
| | | | Subtotal | \$56,000.00 |
| Water Treatment System Upgrades | | | | |
| 6" Flow Meter | 2 | EA. | \$5,000.00 | \$10,000.00 |
| 6" Gate Valve | 4 | EA. | \$1,000.00 | \$4,000.00 |
| Misc. Pipe and Fittings | 1 | LS | \$3,000.00 | \$3,000.00 |
| Submersible Levelogger | 4 | EA. | \$1,500.00 | \$6,000.00 |
| Raw Water Turbidimeter System | 1 | LS | \$4,500.00 | \$4,500.00 |
| Video Surveillance System | 1 | EA. | \$1,500.00 | \$1,500.00 |
| VFD Pump Control System w/ PLC Upgrades | 1 | LS | \$50,000.00 | \$50,000.00 |
| | | | Subtotal | \$79,000.00 |
| Upgraded Water Storage System | | | | |
| Submersible Levelogger | 2 | EA. | \$1,500.00 | \$3,000.00 |
| Telemetry System | 1 | LS | \$5,000.00 | \$5,000.00 |
| Video Surveillance System | 2 | EA. | \$1,500.00 | \$3,000.00 |
| 6" Check Valve w/ Valve Vault | 1 | EA. | \$5,000.00 | \$5,000.00 |
| 6" Gate Valve | 2 | EA. | \$1,000.00 | \$2,000.00 |
| Bypass Pipe and Fittings | 1 | LS | \$4,000.00 | \$4,000.00 |
| | | | Subtotal | \$22,000.00 |
| Upgraded Main Reservoir Booster Pumping Facility | | | | |
| Relocate and Install SHWD Pumps/Panels | 1 | LS | \$10,000.00 | \$10,000.00 |
| New Booster Pump Building | 150 | SF | \$180.00 | \$27,000.00 |
| Building Site Work | 1 | LS | \$5,000.00 | \$5,000.00 |
| New Mechanical Piping and Valves | 1 | LS | \$20,000.00 | \$20,000.00 |
| 4" Flow Meter | 2 | EA. | \$3,000.00 | \$6,000.00 |
| Misc. Electrical/Control | 1 | LS | \$10,000.00 | \$10,000.00 |
| Video Surveillance System | 1 | EA. | \$1,500.00 | \$1,500.00 |
| Standby Generator | 1 | LS | \$45,000.00 | \$45,000.00 |
| Erosion Control Measures | 1 | LS | \$2,000.00 | \$2,000.00 |
| | | | Subtotal | \$126,500.00 |
| Pipe Connection to SHWD (Near Cedar Ridge) | | | | |
| 8" C900 PVC Pipe w/ Fittings | 880 | LF | \$25.00 | \$22,000.00 |
| Trenching and Backfill | 880 | LF | \$10.00 | \$8,800.00 |
| Imported Pipe Bedding | 880 | LF | \$4.50 | \$3,960.00 |
| 8" Gate Valve | 2 | EA. | \$1,500.00 | \$3,000.00 |
| Erosion Control Measures | 1 | LS | \$5,000.00 | \$5,000.00 |
| | | | Subtotal | \$42,760.00 |

CITY OF DOVER
 ALTERNATIVE #3 - SERVICE TO SHWD
 Engineer's Opinion of Probably Construction Cost
 June 6, 2017

| Item Description | Quantity | Units | Unit Price | Amount |
|---|----------|-------|-----------------|-----------------------|
| New Transmission Line | | | | |
| 12" C900 PVC Pipe w/ Fittings | 2400 | LF | \$40.00 | \$96,000.00 |
| Trenching and Backfill | 2400 | LF | \$10.00 | \$24,000.00 |
| Imported Pipe Bedding | 2400 | LF | \$4.50 | \$10,800.00 |
| 12" Gate Valve | 4 | EA. | \$2,000.00 | \$8,000.00 |
| 24" Steel Casing | 340 | LF | \$100.00 | \$34,000.00 |
| Pipe Boring and Jacking | 340 | LF | \$400.00 | \$136,000.00 |
| Erosion Control Measures | 1 | LS | \$5,000.00 | \$5,000.00 |
| | | | Subtotal | \$313,800.00 |
| Emergency Backup Connection to SHWD (Near River) | | | | |
| 6" C900 PVC Pipe w/ Fittings | 650 | LF | \$15.00 | \$9,750.00 |
| Trenching and Backfill | 650 | LF | \$10.00 | \$6,500.00 |
| Imported Pipe Bedding | 650 | LF | \$4.50 | \$2,925.00 |
| 6" Gate Valve | 2 | EA. | \$1,000.00 | \$2,000.00 |
| Clear and Grub Pipe Corridor | 800 | SY | \$4.00 | \$3,200.00 |
| Erosion Control Measures | 1 | LS | \$2,000.00 | \$2,000.00 |
| | | | Subtotal | \$26,375.00 |
| Water Meter Replacements | | | | |
| Meter Only Replacements | 65 | EA. | \$400.00 | \$26,000.00 |
| Meter, Assembly and Box Replacements | 65 | EA. | \$1,200.00 | \$78,000.00 |
| Misc. Erosion Control and Surface Repairs | 1 | LS | \$5,000.00 | \$5,000.00 |
| | | | Subtotal | \$109,000.00 |
| Subtotal Construction Costs | | | | \$1,324,210.00 |
| Contingency (15%) | | | | \$198,631.50 |
| Engineering/Admin. (20%) | | | | \$264,842.00 |
| Total Cost | | | | \$1,787,683.50 |

APPENDIX G

Revised Plan of Correction and Approval



March 29, 2017
Jim Williamson
Idaho DEQ
2110 Ironwood Parkway
Coeur d'Alene, ID 83814

RE: Plan of correction, DEQ Sanitary Survey ID1090193, Survey Date 7-Dec-2016

Dear Mr. Williamson,

After meeting with you in Dover on 27-Feb-2017, the City of Dover is submitting a revised plan of correction for your review and approval. This plan is the result of cooperation between the City of Dover as well as Bob Hansen and Mike Wade of Water Systems Management.

In October 2016, the City of Dover submitted a draft water facility plan to the DEQ. This facility plan has many of the elements that were identified in the Rules and Recommendations that were included in the DEQ Sanitary Survey. Items that were identified in the DEQ Rules and Recommendations that were not included in the draft facility plan will be evaluated for inclusion in the system upgrade that is presented in the draft water facility plan.

RULE REQUIREMENTS

Treatment

- 1) **Utilization of a maximum contact time of 434 minutes:** Scott McNee of TO Engineers has evaluated the Dover water system for a sampling and testing position in the system that meets and/or exceeds the DEQ requirements for contact time while being compatible with the SCADA systems upgrade being presented in the draft water facility plan. Discussions at our meeting in Dover on 27-Feb-2017 indicated that the most practical position for locating the sampling and testing equipment is in the Dover water treatment plant. The water treatment plant will be upgraded so that the sampling and testing equipment will receive potable water from one of the nearby 6" water mains.

P.O. Box 115, 699 Lakeshore Ave., Dover, ID 83825

Phone: 208-265-8339 Fax: 208-265-9035

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- 2) **Residual chlorine, pH and temperature measurement:** Once the sampling location has been confirmed and potable water provided, automated sampling and testing equipment will be installed. Scott McNee of TO Engineers has contacted DEQ to obtain clarifications on the specifications for the automated sampling and testing equipment. A full description of Scott McNee's proposed equipment configuration is attached to this proposal. To summarize, the following test equipment will be purchased and installed:
 - a. HACH CL-17DPD Analyzer (existing)
 - b. HACH SC200 Universal Controller
 - c. HACH pHD SC Differential pH Digital Sensor
 - d. HACH Flow Cell

Pump Control

- 1) **Pump redundancy:** As discussed in our meeting on 27-Feb-2017, providing a fully redundant system at Pump House #3 would include installing redundant booster pump, pump controller and piping as well as enlarging the pump building and possibly purchasing/leasing additional land. This would be prohibitively expensive for the City of Dover Water Department. As an alternative to providing a fully redundant pumping system, the City of Dover proposes the following:
 - As part of the SCADA upgrade that has been outlined in the proposed Water Facility Plan, remote monitoring of pump operation and system pressure has been included. When SCADA is installed, the pump operation and pressure data from Pump House #3 would be transmitted to the centralized monitoring and alarming system. This will inform operating staff immediately of any system de-pressurization and allow Dover to implement repairs and re-pressurization with minimal downtime.
 - To minimize any down-time associated with pump failure, a replacement pump and controller will be kept at the Dover water treatment plant.

Monitoring

- 1) **Sampling:** The system has started collecting total coliform samples according to its written sample siting plan.
- 2) **Sample siting plan:** An updated total coliform sample siting plan has been prepared by Mike Wade (Water Systems Management) and is attached with this plan of correction.



Management

- 1) **Cross connection control program:** The City of Dover has authorized ordering a cross connection management software package that will integrate with Dover's ABS Utility Billing software. During the summer of 2017, the initial stages of the cross connection plan will be implemented.

RECOMMENDATIONS

Source:

- 1) **Submersible pumps:** As part of the facility plan, a new water intake and/or upgrade of the existing intake is being evaluated. The updated electrical code will be included in this intake evaluation and upgrade.
- 2) **Intake screen inspection:** The intake screen was last inspected in 2015. As part of the facility plan, a new water intake and/or upgrade of the existing intake is being evaluated. Design and maintenance of the intake screen will be included in this intake evaluation and upgrade.
- 3) **Intake sediment:** The intake was last inspected in 2014 when a break occurred in the outer pipe. While there was organic material that came from the break (lake weeds) in the intake pumps and pipes, there was minimal sediment in the intake. Design and maintenance of the intake line will be included in this intake evaluation and upgrade.

Treatment

- 1) **O&M manual:** Any system upgrade as presented in the draft facility plan will include a full O&M manual. Once the O&M manual for the system upgrade is complete, the City will work with its contractors/engineers to expand the manual to cover the entire water system.
- 2) **Raw water turbidity measurement:** This measurement will be evaluated for inclusion in the system upgrade that is submitted in the draft water facility plan.

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Storage

- 1) **Check valve:** Installation of a check valve with bypass capabilities will be evaluated for inclusion in the system upgrade that is submitted in the draft water facility plan.
- 2) **Roof vent and overflow freezing:** Installation of a heating system that prevents freezing of the storage overflows and vents will be evaluated for inclusion in the system upgrade that is submitted in the draft water facility plan.
- 3) **Inspection:** Inspection routine will be added to the O&M manual discussed in the "Treatment Recommendations".

Pumps and Controls

- 1) **SCADA system:** This is a component of the draft facility plan that has been submitted.
- 2) **Back-up power:** This is a component of the draft facility plan that has been submitted.

Drinking Water Protection Plan

- 1) **Drinking Water Protection Plan:** The City of Dover completed a Source Water Protection Plan in September 2014. When required by DEQ, this Source Water Protection Plan will be updated and sent in for recertification.

If you have any questions or you require any additional information, feel free to contact me at any time.

Best regards,

A handwritten signature in black ink that reads "William C. Strand".

William C. Strand, Ph.D.
Dover City Council President

Attachments: Total Coliform Sample Siting Plan for Small Systems
City of Dover Public Water Supply System, ID1090193 Disinfection

P.O. Box 115, 699 Lakeshore Ave., Dover, ID 83825

Phone: 208-265-8339 Fax: 208-265-9035

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Total Coliform Sample Siting Plan for Small Systems

This form is intended to assist public water system (PWS) owners and operators with developing a total coliform sample siting plan. This form is designed for systems taking three samples each month or each quarter (serving $\leq 3,300$ people). Using this form is optional. However, all public water system are required to have a written sample siting plan in accordance with the "Idaho Rules for Public Water Systems" (IDAPA 58.01.08.100.01).

Part 1. General System Information

PWSID: PWS Name:

Mailing Address:

PWS Contact Name:

E-mail: Phone:

Emergency Contact Name:

E-mail: Phone:

PWS Type: Community (CWS) Nontransient noncommunity (NTNC) Noncommunity transient (NCT)

Noncommunity Seasonal System: No Yes* If yes, season open: close:

* Seasonal systems are required to perform annual start-up procedures prior to opening for the season unless exempted in writing.

Sources of Water:
Identify sources of drinking water and attach additional sheets as necessary.

| Source/Facility ID Name of drinking water source(s): well tag #, name, spring name, intake source | Source Type GW--ground water, SP--spring, SW--surface water, GU--ground water under the influence of SW, P--purchase water from other system | Usage P--permanent (full/time), E--emergency (not planned for use), I--interim to meet peak demand | 4-log Virus Inactivation* Source has continuous disinfection to provide 4-log virus inactivation |
|--|---|---|---|
| 1. Pend Oreille River | SW | P | <input checked="" type="radio"/> Yes <input type="radio"/> No |
| 2. | | | <input type="radio"/> Yes <input type="radio"/> No |
| 3. | | | <input type="radio"/> Yes <input type="radio"/> No |
| 4. | | | <input type="radio"/> Yes <input type="radio"/> No |

*4-log virus inactivation: Triggered source water monitoring for the Ground Water Rule following a routine total coliform positive sample is required when a system using ground water does not have 4-log virus inactivation for all ground water sources.

Manifold: List sources that combine before distribution

Disinfection Treatment Installed/Using: None Chlorine Chloramination Chlorine dioxide Ozone (check all that apply)

Owner/Operator Name: Phone:

Signature: _____ Date:

Part 2. Sampling Location Information

This section identifies sampling locations for routine and repeat total coliform (TC) samples. This form is designed for systems taking up to 3 routine TC samples per month. Please identify the sample sites by address or dedicated sample point name and location type when applicable (i.e., kitchen faucet). Three repeat samples are required for each routine TC positive result. One repeat is to be taken at the routine location that was TC positive, one repeat is to be taken within 5 connections upstream of the routine TC positive location, and one repeat is to be taken within 5 connections downstream of the routine TC positive location. Seasonal systems on quarterly monitoring must identify the month of highest use or the most vulnerable month in each quarter (such as the month with the most rainfall).

| | Month | Routine Sample Location (address, sample station name) | Repeat sample locations (U = within 5 connections upstream from routine, D = within 5 connections downstream from routine) |
|--|-------------------|---|--|
| Q U A R T E R | January | 1. 347 O' Donnell | U 345 O' Donnell D 349 O' Donnell |
| | | 2. | U D |
| | | 3. | U D |
| | February | 1. 825 Railroad Ave (FireStation) | U 633 Railroad Ave D 855 Railroad Ave |
| | | 2. | U D |
| | | 3. | U D |
| | March | 1. 699 Lakeshore Ave (City Hall) | U 675 Lakeshore Ave (Cottage #9) D 675 Lakeshore Ave (Marina) |
| | | 2. | U D |
| | | 3. | U D |
| 2nd Q U A R T E R | April | 1. 104 Lakeshore Ave | U 102 Lakeshore Ave D 108 Lakeshore Ave |
| | | 2. | U D |
| | | 3. | U D |
| | May | 1. 205 Cedar Ridge Rd | U 397 Cedar Ridge Rd D 117 Cedar Ridge Rd |
| | | 2. | U D |
| | | 3. | U D |
| June | 1. 347 O' Donnell | U 345 O' Donnell D 349 O' Donnell | |
| | 2. | U D | |
| | 3. | U D | |

| | Month | Routine Sample Location (address, sample station name) | Repeat sample locations (U = within 5 connections upstream from routine, D = within 5 connections downstream from routine) | |
|---------------------------------|-----------------------------------|---|--|--|
| Q U A R T E R | July | 1. 825 Railroad Ave (FireStation) | U 633 Railroad Ave D 855 Railroad Ave | |
| | | 2. | U D | |
| | | 3. | U D | |
| | August | 1. 699 Lakeshore Ave (City Hall) | U 675 Lakeshore Ave (Cottage #9) D 675 Lakeshore Ave (Marina) | |
| | | 2. | U D | |
| | | 3. | U D | |
| | September | 1. 104 Lakeshore Ave | U 102 Lakeshore Ave D 108 Lakeshore Ave | |
| | | 2. | U D | |
| | | 3. | U D | |
| | 4th | October | 1. 205 Cedar Ridge Rd | U 397 Cedar Ridge Rd D 117 Cedar Ridge Rd |
| | | | 2. | U D |
| | | | 3. | U D |
| November | | 1. 347 O' Donnell | U 345 O' Donnell D 349 O' Donnell | |
| | | 2. | U D | |
| | | 3. | U D | |
| December | 1. 825 Railroad Ave (FireStation) | U 633 Railroad Ave D 855 Railroad Ave | | |
| | 2. | U D | | |
| | 3. | U D | | |

Most public water system owners or operators are not required to submit total coliform sample siting plans. The following circumstances require submittal and approval of your sample siting plan by your local field office:

- Owners and operators who wish to propose alternative fixed sample sites or criteria for selecting sites based on situational information. This information needs to be written into a standard operating procedure as part of the plan.
- Operators or owners of seasonal systems using only ground water and on monthly monitoring that qualify for and wish to take quarterly samples.

Other considerations:

- Attach a schematic of the distribution system with locations marked for sample sites and other relevant water system information such as wells, storage tanks, booster stations, etc.
- Ensure the entire distribution system is represented when identifying sampling locations.
- If there are two or more distribution systems and those distribution systems are not interconnected, please ensure samples are taken from each distribution system during each compliance period (month or quarter).
- If a routine sampling location is at the end of the distribution system or one service connection away from the end of the distribution system, identify an alternative upstream or downstream sampling location from that routine location.
- Repeat samples must be collected within 24 hours of being notified of a routine positive sample result and must be taken the same day at different sites. However, if there is only one sampling location, such as with a campground, please identify whether you will take one repeat total coliform sample per day for three consecutive days or a larger sample size (300 mL) on one day.
- Public water systems that use only ground water and do not provide 4-log virus inactivation are required to take triggered source water samples after a routine total coliform positive sample result. The samples must be taken from each source active at the time the routine sample was taken and must be taken before any treatment (raw water).



T-O ENGINEERS

March 20, 2017

Mr. Bill Strand
City of Dover
P.O. Box 115
Dover, ID 83825-0115
BillStrand@CityOfDoverIdaho.org

**RE: CITY OF DOVER PUBLIC WATER SUPPLY SYSTEM, ID1090193
DISINFECTION MONITORING**

Dear Bill:

I am writing this letter to present recommendations for disinfection monitoring for free residual chlorine, pH and temperature. This is in response to Treatment Item 2 on page 17 of 18 of the Sanitary Survey conducted by DEQ on December 7, 2016 and submitted to the City on January 5, 2017.

Based on the options presented to the City in my e-mail dated March 1, 2017 the Council has elected to keep the existing HACH CL-17 DPD Analyzer; adding a pH probe and controller. Attached with this letter you will find information provided by HACH on their recommended pH probe and controller. Equipment part numbers and options are as follows:

- HACH SC200 Universal Controller, 5 Ea. 4-20 mA Outputs, Part # LXV404.99.09542
- HACH pH/SC Differential pH Digital Sensor, Ryton, Part # DPD1R1
- HACH Flow Cell, 1" NPT Sensor, Part #9180100

Currently, free residual chlorine is monitored at the water treatment building with a HACH CL-17 DPD analyzer. As discussed, potable water service will be extended to the treatment building with the CL-17 tapped into that supply for monitoring. The addition of the SC200 controller and pH probe will provide for continuous pH and temperature monitoring, which can be integrated into a future SCADA system through a PLC or other device. Additional items including mounting hardware, reagents, and buffer solutions necessary for a completed system should be coordinated directly with HACH.

Please feel free to contact me if you have any questions or require any additional information.

Sincerely,

T-O ENGINEERS, INC.

Scott G. McNee, P.E.

Cc: Annie Shaha, Mayor, City of Dover mayorshaha@cityofdoveridaho.org
Bob Hansen, Responsible Charge Operator, wsmibob@aol.com

Attachments

Hach sc200™ Universal Controller

Controller—Multi-Parameter

Product Overview

One Controller for the Broadest Range of Sensors

The sc200 Universal Controller is the most versatile controller on the market. The new sc200 controller is the only controller that allows the use of digital and analog sensors, either alone or in combination, to provide compatibility with the broadest range of sensors. It replaces the Hach sc100 digital and GLI53 analog controllers with advanced features for easier operator use.

The sc200 controller platform can be configured to operate either 2 Digital Sensor Inputs, or 1 or 2 Analog Sensor Inputs, or a combination of Digital and Analog Sensor Inputs. Customers may choose their communication options from a variety of offerings ranging from MODBUS RTU to Profibus DPV1.



Choose from up to 29 digital or analog sensors for up to 15 different parameters.

Features and Benefits

Maximum Versatility

- Standardized controller eliminates the need for a variety of dedicated controllers
- Multi-channel controller operates either 1 or 2 sensors reducing inventory holding costs and providing an inexpensive option to add a second sensor at a later time
- “Plug and Play” operation with all Hach digital sensors
- True dual sensor controller provides 4-20 mA outputs to transmit primary and secondary measurement values

Ease of Use and Confidence in Results

- New display and guided calibration procedures reduce operator error
- Password protected SD card reader offers a simple solution for data download and transfer
- Visual warning system provides critical alerts

Communication Options

- MODBUS RS232/RS485 or Profibus DPV1



DW
WW
PW
IW

Controller Configuration

2 Channel Digital Controller

Functionality

- Maximum versatility and flexibility:
- Plug and play with all Hach digital sensors
 - Mix and match with Hach digital and GLI analog sensors

2 Channel Controller with
1 Analog and 1 Digital Sensor Input

- Plug and play with any one Hach digital sensor
- Mix and match with any one GLI analog sensor

1 or 2 Channel Analog Controller

- Mix and match up to two GLI analog sensors

DW = drinking water WW = wastewater municipal PW = pure water / power
IW = industrial water E = environmental C = collections FB = food and beverage



Be Right™

Controller Comparison



| Features | Current sc100™ Controller | GLI53 Controller | NEW! sc200™ Controller | Benefits |
|------------------------------|---|--|--|---|
| Display | 64 x 128 pixels 33 x 66 mm (1.3 x 2.6 in.) | 64 x 128 pixels 33 x 66 mm (1.3 x 2.6 in.) | 160 x 240 pixels 48 x 68 mm (1.89 x 2.67 in.) Transreflective | <ul style="list-style-type: none"> Improved user interface—50% bigger Easier to read in daylight and sunlight |
| Data Management | irDA Port/PDA Service Cable | N/A | SD Card Service Cable | <ul style="list-style-type: none"> Simplifies data transfer Standardized accessories/ max compatibility |
| Sensor Inputs | 2 Max Direct Digital Analog via External Gateway | 2 Max Analog Depending on Parameter | 2 Max Digital and/or Analog with Sensor Card | <ul style="list-style-type: none"> Simplifies analog sensor connections Works with GLI and Hach's digital sensors |
| Analog Inputs | N/A | N/A | 1 Analog Input Signal Analog 4-20mA Card | <ul style="list-style-type: none"> Enables non-sc analyzer monitoring Accepts mA signals from other analyzers for local display Consolidates analog mA signals to a digital output |
| 4-20 mA Outputs | 2 Standard | 2 Standard | 2 Standard Optional 4 Additional | <ul style="list-style-type: none"> Total of six (6) 4-20 mA outputs enables up to 3 mA outputs per sensor input |
| Digital Communication | MODBUS 232/485 Profibus DP V1.0 | N/A | MODBUS 232/485 Profibus DP V1.0 | <ul style="list-style-type: none"> Unprecedented combination of sensor breadth and digital communication options |

To complete your measurement system, choose from Hach's portfolio of controller and sensor products...



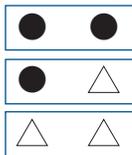
Choose from Hach's Broad Range of Digital and Analog Sensors

| Parameter | Sensor | Digital or Analog |
|------------------|---|-------------------|
| Ammonia | AMTAX™ sc, NH4D sc | ● |
| Chlorine | CLF10 sc, CLT10 sc, 9184 sc | ● |
| Chlorine Dioxide | 9185 sc | ● |
| Conductivity | 3400, 3700 | △ |
| Dissolved Oxygen | LDO™, 5740 sc | ● |
| Dissolved Oxygen | 5500 | △ |
| Flow | U53, F53 Sensors | △ |
| Nitrate | NITRATAX™ sc, NO3D sc | ● |
| Oil in Water | FP360 sc | ● |
| Organics | UVAS sc | ● |
| Ozone | 9187 sc | ● |
| pH/ORP | pHD | ● |
| pH/ORP | pHD, pH Combination, LCP | △ |
| Phosphate | PHOSPHAX™ sc | ● |
| Sludge Level | SONATAX™ sc | ● |
| Suspended Solids | SOLITAX™ sc, TSS sc | ● |
| Turbidity | 1720E, FT660 sc, SS7 sc, ULTRATURB sc, SOLITAX sc | ● |

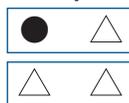
● = Digital △ = Analog

The diagrams below demonstrate the versatility and flexibility for the base controller units. Connect any of the appropriate sensors listed above to meet your measurement needs. Operation of analog sensors require the controller to be equipped with the appropriate sensor card.

2 Channel Digital Controller Configurations



2 Channel Controller with 1 Analog and 1 Digital Sensor Input Configurations



2 Channel Analog Controller Configurations



Engineering Specifications

- The controller shall be a microprocessor based instrument.
- The enclosure shall be 1/2 DIN format, NEMA4X rated for wall, pole and panel mounting.
- The controller shall offer both 100–240 Vac 50/60 Hz and 24 Vdc power options.
- The controller shall offer two analog 0/4-20 mA output signals with independent PID control functions and optional four additional 4-20 mA outputs.
- The controller shall accept either Digital Sensors or Sensor Modules for pH, Conductivity, DO, Paddle Wheel Flow, and Ultra Sonic Flow sensors.
- The controller shall have single channel and dual channel options.
- The controller shall have options for MODBUS RS232, MODBUS RS485 and Profibus DPV1 communication.
- The display contrast shall be adjustable.
- The Menu shall be available in at least 19 different languages.
- The controller shall have 2 Data logs, 128 kb each. The logged data shall be downloadable on a SD card in XML format.
- The controller shall be Hach Company sc200 Universal Controller.

Specifications*

sc200 General Specifications

Display

Graphic dot matrix LCD with LED backlighting
Transreflective

Display Size

48 x 68 mm (1.89 x 2.67 in.)

Display Resolution

240 x 160 pixels

Height x Width x Depth

144 x 144 x 181 mm (5.7 x 5.7 x 7.1 in.)

Weight

1.70 kg (3.75 lb)

Power Requirements

100 – 240 Vac $\pm 10\%$, 50/60 Hz
24 Vdc -15% + 20%

Operating Temperature

-20 to 60°C (-4 to 140°F), 0 to 95% RH non-condensing

Storage Temperature

-20 to 70°C (-4 to 158°F), 0 to 95% RH non-condensing

Analog Output Signal

Two 0/4 to 20 mA isolated current outputs, max 500Ω

Operational Mode

Primary or secondary measurement or calculated value
(dual channel only)

Functional Mode

Linear, Logarithmic, Bi-linear, PID

Optional 4 additional 4/20 mA isolated current outputs,
max 500Ω @ 18-24 Vdc (customer-supplied power source)

Security Levels

Two password protected levels

Enclosure Materials

Polycarbonate, Aluminum (powder coated), Stainless Steel

Mounting Configurations

Wall, pole and panel mounting

Enclosure Rating

NEMA4X / IP66

Conduit Openings

1/2" NPT Conduit

Relays

Four electromechanical SPDT (Form C) contacts, 1200W,
5 A, 250 Vac

Operational Mode

Primary or secondary measurement, calculated value
(dual channel only) or timer

Functional Mode

Alarm, Timer, Feeder Control, PWM or FM Control,
System Alarm

Digital Communication

MODBUS RS232/RS485, Profibus DPV1 optional

Memory Backup

Flash memory

Electrical Certifications

EMC: Certified CE compliant for conducted and radiated
emissions (EN 50081-2) and immunity (EN 61000-6-2)

General Purpose: UL through ETL

Class I, Div. 2 (Groups A, B, C, and D): CSA (pending)

sc200 for Hach Analog pH/ORP Sensors

Measuring Range

-2.0 to 14.0 pH or -2.00 to 14.00 pH
- 2,100 to 2,100 mV

Repeatability

$\pm 0.1\%$ of range

Response Time

0.5 s

Temperature Range

PT100/PT1000: -20 to 200°C (-4 to 392°F)
NTC300: -20 to 110°C (-4 to 230°F)
Manual: -25 to 400°C (-13 to 752°F)

Temperature Accuracy

$\pm 0.5^\circ\text{C}$ (0.9°F)

Temperature Drift

$\pm 0.03\%$ of reading /°C

Temperature Compensation

Automatic from -20 to 110°C (-4 to 230°F) or manual

Temperature Sensors

PT100/PT1000/NTC300

Temperature Compensation Curves

Nernst, for Pure Water: Ammonia, Morpholine,
User Defined (linear)

Sensor-to-Controller Distance (maximum)

pHD or LCP sensor: 914 m (3000 ft.)
pH Combination electrode w/ preamplifier: 300 m (958 ft.)
pH Combination electrode w/o preamplifier: 30 m (100 ft.),
depending on environment this distance is shorter

Calibration Methods

2-point buffer (pH only)
1-point buffer (pH only)
2-point sample (pH only)
1-point sample (pH or ORP)

Specifications *continued*

sc200 for Hach Analog Contacting Conductivity Sensors

Measuring Range

Conductivity

μS/cm: 0-2,000, 0-20.00, 0-200.0 or 0-2,000
mS/cm: 0-2,000, 0-20.00 or 0-200.0

Resistivity

0-19.99 MΩ•cm or 0-999.9 kΩ•cm

TDS

0-9999 ppm or 0-9999 ppb

Repeatability, Precision (0-20 μS/cm, K=1)

±0.02 mS/cm

Repeatability (20-200,000 μS/cm, K=1)

±0.1% of reading

Response Time

0.5 s

Temperature Range

-20 to 200°C (-4 to 392°F)

Temperature Accuracy

±0.5°C (0.9°F)

Temperature Drift

> 20 μS/cm: ±0.02% of reading / °C
< 20 μS/cm: ±0.004 μS/cm

Temperature Compensation

Automatic from -20 to 200°C (-4 to 392°F) or manual

Temperature Sensor

PT100/PT1000

Temperature Compensation Curves

Linear, Ammonia, Natural water, User Defined, none

Sensor-to-Controller Distance (max)

91m (300 ft.)

Calibration Methods

Zero
GLI DRY-CAL
1-point sample

sc200 for Hach Analog Inductive Conductivity Sensors

Measuring Range

Conductivity

μS/cm: 0-200.0 or 0-2,000
mS/cm: 0-2,000, 0-20.00, 0-200.0 or 0-2,000
S/cm: 0-2,000

% Concentration

0-99.99% or 0-200.0%

TDS

0-9999 ppm repeatability

Repeatability > 500 μS/cm

±0.5% of reading

Repeatability < 500 μS/cm

±2.5 μS/cm

Response Time

1 s

Temperature Range

-20 to 200°C (-4 to 392°F)

Temperature Accuracy

±0.5°C (0.9°F)

Temperature Drift

> 500 μS/cm: ±0.02% of reading / °C
< 500 μS/cm: ±0.1 μS/cm

Temperature Compensation

Automatic from -20 to 200°C (-4 to 392°F) or manual

Temperature Sensors

PT1000

Temperature Compensation Curves

Linear, Natural water, User Defined, none**

Concentration Curves

H₃PO₄: 0-40%; HCl: 0-18%; HCl: 22-36%; NaOH: 0-16%;
CaCl₂: 0-22%; HNO₃: 0-28%; HNO₃: 36-96%; H₂SO₄: 0-30%;
H₂SO₄: 40-80%

Sensor-to-Controller Distance

| Full-scale value | Maximum length |
|-----------------------|----------------|
| 200 to 2,000 μS/cm | 61m (200 ft.) |
| 2,000-2,000,000 μS/cm | 91m (300 ft.) |

Calibration Methods

1-point Cond (or Concentration or TDS)
Zero

**Available curves depend on the selected type of measurement (Conductivity, Concentration or TDS).

Continued on next page.

Specifications *continued*

Linearity 3700 Inductive Conductivity Sensors

1.5 mS/cm – 2 S/cm

1% or reading

< 1.5 mS/cm

±15 µS/cm

Linearity 3700 Inductive Conductivity Sensors with Multiple Point Calibration

1.5 mS/cm – 2 S/cm

0.5% or reading

< 1.5 mS/cm

±5 µS/cm

sc200 for Hach Analog Dissolved Oxygen Sensors

Measuring Range

0 to 40 ppm

200% saturation

Repeatability

±0.05% of range

Response Time

0.5 s

Temperature Range

0 to 50°C (32 to 122°F)

Temperature Accuracy

±0.5°C (0.9°F)

Temperature Drift

±0.02% of reading / °C

Temperature Compensation

Automatic from 0 to 40 ppm or manual

Temperature Sensor

NTC30K / Manual

Sensor-to-Controller Distance (max)

305 m (1000 ft.)

Calibration Methods

Sample

Air

Saturation

sc200 for Hach UltraSonic Flow Sensor

Flow Rate

0-9999, 0-999.9, 0-99.99 with selectable flow rate units and multiplier

Volume

0-9,999,999 with selectable volume units

Depth

0-1200.0 inches, 0-100.0 feet, 0-30,000 mm, or 0-30.00 meters

Input Filter

999 sec

Totalizers

8-digit resettable LCD software totalizer

Totalized Flow

Gal., ft.³, acre-ft., lit., m³

Repeatability

±0.1% of span

Sensor-to-Controller Distance (max)

100 m (328 ft.)

Calibration Methods

Cal Depth 1 point

Cal Depth 2 point

sc200 for Hach Paddle Wheel Flow Sensor

Flow Rate

Function of Structure Type: 0-9999, 0-999.9, 0-99.99 with selectable flow rate units and multiplier

Volume

0-9,999,999 with selectable volume units

Input Filter

999 sec

Totalizers

8-digit resettable LCD software totalizer

Totalized Flow

Gal., ft.³, acre-ft., lit., m³

Sensor-to-Controller Distance (max)

GLI impeller Sensors: 610m (2000 ft.)

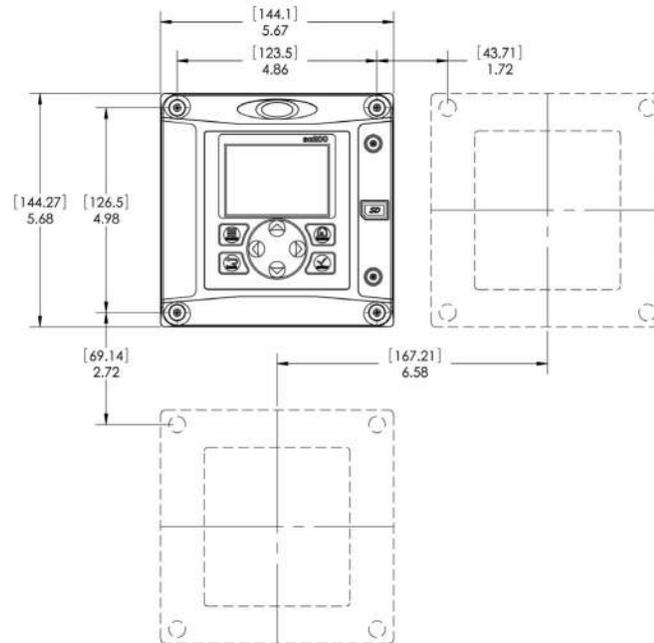
Non-GLI Sensors: 91m (300 ft.)

**Specifications subject to change without notice.*

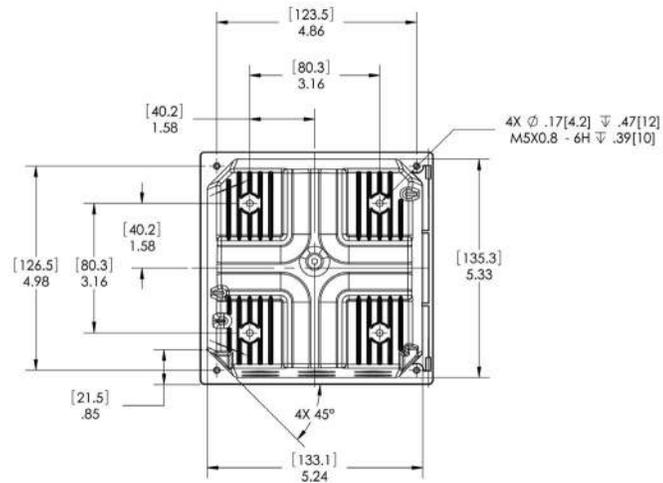
Dimensions

The sc200 controller unit can be installed on a surface, panel, or pipe (horizontally or vertically). No tools are needed to connect the controller unit to any Hach digital sensor. NOTE: Dimensions are in inches [millimeters].

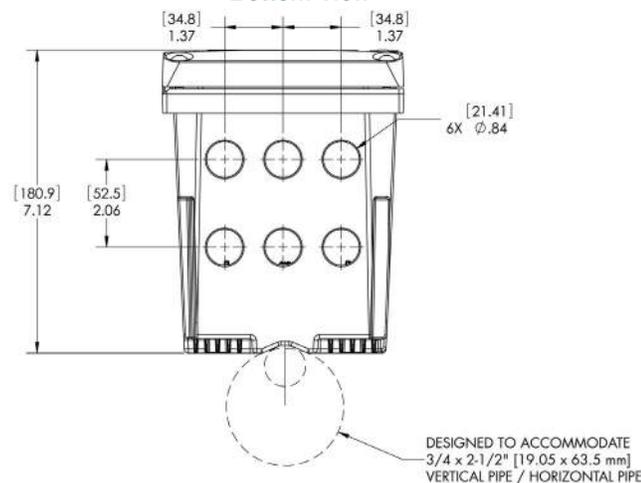
Minimum Spacing Dimensions for Group Mounting



Mounting Dimensions



Bottom View



Ordering Information

sc200 for Hach Digital Sensors

| | |
|-----------------|---|
| LXV404.99.00552 | sc200 controller, 2 channel, digital |
| LXV404.99.00502 | sc200 controller, 1 channel, digital |
| LXV404.99.00542 | sc200 controller, 2 channel, digital & mA input |
| LXV404.99.00512 | sc200 controller, 2 channel, digital & pH/DO |
| LXV404.99.00522 | sc200 controller, 2 channel, digital & Conductivity |
| LXV404.99.00532 | sc200 controller, 2 channel, digital & Flow |

sc200 for Hach Analog Sensors

| | |
|-----------------|---|
| LXV404.99.00102 | sc200 controller, 1 channel, pH/DO |
| LXV404.99.00112 | sc200 controller, 2 channel, pH/DO |
| LXV404.99.00202 | sc200 controller, 1 channel, Conductivity |
| LXV404.99.00222 | sc200 controller, 2 channel, Conductivity |
| LXV404.99.00212 | sc200 controller, 2 channel, pH/DO & Conductivity |
| LXV404.99.00302 | sc200 controller, 1 channel, Flow |
| LXV404.99.00332 | sc200 controller, 2 channel, Flow |
| LXV404.99.00312 | sc200 controller, 2 channel, Flow & pH/DO |
| LXV404.99.00322 | sc200 controller, 2 channel, Flow & Conductivity |

Note: Other Sensor combinations are available. Please contact Hach Technical Support or your Hach representative.

Note: Communication options (MODBUS and Profibus DPV1) are available. Please contact Hach Technical Support or your Hach representative.

Power Cords

| | |
|---------|---|
| 9202900 | sc200 power cord with strain relief, 125 Vac |
| 9203000 | sc200 power cord with strain relief, 230 Vac, European-style plug |

Accessories

| | |
|---------------|--|
| 9220600 | sc200 Weather and Sun Shield with UV Protection Screen |
| 8809200 | sc200 UV Protection Screen |
| 1000G3088-001 | Weather Protection Cover |
| 9218200 | SD card reader (USB) for connection to PC |
| 9218100 | 4 GB SD card |

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In the interest of improving and updating its equipment, Hach Company reserves the right to alter specifications to equipment at any time.

At Hach, it's about learning from our customers and providing the right answers. It's more than ensuring the quality of water—it's about ensuring the quality of life. When it comes to the things that touch our lives...

Keep it pure.

Make it simple.

Be right.

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Be Right™

Differential pH and ORP Sensors

pH/ORP



Hach Digital pH/ORP sensors are available in convertible (PEEK® or Rytan®), insertion, and sanitary body styles. Three electrodes are used in these sensors to increase measurement accuracy and eliminate sensor ground loops.

Features and Benefits

Differential Electrode Measurement Technique

This field-proven technique uses three electrodes instead of the two normally used in conventional pH sensors. Process and reference electrodes measure the pH differentially with respect to a third ground electrode. The end result is unsurpassed measurement accuracy, reduced reference junction potential, and elimination of sensor ground loops. These sensors provide greater reliability, resulting in less downtime and maintenance.

Patented Technology

The former GLI, now a Hach Company brand, invented the Differential Electrode Technique for pH measurement in 1970. The pH^{DM} sensor series (U.S. Patent Number 6395158B1, dated May 28, 2002) takes this field-proven technology to a new level.

Replaceable Salt Bridge/Protector

The unique, replaceable salt bridge holds an extraordinary volume of buffer to extend the working life of the sensor by protecting the reference electrode from harsh process conditions. The salt bridge simply threads onto the end of the sensor if replacement is needed.

Built-in Encapsulated Preamp

Encapsulated construction protects the sensor's built-in preamp from moisture and humidity, ensuring reliable sensor operation. The preamp in the pH^{DM} analog sensor produces a strong signal, enabling the sensor to be located up to 1000 m (3280 ft.) from the analyzer.

Durable Body Materials

Both the digital and analog pH and ORP differential sensors feature a durable PEEK® body for chemical compatibility

with most process solutions. For less aggressive solutions, Hach offers a Rytan® sensor in a convertible style for pH and ORP measurement. A sensor with a stainless steel body is available for immersion applications.

Digital Electronics Modules

Sensors are available with integral digital electronics or with a gateway module for high temperature (above 70°C) applications.

Versatile Mounting Styles

Sensors are available in four mounting styles—convertible, insertion, immersion, and sanitary. Please turn to page 5 for more information.

Full-Featured “Plug and Play” Hach sc Digital Controllers

There are no complicated wiring or set up procedures with any Hach sc controller. Just plug in any combination of Hach digital sensors and it's ready to use—it's “plug and play.”

One or multiple sensors—The sc controller family allows you to receive data from up to eight Hach digital sensors in any combination using a single controller.

Communications—Multiple alarm/control schemes are available using the relays and PID control outputs. Available communications include analog 4–20 mA, digital MODBUS® (RS485 and RS232) or Profibus DP protocols. (Other digital protocols are available. Contact your Hach representative for details.)

Data logger—A built-in data logger collects measurement data, calibration, verification points, and alarm history.

DW = drinking water WW = wastewater municipal PW = pure water / power
IW = industrial water E = environmental C = collections FB = food and beverage



Be Right™

DW

WW

PW

IW

Specifications*

pH Sensors

Most pH applications fall in the 2.5 to 12.5 pH range. A Hach pHD sc Differential pH sensor with the wide-range glass process electrode performs exceptionally well in this range. Some industrial applications require accurate measurement and control below 2 or above 12 pH. In these special cases, please contact Hach Technical Support for further details.

Measuring Range

-2 to 14 pH

Sensitivity

± 0.01 pH

Stability

0.03 pH per 24 hours, non-cumulative

Operating Temperature

Digital Sensor: -5 to 70°C (23 to 158°F)

Analog Sensor with Digital Gateway: -5 to 105°C (23 to 221°F)

Immersion Sensor: 0 to 50°C (32 to 122°F)

Flow Rate

3 m (10 ft.) per second, maximum

Sensor Pressure/Temperature Limits

Digital: 6.9 bar at 70°C (100 psi at 158°F)

Analog: 6.9 bar at 105°C (100 psi at 221°F)

Built-in Temperature Element

NTC 300 ohm thermistor for automatic temperature compensation and analyzer temperature readout

Transmission Distance

100 m (328 ft.), maximum

1000 m (3280 ft.), maximum when used with a termination box

Sensor Cable (integral)

4 conductor cable with one shield and polyurethane jacket; rated to 105°C (221°F); 10 m (33 ft.) standard length

Wetted Materials

PEEK® or Ryton® (PVDF), salt bridge of matching material with Kynar® junction, glass process electrode, titanium ground electrode, and Viton® O-ring seals

(pH sensor with optional HF-resistant glass process electrode has 316 stainless steel ground electrode, and perfluoroelastomer wetted O-rings; consult factory for other available wetted O-ring materials)

ORP (Redox) Sensors

For best ORP measuring results in solutions containing zinc, cyanide, cadmium or nickel, Hach recommends using the pHD sc ORP sensor equipped with an optional gold electrode.

Measuring Range

-1500 to +1500 mV

Sensitivity

± 0.5 mV

Stability

2 mV per 24 hours, non-cumulative

Operating Temperature

Digital Sensor: -5 to 70°C (23 to 158°F)

Analog Sensor with Digital Gateway: -5 to 105°C (23 to 221°F)

Immersion Sensor: 0 to 50°C (32 to 122°F)

Flow Rate

3 m (10 ft.) per second, maximum

Sensor Pressure/Temperature Limits

Digital: 6.9 bar at 70°C (100 psi at 158°F)

Analog: 6.9 bar at 105°C (100 psi at 221°F)

Built-in Temperature Element

NTC 300 ohm thermistor for analyzer temperature readout only—no automatic temperature compensation necessary for ORP measurement

Transmission Distance

100 m (328 ft.), maximum

1000 m (3280 ft.), maximum when used with a termination box

Sensor Cable (integral)

4 conductor cable with one shield and polyurethane jacket; rated to 105°C (221°F); 10 m (33 ft.) standard length

Wetted Materials

PEEK® or Ryton® (PVDF), salt bridge of matching material with Kynar® junction, glass and platinum (or plastic and gold) process electrode, titanium ground electrode, and Viton® O-ring seals

*Specifications subject to change without notice.

Engineering Specifications

PEEK® Sensor

1. The pH or ORP sensor shall be of Differential Electrode Technique design using two measuring electrodes to compare the process value to a stable internal reference standard buffer solution. The standard electrode shall have non-flowing and fouling-resistant characteristics.
2. The sensor shall have a hex-shaped body to facilitate mounting, and shall be constructed of PEEK® material for exceptional chemical resistance and mechanical strength. This material shall enable the sensor to be installed in metal fittings without leakage usually caused by heating and cooling cycles when dissimilar materials are threaded together.
3. The sensor shall have a:
 - a) Convertible body style featuring 1-inch NPT threads on both ends to mount into a standard 1-inch pipe tee, into a Hach adapter pipe for union mounting with a standard 1-1/2 inch tee, or onto the end of a pipe for immersion into a vessel.
 - b) Insertion body style featuring 1-inch NPT threads only on the cable end to mount into a Hach ball valve hardware assembly, enabling the sensor to be inserted into or retracted from the process without stopping the process flow.
 - c) Sanitary body style featuring an integral 2-inch flange to mount into a Hach 2-inch sanitary tee. The sanitary body style sensor shall include a special cap and EDPM compound gasket for use with the Hach sanitary hardware.
4. The built-in electronics of the sensor shall be completely encapsulated for protection from moisture and humidity.
5. The sensor shall have a built-in preamplifier to enable the signal to be transmitted up to 100 m (328 ft.) with standard cabling and up to 1000 m (3280 ft.) with a termination box.
6. The sensor signal shall have an integral temperature sensor. The pH sensor shall automatically compensate measured values for changes in process temperature.
7. The ORP sensor shall include a titanium ground electrode (standard) to eliminate ground loop currents in the measuring electrodes.
8. The sensor shall be Hach Company Model pHD sc or pHD for pH or ORP measurement.

Ryton® Sensor

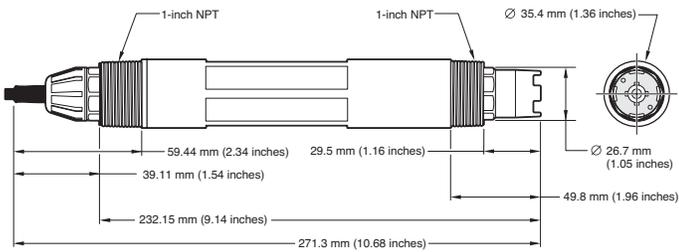
1. The pH or ORP sensor shall be of Differential Electrode Technique design using two measuring electrodes to compare the process value to a stable internal reference standard buffer solution. The standard electrode shall have non-flowing and fouling-resistant characteristics.
2. The sensor shall have a hex-shaped body to facilitate mounting, and shall be constructed of Ryton® material for exceptional chemical resistance and mechanical strength. This material shall enable the sensor to be installed in metal fittings without leakage usually caused by heating and cooling cycles when dissimilar materials are threaded together.
3. The sensor shall have a convertible body style featuring 1-inch NPT threads on both ends to mount into a standard 1-inch pipe tee, into a Hach adapter pipe for union mounting with a standard 1-1/2 inch tee, or onto the end of a pipe for immersion into a vessel.
4. The built-in electronics of the sensor shall be completely encapsulated for protection from moisture and humidity.
5. The sensor shall have a built-in preamplifier to enable the signal to be transmitted up to 100 m (328 ft.) with standard cabling and up to 1000 m (3280 ft.) with a termination box.
6. The sensor signal shall have an integral temperature sensor. The pH sensor shall automatically compensate measured values for changes in process temperature.
7. The ORP sensor shall include a titanium ground electrode (standard) to eliminate ground loop currents in the measuring electrodes.
8. The sensor shall be Hach Company Model pHD sc or pHD for pH or ORP measurement.

Stainless Steel Sensor

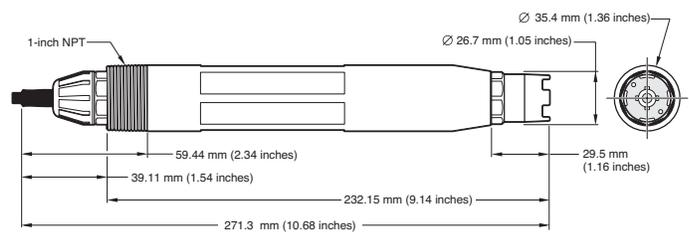
1. The pH or ORP sensor shall be of differential electrode technique design using two measuring electrodes to compare the process value to a stable internal reference standard buffer solution. The standard electrode shall have non-flowing and fouling-resistant characteristics.
2. The sensor shall be capable of chain mounting for immersion applications, and shall be constructed of 316 stainless steel.
3. The built-in electronics of the sensor shall be completely encapsulated for protection from moisture and humidity.
4. The sensor shall have a built-in preamplifier to enable the signal to be transmitted up to 100 m (328 ft.) with standard cabling and up to 1000 m (3280 ft.) with a termination box.
5. The sensor signal shall have an integral temperature sensor to automatically compensate measured values for changes in process temperature.
6. The sensor shall include a titanium ground electrode (standard) to eliminate ground loop currents in the measuring electrodes.
7. The sensor shall be Hach Company Model pHD sc or pHD for pH or ORP measurement.

Dimensions

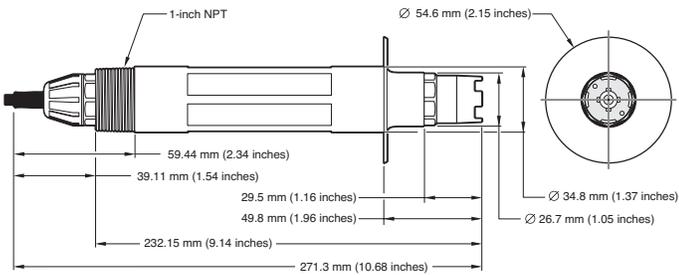
Convertible Style



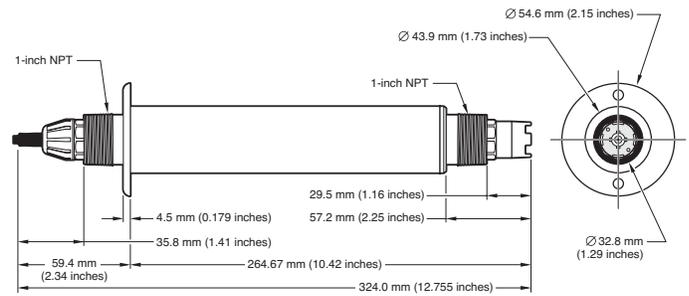
Insertion Style



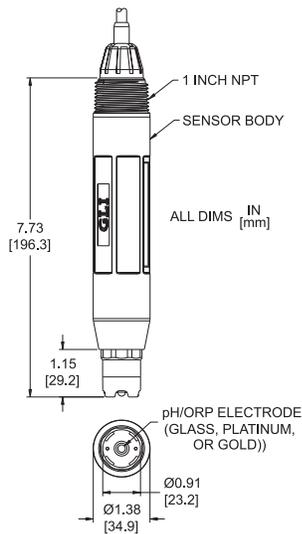
Sanitary Style



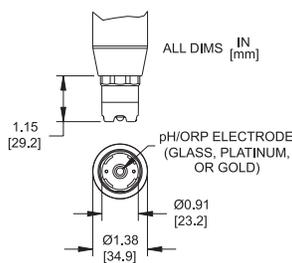
Immersion Style



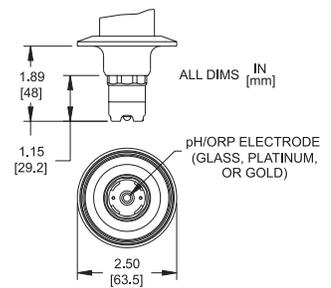
Analog Convertible Style



Analog Insertion Style



Analog Sanitary Style



Ordering Information

pHD sc Digital Differential pH/ORP Sensors

All digital sensors include built-in digital electronics and integral 10 m (33 ft.) cable terminated with connector for the Hach sc Digital Controllers. Body styles:

- *Convertible* – 1-inch NPT threads at both ends, designed for tee-mounting or other flow through mountings, and pipe mounting for immersion
- *Insertion* – no threads on the electrode end, designed for use with insertion valve assembly
- *Sanitary* – 2-inch flange for a tri-clover style fitting
- *Immersion* – used with chain mounting or pipe mounting

pH Sensors

| <u>Product Number</u> | <u>Body Material</u> | <u>Body Style</u> | <u>Electrode Material</u> | <u>Max Temp</u> |
|-----------------------|--------------------------|--------------------|-------------------------------|---------------------|
| DPD1P1 | PEEK ¹ | Convertible | Glass, General Purpose | 70°C (158°F) |
| DPD1P3 | PEEK ¹ | Convertible | Glass, HF-resistant | 70°C (158°F) |
| DPD2P1 | PEEK ¹ | Insertion | Glass, General Purpose | 70°C (158°F) |
| DPD3P1 | PEEK ¹ | Sanitary | Glass, General Purpose | 70°C (158°F) |
| DPD1R1 | Ryton² | Convertible | Glass, General Purpose | 70°C (158°F) |
| DPD1R3 | Ryton ² | Convertible | Glass, HF-resistant | 70°C (158°F) |
| DPS1 | Stainless Steel | Immersion | Glass, General Purpose | 50°C (122°F) |

¹Polyetheretherketone ²Polyphenylene Sulfide

ORP Sensors

| <u>Product Number</u> | <u>Body Material</u> | <u>Body Style</u> | <u>Electrode Material</u> | <u>Max Temp</u> |
|-----------------------|----------------------|-------------------|---------------------------|-----------------|
| DRD1P5 | PEEK ¹ | Convertible | Platinum | 70°C (158°F) |
| DRD1P6 | PEEK ¹ | Convertible | Gold | 70°C (158°F) |
| DRD2P5 | PEEK ¹ | Insertion | Platinum | 70°C (158°F) |
| DRD1R5 | Ryton ² | Convertible | Platinum | 70°C (158°F) |
| DRD1R6 | Ryton ² | Convertible | Gold | 70°C (158°F) |
| DRS5 | Stainless Steel | Immersion | Platinum | 50°C (122°F) |

¹Polyetheretherketone ²Polyphenylene Sulfide

Digital Gateway

6120500 Digital Gateway, convert pHD analog sensors to digital output for connecting to sc1000 digital controller

pHD Analog Sensors

All analog sensors include built-in preamplifier and integral 4.5 m (15 ft.) cable terminated with stripped and tinned wires.

Definitions of body styles:

- *Convertible* – 1-inch NPT threads at both ends, designed for tee-mounting or other flow through mountings, and pipe mounting for immersion
- *Insertion* – has no threads on the electrode end, designed for use with insertion valve assembly
- *Sanitary* – has a 2-inch flange for a Tri-Clover style fitting

pH Sensors

| <u>Product Number</u> | <u>Body Material</u> | <u>Body Style</u> | <u>Electrode Material</u> | <u>Max Temp</u> |
|-----------------------|----------------------|-------------------|---------------------------|-----------------|
| PD1P1 | PEEK ¹ | Convertible | Glass, General Purpose | 95°C (203°F) |
| PD1P3 | PEEK ¹ | Convertible | Glass, HF-resistant | 95°C (203°F) |
| PD2P1 | PEEK ¹ | Insertion | Glass, General Purpose | 95°C (203°F) |
| PD3P1 | PEEK ¹ | Sanitary | Glass, General Purpose | 95°C (203°F) |
| PD1R1 | Ryton ² | Convertible | Glass, General Purpose | 95°C (203°F) |
| PD1R3 | Ryton ² | Convertible | Glass, HF-resistant | 95°C (203°F) |

¹Polyetheretherketone ²Polyphenylene Sulfide

ORP Sensors

| <u>Product Number</u> | <u>Body Material</u> | <u>Body Style</u> | <u>Electrode Material</u> | <u>Max Temp</u> |
|-----------------------|----------------------|-------------------|---------------------------|-----------------|
| RD1P5 | PEEK ¹ | Convertible | Platinum | 95°C (203°F) |
| RD1P6 | PEEK ¹ | Convertible | Gold | 95°C (203°F) |
| RD2P5 | PEEK ¹ | Insertion | Platinum | 95°C (203°F) |
| RD1R5 | Ryton ² | Convertible | Platinum | 95°C (203°F) |
| RD1R6 | Ryton ² | Convertible | Gold | 95°C (203°F) |

¹Polyetheretherketone ²Polyphenylene Sulfide

Ordering Information *continued*

pHD sc Digital and pHD Analog Sensor Accessories

Cables

Extension cables are used only with digital sensors or digital gateways when connecting to an sc Digital Controller.

| | |
|----------------|---|
| 6122400 | Digital Extension Cable, 1 m (3.2 ft.) |
| 5796000 | Digital Extension Cable, 7.7 m (25 ft.) |
| 5796100 | Digital Extension Cable, 15 m (50 ft.) |
| 5796200 | Digital Extension Cable, 31 m (100 ft.) |

Interconnect cables are used only with analog sensors, junction box, and controller.

| | |
|---------------|---|
| 1W1100 | Analog Interconnect Cable, order per foot |
|---------------|---|

Digital Termination Box

Required when the length of cable between the digital sensor/digital gateway and sc Digital Controller is between 100 m (328 ft.) and 1000 m (3280 ft.)

| | |
|----------------|-------------------------|
| 5867000 | Digital Termination Box |
|----------------|-------------------------|

Analog Junction Box

Required when the length of cable between the analog sensor and analog controller is greater than standard length of sensor cable. Each junction box includes terminal strip and gasket.

| | |
|--------------------|--|
| 60A2053 | Junction Box, Surface-mount, aluminum (includes mounting hardware) |
| 60A9944 | Junction Box, Pipe-mount, PVC (for 1/2-inch diameter pipe, includes mounting hardware) |
| 60G2052 | Junction Box, Pipe-mount, PVC (for 1-inch diameter pipe, includes mounting hardware) |
| 76A4010-001 | Junction Box, NEMA 4X (no mounting hardware included) |

Protector for Convertible style sensor

| | |
|----------------------|-----------------|
| 1000F3374-002 | PEEK protector |
| 1000F3374-003 | Ryton protector |

Salt Bridges

The double junction salt bridge on the standard cell of all Hach pHD sensors is field-replaceable. Each salt bridge has a ceramic inner junction, Viton® O-ring, and contains binary, equi-transferrant fill solution. Salt bridges are shipped in a salt solution.

| Product Number | pHD sc and pHD Sensor Body Material | Salt Bridge Materials | |
|----------------------------|-------------------------------------|-----------------------|----------------|
| | | Body | Outer Junction |
| SB-P1SV | PEEK | PEEK | Kynar (PVDF) |
| SB-P2SV | PEEK | PEEK | Ceramic |
| SB-P1SP¹ | PEEK | PEEK | Kynar (PVDF) |
| SB-R1SV | Ryton | Ryton | Kynar (PVDF) |

¹Special perfluoroelastomer O-ring in place of the Viton® O-ring

Cleaning Systems for pHD sc and pHD Sensors

Self-Contained Air Blast Cleaning System

Includes Kynar® (PVDF) washer head with 7.6 m (25 ft.) tubing for air delivery, a quick-disconnect tube fitting, and a compressor housed in a NEMA 4X enclosure.

| | |
|----------------------|-----------------------|
| 1000A3335-005 | For 115 Vac operation |
| 1000A3335-006 | For 230 Vac operation |

Air/Water Blast Cleaning Washer Head

Intended only for immersion applications with a user-supplied air or water wash system.

| | |
|----------------------|---|
| 1000A3335-004 | Kynar (PVDF) washer head includes 1/4-inch barb fitting |
|----------------------|---|

pHD sc Digital and pHD Analog Sensor Reagents and Standards

25M1A1025-115 Standard Cell Solution, to replenish standard cell chamber in Hach pHD sensors while replacing salt bridge, 500 mL

25M8A1002-101 Gel Powder, for high temperature applications, 2 g

pH Buffers

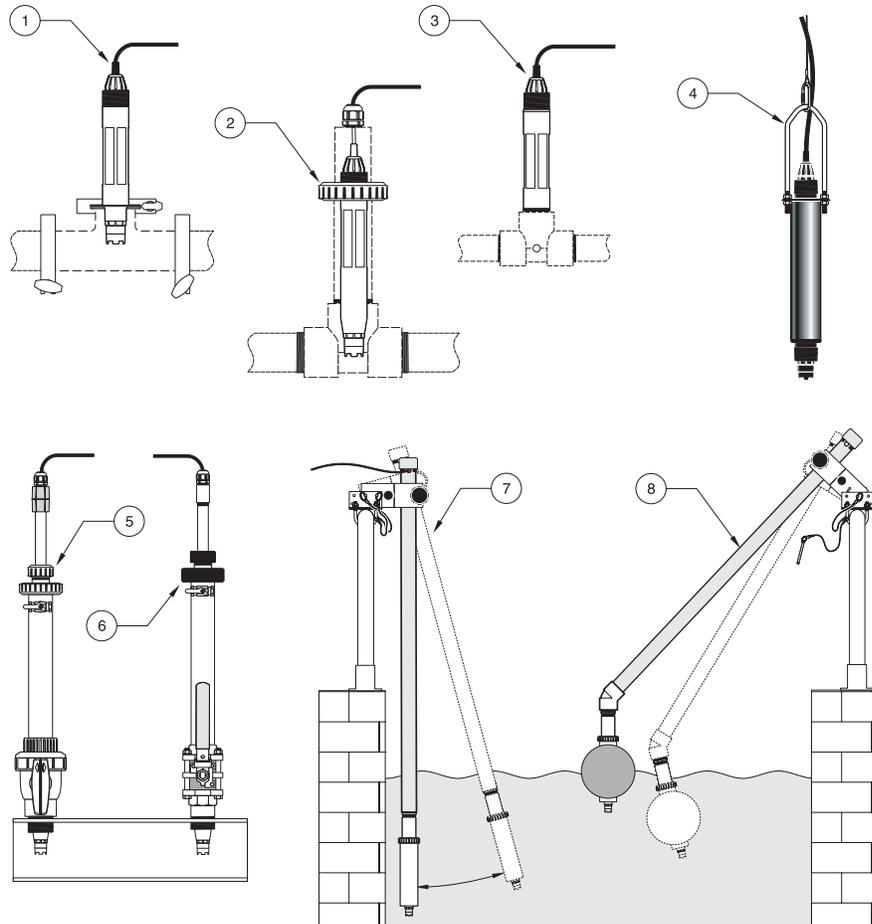
| Product Number | Description | Volume |
|----------------|-------------|-----------------|
| 2283549 | pH 7 | 500 mL (1 pint) |
| 2283449 | pH 4 | 500 mL (1 pint) |
| 2283649 | pH 10 | 500 mL (1 pint) |

ORP Reference Solutions (in resealable plastic bottles)

| Product Number | Description | Volume |
|----------------------|-------------|-----------------|
| 25M2A1001-115 | 200 mV | 500 mL (1 pint) |
| 25M2A1002-115 | 600 mV | 500 mL (1 pint) |

Ordering Information *continued*

Mounting Hardware for pH/DO sc Differential Sensors



1. Sanitary mount
2. Union mount

3. Flow-through mount
4. Hanging stainless steel sensor with the bail

5. PVC Insertion mount
6. Stainless steel insertion mount

7. Immersion mount
8. Immersion mount, ball float

Sanitary Mount

MH018S8SZ 316 SS
Includes 2-inch sanitary tee and heavy-duty clamp. Special cap and EPDM compound gasket are supplied with sensor but can be separately ordered.

Union Mount

6131300 CPVC
6131400 316 SS
Includes standard 1-1/2 inch tee, special union pipe with adapter, sealing hub, and lock ring in respective material, and Viton® O-ring.

Flow-through Mount

MH334N4NZ CPVC
MH314N4MZ 316 SS
Includes a standard 1-inch tee in respective material.

Insertion Mount

| | | | |
|----------------|--------|----------------|--------|
| <i>Digital</i> | | <i>Analog</i> | |
| 5646300 | CPVC | 5646400 | CPVC |
| 5646350 | 316 SS | 5646450 | 316 SS |

Includes a 1-1/2 inch ball valve in respective material, 1-1/2 inch NPT close nipple, sensor adapter with two Viton® O-rings and wiper, extension pipe, pipe adapter, back tube, and lock ring.

Immersion Mount

Standard Hardware

| | | | |
|----------------|--------|------------------|--------|
| <i>Digital</i> | | <i>Analog</i> | |
| 6136400 | CPVC | MH434A00B | CPVC |
| 6136500 | 316 SS | MH414A00B | 316 SS |

Includes 1-inch diameter by 4 ft. long pipe and 1-inch x 1-inch NPT coupling in respective material. (Pipe-mount junction box with terminal strip included in analog hardware.)

Handrail Hardware

MH236B00Z CPVC
Includes 1-1/2 inch diameter by 7.5 ft. long CPVC pipe, and a unique swivel/pivot/ pipe clamp assembly.

Chain Mount Hardware

2881900 316 ss
Includes stainless steel bail, nuts, and washers. Does not include chain. To be used with stainless steel immersion sensor only.

Ball Float Hardware

6131000 CPVC
Includes 1-1/2 inch diameter by 7.5 ft. long CPVC pipe, ball float assembly, and a unique swivel/pivot/ pipe clamp assembly.

NOTE

Contact Hach Technical Support or your Hach representative for information about retro fit hardware for existing installations.

To complete your pH and ORP measurement system, choose from these Hach controllers...

Model sc200 Controller

(see Lit. #2665)

The sc200 controller platform can be configured to operate either 2 Digital Sensor Inputs, or 1 or 2 Analog Sensor Inputs, or a combination of Digital and Analog Sensor Inputs. Customers may choose their communication options from a variety of offerings ranging from MODBUS RTU to Profibus DPV1.



sc200 for Hach Digital Sensors

- LXV404.99.00552** sc200 controller, 2 channel, digital
- LXV404.99.00502** sc200 controller, 1 channel, digital
- LXV404.99.00542** sc200 controller, 2 channel, digital & mA input
- LXV404.99.00512** sc200 controller, 2 channel, digital & pH/DO
- LXV404.99.00522** sc200 controller, 2 channel, digital & Conductivity
- LXV404.99.00532** sc200 controller, 2 channel, digital & Flow

sc200 for Hach Analog Sensors

- LXV404.99.00102** sc200 controller, 1 channel, pH/DO
- LXV404.99.00112** sc200 controller, 2 channel, pH/DO
- LXV404.99.00202** sc200 controller, 1 channel, Conductivity
- LXV404.99.00222** sc200 controller, 2 channel, Conductivity
- LXV404.99.00212** sc200 controller, 2 channel, pH/DO & Conductivity
- LXV404.99.00302** sc200 controller, 1 channel, Flow
- LXV404.99.00332** sc200 controller, 2 channel, Flow
- LXV404.99.00312** sc200 controller, 2 channel, Flow & pH/DO
- LXV404.99.00322** sc200 controller, 2 channel, Flow & Conductivity

Note: Other sensor combinations are available. Please contact Hach Technical Support or your Hach representative.

Note: Communication options (MODBUS and Profibus DPV1) are available.

Model sc1000 Controller

(see Lit. #2403)

Each sc1000 Probe Module provides power to the system and can accept up to 8 digital sensors/expansion boards. Probe Modules can be networked together to accommodate up to 32 digital sensors/expansion boards attached to the same network.



- LXV402.99.00002** sc1000 Display Module
- LXV400.99.1R572** sc1000 Probe Module, 4 sensors, 4 mA Out, 4 mA In, 4 Relays, 110-230V
- LXV400.99.1B572** sc1000 Probe Module, 4 sensors, 4 mA Out, 4 mA In, 4 Relays, RS-485 (MODBUS), 110-230V
- LXV400.99.1F572** sc1000 Probe Module, 4 sensors, 4 mA Out, 4 mA In, 4 Relays, PROFIBUS DP, 110-230V
- LXV400.99.1R582** sc1000 Probe Module, 6 sensors, 4 mA Out, 4 mA In, 4 Relays, 110-230V

Lit. No. 2467 Rev 1

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In the interest of improving and updating its equipment, Hach Company reserves the right to alter specifications to equipment at any time.

At Hach, it's about learning from our customers and providing the right answers. It's more than ensuring the quality of water—it's about ensuring the quality of life. When it comes to the things that touch our lives...

Keep it pure.

Make it simple.

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For current price information, technical support, and ordering assistance, contact the Hach office or distributor serving your area.

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Be Right™

9180100, 9180200, 9180300 and 9180400 Flow Cells

The flow cells are supplied with English or metric fittings.

English: 9180100 for 1 in. NPT sensors, 9180200 for ¾ in. NPT sensors

Metric: 9180300 for 1 in. NPT sensors, 9180400 for ¾ in. NPT sensors

NOTICE

Inlet pressure 50 PSIG (345 kPa) maximum 0–40 °C (32–104 °F). Do not exceed sensor maximum operating pressure and temperature. Maximum flow rate: 2 gal/min (7.5 L/min).

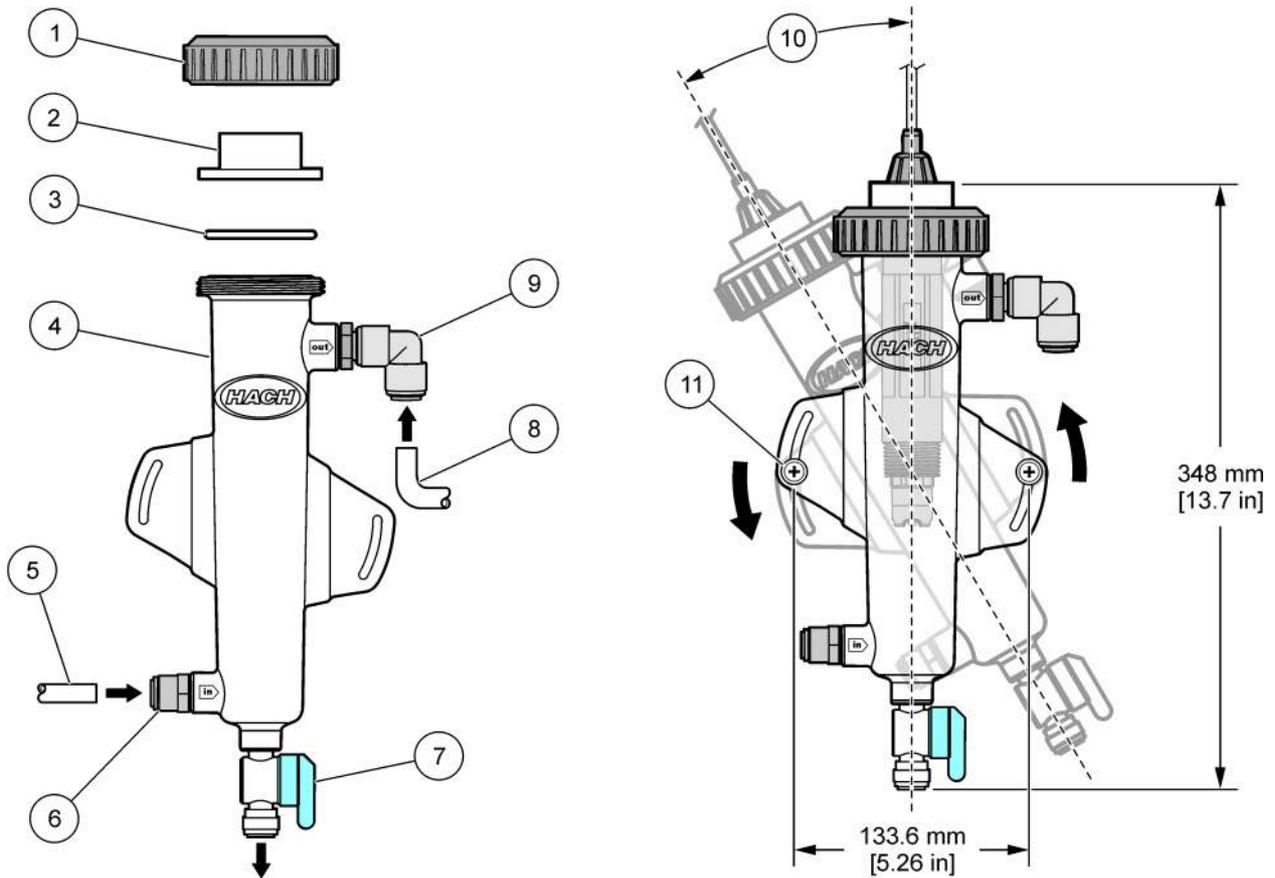
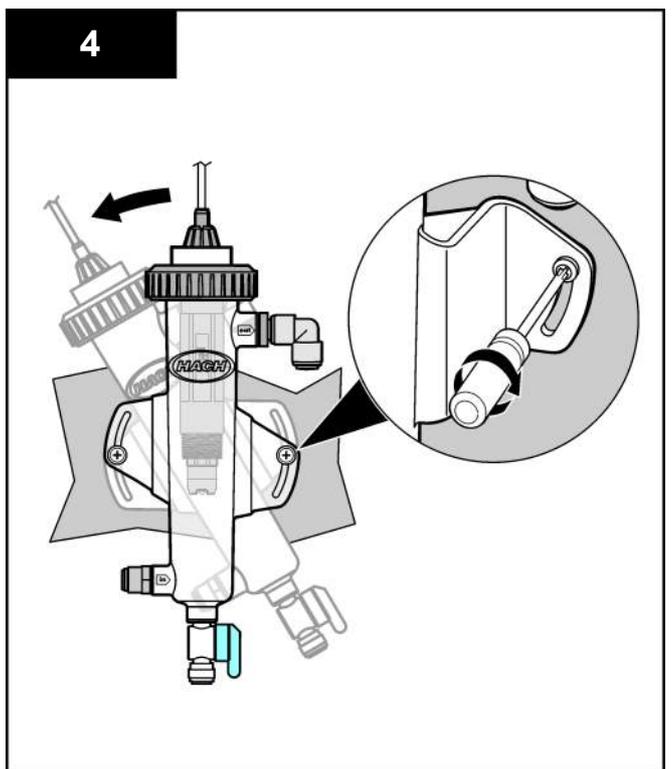
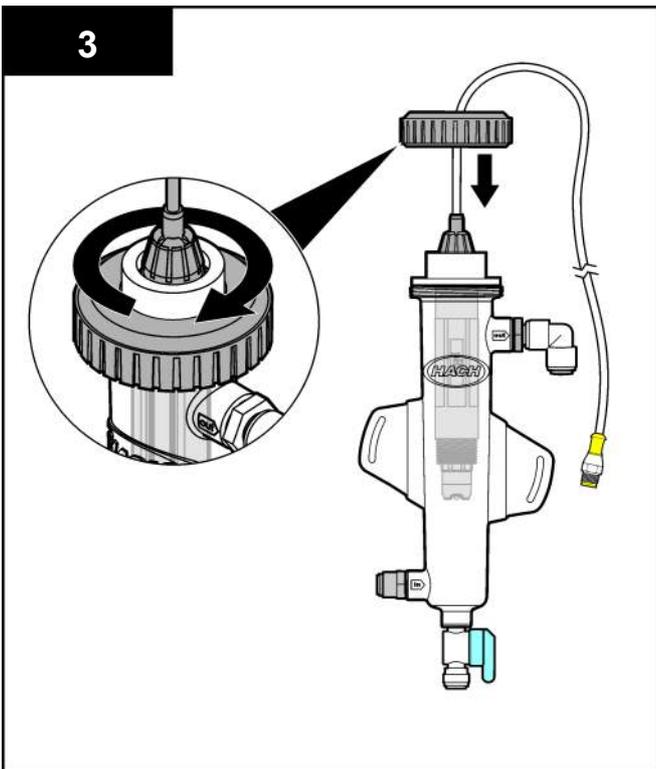
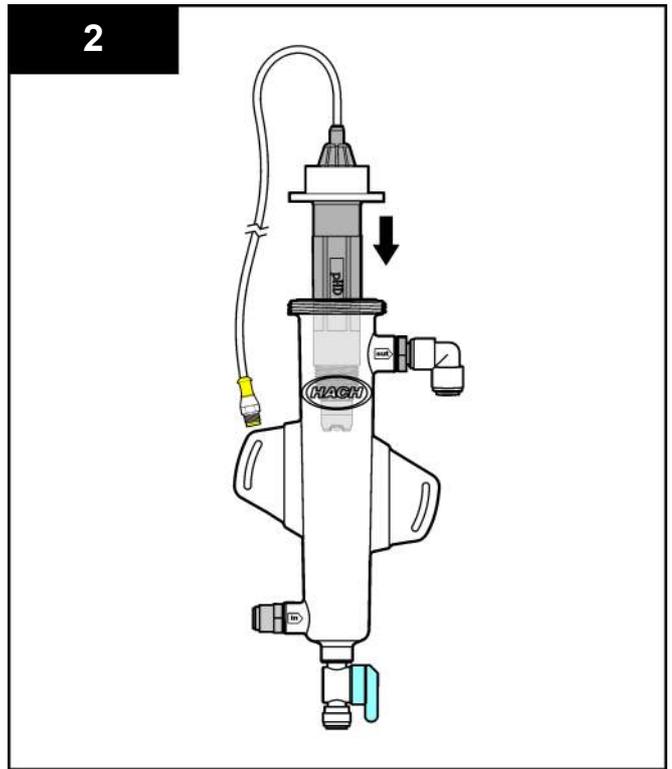
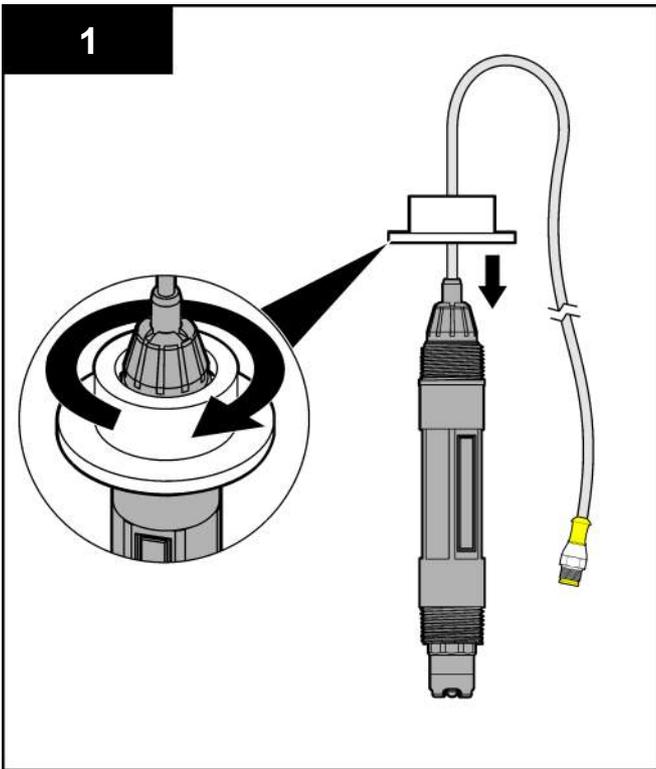


Figure 1 Flow Cell components and features

| | | | |
|---|---|----|---|
| 1 | Lock ring (60F2032-001) | 7 | Speed-fit valve - 3/8 in. OD (9005300) |
| 2 | Sealing hub - 1 in. (60F2021-001) Sealing hub - ¾ in. (9159800) | 8 | English: ½ in. OD tube, customer supplied Metric: 12 mm OD tube, customer supplied |
| 3 | O-ring (5H1223) | 9 | English: Speed-fit elbow fitting - ½ in. OD (9196900) Metric: Speed-fit elbow fitting - 12 mm OD (9197000) |
| 4 | Flow cell body (9159700) | | |
| 5 | English: 3/8 in. OD tube, customer-supplied Metric: 10 mm OD tube, customer-supplied | 10 | If air bubbles become trapped below probe sensor, flow cell may be rotated up to 30° from vertical. |
| 6 | English: Speed-fit fitting - 3/8 in. OD (9159300) Metric: Speed-fit fitting - 10 mm OD (9196500) | 11 | Screw (#10-32 or M5) (2x), customer supplied |



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STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

2110 Ironwood Parkway, Coeur d'Alene, ID 83814 (208) 769-1422

C. L. "Butch" Otter, Governor
John H. Tippetts, Director

June 5, 2017

William C. Strand, Ph.D.
Dover City Council President
PO Box 115
Dover, ID 83825
BillStrand@CityOfDoverIdaho.org

Subject: Sanitary Survey Plan of Correction Conditional Approval

Dear Mr. Strand:

A revised plan of correction (POC) for the City of Dover sanitary survey findings was submitted to the Department of Environmental Quality (DEQ) on April 6, 2017. The submitted POC was found to be acceptable, and approval is contingent upon the following items being addressed:

- 1) Rule Requirements, Treatment #1: Continue to utilize a maximum contact time of 90 minutes until improvements are completed that reflect the conditions previously approved for a contact time of 434 minutes as documented in DEQ files and the sanitary survey report. Notify DEQ in a timely manner of any changes in operation that affect contact time.
- 2) Rule Requirements, Treatment #2: The list of existing and proposed equipment for monitoring free residual chlorine, pH, and temperature is adequate for drinking water disinfection compliance reporting purposes if specific analytical methods are followed:
 - a) pH (online): EPA Method 150.2. The Hach DPD1R1 pH sensor includes automatic temperature compensation. It is recommended that temperature be configured for display on the Hach sc200 controller for compliance reporting purposes. Note also initial pH calibration and recalibrations every 30 days under Section 7.4 and 7.2 of the method.
 - b) Chlorine Residual (online): Standard Method 4500-Cl-G. The Hach CL17 utilizes DPD colorimetric reagents. Note the additional requirement in 40 CFR 141.74(a)(2) for grab-sample calibrations of online instruments at least every 5 days.
 - c) Temperature: Standard Method 2550. No separately listed equipment other than the Hach DPD1R1 pH sensor and sc200 controller has been proposed for temperature measurement. If the City intends another means of temperature monitoring, please submit details. Note also that online thermometers should be periodically checked against a precision NIST-certified thermometer.

- 3) Rule Requirements, Pump Control #1: DEQ recommends the City complete the SCADA alarm improvements and stocking of onsite replacement parts as suggested. Further review of potential pump deficiencies will be conducted during a future sanitary survey and at such time that the pump facility has been put into service with active connections.

I am available to assist you with any remaining questions or concerns.

Sincerely,



Jim Williamson

Drinking Water Analyst

Jim.Williamson@deq.idaho.gov

- c: Anna Moody, Drinking Water Program Supervisor, anna.moody@deq.idaho.gov
Bob Hansen, Operator, wsmibob@aol.com
Scott McNee, Engineering Consultant, smcnee@to-engineers.com
TRIM file: ID1090193, City of Dover

APPENDIX H

Selkirk Fire Letter



SELKIRK FIRE, RESCUE & EMS

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May 8, 2017

Annie Shaha
Mayor
City of Dover
P.O. Box 115
Dover, Idaho 83825-0115

Dear Mayor Shaha,

Selkirk Fire had a chance to go and review the Upper Cedar Ridge Water System. The system consists of a 43,000 thousand gallon water tank that is connected to approximately 11 gravity fed fire hydrants. The water tank is constantly fed by two water pumps that are supplied water from the City of Dover water system.

In 2016/17, the fire department tested all the hydrants in the Upper Cedar Ridge System and we believe that the system has an adequate supply of available fire suppression water in the event a structure fire was to occur in the Cedar Ridge area.

Please let me know if you have any questions. I can be contacted at (208) 263-3502.

Sincerely,

A handwritten signature in black ink, appearing to read "Ron Stocking".

Ron Stocking
Fire Chief



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