ATTACHMENT A

KING COUNTY WATER DISTRICT 54

KING COUNTY WATER DISTRICT NO. 54

Comprehensive Water System Plan

G&O #18422
October 2019

Gray & Osborne, Inc.

ATTACHMENT A

KING COUNTY WATER DISTRICT NO. 54

KING COUNTY **WASHINGTON**

COMPREHENSIVE WATER SYSTEM PLAN

WARREN W. PERKINS
33786

Warren W. Perkins

10/10/19

G&O #18422
OCTOBER 2019

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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EXECUTIVE SUMMARY

King County Water District 54 operates a water system that serves downtown Des Moines and a portion of the southern portion of Normandy Park. The District supplies unchlorinated groundwater to its customers. The District has a staff of three.

The District was formed in 1935 to serve 300 people and now serves a population of approximately 5,200 on 755 connections. Of those, 102 connections serve 1,630 multi-family units including apartment/condominium buildings with another 158 non-residential connections.

The District is bordered by Puget Sound on the west and Highline Water District on all other sides. Most of the parcels within the District are developed, thus growth in the District is anticipated to be slow, mostly through redevelopment on existing lots. The current number of ERU is anticipated to increase from 2,205 in 2018 to 2,417 in 2039.

The District's source capacity is estimated at 910 gpm. The District has sufficient water rights and pumping capacity to serve the anticipated demand for the 20-year planning period, Table 1.

TABLE E-1

Production and Water Rights

	Production		Water Rights	
Year	**Annual (ac-ft/yr)**	**Maximum Day (gal/min)**	**Annual (ac-ft/yr)**	**Instantaneous (gal/min)**
2017	368	431	1,256	2,025
2039	433	564		

The quality of the District's water is excellent, with the caveat that manganese is present at the secondary MCL of 0.050 mg/L. Manganese has caused the occasional "brown water" complaint. For a period from 2013 through 2016 the District was required to chlorinate the water as a result of two positive coliform samples one of which was E. coli positive. During this period the brown water complaints increased substantially, from a few per year to a few per week. Since the chlorination ceased the brown water complaints have decreased to pre-chlorination levels.

The District has sufficient storage for the planning period. However, the District's elevated reservoir is in need of substantial maintenance, and should be seismically upgraded. If the District elects to remove the reservoir, in lieu of the maintenance and upgrades, there will be a modest storage deficit which will need to be replaced either by new onsite storage, or storage acquisition from Highline Water District.

The District's distribution system operates in one hydraulic zone. Pressures vary from slightly above 30 psi to over 100 psi along the waterfront. The requisite fire flow is provided throughout the system with the exception of the low pressure area of North Hill and at the end of short cul-de-sacs that have undersized water mains.

Three capital projects are identified which may be paid for out of existing, or anticipated, District reserves without loan funding:

- Replacement of the 8th Avenue South water main;
- Replacement of the 11th Avenue South water main;
- Removal of the elevated reservoir and replacement with a 150,000-gallon low level reservoir.

Unfunded, identified, capital projects include the North Hill Booster station, a new office and water main replacement. In total the identified, unfunded capital projects total to $4,137,000, in 2018 dollars.

The largest challenge facing Water District 54 is its aging infrastructure and obtaining the necessary funding to complete infrastructure repair and upgrade projects.

CHAPTER 1

DESCRIPTION OF WATER SYSTEM

In accordance with Washington Administrative Code (WAC) 246-290-100 and the Washington State Department of Health (DOH), water system plans are now required to be updated every 10 years, or more frequently if requested by DOH or by the purveyor with approval by DOH to reflect the current conditions of the system. This Plan has been prepared to update the King County Water District 54's (District) *2011 Water System Plan*, using the *DOH Water System Design Manual*, December 2009, and the *DOH Water System Planning Handbook*, April 1997. Copies of the DOH Water System Plan Submittal Forms are included in Appendix A.

SYSTEM OWNERSHIP AND MANAGEMENT

The District is located in downtown Des Moines and the southerly part of Normandy Park in southwest King County (Figure 1-1). It serves a population of approximately 5,200 with unchlorinated groundwater.

The District is governed by a three-member Board of Commissioners who are elected to 6-year terms. The current commissioners are Jim Langston, Yoshiko Grace Matsui and Kris VanGasken. Day-to-day operations of the District are managed by the District Superintendent, Eric Clarke, who is appointed by the Board. The office address is:

King County Water District 54
922 South 219th Street
Des Moines, Washington 98198

The DOH system identification number for the District is 39950. A copy of the District's *Water Facilities Inventory* (WFI) can be found in Appendix B.

SYSTEM BACKGROUND

SERVICE AREA

The District's existing service area and water system is shown in Figure 1-2. The District's service area extends from South 212th Street on the north to the Kent Des Moines Road on the south, and from Puget Sound on the west to 13th Avenue on the east. The service area covers approximately 0.7 square miles. It encompasses parts of the cities of Des Moines and Normandy Park. Approximately 90 percent of the service area is in the City of Des Moines and the remainder is in the southwest portion of the City of Normandy Park. The District is located within the service area for the Midway Sewer District, which provides sewer service to the majority of the District's customers.

In accordance with Municipal Water Law (MWL), the District is required to designate a retail service area within which it has a duty to serve all customers, and if appropriate, also designate a future service area and wholesale service area. At this time, the District provides only retail service and has no plans to provide wholesale service. The District has no plans to expand its service area.

Service Area

The District acknowledges that it has a duty to serve all new connections within its retail service area. The District's retail service area is confined by Puget Sound on the west side and by the Highline Water District in all other directions and as such has no potential areas for expansion. The District defines the extent of its existing retail service area as its existing the District boundary.

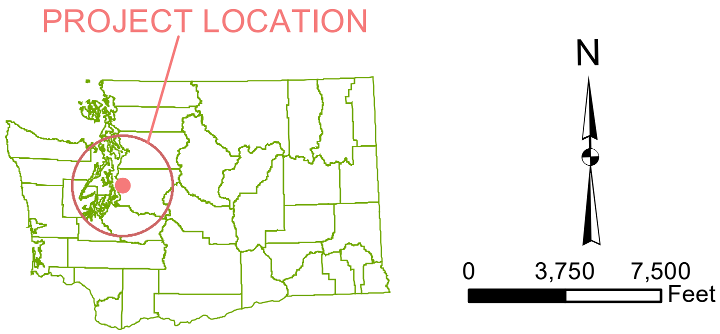
While the District has a duty to serve new connections, there are four threshold factors that must be met prior to providing service. These are:

1. The municipal supplier has sufficient water rights to provide service.
2. The municipal supplier has sufficient capacity to serve in a safe and reliable manner.
3. The service request is consistent with adopted local plans and development regulations.
4. Service can be provided in a timely and reasonable manner.

ZONING AND LAND USE

The land served within the City of Des Moines includes commercial as well as single- and multi-family residential uses. Within the City of Normandy Park the area served by the District is single-family residential. Figure 1-3 and Table 1-1 present the zoning in the District's service area.

ATTACHMENT A



KING COUNTY WATER DISTRICT 54

WATER SYSTEM PLAN
FIGURE 1-1
LOCATION MAP

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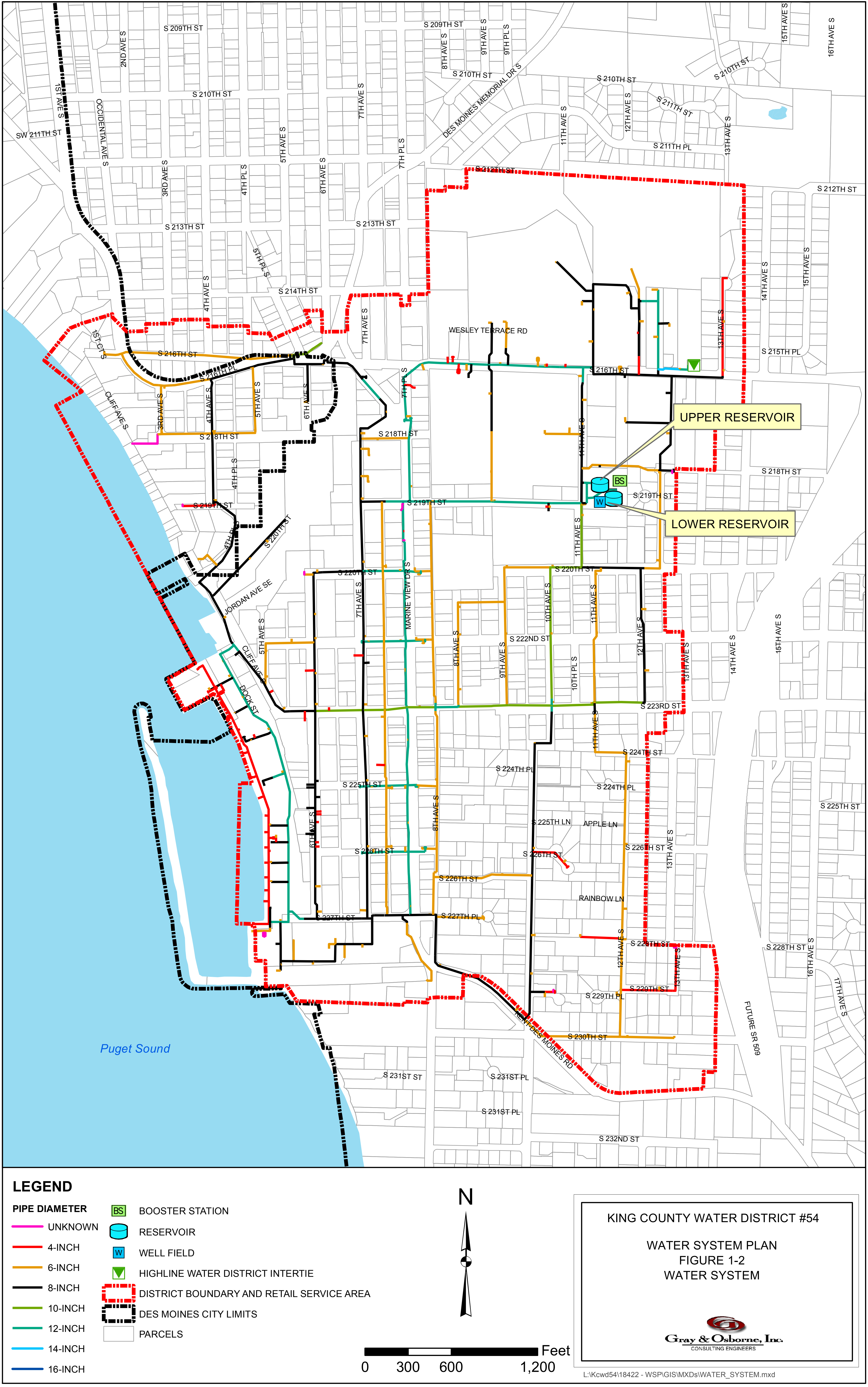
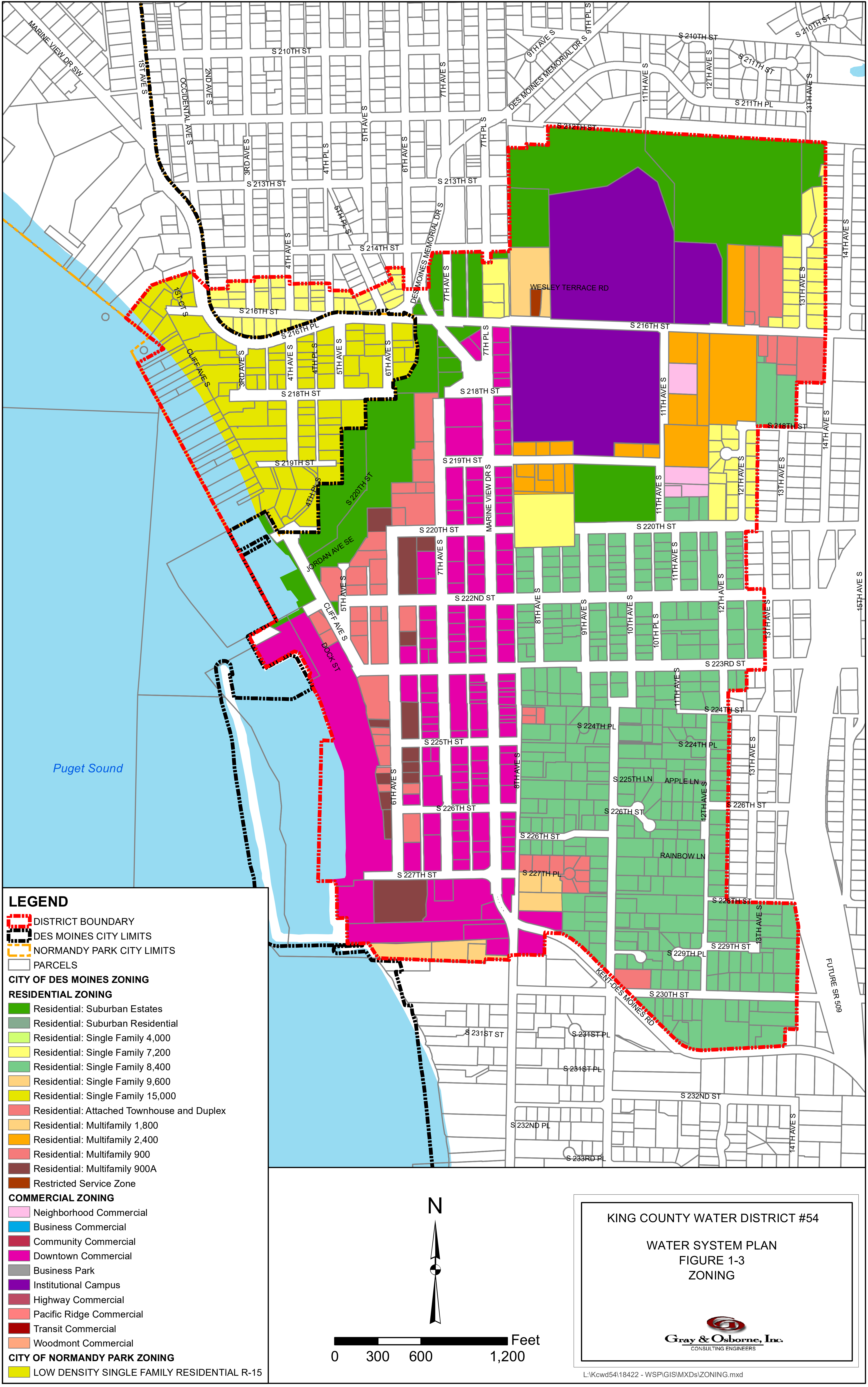
ATTACHMENT A



KING COUNTY WATER DISTRICT #54

WATER SYSTEM PLAN
FIGURE 1-2
WATER SYSTEM

ATTACHMENT A



LEGEND

▭ DISTRICT BOUNDARY
▭ DES MOINES CITY LIMITS
▭ NORMANDY PARK CITY LIMITS
▭ PARCELS

CITY OF DES MOINES ZONING

RESIDENTIAL ZONING

🟩 Residential: Suburban Estates
🟩 Residential: Suburban Residential
🟩 Residential: Single Family 4,000
🟨 Residential: Single Family 7,200
🟩 Residential: Single Family 8,400
🟧 Residential: Single Family 9,600
🟨 Residential: Single Family 15,000
🟥 Residential: Attached Townhouse and Duplex
🟧 Residential: Multifamily 1,800
🟧 Residential: Multifamily 2,400
🟥 Residential: Multifamily 900
🟫 Residential: Multifamily 900A
🟫 Restricted Service Zone

COMMERCIAL ZONING

🟪 Neighborhood Commercial
🟦 Business Commercial
🟥 Community Commercial
🟪 Downtown Commercial
⬜ Business Park
🟪 Institutional Campus
🟥 Highway Commercial
🟥 Pacific Ridge Commercial
🟥 Transit Commercial
🟧 Woodmont Commercial

CITY OF NORMANDY PARK ZONING

🟨 LOW DENSITY SINGLE FAMILY RESIDENTIAL R-15

KING COUNTY WATER DISTRICT #54

WATER SYSTEM PLAN
FIGURE 1-3
ZONING

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TABLE 1-1

Zoning

Designation	Acres
City of Des Moines	
Single-Family	116.1
Townhome	8.4
Multi-Family	42.9
Retirement Facility Campus	42.1
Commercial	61.3
Park	57.4(1)
City of Normandy Park	
Low Density Single-Family	36.8
Total	**365.1**

(1) Includes 19.1-acre parcel for Midway Sewer Treatment Facility.

HISTORY OF SYSTEM DEVELOPMENT AND GROWTH

The District was created in 1935 to serve a population of approximately 300 people. The District has expanded through the years to its current service area. The majority of future growth in the District will likely be due to redevelopment and increased density as a response to zoning changes by Des Moines or Normandy Park.

The District has its own well sources, all of which are located on the site of the District's maintenance and reservoir facilities. Wells 1 and 2 were abandoned as supply sources prior to 2000. Well 3 is now used only to monitor the aquifer level. Wells 4, 5, 6, and 7, drilled in 1968, 1983, 1991, and 2000, respectively, continue to serve as the sources of supply. Well 4 is rarely used. The District constructed a 250,000-gallon elevated steel reservoir (Upper Reservoir) with an overflow elevation of 263.5 in 1969. In 2004, the District completed construction of a 660,000-gallon ground-level concrete reservoir (Lower Reservoir) and a new booster pump station (BPS), increasing both storage and fire flow to the system.

HISTORY OF SYSTEM CHLORINATION

In September 2013, a routine sample tested positive for E. coli coliform. A repeat sample tested positive for total coliform. All sources tested negative for coliform. In accordance with State law the District notified the Washington State Department of Health (DOH). DOH required the District to chlorinate the source water prior to entering the system. After the District began chlorinating its system, it received customer complaints multiple times per week regarding tea- or coffee-colored water, "brown water" complaints. Prior to chlorine addition the District would receive on the order of 4 to 6 brown water complaints per year. After extensive testing, and with DOH's permission, chlorination was discontinued on December 31, 2016. More detailed information is included in Chapter 3.

GEOGRAPHY

The topography of the service area can be characterized as part of the lower portions of the sloping hillside that flanks the east shore of Puget Sound. The slope reaches a small plateau near the eastern edge of the service area before taking a small dip and rising further to the east. This small plateau is the location of the District's production and storage facilities. The ground elevations within the service area range from sea level at Puget Sound to approximately 195 feet at the highest elevation.

CLIMATE

The climate in the District is characterized by high rainfall and low evaporation rates in winter while summers are moderate and relatively dry. The average winter daytime temperature is in the mid-40s and the summer average daytime temperature is in the mid- to low-70s. Most precipitation (approximately 35 inches annually) occurs between October and March.

ADJACENT PURVEYORS

Highline Water District

The Highline Water District borders the District on the north, east and south. An emergency intertie between the two systems is located on the north side of South 216th Street at 13th Avenue South. The intertie is equipped with a pressure reducing valve that supplies water to maintain the hydraulic grade of the District's distribution system. The intertie will only be activated if the water pressure drops by 5 psi at the intertie. The intertie last opened in January 2018 when it was triggered by a water main break. The vault and valve equipment are maintained by the District.

INVENTORY OF EXISTING FACILITIES

The District maintains four production wells, an elevated reservoir (Upper Reservoir), a ground level reservoir (Lower Reservoir) and a booster station on one site. The District also maintains transmission and distribution water mains throughout the service area as well as an intertie with Highline Water District. The District's facilities are shown in Figure 1-2.

SOURCE OF SUPPLY

Wells

Table 1-2 provides information on the District's active wells, and their capacities.

TABLE 1-2

Active Well Characteristics and Capacities

Characteristic	Well 4(1)	Well 5	Well 6	Well 7
Depth (Ft)	334	245	375	379
Casing Size (In)	16	12	16	12
Year Drilled	1968	1983	1991	2000
Original Tested Yield	550	500	360	340
Current Pumping Capacity (gpm)	40	280	310	320

(1) Well 4 is primarily used as a monitoring well.

Under normal conditions, the wells discharge to the Lower Reservoir; water is pumped to the Upper Reservoir by the booster station and then gravity fed to the distribution system.

The District holds several water rights. Table 1-3 presents a summary of the District's water rights. Water rights documents and water rights self-assessments are provided in Appendix C.

TABLE 1-3

District Water Rights

Permit, Certificate, or Claim #	Priority Date	Point of Withdrawal	Maximum Instantaneous Flow Rate (Qi) (gpm)	Primary Maximum Annual Volume (Qa) (acre-ft/yr)	Supplementary Maximum Annual Volume (Qa) (acre-ft/yr)
Cert. 2, 597-D #751	1905		75(1)	15(1)	N/A
Cert. 4, 1677-A	June 8, 1951		100(1)	48(1)	N/A
Cert. 1, 45-D #78	May 1938	Wellfield(3)	150	244	N/A
Cert. 1, 36-A	January 17, 1945	Wellfield(3)	300	490	N/A
Cert. 6, 2765-A(4)	May 3, 1954	Wellfield(3)	250	0	N/A
Cert. 13, 6076-A	May 12, 1966	Wellfield(3)	650	162(2)	734(1)
G1-23881-C	July 24, 1981	Wellfield(3)	500	360	N/A
Total			**2,025**	**1,256(4)**	**734(2)**

(1) Water rights relinquished from Wesley Gardens to the District, amount included in other water rights.

(2) The water right C-6076-A provides for 734 ac-ft/yr supplemental to 45-D #78, 36-A and 2765-A, plus a primary right for 162 ac-ft/yr for a total annual withdrawal of 896 ac-ft/yr. Wells 6 and 7 are additional points of withdrawal until G1-26306-A is approved and permitted.

(3) Wellfield contains Wells 1 through 7. Well 1, 2, and 3 no longer in service.

(4) System cap of 896 ac-ft/yr for all prior Water Rights combined.

(5) Total = 896 + 360 = 1,256 ac-ft/yr.

The District has a water right application G1-26306A with priority date of August 29, 1991. The application is for Q_i = 350 gpm and Q_A = 565 acre ft/yr.

Treatment

The District does not treat its source water. The District has an emergency chlorination system including sodium hypochlorite storage and individual chemical feed pumps for Wells, 5, 6 and 7 located in separate enclosures adjacent to the well buildings. The chlorination facilities were installed in 2014 when the District was required to disinfect its source water.

Pumping and Transmission from Sources

The wells are controlled by the District's telemetry system based on water levels (set points) in the reservoirs. System operation is discussed in Chapter 7: Operation and Maintenance.

STORAGE

The District operates two storage reservoirs with a total nominal capacity of 910,000 gallons. The Upper Reservoir is a "waterspheroid" style steel tank with a single support column and a spherical reservoir. This reservoir sets the hydraulic grade of the distribution system. The concrete Lower Reservoir provides the majority of water storage. A booster station transfers water to the Upper Reservoir and the distribution system. The Upper Reservoir supplies water to the distribution system by gravity through a 12-inch outlet pipe. Typically, the wells discharge to the Lower Reservoir and are controlled by levels within the low reservoir; however, Wells 5 and 6 can provide water directly to the Upper Reservoir, if necessary. A summary of reservoir capacities and elevations is provided in Table 1-4.

TABLE 1-4

Reservoir Capacity

Reservoir	Diameter (ft)	Overflow Elevation (ft)	Maximum Operational Elevation (ft)	Bottom Elevation (ft)	Capacity(1) (gal)
Upper Reservoir	43.7(2)	263.5	263.4	232.3	250,000
Lower Reservoir	70	174.3	173.8	151.3	660,000
Total					**910,000**

(1) Based on overflow elevation.
(2) The Upper Reservoir is spherical, and the maximum diameter is listed in Table 1-4.

BOOSTER PUMP STATION

The District's booster pump station (BPS) has three low-flow pumps, three high-flow pumps and a telemetry control system. The low-flow pumps transfer water from the

Lower Reservoir into the Upper Reservoir and are set to operate in sequence based on the water level in the elevated reservoir. The low-flow pumps include two pumps with 250 gpm capacity and one with 440 gpm capacity. The three high-flow pumps discharge at 1,750 gpm each directly to the distribution system from the Lower Reservoir. Two high-flow pumps are used to meet the 3,500 gpm fire flow requirement and one is redundant. Under normal operating conditions, the high-flow pumps are called to service only when the three low-flow pumps are unable to meet demand.

If there is a high demand from the distribution system (i.e., fire flow or main break) causing the water level in the Upper Reservoir to drop below a set point, the high flow pumps at the booster station turn on sequentially and water is pumped directly from the Lower Reservoir to the distribution system. When the demand decreases, water will flow from the distribution system and backfill the Upper Reservoir. When the water level reaches the shutoff point the high flow pumps shutoff.

If required, the booster station can provide system pressure, allowing the Upper Reservoir to be taken offline for maintenance.

DISTRIBUTION

The District's distribution system has approximately 78,250 feet of water mains ranging in size from 4 to 12 inches in diameter. The older mains are generally asbestos cement (AC) and the newer mains are ductile iron. The AC mains are being replaced with ductile iron mains whenever main replacement is needed. Table 1-5 provides a breakdown of the size and quantity of pipe in the distribution system.

TABLE 1-5

Distribution System Pipe Inventory

Diameter (in)	Length (ft)	Percentage
4	6,503	8.3%
6	26,689	34.1%
8	27,319	34.9%
10	4,251	5.4%
12	12,811	16.4%
14	139	0.2%
16	18	0.0%
Unknown	512	0.7%
Total	**78,243**	**100.0%**

PRESSURE ZONES

The distribution system currently operates as one pressure zone with a nominal hydraulic grade line of 263 feet. Service pressures within the system range from slightly above 30 psi to 110 psi under normal operating conditions. The lowest service pressures are in the northwest corner of the system. The District is planning on adding a second pressure zone in the future in the northwest corner of the system to improve these low pressures.

RELATED PLANNING DOCUMENTS

KING COUNTY WATER DISTRICT 54 *WELLHEAD PROTECTION PLAN* (2004)

The District's *Wellhead Protection Plan* (Hedges Engineering & Consulting, Inc., 2004) used analytical modeling combined with hydrogeologic mapping was used to estimate the wellhead protection zone. The results of this study are presented in Chapter 6.

KING COUNTY WATER DISTRICT 54 *COMPREHENSIVE WATER SYSTEM PLAN* (2011)

The Water System Plan reviewed the historical production and consumption of water within the District. Using projected population growth water demand was forecasted. A Capital Improvement Plan was identified to improve system hydraulics, as well as financial plan to support the CIP.

The Plan concluded that the District has sufficient water rights to support projected growth.

HIGHLINE WATER DISTRICT *WATER SYSTEM PLAN* (2016)

The Highline Water District (HWD) approved a system plan in September 2016. The HWD system plan presents the water quality, anticipated capital improvements and reviews Highline's finances. The HWD has the ability to serve the District through an emergency intertie from the HWD's 490 ft. zone. The 490 Zone has sufficient storage to meet current and anticipated future demand. The HWD system plan did not include any capital improvements in the vicinity of the intertie.

SOUTH KING COUNTY *COORDINATED WATER SYSTEM PLAN*

The *South King County Coordinated Water System Plan* (CWSP) which includes the District's service area was adopted in 1989. The CWSP provides the management and planning framework for supply development in South King County to ensure that public supplies can meet the future demands created by adopted King County land use policies.

CITY OF SEATTLE *WATER SYSTEM PLAN* (2016)

The City of Seattle's *2016 Water System Plan* has an indirect effect on the District. Seattle supplies water to the HWD and thus potentially to the District through the existing intertie.

KING COUNTY WATER DISTRICT 54 *ASSESSMENT OF ALTERNATIVES FOR IMPROVING SERVICE PRESSURES AND FIRE FLOWS IN HIGHER PORTIONS OF THE SERVICE AREA* (2005)

Gray & Osborne complete a review of alternatives to increase pressures within the District. The alternatives included an evaluation of the installation of pressure reducing valves and booster stations.

INTERLOCAL AGREEMENTS

The District has a Fire Protection and Emergency Intertie Agreement with HWD that defines the terms of use for the emergency intertie between the two districts. The District also has an Operational and Maintenance Services Agreement with HWD, which allows HWD to provide routine, non-routine and emergency services to the District when necessary. The District has entered into mutual aid agreements to provide sharing of resources and to provide assistance in case of emergency with King County Water District 125, Lakehaven Utility District, Washington Association of Sewer and Water Districts (WASWD) and Washington Water/Wastewater Agency Response Network (WAWARN). Copies of these agreements are included in Appendix D.

SERVICE AREA POLICIES AND CONDITIONS OF SERVICE

Copies of the District's resolutions related to policy are found in Appendix E and are enumerated in Table 1-6.

TABLE 1-6

Service Area Policies

Policy	Reference
Revised Operation and Maintenance Best Management Practices Manual	District Resolution 2016-3
Emergency Response Plan Manual	District Resolution 2016-2
Implementing of Fees for Cross Connection Control	District Resolution 2015-1
Installation or Modification of Water Service – District requires a Water Availability/Fire Flow Analysis Application.	District Resolution 2011-1

TABLE 1-6 – (continued)

Service Area Policies

Policy	Reference
Design and Construction Standards – Design and construction shall equal or exceed standards adopted by District.	Water System Plan
Satellite System Management – District does not provide satellite system management services.	Water System Plan
Metering - All sources and services shall be metered.	Water System Plan
Latecomers – District will allow for latecomers agreements in accordance with State law.	Water System Plan
Fire Flow Policy – District will endeavor to provide fire flow in support of the local zoning code.	Water System Plan
Prioritization of Water Main Extension and Replacement – Water main extensions and replacement will be sized to meet fire flow, and will occur where practical and as funding allows.	Water System Plan
Intrastate Agreement with WAWARN	District Resolution 2009-2
Coliform Monitoring – Coliform monitoring is conducted in accordance with State Law (Appendix H).	WAC 246-290-300
Developer Extensions – Developer extensions shall be completed in accordance with District policy.	District Resolution 2000-3
Timely and Reasonable Service - The District will issue, or deny, a Certificate of Water Availability to applicants with reasonable applications for development within 120 days of receipt of written request. The application will be considered reasonable if the City confirms that it complies with applicable zoning and land use planning. Connection to the system will only be allowed after approval of construction documents, construction in accordance with District and Health Department Standards.	Water System Plan Resolution 2019-4

CHAPTER 2

BASIC PLANNING DATA

INTRODUCTION

Basic land use and population planning data is required for water demand forecasts needed to assess the current and future capabilities of the system. This Chapter provides historical and projected populations, service connections, demand (production and consumption), and equivalent residential units (ERU) for the 10- and 20-year planning periods.

CURRENT POPULATION, SERVICES, AND DEMAND

HISTORICAL POPULATION

The Puget Sound Regional Council (PSRC) publishes regional population data divided into Forecast Analysis Zones (FAZ). The District service area is included in FAZ 3046. Based upon the total number of single- and multi-family dwelling units within the District's service area, the percentage of the FAZ 3046 population residing within the District's boundaries varied year to year from approximately 21 to 22 percent between 2015 and 2017 with an average of 21.5 percent, which will be used for projections later in this chapter.

As shown in Table 2-1, the District's population has slightly decreased in the FAZ 3046 from 2012 to 2017 by an average negative growth rate of 0.7 percent. The data indicates there has been a slight increase in the number of residential units and a decrease in the people per household. Growth in residential population is expected to occur through redevelopment and increased density. The Adriana Senior Apartments opened January, 2018 with 113 new residential units that are mostly occupied.

TABLE 2-1

Historical Populations

Year	Residential Units[1]	People per Household	Population
2012	2,009	2.56[2]	5,133
2013	2,009	2.55[2]	5,131
2014	2,012	2.54[2]	5,105
2015	2,012	2.52[3]	5,063
2016	2,012	2.49[3]	5,010
2017	2,012	2.46[3]	4,958

(1) Total residential units is the sum of single-family units and multi-family units.

(2) PSRC does not have historical data for FAZ 3046 from 2012 to 2014. However, PSRC has general historical data for the region. The PSRC FAZ 3046 data in 2015 was reported as 2.78 percent higher than the PSRC general regional data. Thus, a 2.78 percent increase was applied to the PSRC general regional data to yield the PSRC FAZ 3046 equivalent historical people per household data.

(3) People per household data linearly extrapolated from the PSRC FAZ 3046 forecast population analysis from 2015 to 2020 data.

SERVICE CONNECTIONS

According to the District, there were 755 total connections with 495 single-family residential connections, 102 multi-family residential and 158 non-residential connections in 2017. The number of connections has stayed relatively the same for the last 6 years. All services connected to the District system are equipped with service meters. The majority of the system connections are single family units with 3/4-inch meters. Table 2-2 presents information showing service connections for the District.

TABLE 2-2

Service Connections

Year	Single-Family Connections	Multi-Family Connections	Residential Units[1]	Non-Residential Connections	Total Connections
2012	492	102	2,009	158	752
2013	492	102	2,009	158	752
2014	495	102	2,012	158	755
2015	495	102	2,012	158	755
2016	495	102	2,012	158	755
2017	495	102	2,012	158	755

(1) Sum of single-family connections, each of which represents one residential unit and 1,517 multi−family residential units served by 102 connections.

HISTORICAL DEMANDS

Production is metered at each of the wells. Production data is recorded every working day. Consumption data is currently available for both commercial and residential connections, which are fully metered. Commercial and residential service meters are both read every two months.

Production History

Production is defined as the amount of water flowing through the source meters at the District's wells.

Table 2-3 shows the District's yearly production history per well from 2012 to 2017. The annual metered production for the District's wells has ranged from 97.5 million gallons in 2014 to 123.4 million gallons in 2015. However, there were several issues with Well 6's source meter in 2014, so that year's data is unreliable and will not be used in subsequent analyses.

TABLE 2-3

Annual Production by Well (gallons)

Year	Well 4	Well 5	Well 6	Well 7	Total
2012	4,548,000	56,183,000	17,513,000	42,872,000	**121,116,000**
2013	868,000	52,325,000	13,492,000	53,771,000	**120,456,000**
2014(1)	313,000	37,571,000	21,734,684	37,878,000	**97,496,684**
2015	12,000	53,954,000	50,263,908	19,205,000	**123,434,908**
2016	30,000	41,387,000	52,064,032	26,901,000	**120,382,032**
2017	464,000	49,827,000	41,618,752	29,000,000	**120,909,752**

(1) There were several Well 6 source meter issues in 2014, so the total annual production was under recorded. Therefore, the 2014 data will not be used in analyses.

Table 2-4 shows monthly production per source for the year 2017.

TABLE 2-4

2017 Monthly Production by Well (gallons)

Month	Well 4	Well 5	Well 6	Well 7	Total
January	0	2,150,000	5,002,080	1,783,000	8,935,080
February	2,000	4,923,000	1,652,176	1,276,000	7,853,176
March	1,000	3,960,000	3,566,800	1,744,000	9,271,800
April	2,000	2,816,000	4,277,488	1,129,000	8,224,488
May	1,000	3,130,000	3,949,248	3,627,000	10,707,248
June	41,000	4,318,000	1,860,384	5,146,000	11,365,384
July	300,000	7,045,000	5,671,584	691,000	13,707,584
August	57,000	8,173,000	5,744,448	503,000	14,477,448
September	40,000	5,599,000	2,094,672	3,696,000	11,429,672
October	2,000	1,897,000	2,269,728	5,100,000	9,268,728
November	2,000	2,996,000	2,117,056	2,939,000	8,054,056
December	16,000	2,820,000	3,413,088	1,366,000	7,615,088
Total	**464,000**	**49,827,000**	**41,618,752**	**29,000,000**	**120,909,752**

The District's historic average day production and daily per capita production are shown in Table 2-5. The daily per capita production includes water used for residential, commercial, DSL and other District purposes. The mean daily per capita production value from 2012 through 2017 (2014 excluded) will be used as an estimate to project future production requirements throughout the 20-year planning horizon. There has been a slight increase in daily gallons per capita production (gpcd) from 2012 through 2017 due to the slight decrease in population. The average day demand (ADD) and daily per capita production has remained fairly steady since 2012.

TABLE 2-5

Historical Annual Production

Year	Total Annual Production (gal)	ADD (gpd)	Total Residential Units[(1)]	Population[(2)]	Daily Per Capita Production[(3)] (gpcd)
2012	121,116,000	330,918	2,009	5,133	64
2013	120,456,000	330,016	2,009	5,131	64
2014[(4)]	97,496,684	-	2,012	5,105	-
2015	123,434,908	338,178	2,012	5,063	67
2016	120,382,032	328,913	2,012	5,010	66
2017	120,909,752	331,260	2,012	4,958	67
Mean[(3)]					**66**

(1) Total residential units is the sum of single-family units and multi-family units.

(2) Extrapolated people per household data from PSRC population analysis for the FAZ 3046. See Table 2-1 for more details.

(3) Includes residential, commercial, DSL and other District purposes.

(4) There were several Well 6 source meter issues in 2014, so the total annual production was under recorded. Therefore, the 2014 data will not be used in analyses.

Maximum Day Demand

The District's MDD data are presented in Table 2-6.

TABLE 2-6

Historic MDD

Year	MDD (gpd)	MDD (gpm)	Date
2012	696,000	483	Friday, August 17
2013	597,000	415	Tuesday, July 2
2014[(1)]	-	-	
2015	637,188	442	Thursday, July 2
2016	601,394	418	Thursday, July 28
2017	572,208	397	Wednesday, August 30
Mean[(1)]	**620,758**	**431**	

(1) There were several Well 6 source meter issues in 2014, so the total annual production was under recorded. Therefore, the 2014 data will not be used in analyses.

Consumption History

Table 2-7 provides the consumption by class of service for the past 6 years. The residential per capita consumption has remained fairly constant since 2012, with a mean value of 44 gallons per capita per day (gpcd). The District has a relatively low per capita consumption likely due to the large percentage of multi-family units.

TABLE 2-7

Consumption by Service Class and Per Capita

Year	**Single-Family Residential (gal/yr)**	**Multi-Family Residential (gal/yr)**	**Non-Residential (gal/yr)**	**Bulk Sales(1) (gal/yr)**	**Other Authorized Use(2)**	**Total Authorized Consumption (gal/yr)**	**Population(3)**	**Daily Residential Per Capita Consumption (gpcd)(4)**
2012	28,816,459	54,904,773	27,772,927	111,804	2,000,000	113,605,962	5,133	45
2013	28,584,563	51,896,856	29,357,301	130,378	5,000,000	114,969,097	5,131	43
2014	28,408,023	53,153,583	29,126,153	85,637	7,000,000	117,773,395	5,105	44
2015	30,002,122	55,005,760	28,656,376	61,250	7,000,000	120,725,508	5,063	46
2016	28,921,186	49,697,583	28,483,576	61,250	9,000,000	116,163,596	5,010	43
2017	28,265,077	46,135,359	31,400,231	96,057	7,000,000	112,896,725	4,958	41
Mean	**28,832,905**	**51,798,985**	**29,132,760**	**91,063**	**6,166,667**	**116,022,380**	**5,067**	**44**

(1) Bulk sales are from street sweeper trucks.
(2) This value is estimated by operations staff and includes the District's flushing program, water system maintenance and main breaks.
(3) See details in Table 2-1.
(4) Sum of single-family and multi-family consumption divided by total population.

The District reads service meters every 2 months. Water sold through service meters in 2016 for single-family residential, multi-family residential, and non-residential (commercial) is presented in Table 2-8. The multi-family residential class consumes the most water in the District.

TABLE 2-8

2017 Monthly Consumption by Service Class (gal/yr)(1)

Months(2)	Single-Family Residential	Multi-Family Residential	Non-Residential	Total(3)
January/February	3,813,569	7,645,091	3,371,470	14,830,131
March/April	3,553,995	7,333,154	3,641,517	14,528,666
May/June	4,791,206	8,363,969	5,130,141	18,285,316
July/August	7,983,211	8,354,993	9,242,182	25,580,386
September/October	4,981,278	7,485,008	6,921,725	19,388,012
November/December	3,141,818	6,953,143	3,093,195	13,188,157
Total	**28,265,077**	**46,135,359**	**31,400,231**	**105,800,667**

(1) Bulk sales and other authorized usage are recorded on an annual basis and are not included in this table.
(2) The District reads customer meters at the end of every other month.
(3) Does not include other authorized use.

DISTRIBUTION SYSTEM LEAKAGE

Distribution System Leakage (DSL) is defined as the difference between the total volume of source production and the total volume authorized for consumption. Generally, DSL is represented as a percentage, the difference divided by the amount produced. Water used for flushing water mains, fire flows, or other uses that is estimated or measured has been added to the authorized consumption.

The Washington State's Municipal Water Law established that all municipal water suppliers must use water more efficiently in exchange for water right certainty and flexibility to help systems meet future demand. The DOH's *2017 Water Use Efficiency Handbook* necessitates that all systems meet a 3-year rolling average DSL of 10 percent or less.

Table 2-9 shows the District's DSL rate ranging from 2.20 to 6.63 percent. The District has complied with this water use efficiency standard as further detailed in Chapter 4.

TABLE 2-9

Distribution System Leakage

Year	Total Production (gal/yr)	Total Authorized Consumption[1] (gal/yr)	DSL (gal/yr)	DSL (%)	3-Year Rolling Average DSL (%)
2012	121,116,000	113,605,962	7,510,038	6.2%	-
2013	120,456,000	114,969,097	5,486,903	4.6%	-
2014[2]	97,496,684	117,773,395	-	-	-
2015	123,434,908	120,725,508	2,709,400	2.2%	4.3%
2016	120,382,032	116,163,596	4,218,436	3.5%	3.4%
2017	120,909,752	112,896,725	8,013,027	6.6%	4.1%

(1) Includes other accounted for water not included in Table 2-7.

(2) There were several Well 6 source meter issues in 2014, so the total annual production was under recorded. Therefore, the 2014 data will not be used in analyses.

EQUIVALENT RESIDENTIAL UNITS

An Equivalent Residential Unit (ERU) is a means to express demand by non-residential customers. One ERU is equivalent to water usage by a typical single-family residence. An ERU is calculated by dividing the total volume of water sold to single-family customers by the total number of single-family residential connections. This number defines the average single-family residential use. The volume used by other customer classes can then be divided by this number to determine the equivalent residential units utilized by the other customer classes.

Table 2-10 summarizes the annual ERU values since 2012. For this Plan, the average ERU usage from 2012 to 2017 is 160 gpd, which will be used in the subsequent projections analysis.

TABLE 2-10

Equivalent Residential Units

Year	Single-Family Residential Consumption (gal/yr)	Single-Family Residential Consumption (gpd)	Single-Family Residential Connections	Consumption per ERU (gpd)
2012	28,816,459	78,733	492	160
2013	28,584,563	78,314	492	159
2014	28,408,023	77,830	495	157
2015	30,002,122	82,198	495	166
2016	28,921,186	79,020	495	160
2017	28,265,077	77,439	495	156
Mean(1)				**160**

(1) The mean consumption per ERU will be used later in this chapter for water use projections.

Table 2-11 summarizes the number of ERUs for the system from 2012 to 2017, based on the ERU demand for each year reported in Table 2-10. These data include unmetered water for District uses. Based upon the data, the District's demand is equal to a total of approximately 2,070 ERUs.

TABLE 2-11

Total Number of Equivalent Residential Units

Year	Single-Family Residential		Multi-Family Residential		Non Residential		Bulk Sales		DSL(1)		Other Authorized Use(2)		Total ERUs
	Consumption (gpd)	**ERUs(3)**	**Consumption (gpd)**	**ERUs(3)**	**Consumption (gpd)**	**ERUs(3)**	**Consumption (gpd)**	**ERUs(3)**	**Consumption (gpd)**	**ERUs(3)**	**Consumption (gpd)**	**ERUs(3)**	
2012	78,733	492	150,013	937	75,882	474	305	2	20,519	128	5,464	34	2,068
2013	78,314	492	142,183	893	80,431	505	357	2	15,033	94	13,699	86	2,073
2014(2)	77,830	495	145,626	926	79,798	508	235	1	-	-	19,178	122	-
2015	82,198	495	150,701	908	78,511	473	168	1	7,423	45	19,178	115	2,037
2016	79,020	495	135,786	851	77,824	488	167	1	11,526	72	24,590	154	2,060
2017	77,439	495	126,398	808	86,028	550	263	2	21,953	140	19,178	123	2,117
Mean													**2,071**

(1) There were several Well 6 source meter issues in 2014, so the total annual production was under recorded. Therefore, the 2014 data will not be used in analyses.
(2) These values are estimated by operations staff and includes the District's flushing program, water system maintenance and main breaks.
(3) Based on the ERU consumption for each year (Table 2-10).

Table 2-12 summarizes the top ten highest users for the year 2017. These users represent 35 percent of the total consumption and ERUs, yet only 9 percent of connections. These connections include relatively large restaurants and large multi-family buildings.

TABLE 2-12

2017 – Top 10 Users

Customer	**Description**	**Annual Consumption (gal/yr)**	**Average Consumption (gpd)**	**Number of ERUs**	**Number of Connections**
Wesley Retirement Community	Apartments, gardens, terrace and conference center, and healthcare facilities	18,363,180	50,310	322	28
Regatta Apartments	8 buildings	4,031,252	11,045	71	8
Carwash Enterprises	Car wash	3,656,478	10,018	64	1
Anthony's Home Port	Restaurant	2,670,546	7,317	47	1
City of Des Moines	City-owned marina and other City buildings	2,438,650	6,681	43	25
Mariner Manor Condominiums	1 building	2,160,374	5,919	38	1
Spyglass Condominiums	2 buildings	1,764,655	4,835	31	2
Red Robin	Restaurant	1,635,242	4,480	29	1
South Shore Condominiums	1 building	1,627,013	4,458	28	1
El Mirador Apartments	1 building	1,300,862	3,564	23	1
Total Ten Highest Users		**39,648,252**	**108,625**	**694**	**69**
Total System		**112,896,725**	**309,306**	**2,117**	**755**

PEAKING FACTORS

To estimate future maximum day and peak hour production for the District, peaking factors were calculated from historical production data.

PEAK DAY FACTOR

The MDD for the District's production since 2012 is shown in Table 2-13 and is based on available production data.

TABLE 2-13

MDD/ADD Peaking Factor

Year	ADD (gpd)	MDD (gpd)	Peaking Factor (MDD/ADD)
2012	330,918	696,000	2.10
2013	330,016	597,000	1.81
2014(1)	-	-	-
2015	338,178	637,188	1.88
2016	328,913	601,394	1.83
2017	331,260	572,208	1.73
Minimum(1)			**1.73**
Mean(1)			**1.87**
Maximum(1)			**2.10**

(1) There were several Well 6 source meter issues in 2014, so the total annual production was under recorded. Therefore, the 2014 data will not be used in analyses.

The peaking factor ranges from 1.73 to 2.10 for the 6-year period from 2012 to 2017 with a mean value of 1.87. For the purposes of extrapolating future MDD use, a peaking factor of 2.10 is used.

PEAK HOUR DEMAND

The District's average annual production from 2012 to 2017, as shown in Table 2-5, is used as the basis for the determination of the peak hour demand peaking factor. The average MDD and ERUs from 2012 to 2017 as shown in Tables 2-6 and 2-11 were used to calculate the gpd/ERU, peak hour demand and peaking factor. This is based on the guidelines set forth in DOH's *2009 Water System Design Manual* for Equation 5-1.

PHD = (MDD/1440) * [(C)(N) + F] + 18

PHD = Peak Hour Demand, (gallons per minute, gpm)
MDD = Maximum Day Demand, (gpd/ERU)
C = Coefficient associated with ranges of ERUs
N = Number of ERUs
F = Factor associated with ranges of ERUs

Table 2-14 shows the PHD and the values used to calculate the PHD as well as the peaking factor (PHD/MDD). The estimated peaking factor of 1.76 is within the generally accepted range of 1.5 to 2.5. Historic PHD values are shown later in this Chapter in Table 2-16.

TABLE 2-14

PHD and PHD/MDD Peaking Factor

PHD	MDD(1)				N(4)		Peaking Factor
(gpm)	(gpm)	(gpd)	(gpd/ERU)(2)	C(3)	(ERUs)	F(3)	(PHD/MDD)
765	436	627,374	319	1.6	1,967	225	1.75

(1) The mean MDD from 2012 to 2017 (with the exception of 2014). There were several Well 6 source meter issues in 2014, so the total annual production was under recorded. Therefore, the 2014 data will not be used in analyses.
(2) The gpd/ERU was calculated using the mean number of ERUs and MDD from 2012 to 2017, with the exception of 2014.
(3) Based on the 2012 to 2017 consumption data shown in Table 2-11, the range of the number of ERUs served by the District put it in the category of greater than 500 ERUs for the C and F values, respectively.
(4) The mean total number of ERUs from 2012 to 2017 (with the exception of 2014) is calculated from consumption data are shown in Table 2-11.

FUTURE POPULATION AND DEMANDS

PROJECTED POPULATION

The population projections for the 20-year planning horizon were estimated by using the PSRC FAZ 3046 people per household and number of households projections for the City of Des Moines and the District's numbers of residential units. The District's number of households is approximately 21.5 percent of the total number of households in the City of Des Moines.

Historical and projected populations are shown and described in Table 2-15. A 113-unit senior living apartment complex, called the Adriana Senior Apartments opened in the District in January, 2018 with 1- and 2- person residential units and currently has an average of 1.5 people per unit (170 people total). This significant population increase was not taken into account in the PSRC FAZ 3046 data; however, it has been added to the PSRC FAZ 3046 projections starting in 2018 in Table 2-15 in addition to the growth projected by the PSRC FAZ 3046. The projections shown in Table 2-15 indicate an increase of 29 percent in District residential units, a 6.5 percent decrease in people per household, and a population growth of 20.0 percent between 2012 and 2039. The City of Des Moines Comprehensive Plan does not separate out the District's service from the rest of the City, thus PSRC FAZ data has been used to project future population.

TABLE 2-15

District Historical and Projected Populations

Year	District Residential Units(1)	People per Household(2)	Population(3)
2012(4)	2,009	2.56	5,133
2013(4)	2,009	2.55	5,131
2014(4)	2,012	2.54	5,105
2015(4)	2,012	2.52	5,063
2016(4)	2,012	2.49	5,010
2017(4)	2,012	2.46	4,958
2018(5)	2,202	2.44	5,369
2019	2,242	2.41	5,409
2020	2,283	2.39	5,447
2021	2,300	2.38	5,472
2022	2,317	2.37	5,496
2023	2,334	2.36	5,521
2024	2,352	2.36	5,545
2025	2,369	2.35	5,568
2029	2,406	2.34	5,629
2039	2,594	2.30	5,962

(1) Projections based on historical District data and use the variable growth rate from the PSRC FAZ 3046 population analysis data. The growth rate has been linearly extrapolated from the PSRC FAZ 3046 data which has growth rates of 9.70, 3.77, 2.00, 3.79 and 4.32 percent for the years 2020, 2025, 2030, 2035 and 2040, respectfully.

(2) Linearly extrapolated people per household data from the PSRC FAZ 3046 forecast population analysis from 2015 to 2040 data. Households include single- and multi-family units.

(3) Based on number of households and people per household shown in Table 2-15.

(4) See Table 2-1 for details.

(5) The 113-unit senior living apartment complex with approximately 170 people opened January 2018 and is nearly full.

PROJECTED DEMAND AND ERUS

An essential component of the Plan is to project demands during the 6-, 10- and 20-year planning periods. Demand forecasting predicts future demand based upon historical populations, average gallons per day per capita production, ADD, MDD, and PHD.

Production data have been used for demand projections since the data set better represents total water drawn from the wells. The demand forecast will be used to analyze source capacity in Chapter 3. As shown in Table 2-5, the average gallons per day per capita production from 2012 to 2017 was 66 gpcd. Table 2-16 shows the historical and projected population, ADD, MDD, PHD, and ERUs from 2012 to 2039.

TABLE 2-16

Projected Production and ERUs through 2039

Year	**Population(1)**	**Average Day Demand(2)**		**Maximum Day Demand(3)**		**Peak Hourly Demand(4)**		**ERUs(5)**
		(gpd)	**(gpm)**	**(gpd)**	**(gpm)**	**(gpd)**	**(gpm)**	
2012(6)	5,133	330,918	230	696,000	483	1,221,960	849	2,071
2013(6)	5,131	330,016	229	597,000	415	1,048,147	728	2,066
2014(7)	5,105	(7)	(7)	(7)	(7)	(7)	(7)	(7)
2015(6)	5,063	338,178	235	637,188	442	1,118,704	777	2,117
2016(6)	5,010	328,913	228	634,472	441	1,113,936	774	2,059
2017(6)	4,958	331,260	230	572,208	397	1,004,620	698	2,073
2018	5,369	354,347	246	744,128	517	1,302,189	904	2,215
2019	5,409	356,988	248	749,676	521	1,311,897	911	2,231
2020	5,447	359,491	250	754,932	524	1,321,095	917	2,247
2021	5,472	361,129	251	758,371	527	1,327,113	922	2,257
2022	5,496	362,750	252	761,776	529	1,333,072	926	2,267
2023	5,521	364,356	253	765,147	531	1,338,972	930	2,277
2024	5,545	365,945	254	768,485	534	1,344,812	934	2,287
2025	5,568	367,519	255	771,789	536	1,350,594	938	2,297
2029	5,629	371,520	258	780,192	542	1,365,298	948	2,322
2039	5,962	393,508	273	826,366	574	1,446,101	1,004	2,459

(1) See details in Tables 2-1 and 2-15.

(2) Projected Average Day Demand = Population * 66 gpcd (Table 2-5).

(3) Projected Maximum Day Demand assumes a factor of 2.10 * ADD (Table 2-13).

(4) Projected Peak Hour Demand assumes a factor of 1.76 * MDD (Table 2-14).

(5) Projected ERUs = Average Day Demand in gpd / 160 gpd/ERU (Table 2-10).

(6) Historical data.

(7) There were several Well 6 source meter issues in 2014, so the total annual production was under recorded. Therefore, the 2014 data will not be used in analyses.

CHAPTER 3

WATER QUALITY ANALYSIS

INTRODUCTION

The purpose of this chapter is to summarize existing water quality regulations and compare the District's water quality to those regulations.

WATER QUALITY STANDARDS

APPLICABLE DRINKING WATER QUALITY REGULATIONS

Group A public community systems in Washington State must comply with the drinking water standards adopted by the DOH and the federal Safe Drinking Water Act and its amendments. The DOH has adopted the federal standards under WAC 246-290. Existing state law contains regulations for bacteriological contaminants, inorganic chemicals and inorganic physical parameters (IOCs), volatile organic chemicals (VOCs), synthetic organic chemicals (SOCs), radionuclides, total trihalomethanes (TTHMs) and haloacetic acids (HAA5s).

Table 3-1 lists the existing drinking water regulations and the applicability of each regulation. This table lists only the regulations applicable to the District. For example, the Surface Water Rule is not listed nor is it applicable to the District.

Many of the regulations shown in Table 3-1 define water quality standards and establish water quality monitoring schedules. The implementation schedules for the regulations are subject to revision, and the District should continue to stay informed regarding regulatory deadlines.

As described in detail in Chapter 1, the District chlorinated its system from September, 2013 to December 2016. The District no longer chlorinates. However, the regulations relating to disinfection are still included in Table 3-1 because the District did chlorinate since that last water system plan and still has their chlorination facilities.

TABLE 3-1

Summary of Drinking Water Regulations

Drinking Water Regulation(1)	Contaminants Affected	District Action
Revised Total Coliform Rule	Coliform	Monitoring
Residual Disinfectants	Total and Free Chlorine	No Longer Monitoring(2)
Consumer Confidence Report	Reporting Only	Reporting
Inorganic Chemicals and Physical Parameters	IOCs	Monitoring/Waiver(3)
Arsenic Rule	Arsenic	Monitoring/Waiver(3)
Volatile and Synthetic Organic Compounds	VOCs, SOCs	Monitoring/Waiver(4)(5)
Asbestos	Asbestos	Monitoring
Lead and Copper Rule	Lead, Copper	Monitoring
Radionuclide Rule	Radionuclides	Monitoring/Waiver(6)
Disinfectants/Disinfection Byproducts Rule (Stage I and II)	TTHMs, HAA5, Chlorite, Bromate	No Longer Monitoring(2)
Groundwater Rule with Triggered Source Monitoring	Bacteriological	Monitoring

(1) Drinking water regulations as of 2018.

(2) The District previously chlorinated its system from September, 2013 to December 2016. More details are included in Chapter 1.

(3) For complete IOCs and arsenic, Well 6 has a 9-year waiver through 2027 and Wells 4, 5 and 7 have a 9-year waiver through 2019. Nitrate and manganese samples are analyzed on a 1- or 3-year basis, respectively.

(4) For VOCs, Wells 4, 5, 6 and 7 have 6-year waivers through 2023, 2019, 2021 and 2024, respectively.

(5) For SOCs, Wells 4, 5, 6 and 7 have 9-year waivers for herbicides through 2022 and 3-year waivers for pesticides and soil fumigants through 2019.

(6) For radionuclides, Wells 4 and 5 have a 6-year waiver through 2023 and Wells 6 and 7 have a 6-year waiver through 2021.

WATER QUALITY STANDARDS AND ANALYSIS

Minimum standards for water quality are specified in terms of Maximum Contaminant Levels (MCLs). Primary MCLs are based on chronic and/or acute human health effects. Secondary MCLs are based on factors other than health effects, including aesthetics. MCLs are specified in WAC 246-290 and described in the following pages and tables. Water quality data and the water quality monitoring schedule are included in Appendix F.

Consumer Confidence Report

The Consumer Confidence Report Rule requires community system purveyors to prepare and distribute an annual report of water quality analyses to their customers by the first of July annually. The District issues an updated Consumer Confidence Report to its customers each year prior to July 1. Appendix G includes the most recent version of this report.

Total Coliform Rule

Introduction

Many serious diseases are caused by bacteria, which are a classification of single-celled organisms. To test for contamination in drinking water, specific bacteria generally known as indicator organisms are measured. Indicator organisms are used because they are easy to test for and their presence is generally indicative of biological contamination. Total coliform, fecal coliform, and *E. coli* are typical indicator organisms.

Monitoring Requirements and Analysis

WAC 246-290 establishes bacteriological testing requirements for public water systems. Compliance with this rule is based on the presence/absence of total coliforms. The number of routine samples required depends on the system size.

The Revised Total Coliform Monitoring Rule specifies each total coliform positive routine sample must be tested for the presence of *E. coli.*; if any total coliform positive sample is also *E. coli*. positive, then the sample must be reported to the state by the end of the day. If a routine sample is positive for total coliform, repeat samples are required.

Within 24 hours of learning of the total coliform positive sample result, at least three repeat samples must be collected and analyzed for total coliform. One repeat sample must be collected from the same tap as the original sample, one repeat sample must be collected within five service connections upstream, and one repeat sample must be collected within five service connections downstream. If one or more repeat sample is positive for total coliform, the sample must be analyzed for *E. coli*. If the total coliform positive sample is positive for *E. coli*, the sample must be reported to the state. Another set of repeat samples must then be collected unless an assessment has been triggered and the state has been notified. In addition to repeat sampling within the distribution system, each source that was running at the time of the original total coliform positive sample must be sampled, as discussed in the Groundwater Rule section below.

The District is required to sample for bacteriological contaminants six times each month. A copy of the sampling locations and the repeat samples are included in Coliform Monitoring Plan in Appendix H.

The District has not tested positive for coliform on any of its routine samples since 2013.

Residual Disinfectant

According to WAC 246-290-300, systems providing disinfection treatment shall measure residual disinfectant concentration within the distribution system when taking routine or repeat coliform samples. The District does not disinfect its source water and therefore does not monitor residual disinfectant levels.

Groundwater Rule

Introduction

The federal Groundwater Rule (GWR) is designed to protect people served by groundwater sources from bacteria and viruses. The GWR establishes a risk-targeted approach to identify water systems susceptible to fecal contamination. Water systems can comply with the monitoring portion of this rule in two basic ways: compliance monitoring of treatment providing at least 4-log virus inactivation or removal, or triggered source monitoring if treatment is not provided or does not provide at least 4-log virus inactivation.

Monitoring Requirements and Analysis

The District, as an unchlorinated system, will comply with the GWR through triggered source monitoring. The GWR requires triggered source water monitoring within 24 hours of receiving an unsatisfactory total coliform distribution system sample. To comply with the GWR water systems must take at least one sample directly from each active individual well that was running at the time of the positive coliform sample. Source water samples are to be analyzed for fecal coliform in accordance with EPA guidelines, and the results reported to DOH. If the triggered source sample is fecal-indicator positive and DOH does not require corrective actions after a first positive triggered source sample, the water system must collect five additional source water samples from the same source within 24 hours of being notified of the fecal indicator-positive sample.

The GWR requires corrective action if a significant deficiency is identified, or if the initial triggered source sample or one of the five additional source samples test positive for fecal contamination. Water systems are required to implement at least one of the following corrective actions:

- Provide an alternative source of water as soon as possible.
- Eliminate the source of contamination as soon as possible.
- Correct all significant deficiencies identified by sanitary surveys.

- Provide treatment that reliably achieves at least 4-log treatment of viruses before or at the first customer for the groundwater source.

The GWR also requires that the DOH conduct sanitary surveys on water system facilities. The purpose of the sanitary survey is to identify deficiencies in the system where contamination could occur. In general, the DOH conducts sanitary surveys on water systems every 3 to 5 years.

The District's last sanitary survey was competed by DOH in December 2017 and found no acute health concerns.

Inorganic Physical and Chemical Characteristics

Introduction

This category includes several inorganic elements and compounds. Many of the inorganic chemicals include elemental metals such as mercury, arsenic, and iron. Some non-metallic constituents such a chloride, fluoride, and sulfate are also included. Physical properties affecting water quality in this category include turbidity, specific conductivity, total dissolved solids, and color.

WAC 246-290-310 specifies primary and secondary MCLs for inorganic physical and chemical characteristics. Primary MCLs are based on health effects, and secondary MCLs are based on non-health factors, such as aesthetics. Three chemicals, lead, copper, and sodium do not have primary or secondary MCLs, but are required to be monitored along with other IOCs. Lead and copper are regulated under the Lead and Copper Rule, described in detail later in this chapter. Primary and secondary MCLs for inorganic chemical and physical characteristics are summarized in Tables 3-2 and 3-3, respectively.

TABLE 3-2

Primary Water Quality Standards Inorganic Chemical Characteristics

Chemical	Primary MCL
Antimony (Sb)	0.006 mg/L
Arsenic (As)	0.01 mg/L
Asbestos	7 million fibers/liter (length >10 microns)
Barium (Ba)	2.0 mg/L
Beryllium (Be)	0.004 mg/L
Cadmium (Cd)	0.005 mg/L
Chromium (Cr)	0.1 mg/L
Copper (Cu)	1.3 mg/L (Action Level)
Cyanide (HCN)	0.2 mg/L
Fluoride (F)	4.0 mg/L
Lead (Pb)	0.015 mg/L (Action Level)
Mercury (Hg)	0.002 mg/L
Nickel (Ni)	0.1 mg/L
Nitrate (as N)	10.0 mg/L
Nitrite (as N)	1.0 mg/L
Selenium (Se)	0.05 mg/L
Sodium (Na)	20 mg/L (EPA recommendation)
Thallium (Tl)	0.002 mg/L

TABLE 3-3

Secondary Water Quality Standards
Inorganic Chemical and Physical Characteristics

Chemical/Characteristic	Secondary MCL
Chloride (Cl)	250.0 mg/L
Fluoride (F)	2.0 mg/L
Iron (Fe)	0.3 mg/L
Manganese (Mn)	0.05 mg/L
Silver (Ag)	0.1 mg/L
Sulfate (SO4)	250.0 mg/L
Zinc (Zn)	5.0 mg/L
Color	15 Color Units
Hardness	None Established
Specific Conductivity	700 µmhos/cm
Total Dissolved Solids (TDS)	500 mg/L

Monitoring Requirements and Analysis

Groundwater sources must be sampled for inorganic compounds once every 3 years, unless a monitoring waiver is granted by DOH. The District currently has a 9-year waiver for IOC sampling, which is in effect from May 2010 to 2019 for Wells 4 and 5 and from May 2018 to 2027 for Wells 6 and 7. Nitrate samples are required annually and nitrite samples are required once every 3 years. Because nitrates and nitrites are included in IOC sampling, additional individual samples are not required in years when an IOC is taken from the source.

Inorganic water quality results for detected constituents in the District's sources (prior to treatment) are summarized in Table 3-4 from the most recent complete IOC sampling of raw water sources.

TABLE 3-4

Detected Inorganic Chemical and Physical Characteristics Sampling Results

Measured Constituent(1)	**Units**	**Well 4 5/13/2010**	**Well 5 5/13/2010**	**Well 6 5/15/2018**	**Well 7 5/13/2010**	**MCL**
Chloride	mg/L	4.0	4.0	2.5	3.0	250
Manganese	mg/L	0.06	0.05	0.05	0.06	0.05
Sulfate	mg/L	12.0	12.0	2.3	3.0	250
Sodium(2)	mg/L	8.0	9.0	11.4	11	25(2)
Hardness	mg/L	87	92	56	56	N/A
Conductivity	Umhos/cm	166	172	134	130	700
Turbidity	NTU	0.2	<0.1	0.6	0.2	N/A

(1) Inorganic constituents and physical characteristics listed in Tables 3-3 and 3-4, but not present in this table, were not detected in the District's sampling results.

(2) EPA recommended limit of 25 mg/L for sodium

The District source water contains manganese at close to the secondary Maximum Contaminant Level (MCL), 0.050 mg/L. The MCL for manganese was established based upon aesthetic considerations and is a secondary MCL. Excessive manganese concentrations can stain clothes, cause the water to appear tea or coffee colored, and change the taste of the water. WDOH has recently reviewed potential health impacts of manganese in drinking water, particularly on infants and is considering setting a treatment goal of manganese in drinking water to 0.020 mg/L. WDOH has removed "manganese does not pose a threat to human health" from its publications.

When the District chlorinated its system from September 2013 to December 2016, it received customer complaints multiple times per week regarding tea or coffee colored water, "brown water." Prior to chlorine addition the District would receive on the order of 4 to 6 brown water complaints per year.

Manganese biofilm may have developed on the inside of water mains over the years due to the manganese concentrations in the water. Chlorine oxidizes manganese. The chlorine addition may have caused the biofilm to oxidize and dislodge resulting in the tea or coffee colored water.

The District conducted extensive testing and received DOH's permission to discontinue chlorination on December 31, 2016.

The District developed and implemented a unidirectional flushing program after the increase in discolored water complaints. The intent of unidirectional flushing is to physically remove any biofilm by pushing water through the system at a minimum velocity 2.5 feet per second. The unidirectional flushing program did reduce the frequency of brown water complaints for a period of time after it was completed, but it did not eliminate them. Since the District stopped adding chlorine to the system, "brown water" complaints have dropped to one every few months.

With the exception of manganese the District's inorganic chemical and physical characteristics meet the DOH standards.

Arsenic

Introduction

Arsenic is an inorganic chemical that has received significant health attention. Long-term exposure to low concentrations of arsenic in drinking water can lead to skin, bladder, lung, or prostate cancer. Non-cancer effects of ingesting arsenic at low levels include cardiovascular disease, diabetes, and anemia, as well as reproductive, developmental, immunological, and neurological effects.

After several proposals and revisions by EPA, the current arsenic standard was published in February 2001, and became effective in the State of Washington in 2004, replacing the previous standard of 0.05 mg/L. Compliance with the MCL standard of 0.01 mg/L is required for all systems.

Monitoring Requirements and Analysis

Arsenic monitoring requirements are consistent with monitoring for other IOCs. IOCs, including arsenic, are tested every three years; however, the District currently has 9-year waivers on all of its wells through December 2019. Any system that has a sample exceeding the MCL must increase the frequency of monitoring at that sample location to quarterly sampling. Compliance with the MCL will be based on the running annual average of the samples. Systems triggered into increased monitoring would not be considered in violation of the MCL until they have completed 1 year of quarterly sampling. However, if any sample result causes the running annual average to exceed the MCL at any sampling point, the system is out of compliance with the MCL immediately.

Inorganic testing showed arsenic levels below the detection level for the last 8 years and a value of 0.002 mg/L in 2010.

Lead and Copper

Introduction

In 1991, the EPA promulgated the Federal Lead and Copper Rule. The State of Washington adopted this rule in 1995, with minimal changes. The Lead and Copper Rule is intended to reduce the tap water concentrations of lead and copper that can occur when corrosive source causes lead and copper to leach from meters and other plumbing fixtures.

Monitoring Requirements and Analysis

Based on the requirements of the EPA Lead and Copper Rule (40 CFR 141), lead and copper monitoring must be completed for two consecutive 6-month monitoring periods. If lead and copper action levels are not exceeded, then the number of samples may be reduced to one-half the original number for three consecutive annual periods. Assuming compliance with the action level is maintained, reduced sampling may continue once every 3 years thereafter.

Ninety percent of the distribution system lead samples collected according to the procedures outlined in WAC 246-290 must have concentrations below the “Action Level” of 0.015 mg/L. Similarly, 90 percent of the copper samples must have concentrations less than 1.3 mg/L. Systems exceeding the action levels are required to provide public notification and implement a program for reducing lead and copper levels.

The District last collected lead and copper samples in August 2015. Distribution system samples were taken at 20 locations. The results of the lead and copper testing conducted in 2015 are shown in Table 3-5. As shown, all lead and copper samples were below the action limit. The District meets the regulations for lead and copper.

TABLE 3-5

Lead and Copper Testing Results (2015)

Parameter	Lead (mg/L)	Copper (mg/L)
Action Level, mg/L	0.015	1.3
State Reporting Level, mg/L	0.001	0.02
Maximum Concentration Reported, mg/L	0.0110	0.080
90th Percentile Concentration	0.006	0.06
Samples Taken	20	20
Samples Exceeding Action Level	0	0
Minimum Concentration Reported, mg/L	0.0010	0.0200

Nitrates

Sampling and testing for nitrates is required annually. The MCL is 10 mg/L for nitrate. Nitrate is a common concern for water systems with sources including fertilizer runoff, septic tanks and erosions of natural deposits. Health effects of water with nitrates or nitrites in excess of the MCL on infants under 6 months include shortness of breath and blue-baby syndrome. Testing results showed no detectable nitrates in any District sample for at least the past 7 years. The District water supply meets the regulations for nitrates.

Volatile Organic Compounds and Synthetic Organic Compounds

Introduction

VOCs are manufactured, carbon-based chemicals that vaporize quickly at normal temperatures and pressures. VOCs include many hydrocarbons associated with fuels, paint thinners, and solvents. This group does not include organic pesticides, which are regulated separately as SOCs. VOCs are divided into the two following groups:

1. Regulated VOCs that have been determined to post a significant risk to human health.

2. Unregulated VOCs for which the level of risk to human health has not been established.

There are currently 21 regulated VOCs and 33 regulated SOCs. WAC 246-290-310 defines the maximum contaminate levels for VOCs and SOCs. The MCLs for VOCs are as described in 40 CFR 141.61(a) and the MCLs for SOCs are as described in 40 CFR 141.61(c).

Monitoring Requirements and Analysis

Per the DOH requirements, SOCs and VOCs must be sampled once every 3 years, unless a waiver is in place. Sampling reported no detectable VOCs or SOCs in any District samples, except for the following shown in Table 3-6.

TABLE 3-6

VOCs and SOCs Testing Results (µg/L)

Measured Constituent	Well 7 (4/19/2016)	Well 6 (4/14/2015)	MCL	State Reporting Limit
2,4-D	0.5	0.5	70.0	0.1
2,4,5 TP (Silvex)	1.0	1.0	50.0	0.2
Pentachlorophenol	0.2	0.2	1	0.04
Dinoseb	1.0	1.0	7.0	0.2

Asbestos

Introduction

Asbestos is the name for a group of naturally occurring, hydrated silicate minerals with fibrous morphology. Included in this group are chrysotile, corcidolite, amosite, and the fibrous varieties of anthophyllite, tremolite, and actinolite. Most commercially mined asbestos is chrysotile. Asbestos' flexibility, strength, and chemical and heat resistance properties have adapted it to many uses including building insulation, brake linings, and water pipe.

In recent years, there has been much concern with the health risks associated with asbestos. Several studies and case histories have documented the hazards to internal organs as a result of inhalation of asbestos fibers. Data is limited on the effects of ingestion of asbestos fibers or on the effects of inhalation exposure from drinking water. Ingestion studies have not caused cancer in laboratory animals, although studies of asbestos workers have shown increased rates of gastrointestinal cancer.

Monitoring Requirements and Analysis

Asbestos is listed as a primary inorganic contaminant; however, it is not routinely included in IOC samples from public systems. Asbestos monitoring is to be conducted every 9 years unless a waiver is applied for and grated by the DOH.

The District's last sampling for asbestos was performed in July 2018. The results showed asbestos fibers at a concentration of 0.123 MFL; the MCC is 7.0 MFL (MFL – million fibers per liter of water).

Radionuclides and Radon

Introduction

Radionuclides include radioactive substances occurring naturally in subsurface waters. Regulated substances include radium-226, radium-228, uranium, and gross alpha and beta particles. Table 3-7 summarizes radionuclide MCLs as defined by EPA's Radionuclide Rule, WAC 246-290-210(6), and 40 CFR 141.66.

TABLE 3-7

Radionuclide MCLs

Radionuclide	MCL
Combined Radium -226 and -228	5 pCi/L
Uranium	20 μg/L
Gross Alpha (excluding uranium and radon)	15 pCi/L
Gross Beta	4 millirem/year

Monitoring Requirements and Analysis

WAC 246-290-200(10) and 40 CFR 141.26 require two radionuclide samples once every 2 years from each source. A gross alpha particle activity measurement may be substituted for the required radium-226 and radium-228 analysis provided the measured gross alpha particle activity does not exceed 5 pCi/L at a confidence level of 95 percent.

In November of 1999, EPA proposed a preliminary radon MCL of 200 pCi/L. EPA is considering an alternative MCL of 4,000 pCi/L if states or water purveyors implement a multimedia mitigation program aimed at reducing household indoor-air health risks from radon gas from soil as well as tap water. In 2012, the EPA published Report to Congress: Radon in drinking Water Regulations to detail the findings in support of the proposed radon rule. The date for publication of the final Radon Rule is unknown at this time.

The District collected radionuclide samples for 2015 and 2017, which had no detectable radionuclides in any sample.

Disinfectants/Disinfection Byproducts Stage Rule (Stages I and II)

WAC 246-290-300(6) requires purveyors of public systems that provide water treated with chemical disinfectants to monitor for disinfectants and disinfection byproducts. The D/DBP Rule establishes residual disinfectant concentrations and MCLs for disinfection byproducts. TTHMs and HAA5 are a group of organic compounds that can be formed as a result of drinking water disinfection by chlorine and are, therefore, often referred to as disinfection byproducts. TTHM include the sum of the concentrations of four disinfection byproducts: chloroform, bromoform, bromodichloromethane, and dibromochloromethane.

The Stage 1 D/DBP rule was published by the Environmental Protection Agency in 1998, incorporated into Washington State's Drinking Water Regulations in April 2003, and Stage 1 became effective January 1, 2004. The Stage 1 D/DBP Rule remained in effect for compliance until October 1, 2013.

Stage 2 of the D/DBP Rule was published in January 2006 and compliance with the new regulations began on October 1, 2013. Under Stage 2 of the D/DBP Rule, the MCLs for TTHM and HAA5 remain 80 μg/L and 60 μg/L, respectively; however, compliance with the MCL is based on the running annual average of each individual sample instead of the running annual average of all samples combined. The number of samples taken is dependent on the population served. Systems serving between 500 and 9,999 people must collect two samples per year.

The District chlorinated its water from September 2013 to December 2016. The District monitored for TTHM and HAA5 during that time and has continued to do so as part of the agreement with DOH when the District discontinued chlorination December 2016. The TTHM and HAA5 samples shown in Table 3-8 are all under the MCL.

TABLE 3-8

Disinfection Byproduct Samples (μg/L)

Date	Location	TTHM(1)	HAA5(1)	TTHM MCL	HAA5 MCL
9/14/2016	227th South Dock Avenue	3.9	1.3	80	60
9/14/2016	21516 13th Avenue South	5.3	1.1	80	60
8/26/2015	Harbor Master's Office (North)	11	1.4	80	60
8/26/2015	21516 13th Avenue South	10.8	3.4	80	60
9/9/2014	Dock Street (Marina)	(1)	(1)	80	60
9/9/2014	21516 13th Avenue South	0.3	(1)	80	60

(1) Below detection limits.

CONCLUSIONS

The District is meeting all regulations for water quality.

CHAPTER 4

SYSTEM ANALYSIS

INTRODUCTION

The purpose of this chapter is to determine if the existing water system facilities are able to supply sufficient quantity of water to meet existing and projected demands. In this section, three major planning components will be analyzed:

- System Design Standards
- System Component Analysis
- System Deficiencies and Proposed Improvements

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

SYSTEM DESIGN STANDARDS

Performance and design criteria typically address the sizing and reliability requirements for source, storage, distribution, and fire flow. Washington Administrative Code (WAC) 246-290 contains general criteria and standards that must be followed in development of public water systems. In addition, the Washington State Department of Health (DOH) *Water System Design Manual* (December 2009) provides specific guidance for system design. The general facility design standards for the following subjects are discussed in the order shown below:

1. Average and Peak Day Demand
2. Peak Hour Demand
3. Storage Requirements
4. Fire Flow Rate and Duration
5. Minimum System Pressure
6. Minimum Pipe Sizes
7. Backup Power Requirements
8. Valve and Hydrant Spacing Recommended Standard
9. Other System Policies

The DOH relies on various publications, agencies, and the District to establish design criteria. A brief description of the most widely recognized performance and design standards are listed as follows:

- *WAC 246-290, Group A Public Water Systems*, Washington State Board of Health (October 2009).

  This is the primary drinking water regulation utilized by the DOH to assess capacity, water quality, and overall compliance with drinking water standards.

- *Water System Design Manual,* DOH (December 2009).

  Significant revisions to the former DOH Sizing Guidelines have recently been adopted. These standards will serve as guidance for the preparation of plans and specifications for Group A public water systems in compliance with WAC 246-290.

Table 4-1 lists the suggested DOH *Water System Design Manual* guidance and the District policies with regard to each standard for general facility requirements.

TABLE 4-1

General Facility Recommendations and Requirements

Standard	DOH *Water System Design Manual* (December 2009)	District Standards
Average Day and Maximum Day Demand	Average Day Demand (ADD) should be determined from previous metered water use data. Maximum Day Demand (MDD) is estimated at approximately 2.0 times the average day demand if metered data is not available.	ADD = Metered consumption using 5-year average. MDD = Based on peaking factor determined from historical source production data
Peak Hour Demand	Peak hour demand (PHD) is determined using the following equation: PHD = (MDD*N/1440)*[(C)*(N)+F]+18 C = Coefficient from DOH Table 5-1 N = Number of connections, ERUs F = Factor of range from Table 5-1	PHD is determined by applying a peaking factor of 1.75 for MDD to PHD, based upon the DOH equation shown to the left and the 2012 to 2017 MDD data (see Tables 2-13 and 2-14).
Source Capacity	Capacity must be sufficient to meet MDD.	Same as DOH *Water System Design Manual*, Chapter 7.
Storage Requirements	The sum of: Operational Storage Volume sufficient to prevent pump recycling. Equalizing Storage $V_{ES} = (Q_{PH} – Q_S) * 150$ Dead Storage As needed to maintain pressure Plus the larger of Standby Storage $V_{SB} = (2 * ADD * N) – t_m * (Q_S – Q_L)$ with a minimum of (200*N) Fire Suppression Storage $V_{FSS} = NFF * T$ Definitions ADD = average day demand, gpd/ERU N = number of ERUs Q_{PH} = peak hour demand (gpm) Q_S = total normal source capacity (gpm) Q_L = capacity of largest source (gpm) t_m = daily pump source run time (1440 min) NFF = Required fire flow (gpm), set by Fire Marshall) T = fire flow duration (min), set by Fire Marshall)	Same as DOH *Water System Design Manual*, using the formulas provided in the manual, Chapter 9.
Minimum System Pressure	The system shall be designed to maintain a minimum of 30 psi in the distribution system under peak hour demand and 20 psi under fire flow conditions during MDD.	Same as DOH *Water System Design Manual*, Chapter 8.

TABLE 4-1 – (continued)

General Facility Recommendations and Requirements

Standard	DOH *Water System Design Manual* (December 2009)	District Standards
Fire Flow Standard	The minimum fire flow shall be determined by the local fire authority or WAC 246-293 for systems within a critical water supply service area (CWSSA).	The District's fire flow requirements are based on the City of Des Moines Standards and the Fire Marshal's determination of required flows for non-residential structures.
Minimum Pipe Size	The diameter of a transmission line shall be determined by hydraulic analysis. The minimum size distribution system line shall not be less than 6 inches in diameter for a looped system or 8 inches in diameter for a single line system unless hydraulic analysis shown smaller.	The minimum size for a waterline providing fire flow shall be sufficient to provide the required flow rate to maintain a velocity in the pipeline(s) not greater than 10 ft/sec.
Reliability Recommendations	• Well sources capable of supplying MDD within an 18-hour period • Sources meet ADD with largest source out of service • Back-up power equipment for pump stations unless there are two independent commercial power sources • Provision of multiple storage tanks • Standby storage equivalent to ADD x 2, with a minimum of 200 gpd/ERU • Low and high level storage alarms • Looping of distribution mains when feasible • Pipeline velocities not > 8fps at PHD • Flushing velocities of 2.5 fps for all pipelines	Same as DOH *Water System Design Manual*, Chapter 5.
Valve and Hydrant Spacing	Sufficient valving should be placed to keep a minimum of customers out of service when water is turned off for maintenance or repair. As a general rule, valves on distribution mains of 12 inches and smaller should be located every 1,000 feet. Fire hydrants on laterals should be provided with their own auxiliary gate valve.	Valve and hydrant standards are outlined in the District's Development Standards.
Water Quality Standards	The primary drinking water regulation utilized by DOH to assess water quality and overall compliance with drinking water standards.	WAC 246-290

CONSTRUCTION STANDARDS

Construction standards set forth the materials and construction standards that contractors, developers, and the District must follow when constructing system facility improvements. The District's Development Standards are included in Appendix I.

SYSTEM COMPONENT ANALYSIS

The following section evaluates the existing water system facilities. They are analyzed based on their capacity, physical conditions, and performance capabilities relative to existing and projected growth conditions.

SUPPLY ANALYSIS

A description of the District's sources of supply was presented in Chapter 1. According to the DOH *2009 Water System Design Manual*, source production capacity must be sufficient to supply the maximum day demand (MDD). Projections for MDD as well as average day demand (ADD) must also comply with the maximum instantaneous and maximum annual withdrawal limitations of associated water rights.

Water Rights Analysis

All appropriations of water for public use within Washington State must be made in accordance with existing water rights and the established procedures that govern their implementation and use. The District's water rights are discussed in Chapter 1 and are summarized in Table 1-3. The District's water rights have an annual capacity of 1,319 acre-feet/year. An analysis of historical and projected demands on annual water rights is provided in Table 4-2. Under current growth projections, the District has sufficient annual water rights to meet the 20-year planning period.

TABLE 4-2

Historical and Projected Annual Water Right Capacity Analysis

Year	Annual Water Right		Historical(1) and Projected(2) Annual Production		Water Right Surplus or (Deficit)	
	(gal/yr)	(ac-ft/yr)	(gal/yr)	(ac-ft/yr)	(gal/yr)	(ac-ft/yr)
2012(3)	409,240,973	1,256	121,116,000	372	288,124,973	884
2013(3)	409,240,973	1,256	120,456,000	370	288,784,973	886
2014(3)(4)	409,240,973	1,256				
2015(3)	409,240,973	1,256	123,434,908	379	285,806,065	877
2016(3)	409,240,973	1,256	120,382,032	369	288,858,941	887
2017(3)	409,240,973	1,256	120,909,752	371	288,331,221	885
2018	409,240,973	1,256	129,336,559	397	279,904,414	859
2019	409,240,973	1,256	130,300,775	400	278,940,198	856
2020	409,240,973	1,256	131,214,367	403	278,026,605	853
2021	409,240,973	1,256	131,812,081	405	277,428,892	851
2022	409,240,973	1,256	132,403,932	406	276,837,041	850
2023	409,240,973	1,256	132,989,920	408	276,251,053	848
2024	409,240,973	1,256	133,570,045	410	275,670,928	846
2025	409,240,973	1,256	134,144,307	412	275,096,666	844
2029	409,240,973	1,256	135,604,769	416	273,636,204	840
2039	409,240,973	1,256	143,630,325	441	265,610,648	815

(1) Historic production data is shown in Table 2-3 for the years 2012 to 2017.

(2) Projected production data is shown in Table 2-16 for the years 2018 and onwards.

(3) Historic data.

(4) There were several Well 6 source meter issues in 2014, so the total annual production was under recorded. Therefore, the 2014 data will not be used in analyses.

The District's water rights have an instantaneous capacity of 2,025 gpm. Table 1-3 provides a summary of the District's water rights. An analysis of instantaneous water rights is provided in Table 4-3, which shows the District has sufficient water rights to supply their maximum day demand (MDD) through the 20-year planning period.

TABLE 4-3

Instantaneous Water Right Capacity Analysis (gpm)

Year	Maximum Instantaneous Water Right (gpd)	Maximum Instantaneous Water Right (gpm)	MDD[(1)] (gpd)	MDD[(1)] (gpm)	Instantaneous Water Right Capacity Surplus or (Deficit) (gpm)
2012(2)	2,664,000	2,025	696,000	483	1,542
2013(2)	2,664,000	2,025	597,000	415	1,610
2014(2)(3)	2,664,000	2,025	-	-	-
2015(2)	2,664,000	2,025	637,188	442	1,583
2016(2)	2,664,000	2,025	634,472	441	1,584
2017(2)	2,664,000	2,025	572,208	397	1,628
2018	2,664,000	2,025	744,128	517	1,508
2019	2,664,000	2,025	749,676	521	1,504
2020	2,664,000	2,025	754,932	524	1,501
2021	2,664,000	2,025	758,371	527	1,498
2022	2,664,000	2,025	761,776	529	1,496
2023	2,664,000	2,025	765,147	531	1,494
2024	2,664,000	2,025	768,485	534	1,491
2025	2,664,000	2,025	771,789	536	1,489
2029	2,664,000	2,025	780,192	542	1,483
2039	2,660,000	2,025	826,366	574	1,451

(1) Historical data from Table 2-16.
(2) Historic data.
(3) There were several Well 6 source meter issues in 2014, so the total annual production was under recorded. Therefore, the 2014 data will not be used in analyses.

Well Pump and Capacity Analysis

The District's four wells are described in Chapter 1 of this Plan. Table 4-4 presents the well and pump capacities.

TABLE 4-4

Well and Well Pump Capacity Analysis (gpm)

Maximum Instantaneous Water Right (Qi)(1)	Well Pump Capacity(2)
2,025	910

(1) As shown in Table 1-3.
(2) See Table 1-2 for individual well pump capacities. The District also has a booster pump station that pumps from the reservoirs to the distribution system which has three low-flow pumps (two with a 250 gpm and one with a 440 gpm capacity) and three high flow pumps, each with a capacity of 1,750 gpm. Well 4 capacity is not utilized in this analysis as it is primarily used as a monitoring well.

Table 4-5 presents an analysis of the District's well capacity under normal conditions to provide the projected the ADD and MDD for the 6-, 10- and 20-year planning periods. Under normal conditions, the District is not expected to have a source capacity deficit. Per DOH recommendation, the largest source, Well 7, is assumed to be offline for average day comparison. All sources are assumed to be pumping for 18-hours when comparing capacity to maximum day demand.

TABLE 4-5

System Demand and Well Pump Capacity Analysis (gpm)

Year	Total Well Pump Capacity(1)	ADD(2)	MDD(3)	Surplus or (Deficit)(2) (ADD/MDD)
2012(4)	910	230	483	360/199
2013(4)	910	229	415	361/268
2014(4)(5)	910	-	-	-/-
2015(4)	910	235	442	355/240
2016(4)	910	228	441	362/242
2017(4)	910	230	397	360/285
2018	910	246	517	344/166
2019	910	248	521	342/162
2020	910	250	524	340/158
2021	910	251	527	339/156
2022	910	252	529	338/153
2023	910	253	531	337/151
2024	910	254	534	336/149
2025	910	255	536	335/147
2029	910	258	542	332/141
2039	910	273	574	317/109

(1) Data from Table 1-2.
(2) ADD – assumes Well 7 at 320 gpm not pumping.
(3) MDD – assumes 18 hours of pumping per day, Wells 5, 6 and 7.
(4) Historic data.
(5) There were several Well 6 source meter issues in 2014, so the total annual production was under recorded. Therefore, the 2014 data will not be used in analyses.

STORAGE

Storage requirements for the District are determined according to the DOH's *2009 Water System Design Manual*. The effective storage requirement is based on the sum of the following:

- Operational Storage (OS)
- Equalizing Storage (ES)
- Standby Storage (SS)
- Fire Suppression Storage (FSS)

- Dead Storage (DS)

Operational Storage

Operational storage is typically defined as the volume of water in a reservoir used while the sources of supply are turned off during normal system operation. This means the amount of storage above the level where the first pump or well is turned on to fill the reservoir. The amount operational storage depends on the specifications of the control system and the dimensions of the system reservoirs. This storage component is necessary to prevent excessive cycling (starting and stopping) of wells and booster pumps and to allow for water turnover in the reservoir.

The District controls the operations of its wells and booster pumps using level sensors in the reservoirs. Set points are given in Table 7-3 in the Operations and Maintenance, Chapter 7.

Operational storage is defined by the lead well pump for the Lower Reservoir. The 70-foot diameter Lower Reservoir has an operational range between 18.5 to 20.5 feet, for a total operational storage volume of 57,577 gallons.

The Upper Reservoir has an operational range from an elevation of 260.9 feet (when the first low-flow pump turns on) to an elevation of 263.4 feet. The Upper Reservoir has a total operational volume of 23,073 gallons.

Table 4-6 provides the operational storage requirements for the District.

Equalizing Storage

Equalizing storage is the amount of water needed to meet peak system demand for a period of time that the system demand exceeds the system source capacity. The DOH's *2009 Water System Design Manual* recommends that this volume be estimated as PHD minus source capacity for 150 minutes, but in no case less than zero.

Equalizing storage is calculated using the following equation:

$$ES = (Q_{PH} - Q_{S}) * 150 \text{ minutes, but in no case less than zero}$$

Where:

ES = Equalizing storage component (gallons)
Q_{PH} = Peak hourly demand (gpm)
Q_{S} = Total source of supply capacity, excluding emergency sources (gpm)

The District's sources of supply are four wells with a total capacity of 950 gpm and are shown in Table 2-11, which have a greater capacity than the peak hour demands 2030. Thus, the District requires 0 gallons for its equalizing storage component through 2030. Equalizing storage for 2031 through 2037 is calculated using the DOH equation shown above. Table 4-6 provides the equalizing storage requirements for the District.

Standby Storage

Standby storage is provided to meet demands in the event of a system failure such as a power outage, an interruption of supply, or break in a major transmission line. The amount of standby storage should be based on the reliability of supply and pumping equipment, standby power sources, and the anticipated length of time the system could be out of service.

Standby storage is calculated using the following equation:

$$SS = (2\text{ days})\ [\ (ADD)\ (N) - t_m\ (Q_S - Q_L)\ ]$$

Where

SS = Total standby storage component for a multiple source system (gallons)
ADD = Average daily demand for the design year (gpd/ERU)
N = Number of ERUs
t_m = Time the remaining sources are pumped on the day when the larges source is not available (minutes/day); unless restricted otherwise, assume 1,440 minutes/day
Q_S = Sum of all installed and continuous available supply source capacities, except emergency sources (gpm)
Q_L = The largest capacity sources available to the system (gpm)

DOH recommends that standby storage volume be not less than 200 gallons per ERU.

Standby storage calculations are based on the fact the District has multiple well sources with capacity to meet average daily demands with the largest source out of service. Therefore, for the purposes of this analysis, projected average daily demands are used to estimate the total source of supply capacity with the largest source out of service.

The calculated standby storage is less than the minimum of 200 gallons per ERU, therefore 200 gallons per ERU is used for the standby storage volume. Table 4-6 provides the standby storage requirements for the District.

Fire Suppression Storage

Fire suppression storage is provided to ensure the volume of water required for fighting fires is available when necessary. Fire suppression storage also reduces the impact of firefighting on distribution system pressure. The amount of water required for firefighting purposes is specified in terms of rate of flow in gallons per minute (gpm) and an associated duration. Fire flows must be provided at a residual system pressure of at least 20 pounds per square inch (psi).

Fire suppression storage is calculated using the following equation:

$$FSS = FF * T$$

Where

FSS = Required fire suppression storage component (gallons)
FF = Required fire flow rate as specified by fire protection authority or under WAC 246-293-640, whichever is greater (3,500 gpm)
T = Duration of FF rate as specified by the fire protection authority or under WAC 246-293-640 (180 min)

The standby storage component or the fire suppression storage component, whichever volume is smaller, can be excluded from a water system's total storage requirement provided that such practice is not prohibited by (1) a locally developed and adopted Coordinated Water System Plan; (2) local ordinance; or (3) the local fire protection authority or County Fire Marshal (reference WAC 246-290-235(4)). The District's current policy is to allow nesting of these components.

A fire flow of 3,500 gpm for a duration of 3 hours (630,000 gallons) was included in the storage analysis based upon zoning and requirements from the South King County Fire and Rescue (SKF&R). Table 4-6 provides the fire suppression storage requirements for the District.

As stated in Chapter 1, the Upper Reservoir sets the grade for the system. In times of abnormally high flow, such as fire flow, the upper reservoir provides usable storage volume between the water depths needed to maintain 30 psi and 20 psi.

Dead Storage

Dead storage is the amount of non-usable storage in a reservoir. Typically, this volume is required to maintain minimum pressures within the distribution system but it also includes the unused volume of a reservoir above pump-off set points. For peak hour demand, the system must maintain a minimum pressure of 30 psi at all times except during a fire flow event. The system must maintain a minimum pressure of 20 psi at all times, even at the end of a fire flow event.

Supply from the Upper Reservoir is provided directly to the distribution by gravity. The Upper Reservoir has a non-usable volume of 39,573 gallons (water level at 9 feet) that is needed to maintain a minimum fire flow pressure of 20 psi at the District's highest service elevation of 195 feet. Supply from the Lower Reservoir is pumped either to the Upper Reservoir or directly to the distribution system. As such the reservoir level does not affect system pressure and dead storage is defined by the set points of the pumps. The Lower Reservoir storage calculations assume that 2 feet of water is reserved in the bottom of the reservoir to prevent the booster pumps from cavitating. This dead storage volume is 57,577 gallons. The total dead storage for both District reservoirs is 97,150 gallons. Table 3-13 provides the dead storage components for the District.

Storage Analysis

Table 4-6 provides the various storage components associated with the District. Standby storage has been nested within the fire flow storage requirement.

TABLE 4-6

Storage Requirements and Storage Capacity Analysis

Year	OS	ES	SS	FSS	DS	Total Required Storage(1)	Total Available Storage	Storage Surplus or (Deficit)
2012	80,650	0	413,648	630,000	97,150	807,797	910,000	102,203
2013	80,650	0	412,521	630,000	97,150	807,797	910,000	102,203
2014(2)	-	0	-	630,000	97,150	807,797	910,000	102,203
2015	80,650	0	422,722	630,000	97,150	807,797	910,000	102,203
2016	80,650	0	411,141	630,000	97,150	807,797	910,000	102,203
2017	80,650	0	414,074	630,000	97,150	807,797	910,000	102,203
2018	80,650	0	442,933	630,000	97,150	807,797	910,000	102,203
2019	80,650	156	446,236	630,000	97,150	807,953	910,000	102,047
2020	80,650	1,114	449,364	630,000	97,150	808,911	910,000	101,089
2021	80,650	1,741	451,411	630,000	97,150	809,538	910,000	100,462
2022	80,650	2,362	453,438	630,000	97,150	810,159	910,000	99,841
2023	80,650	2,976	455,445	630,000	97,150	810,773	910,000	99,227
2024	80,650	3,585	457,432	630,000	97,150	811,382	910,000	98,618
2025	80,650	4,187	459,398	630,000	97,150	811,984	910,000	98,016
2029	80,650	5,719	464,400	630,000	97,150	813,516	910,000	96,484
2039	80,650	14,136	491,885	630,000	97,150	821,933	910,000	88,067

(1) Sum of all components and includes the larger of standby or fire suppression storage since standby storage can be nested into fire suppression storage.

(2) There were several Well 6 source meter issues in 2014, so the total annual production was under recorded. Therefore, the 2014 data will not be used in analyses.

BOOSTER STATION ANALYSIS

The booster station analysis ensures District's system has sufficient capacity to meet the required demands. The low and intermediate pumps at the District's booster station normally pump from the Lower Reservoir to the Upper Reservoir. The high flow pumps discharge directly to the distribution system. If the rate from the high flow pumps exceed demand water will backflow from the distribution system to the elevated reservoir to prevent overpressurizing the system. When the Upper Reservoir is taken offline for maintenance, the discharge from the low and intermediate pumps is directed to the distribution system. A 4-inch pressure relief valve relieves pressure from the distribution back to the lower reservoir to prevent over pressurization of the distribution system. The high flow pumps at the booster station are taken offline when the Upper Reservoir is out of service to prevent over pressurization of the distribution system, should they be called to run. Fire flow is provided through the Highline Intertie in this scenario.

The District has an open system, the pressure is governed by an atmospheric storage tank. For open systems, WAC 246-290-230 requires the booster station be designed to meet the MDD for the zone with all pumps in service and meet the ADD with the largest routinely pump out of service. Table 4-7 provides the booster station analysis.

TABLE 4-7

Booster Station Analysis – Open System

	2018	**2029**	**2039**
ADD (gpm)	245	255	268
MDD (gpm)	517	542	574
Pumping Capacity (gpm)(1)	3,500	3,500	3,500
Pumping Capacity with Largest Routinely Used Pump Out of Service (gpm)(2)	500	500	500
Meet ADD with Largest Routinely Used Pump Out of Service	Yes	Yes	Yes
Meet MDD with Existing Pumping Capacity	Yes	Yes	Yes

(1) The booster station is equipped with six pumps: three low-flow pumps (capacities of 250 gpm, 250 gpm, and 440 gpm) and three high-flow pumps (all have capacities of 1,750 gpm). The high flow pumps are only called on when the three low-flow pumps are unable to meet demand. One of the high-flow pumps is redundant. See Chapters 1 and 6 for more details.

(2) For this analysis the intermediate pump is assumed to be the largest routinely used pump. The high flow booster pumps are not normally used.

The booster station is currently able to supply ADD with the largest routinely used pump out of service and MDD with the existing pumping capacity through the 20-year planning period.

DISTRIBUTION SYSTEM ANALYSIS

HYDRAULIC MODEL

DOH regulations (WAC 246-290) require hydraulic modeling as a component of Water System Plans in order to evaluate each system's capabilities. In addition to analyzing the existing system, the model allows the modeler to review the effectiveness of any improvements proposed to address the identified deficiencies.

The District's water system was analyzed using Innovyze's InfoWater hydraulic modeling software. The InfoWater model has been created by converting H_2ONet to InfoWater and then updating the computer model to reflect current conditions. Reservoir elevations, well and booster pump station capacities, and control settings have been verified using planning documents, construction drawings and information provided by the system operator. The model was then calibrated using hydrant flow testing. Detailed results from the hydraulic model are provided in Appendix J.

HYDRAULIC CAPACITY ANALYSIS

The District's system was analyzed under peak hour demand and maximum day demand plus fire flow scenarios. The purpose of these analyses is to determine if the system can supply the required flows while maintaining the required minimum system pressures, and if not, to determine the current capabilities and identify potential improvements necessary to bring the system into conformance with those criteria.

The following scenarios were modeled in the InfoWater analysis:

- 2039 Maximum Day Demands: These demands were used to evaluate the system's ability to meet the maximum day demands plus required fire flows at DOH's requirement of 20 psi within the 10-year planning period.

- 2039 Peak Hour Demands: These demands were used to verify the system is able to meet the DOH standards to supply domestic water at a minimum system wide pressure of 30 psi within the 20-year planning period.

- 2039 Maximum Day Demands: These demands were used to evaluate the system's ability to meet the maximum day demands plus required fire flows at DOH's requirement of 20 psi within the 20-year planning period with the identified capital improvement projects.

MODEL INPUT

Model input assumptions have significant impacts on peak hour and fire flow results. Table 4-8 shows the levels of the elevated reservoir during the model scenarios. Reservoir levels for peak hour scenarios are equal to the total available storage less the sum of operational storage for the corresponding year. The booster station discharge rate to the upper reservoir is greater than peak hour demand, thus the equalizing storage requirement in the upper reservoir, which establishes the grade for the system, is zero.

Operational storage is removed from each reservoir. Equalizing storage and most of the fire suppression storage requirement is removed from the lower reservoir such that the lower reservoir is reduced to its dead storage volume during the fire flow analysis. The remaining volume of fire suppression storage is removed from the upper reservoir. Fire suppression storage is greater than standby storage for both year 2018 and year 2039 thus the required storage does not change (Table 4-6).

TABLE 4-8

Reservoir Levels for Modeling

Reservoir	2018 Level (ft)		2039 Level (ft)	
	MDD Fire Flow	PHD	MDD Fire Flow	PHD
Upper Reservoir	14.8	26.4	14.8	26.4
Lower Reservoir	2.0	21.0	2.0	20.6

MODEL CALIBRATION

The calibration of a hydraulic model provides a measure of assurance that the model is an accurate and realistic representation of the actual system. The hydraulic model of the District's water system was calibrated using data obtained from fire hydrant tests at various locations throughout the water system. Three fire hydrant tests were conducted by District staff in March and April 2019. During these tests, static and residual pressures were recorded as the operator opened hydrants and recorded the flow rate. Field results were used to calibrate the hydraulic model through verification and adjustment of pipe sizes, roughness coefficients, and elevations. The system conditions at the time of testing were replicated in the hydraulic model during the calibration process.

For each hydrant test, the hydraulic model was used to generate static pressure and residual pressure at the measured hydrant flow rate. The total system demand at the time of the hydrant tests was assumed to be the 2018 average day demand. Model output was generated at points in the model equivalent to the locations of the hydrant tests.

The values measured in the hydrant flow tests are compared to the model output values in Table 4-9.

TABLE 4-9

Water System Modeling Calibration Results

Location	Flow (gpm)	Field Pressure (psi)			Model Pressure (psi)			ΔP Difference (psi)
		Static	Residual	ΔP	Static	Residual	ΔP	
South 227th Street and Dock Street	3,037	111	100	11	106	95	11	0
South 220th Street and 10th Avenue South	628	63	55	8	63	56	7	1
South 224th Street and 12th Avenue South	750	34	28	6	37	33	5	1

Calibration of the hydraulic model for the District produced drops in pressure during high flow events that were nearly equal to the observed values.

Peak Hour Demand Scenario

The peak hour demand analysis shows that the majority of the system has adequate service pressure. Several locations in the northwest of the system and in the vicinity of the reservoirs meet service standards but have pressures marginally above 30 psi.

Areas along the water front, such as the marina and Anthony's Home Port restaurant have peak hour pressures of approximately 110 psi. All services with a static pressure in excess of 80 psi are fitted with service PRVs to reduce pressure to the domestic plumbing to 80 psi or less.

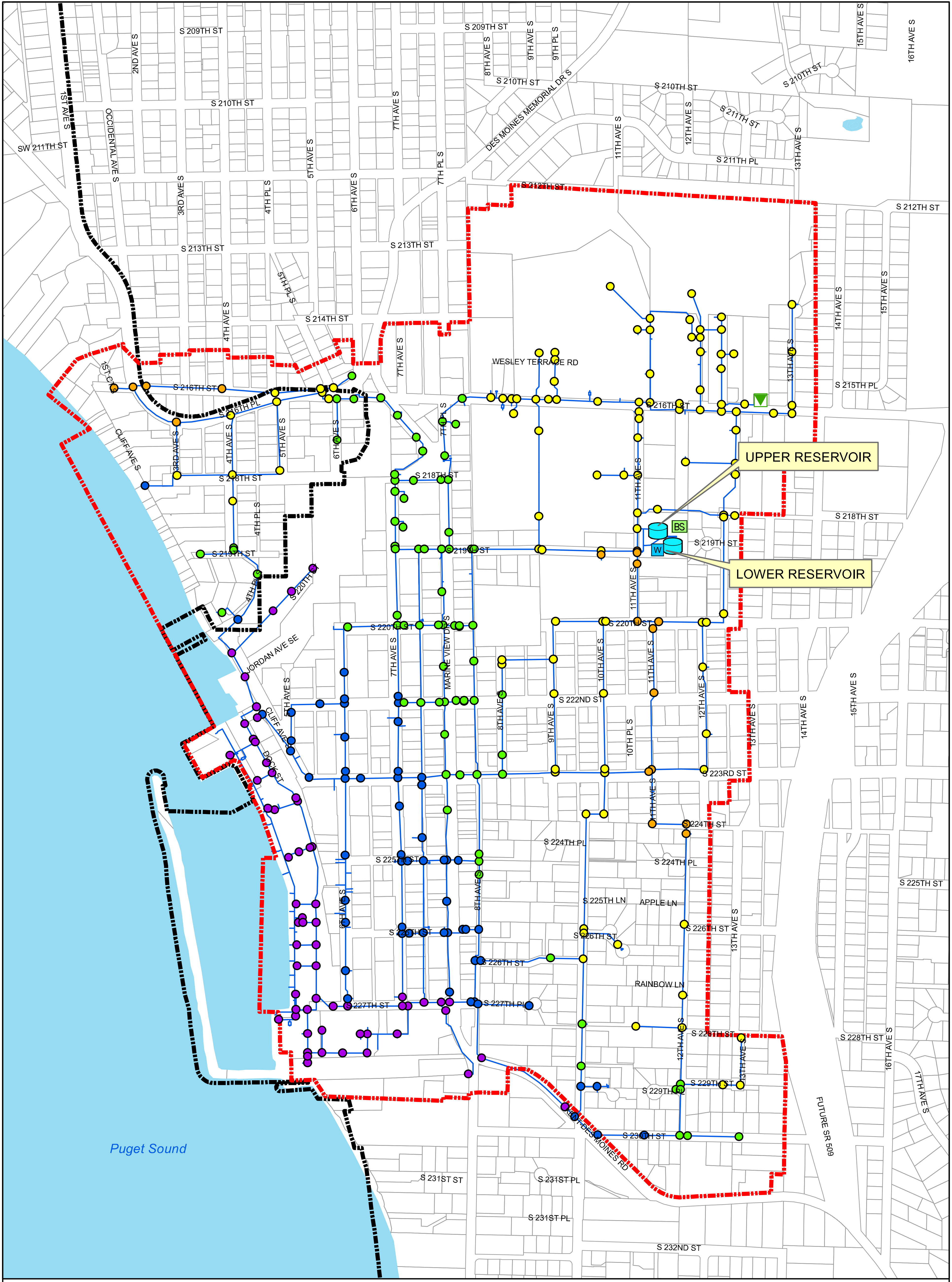
Figure 4-1 shows the available system pressure during the projected 2038 PHD scenario. A booster station is proposed to provide improved pressure to the North Hill area in the northwest of the District's service area. This is described further in Chapter 8.

Available Fire Flow Analysis

The DOH Water System Design Manual states that a water system should be designed to provide adequate fire flow under maximum day demand conditions, while maintaining a minimum system pressure of at least 20 psi throughout the system.

The required fire flow in the area of downtown Des Moines is 3,500 for 3 hours, as shown on Figure 4-2. Residential areas outside the downtown area are required to have 1,000 gpm. Fire flow should be maintained while providing a minimum pressure of 20 psi and with the water velocity in the pipes remaining below 10 feet per second.

ATTACHMENT A



LEGEND

PRESSURE (PSI)

●	0 - 30
●	30 - 40
●	40 - 60
●	60 - 80
●	80 - 100
●	100 +
—	WATER PIPES
BS	BOOSTER STATION
⛁	RESERVOIR
W	WELL FIELD
▼	HIGHLINE WATER DISTRICT INTERTIE
▭	DISTRICT BOUNDARY
▭	DES MOINES CITY LIMITS
▭	PARCELS

N

Feet
0 250 500 1,000

KING COUNTY WATER DISTRICT #54

WATER SYSTEM PLAN
FIGURE 4-1
2039 PHD PRESSURES

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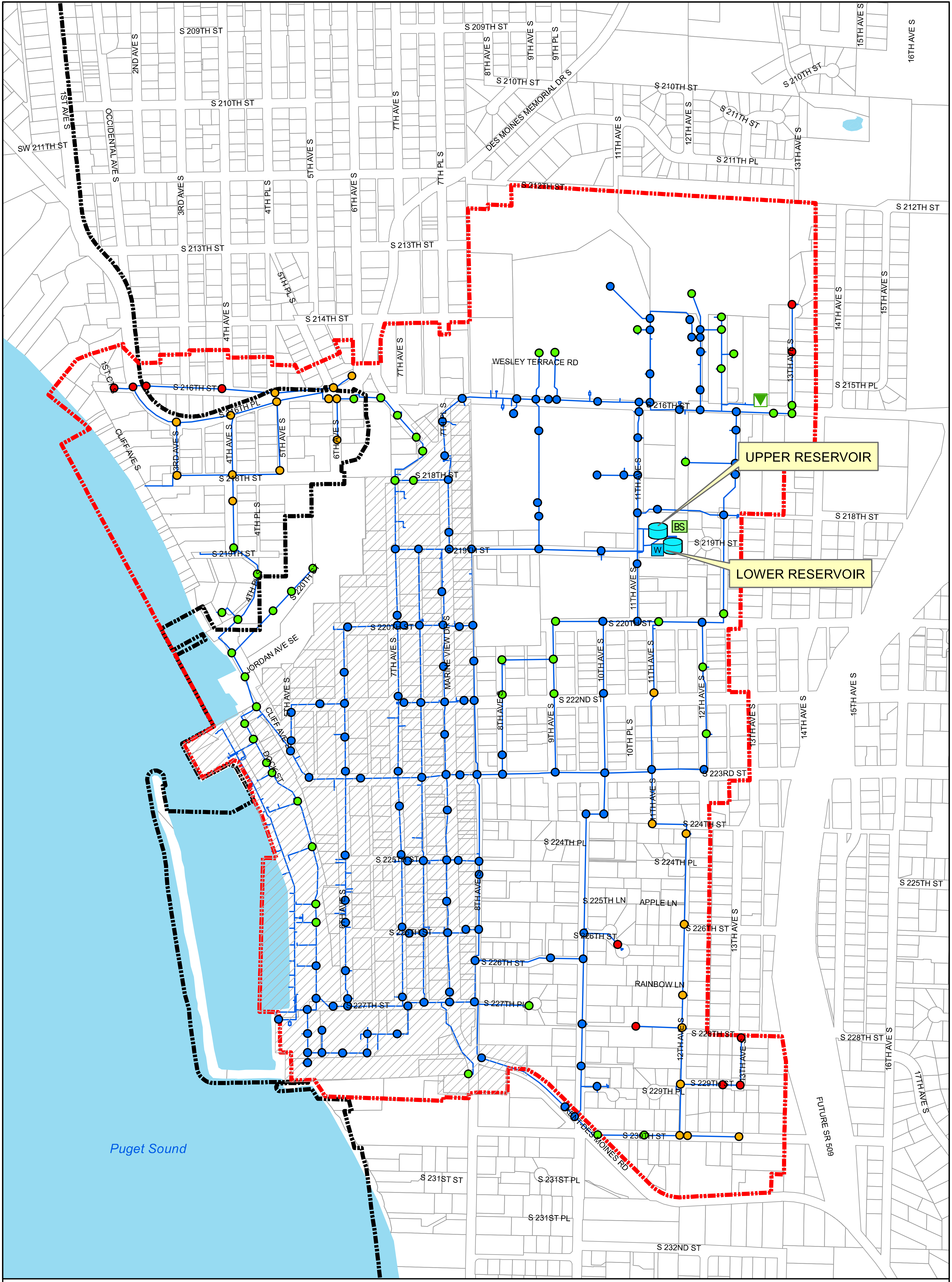
ATTACHMENT A



Available fire flow based on minimum pressure of 20 psi throughout District

LEGEND

AVAILABLE FIRE FLOW (GPM)

- ● 0 - 999
- ● 1000 - 1499
- ● 1500 - 3499
- ● 3500 +
- — WATER PIPES
- ▨ 3500 GPM FIRE FLOW AREA
- BS BOOSTER STATION
- RESERVOIR
- W WELL FIELD
- ▼ HIGHLINE WATER DISTRICT INTERTIE
- DISTRICT BOUNDARY
- DES MOINES CITY LIMITS
- ☐ PARCELS

N

Feet
0 250 500 1,000

KING COUNTY WATER DISTRICT #54

WATER SYSTEM PLAN
FIGURE 4-2
2039 MDD AVAILABLE FIRE FLOW
WITH 20 PSI SYSTEM-WIDE LIMITATION

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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Since the 2011 Water System Plan, the District installed a 12-inch water main on Marine View Drive and connected to dead end lines on side streets. With this installation, the District now provides fire flow in excess of 3,500 gpm in the downtown area with a 20 psi minimum in the system. The water main along the marina provides flow at minimum 3,000 gpm while maintaining a 20 psi minimum.

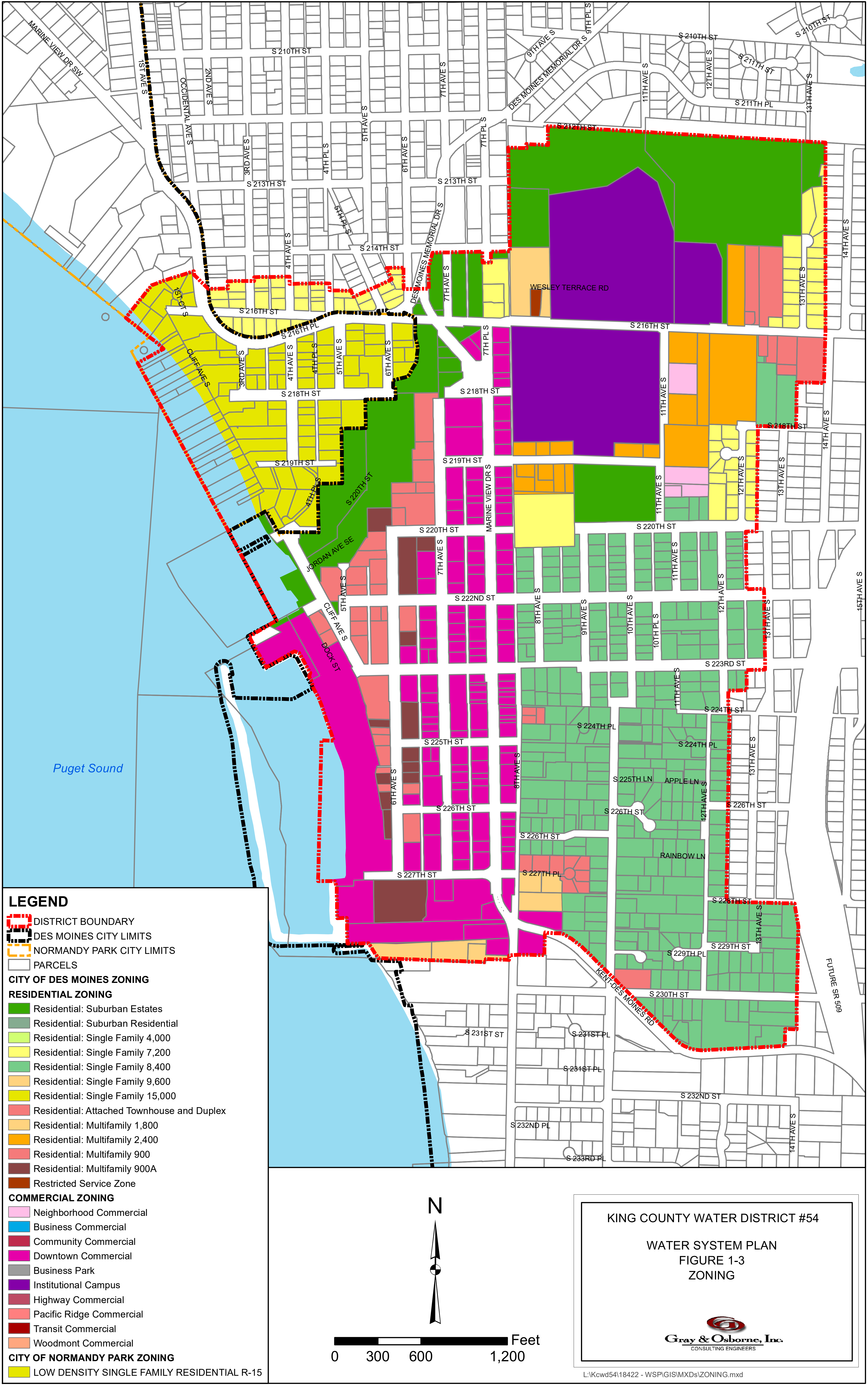
Adequate fire flow is not available in the North Hill area and at the ends of several cul-de-sacs while maintaining flow velocities below 10 ft/sec and service pressures above 20 psi. The North Hill area has insufficient fire flow due to low static pressure. The cul-de-sacs have insufficient fire flow as they are served by 4-inch or 6-inch water mains, which are limited by flow velocities. Improvements to these deficiencies are provided in Chapter 8. Figure 4-2 shows the results of this analysis.

Figure 4-3 demonstrates the available fire flow with only the pressure constraint, and no limit on the water velocity and includes hydraulic upgrades as discussed in Chapter 9. The high-elevation North Hill area limits the available fire flow throughout the system, as pressures here drop to 20 psi before the full fire flow requirement can be provided in some locations. The capital improvement plan includes a project to separate this area into its own higher pressure zone with a booster station and a PRV. This will allow for higher pressures in the North Hill area during regular service during high flow events.

ERU CAPACITY

Based upon the District's water rights, pumping capacity and the projected demand the District should have sufficient capacity to serve growth through the planning period, approximately 2,460 ERU. As indicated in Table 4-6, a small storage deficiency is projected at the end of the planning period.

ATTACHMENT A



LEGEND

- DISTRICT BOUNDARY
- DES MOINES CITY LIMITS
- NORMANDY PARK CITY LIMITS
- ☐ PARCELS

CITY OF DES MOINES ZONING

RESIDENTIAL ZONING

- 🟩 Residential: Suburban Estates
- 🟩 Residential: Suburban Residential
- 🟩 Residential: Single Family 4,000
- 🟨 Residential: Single Family 7,200
- 🟩 Residential: Single Family 8,400
- 🟧 Residential: Single Family 9,600
- 🟨 Residential: Single Family 15,000
- 🟥 Residential: Attached Townhouse and Duplex
- 🟧 Residential: Multifamily 1,800
- 🟧 Residential: Multifamily 2,400
- 🟥 Residential: Multifamily 900
- 🟫 Residential: Multifamily 900A
- 🟫 Restricted Service Zone

COMMERCIAL ZONING

- 🟪 Neighborhood Commercial
- 🟦 Business Commercial
- 🟥 Community Commercial
- 🟪 Downtown Commercial
- ⬜ Business Park
- 🟪 Institutional Campus
- 🟥 Highway Commercial
- 🟥 Pacific Ridge Commercial
- 🟥 Transit Commercial
- 🟧 Woodmont Commercial

CITY OF NORMANDY PARK ZONING

- 🟨 LOW DENSITY SINGLE FAMILY RESIDENTIAL R-15

KING COUNTY WATER DISTRICT #54

WATER SYSTEM PLAN
FIGURE 1-3
ZONING

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CONSULTING ENGINEERS

CHAPTER 5

WATER USE EFFICIENCY PROGRAM

INTRODUCTION

The purpose of this chapter is to identify the District's conservation and water use efficiency requirements, evaluate past conservation efforts, and describe the District's water use efficiency plan for the next 10 years.

BACKGROUND

The Washington Legislature passed the Water Use Efficiency Act of 1989 (RCW 43.20.230), which directs the Department of Health (DOH) to develop procedures and guidelines relating to water use efficiency. In response to this mandate, the Department of Ecology (Ecology), the Washington Water Utilities Council, and DOH jointly published a document titled *Conservation Planning Requirements* (1994).

In 2003, the Municipal Water Supply – Efficiency Requirements Act (Municipal Water Law) was passed and amended RCW 90.03 to require additional conservation measures. The Municipal Water Law, among other things, directed DOH to develop the Water Use Efficiency Rule (WUE Rule), which is outlined in the *Water Use Efficiency Guidebook* and became effective January 22, 2007.

These documents provide guidelines and requirements regarding the development and implementation of conservation and efficiency programs for public water systems. Conservation and efficiency programs developed in compliance with these documents are required by DOH and by Ecology as part of a public water system water right application. Conservation must be evaluated and implemented as an alternate source of supply before state agencies approve applications for new or expanded water rights.

Conservation can be used effectively to help meet the increased demand for water. Conservation must be evaluated and implemented as an alternate source of supply before state agencies approve applications for new or expanded water rights. Public awareness and participation are necessary for the District to develop an active and beneficial conservation plan.

The third and most recent edition of the WUE Guidebook was released in January 2017. As an extension to the Conservation Planning Requirements, the WUE Rule sets more stringent requirements for public water purveyors. The WUE Rule is comprised of the following four sections:

1. Planning Requirements
2. Distribution System Leakage

3. Customer Goal Setting
4. Annual WUE Reporting

The following sections provide a discussion of each section, requirements, and the impact the WUE Rule has on the District.

WATER USE EFFICIENCY REQUIREMENTS

The *Water Use Efficiency Guidebook* establishes varying implementation and evaluation requirements for municipal water suppliers. The new requirements focus on the importance of measuring water usage and evaluating the effectiveness of the WUE program. Key elements of the rule and the District's progress in meeting the rule are summarized in Table 5-1.

TABLE 5-1

Summary of Water Use Efficiency Rule Requirements

Requirement	Deadline(1)	District Status
Begin Collecting production and consumption data	January 1, 2007	In Compliance
Install Production Meters	January 22, 2007	In Compliance
Include WUE program in planning documents	January 22, 2008	In Compliance
Set District WUE goals	July 1, 2008	In Compliance
Submit first annual WUE report	July 1, 2008	In Compliance
Submit service meter installation schedule	July 1, 2008	In Compliance
Meet distribution leakage standard	July 1, 2010 (2)	In Compliance
Complete installation of all service meters	January 22, 2017	In Compliance

(1) Deadlines are for systems with less than 1,000 connections.
(2) Or 3 years after installing all service meters.

WATER METERS

Metering all production and consumption is critical for determining system wide and individual water use efficiency. Production meters on each source of supply are required to measure the amount entering the distribution system. Service meters on each connection are required to measure the amount being consumed by the customers. The distribution system leakage is calculated from the data collected by the meters.

As Table 5-1 indicates, the District is fully metered and in compliance with the WUE Rule requiring production and consumption meters on all supply sources and customer services, respectively. The District is in the process of replacing service meters to reduce DSL by more accurately accounting for water used by customers. This process includes replacing both residential meters as well as large meters on multi-family and commercial services. Since 2014, the District has upgraded approximately two-thirds of its service meters and plans on replacing the remaining one-third of meters by 2022.

DATA COLLECTION AND REPORTING

The WUE Rule requires regular collection of production and consumption data. Data must be reported in the District's planning documents and annual performance report to DOH. Water use data will be used for the following:

- Calculating leakage
- Forecasting demand for future water needs
- Identifying areas for more efficient water use
- Evaluating the success of your WUE program
- Describing water supply characteristics
- Aiding in decision making about water management

Table 5-2 summarizes the water use data collection requirements.

TABLE 5-2

Summary of Water Use Data Collection

Data Type	Includes
Source of Supply Meter Data	Monthly and annual totals of water produced, purchased from another water system, and/or supplied to other water systems through intertie.
Service Meter Data	Total annual water consumed, annual water consumed by each customer class.

These data are needed to meet the planning and performance reporting requirements and check compliance with the distribution system leakage standard of the WUE Rule.

The District meters all its sources. Water production is measured at each of the wells and recorded on a daily basis for each weekday. The District meters each of its customer connections. Customer meters are read every other month. Water production and consumption data is summarized in Chapter 2 of this Plan.

DISTRIBUTION SYSTEM LEAKAGE

The *Conservation Planning Requirements* set the maximum allowable rate of lost and unaccounted for water at 20 percent of total source production. The WUE Rule requires that distribution systems have a leakage rate less than 10 percent of finished water production based on a 3-year rolling average. Distribution system leakage (DSL) is defined as the difference between the volumes of production by sources and authorized consumption as measured by service meters plus any other credibly estimated usage.

As shown in Table 5-3 the District's current 3-year rolling average is 4.1 percent from 2012 to 2017, which meets the DOH requirements of less than 10 percent. In the *2008 Water System Plan*, the District's DSL was above the 10 percent maximum allowed by the WUE rule. Service meter replacement appears to be reducing DSL.

TABLE 5-3

Distribution System Leakage

Year	Total Production (MG)	Authorized Consumption[1] (MG)	Distribution System Leakage		
			(MG)	(%)	3-Year Rolling Average
2012	121.1	113.6	7.5	6.2%	-
2013	120.5	115.0	5.5	4.6%	-
2014[2]	97.5	117.8	-	-	-
2015	123.4	120.7	2.7	2.2%	4.3%
2016	120.4	116.2	4.2	3.5%	3.4%
2017	120.9	112.9	8.0	6.6%	4.1%

(1) See Table 2-7.
(2) There were several Well 6 source meter issues in 2014, the total annual production was under recorded. Therefore, the 2014 data will not be used in analyses.

DEMAND FORECASTING

Demand forecasting is an essential element of planning. It provides a basis for comparison for growth and usage, and also helps in scheduling system improvements. For the purposes of the WUE Rule, forecasting is used in goal setting and measuring the success of the WUE program.

Complete retail service area population and demand forecasts are provided in Table 2-16 of this Plan. A summary is included in Table 5-4 for the 10- and 20-year planning periods. These forecasts do not include anticipated reductions in use from conservation and efficient water use efforts. The District's consumption rate per ERU value of 160 gallons per day per ERU is not excessive and the DSL meets requirements.

TABLE 5-4

Population and Demand Projections

Year	Population	Average Day Production (gpd)	Maximum Day Production (gpd)	Peak Hour Production (gpm)	ERUs
2018	5,369	354,374	744,128	904	2,215
2029	5,629	371,520	780,192	948	2,322
2039	5,962	393,508	826,366	1,004	2,459

WATER USE EFFICIENCY PROGRAM AND GOALS

Under the WUE Rule, the District must develop a water use efficiency program as part of its planning documents. This program includes several elements, such as evaluating past conservation efforts, evaluating distribution system leakage, setting water use efficiency goals and evaluating and implementing measures to meet these goals, and several more.

The District must set water use efficiency goals and measure progress each year toward meeting these goals. Goals must include a measurable outcome, address supply or demand characteristics, and include an implementation schedule. The District must also evaluate or implement efficiency measures to help meet these goals.

These elements are described in the following sections.

WATER CONSERVATION PROGRAM

The District’s past water conservation program was established in the August 2011 Water System Plan. This document identified water conservation as an important goal for the District and its customers.

Under the WUE Rule, the District’s governing board must set water use efficiency goals and measure progress each year toward meeting these goals. Goals must include a measurable outcome, address water supply or demand characteristics, and include an implementation schedule. The District must also evaluate or implement efficiency measures to help meet these goals.

WUE Goals

The first WUE Rule established by the District was to reduce DSL to less than 10 percent. At the time of the 2011 Water System Plan the three-year running average DSL for the period 2007 through 2009 was 14.1 percent. The District has replaced the majority of the meters and through that process has seen water sales increase and DSL drop to 4 percent. The older meters were likely under reading and thus causing a high DSL. The District’s goal is to maintain a DSL of less than 7 percent.

The District's second goal is to reduce the average level of per capita residential water production. The average per capita water production for the years 2004-2009 was79 gpcd. That production has decreased is now averaging 66 gpcd. The District goal is to reduce the water use per capita to 60 gpcd by 2028. Water Use Efficiency measures to accomplish to reduction goal are presented below.

WUE Measures

The WUE Rule requires the evaluation or implementation of water use efficiency measures to help meet the WUE goals. The *WUE Guidebook* states several measures that must be implemented or evaluated and provides a list of measures that can be counted as supplemental measures in the WUE Program. WAC 246-290-810 identifies the minimum number of water use efficiency measures that must be evaluated based on system size. The District currently serves 755 connections and therefore must evaluate or implement four supplementary water use efficiency measure. The following sections describe both the mandatory and supplementary water use efficiency measures evaluated and indicate which have been or will be implemented by the District.

Implement Source and Service Metering and Meter Calibration (Mandatory)

As stated previously, the District meters all sources, all residential services and all commercial services. The District will also continue to calibrate source meters as scheduled and service meters as needed.

Water Loss Control (DSL)

The District tracks water use by month and annually. If the DSL increases passed the 7 percent goal the District will contract with a leak detection service.

Implement Customer Education

The District educates customers about efficient water use by providing information in the annual newsletter. The newsletter informs customers of ways they can reduce their water demands and also educate customers of the ways the District is working to improve system efficiency. The District will continue to distribute water use efficiency information to its customers annually.

Evaluate Conservation Rate Structure

The Water Use Efficiency Rule requires evaluation of a rate structure that encourages conservation as a mandatory measure. Implementation of a conservation rate structure counts as a supplementary measure. The District's current rate structure, shown in Tables 5-5 and 5-6, is set up to encourage conservation. The District classifies its customers into residential, multi-family and non-residential classes. The District's current rate structure includes a base charge with a seasonally variable per unit rate that is higher in the summer to discourage excess consumption during peak demands. The seasonal rate applies to all three customer classes and as such the implementation of a conservation rate structure counts as three supplementary measures.

TABLE 5-5

Monthly Rates – Effective January 2019

Customer Class	Meter Size	Base Rate	Per Billing Cycle	Capital Facility Charge
Residential	5/8" or 3/4"	$13.90	$27.80	$6.50
	1"	$14.40	$28.80	$10.50
Multi-Family (Per Unit)	Varies	$13.90	$27.80	Varies(1)
Non-Residential	5/8" or 3/4"	$37.04	$74.08	$10.50
	1"	$38.41	$76.82	$18.00
	1-1/2"	$62.84	$125.68	$35.00
	2"	$110.75	$221.50	$56.00
	3"	$199.20	$398.40	$112.00
	4"	$371.19	$742.58	$175.00
	6"	$739.74	$1,479.48	$350.00
	8"	$1,231.14	$2,462.28	

(1) Depends on meter size.

TABLE 5-6

Seasonal Water Rates – Effective January 2011

Consumption Rate	Dates	Rate per 100 Cubic Feet
Summer Water Rates	5/1 through 10/31	$4.10
Winter Water Rates	11/1 through 4/30	$3.80

Notifying Customers about Leaks on Their Properties

The District monitors customer’s accounts for abnormally high consumption indicating a potential leak. If a leak is suspected, a door hanger is used to notify the customer of the potential leak. If the District has the phone number or email on record, staff will attempt to contact the occupant in person. Currently District staff reads meters once every 2 months. Leaks or high usage are discovered at the time of meter reads. More frequent meter reads will catch abnormal use on a more frequent basis.

Meter Replacement

The District is in the process of replacing service meters with radio read meters to reduce DSL by more accurately accounting for water used by customers. This process includes replacing both residential meters as well as large meters on multi-family and commercial services. The District has seen its DSL drop as the meter replacement program has progressed.

Summary of Measures

The WUE Rule requires municipal water systems of the District's size to implement four supplementary measures. The District's water use efficiency measures are listed in Table 5-7. As indicated, the District is implementing nine additional measures, meeting the requirement.

TABLE 5-7

Water Use Efficiency Supplementary Measures

Implemented Measure	Included Customer Classes
Conservation Rate Structure	3
Customer Education	3
Total Supplementary Measures	**9**

EVALUATING WUE EFFECTIVENESS

The District plans to evaluate the effectiveness of its WUE efforts by:

- Estimating DSL on a monthly basis. The new meters allow meter reads in 1 day and thus a monthly estimation of DSL is possible.

- The District will also calculate the demand per ERU on an annual basis to evaluate the efficacy of the rate structure and education on the reduction of water use.

CHAPTER 6

WELLHEAD PROTECTION PROGRAM

The District completed a Wellhead Protection Plan in 2004, prepared by Hedges Engineering and Robinson & Noble, Inc. The 2004 Wellhead Protection Plan includes a hydrogeologic assessment of the area, delineation of a wellhead protection area (WHPA) for each of the District's wells, an updated inventory of potential sources of contaminants within the protection area and contingency plans for potential contamination problems. The wellhead protection area was delineated using analytical modeling and hydrogeologic mapping. The potential contaminant source inventory update was completed through review of Ecology and EPA databases and a windshield survey of the area. This Chapter includes a summary of the findings of the 2004 Wellhead Protection Plan which is attached in Appendix K.

WELLHEAD PROTECTION AREA DELINEATION

The hydrogeology of the vicinity of the District wells was created by repeated glaciation of the Puget Sound area. The District's wells are completed into two aquifers. Three of the wells (Wells 4, 6, and 7) have a screened interval of 320 to 340 feet in what is referred to as the "deep aquifer." The other well (Well 5) has a screened interval of 213 to 239 feet in what is referred to as the "shallow aquifer."

The wellhead protection area varies depending upon the hydrogeologic characteristics of the aquifers. Hydrogeologic characteristics include groundwater gradient, aquifer transmissivity, aquifer thickness and well discharge. WHPAs are primarily based on time of travel capture zones. Capture zones are defined for time of travel periods of 6 month and 1, 5 and 10 years. The 2004 Wellhead Protection Plan delineated a wellhead protection area based as shown in Figures 5 and 6 of the attached report. Generally, the wells pull water from the area northeast of the wellfield, though there is some potential contribution from areas nearer the Puget Sound for the deep aquifer.

INVENTORY OF POTENTIAL CONTAMINANT SOURCES

An essential element of wellhead protection is an inventory of all potential sources of groundwater contamination in and around the delineated wellhead protection areas. The purpose of the inventory is to identify past, present, and proposed activities that may pose a threat to the well, spring, or surrounding area. For the inventory to be effective a full accounting of all known and potential sources of contamination within the zones must be conducted and the information accurately mapped. An accurate description of inventory data sources is required by WAC 246-290-135.

POTENTIAL CONTAMINANT SOURCES

Within a wellhead protection zone, there are many diverse activities that may contaminate an aquifer thereby jeopardizing the water supply. It is important that these activities are properly inventoried and, if necessary, regulated to prevent degradation of the groundwater supply. The District's wellhead protection zones extend from SeaTac Airport in the North to the community of Midway in the south. The eastern edge of the zones extends to Interstate 5 and the western edge extends into Puget Sound for the deep aquifer and within 1/2 mile for the shallow aquifer. This area incorporates many different residential, commercial and industrial land use areas and many potential contaminant sources.

Underground Storage Tanks

Underground storage tanks (USTs) and leaking underground storage tanks (LUSTs) are a major threat to groundwater quality. Petroleum products, which may contain impurities that are mobile in the groundwater system are the most commonly stored substances in USTs. The EPA estimates that 35 percent of all USTs could be leaking. The most common causes of leaks are structural failure, corrosion, improper fittings, and improper installation. Ecology regulates underground storage tanks in Washington State under WAC 173-360. The regulations require that owners and operators of underground storage tanks comply with the following sections of the regulations:

- Notification, reporting, and record keeping
- Performance standards and operating closure requirements
- Registration and licensing
- Financial responsibility

The WAC allows a number of exemptions including tanks whose capacity is 110 gallons or less, farm and residential tanks with less than 1,100 gallons, heating oil less than 1,100 gallons per premises, and septic tanks. The homes within the wellhead protection zone, if heated with oil, likely have underground tanks that are exempt. The 2004 Wellhead Protection Plan identifies a small number of homes with heating oil tanks. Additionally, the 2004 WHPP identifies fuel storage tanks at service stations as well as at SeaTac airport as potential contaminant sources.

Septic Systems

King County is responsible for regulating and permitting residential on-site sewage disposal systems within the county. Contaminants associated with septic tank effluent include pathogenic organisms, toxic substances, and nitrogen compounds. Ammonia and nitrate nitrogen are highly soluble in water. There are several areas within the WHPA that are unsewered and on septic tanks. The 2004 Wellhead Protection Plan found that these areas were small in comparison with the protection areas and that potential contamination from septic systems would be diluted before entering the District wells.

Accidental Spills

Accidental spills or releases of contaminants can potentially impact groundwater supplies. Potential sources of spills and leaks include underground storage tanks, accidents and poor disposal practices. The most likely source for accidental spills is along Interstate 5, Pacific Highway South and other major highway corridors which run through the District's WHPA.

Landfills

A landfill is a disposal facility in which solid waste is permanently placed. Landfills are regulated by the Washington State Department of Ecology under WAC 173-304, Minimum Functional Standards for Solid Waste Handling. These regulations set siting and closure criteria, performance standards, and operating requirements for landfills. The regulations are highly restrictive in that a proposed landfill site must meet a series of "fatal flaw" tests. A wellhead protection would qualify as a fatal flaw, thereby prohibiting the construction of a new landfill.

Past landfill practices were not so restrictive. Abandoned and improperly maintained landfills and dump sites are often a major source of groundwater contamination. Leachate from landfills poses a threat to groundwater quality should it migrate to the water table. The Department of Ecology is responsible for mitigating dump site cleanup when potentially hazardous leachates are present.

The now closed SeaTac Disposal Industrial Waste Facility is located within the District's WHPA.

Stormwater

Storm water can contain many chemicals, which are derived from road runoff. These include: heavy metals such as lead and zinc, oils and grease, pathogens and nutrients. Typically, the concerns regarding storm water are related to the impacts on surface water. However, groundwater can also be adversely impacted by stormwater.

Wastewater Treatment Plants

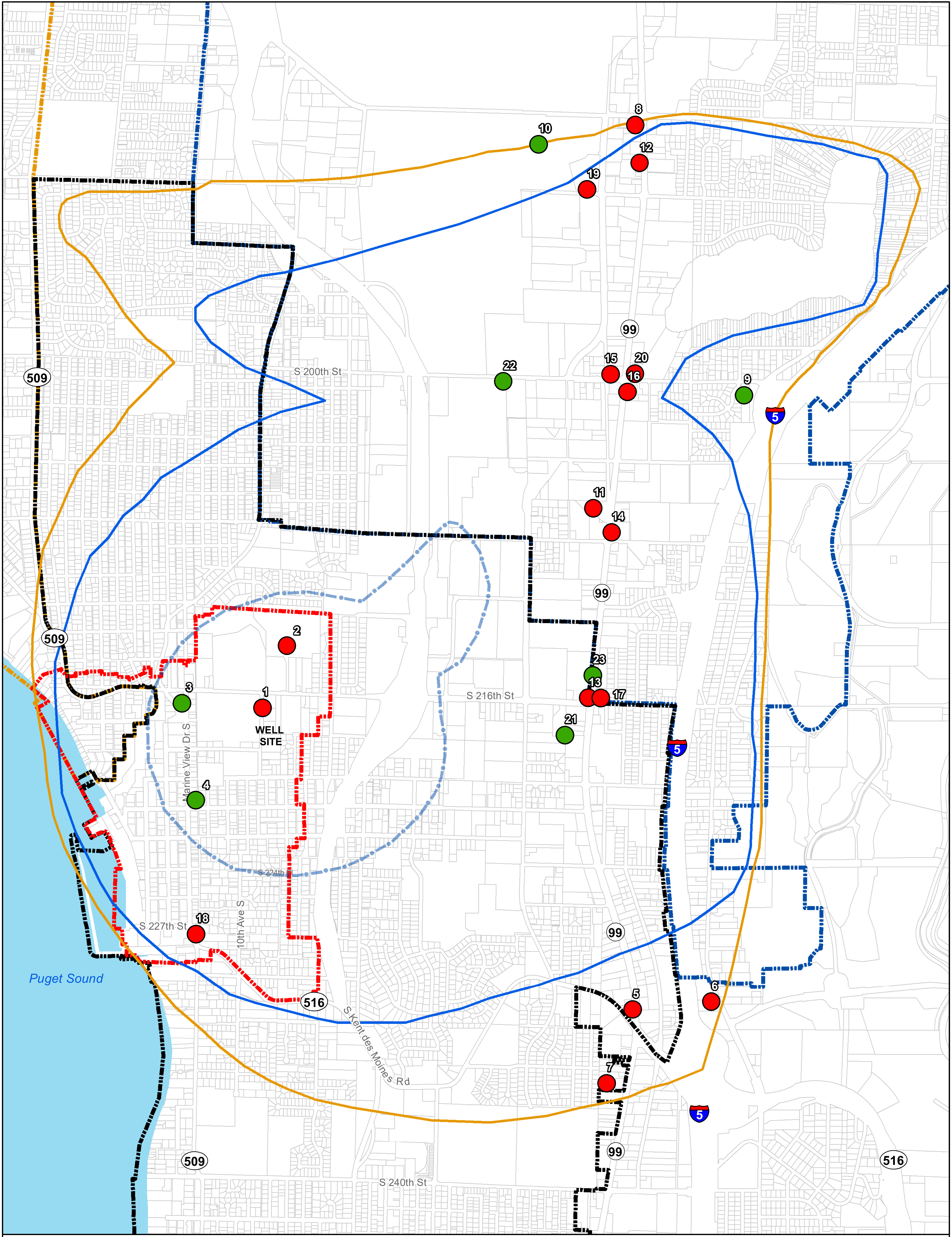
Wastewater treatment plants are a potential source of contamination if sewage is spilled or leaks into the surrounding area. Midway Sewer District's wastewater treatment plant is located within the 6-month WHPA for the wells. The 2004 Wellhead Protection Plan identified that the treatment plant has no recorded violations for contamination.

POTENTIAL CONTAMINANT SOURCE INVENTORY

A review of potential contaminant sources was completed for this Water System Plan by reviewing the District's wellhead protection plan and accessing the "Fortress" database maintained by the Department of Ecology.

The Wellhead Protection plan (Robinson & Noble, Inc. 2004) was used to identify the 1-, 5-, and 10-year protection zone. The District has wells in both the upper aquifer (Well 5) and the lower aquifer (Wells 6 and 7). The attached figure shows the combined 1-year protection zone for both aquifers.

The Ecology database was used to identify the sites that may have an adverse environmental impact. Those sites that are within the 10-year travel time (protection zone) are shown. Twenty three sites were identified, Table 6-1 and Figure 6-1. The District should contact each property owner within the wellhead protection area and remind them of the importance of their role in helping to maintain groundwater quality by properly disposing of all waste products.



Legend

- 🔴 Leaking Underground Storage Tank
- 🟢 Underground Storage Tank
- ▭ 1 Year WHPA
- ▭ 5 Year Boundary
- ▭ 10 Year Boundary
- ▭ DISTRICT BOUNDARY
- ▭ DES MOINES CITY LIMITS
- ▭ SEATAC CITY LIMITS
- ▭ NORMANDY PARK CITY LIMITS

N

0 750 1,500 3,000 Feet

KING COUNTY WATER DISTRICT #54

WATER SYSTEM PLAN
FIGURE 6-1
INVENTORY OF POTENTIAL
CONTAMINANT SITES

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\Kcwd54\18422 - WSP\GIS\MXDs\Tank Inventory.mxd

TABLE 6-1

Possible Contaminant Source Inventory

No.	Site Name	LUST Status	Status Date	Address	City	Contaminant Name	Boundary
1	Des Moines City Public Works	LUST - Cleanup Started	1995-06-01	21650 11th Avenue South	Des Moines	Petroleum-Other	1 Year
2	Midway Sewer Treatment Plant	LUST - NFA	-	-	Des Moines		1 Year
3	EZ MART	Operational		21620 Marine View Drive	Des Moines		1 Year
4	Union 76	Operational		22026 Marine View Drive	Des Moines		1 Year
5	Midway Texaco	LUST - Cleanup Started	1995-06-01	23031 Pacific Hwy. South	Des Moines	Benzene	10 Year
6	VALLEY I5	LUST - NFA	2006-11-16	23051 Military Road South	Kent	Benzene	10 Year
7	Southgate Oil	LUST - Cleanup Started	2000-10-14	23428 Pacific Hwy. South	Kent	Petroleum-Diesel	10 Year
8	Exxon 73287	LUST - Cleanup Started	1995-06-01	2841 South 188th	SeaTac	Benzene	10 Year
9	INTERSTATE 5 76	Operational		20619 Military Road South	SeaTac		10 Year
10	Port of Seattle, SEA-TAC Airport	Operational		2350 South 190th Street	Seattle		10 Year
11	Alamo Rent A Car Inc	LUST - Cleanup Started	2011-04-12	20636 Pacific Hwy. South	Seattle	Benzene	5 Year
12	Retail Building	LUST - Awaiting Cleanup	2000-02-28	19019-19023 Pacific Hwy. South	Seattle	Petroleum-Other	5 Year
13	Sunmart 1	LUST - Cleanup Started	1995-06-01	21449 Pacific Hwy. South	Des Moines	Benzene	5 Year
14	Unocal 3965	LUST - Cleanup Started	2004-12-15	20658 Pacific Hwy. South	Seattle	Benzene	5 Year
15	Chevron 94411	LUST - NFA	2000-06-05	19923 Pacific Hwy. South	Seattle	Petroleum-Other	5 Year
16	U-Haul Pac Hwy S	LUST - Cleanup Started	2013-02-07	20024 Pacific Hwy. South	Seattle	Petroleum-Gasoline	5 Year
17	7-Eleven 21776	LUST - Cleanup Started	1998-03-11	21454 Pacific Hwy. South	SeaTac	Benzene	5 Year
18	Brown Bear Car Wash	LUST - Cleanup Started	1995-06-01	22706 Marine View Drive	Des Moines	Benzene	5 Year
19	SEATAC Alaska Airlines RAD Bldg-1995	LUST - Cleanup Started	2011-07-01	2651 South 192nd Street	Seattle	Petroleum-Gasoline	5 Year
20	BP 11255	LUST - Cleanup Started	1995-06-01	19924 International Blvd.	SeaTac	Benzene	5 Year
21	7-ELEVEN 2307-27742A	Operational		20008 Pacific Hwy. South	SeaTac		5 Year
22	Federal Bureau of Prisons	Operational		2425 South 200th Street	SeaTac		5 Year
23	Safeway Fuel 3540	Operational		21409 International Blvd.	Des Moines		5 Year

SPILL RESPONSE

Spill response planning is an important aspect of both an emergency management plan and a wellhead protection program. Coordination of local emergency response organizations is important in the development of spill response program. In order to be accepted by local emergency responders, spill response procedures for wellhead protection areas should be realistic and easily implemented.

The first responder to a spill would likely be South King Fire & Rescue (SKF&R) as the District's WHPA is within their service area. SKF&R has hazardous materials spill containment capabilities. Their efforts would include containment of spill, sealing of the area and notifying other appropriate agencies, most likely the Department of Ecology and the Washington State Patrol. If surface waters are impacted the Coast Guard will be notified.

- **Washington State Patrol**
  The Washington State Patrol is the "Incident Command Agency" for all spills. If a spill occurs, they will coordinate initial response and containment efforts.

- **Department of Ecology (Ecology)**
  Ecology's Spill Response Team is responsible for determining the source and cause of the release and the responsible party. If the responsible party is unknown, Ecology will investigate to determine who is responsible and ensure that containment, clean up, and disposal proceedings begin. Additionally, Ecology is the first responder to accidental spills of hazardous materials on roadways. They have a 24-hour on call HAZMAT team should a spill occur.

- **King County**
  The King County Department of Emergency Management has on call hazardous materials response teams.

Organizations involved in the storage and transport of hazardous substances have also been required to develop spill response plans. In addition, cleanup contractors are on call 24 hours a day to respond to spills.

CONTINGENCY PLANNING

Contingency planning is an important component of a wellhead protection program, however, planning alone cannot account for unanticipated incidents. A worst case scenario would be a contamination event, which would render the sources unusable. The District's wells are completed into two different aquifers. An event that contaminates the shallow aquifer may not impact the deep aquifer quickly. The District also has an emergency intertie with Highline Water District. This intertie is capable of providing

3,500 gpm under emergency fire flow conditions. If the District's source of supply was rendered unusable this intertie would be able to provide supply to the District.

SUMMARY AND RECOMMENDATIONS

In accordance with the requirements of the Washington State Department of Health, a wellhead protection program has been prepared. A hydrogeologic framework was developed to estimate the wellhead protection area. Wellhead protection areas were identified for both aquifers for the 6-month, 1-, 5-, and 10-year periods. An inventory of potential contamination sources within the WHPA was developed. The 2004 Wellhead Protection Plan identifies 158 potential contaminate sources within the WHPA. A hazardous materials spill or leaking underground tanks could pose a threat to the source water quality. Property owners within the wellhead protection area should be made aware that if they have underground tanks they should be vigilant to prevent leaks or take corrective action quickly should leaks occur.

CHAPTER 7

OPERATION AND MAINTENANCE

INTRODUCTION

There are two primary objectives for this chapter. The first is to provide documentation of satisfactory water system management operations in accordance with WAC 246-290-100 and 246-290-415. The second is to provide a comprehensive reference of system components, procedures and programs to assist the District in its operations, training, and planning activities. In addition to this chapter the District has developed a stand-alone Emergency Response Plan which is presented in Appendix L.

ORGANIZATION

The District is governed by a three-member Board of Commissioners. The Board appoints a superintendant who is responsible for day-to-day operations and management of the District. The current superintendant is Mr. Eric Clarke. The District has a total of three full-time employees. Routine operations and maintenance tasks for District employees include: water meter replacement and water meter reading; water quality monitoring; water main inspections and repair; water main flushing; control valve service and repair; system valve maintenance and repair; booster station maintenance and repair; reservoir inspection and maintenance; fire hydrant maintenance, testing and repair; meter reading; water meter testing, repair and replacement.

CERTIFICATION REQUIREMENTS

Water Works Operator Certification, required under WAC 246-292-060, mandates Group A community water systems retain in their employment individuals who are certified, by examination, as competent in water supply operation and management. The Washington State Department of Health (DOH) determines the required level and number of certified positions based on the population and complexity of the water system. The public water system classification provided in WAC 246-292-040 is listed in Table 7-1.

TABLE 7-1

Water System Classification

Classification	Population Served
Group S	Less than 251
Group 1	251 - 1,500
Group 2	1,501 – 15,000
Group 3	15,001 – 50,000
Group 4	greater than 50,000

The District water system has an approximate service area population of 5,000 and is classified as a Group 2 public water system. Under the current certification requirements, the District must have on staff a Water Distribution Manager (WDM) Level 2.

Table 7-2 lists the District's water system personnel certifications. The District has a mutual aid agreement with the Highline Water District to provide assistance to the District if needed.

TABLE 7-2

Water System Personnel Certifications

Name	Title	Water Distribution Manager (WDM)	Operator Certification Number	Cross-connection Control Specialist (CCS)
Eric Clarke	Superintendent	3	004564	Yes

PROFESSIONAL GROWTH REQUIREMENTS

In order to promote and maintain expertise for the various grades of operator certification, Washington State requires that all certified operators complete not less than three Continuing Education Units (CEU) within each 3-year period. Programs sponsored by both Washington Environmental Training and Resource Center (WETRC) and the American Waterworks Association (AWWA) Pacific Northwest Subsection are the most popular source of CEUs for certified operators in Washington State. All operators have acquired, or will acquire, the proper number of CEUs for recertification.

Besides providing CEUs, operator training is an important component in maintaining a safe and reliable water system. At a minimum, all personnel performing water system related duties should receive training in the following areas:

- Confined spaces
- Trenching and shoring
- Flagging and Traffic control
- Asbestos cement pipe safety
- Cross-Connection control
- First Aid and CPR

The District supports the efforts of its employees to acquire and maintain state certification and to increase professional knowledge.

Employees are required to retake a variety of safety related courses. These include defensive driving, hazardous materials, first aid/CPR, blood borne pathogens, and flagging/traffic control. Annually, each field employee receives training for work in confined spaces.

NORMAL SYSTEM OPERATION

The District's four wells, two reservoirs and booster pump station are all located on one site and operate together to provide source of supply and storage. The District's booster pump station (BPS) transfers water from the lower reservoir to the elevated reservoir, or directly to the distribution system during periods of abnormally high demand. The elevated reservoir maintains system pressure.

All wells discharge into the Lower Reservoir under normal conditions. If needed Wells 5 and 6 may be discharged to the elevated reservoir. The set points for operating the wells are between a low of 18.5 feet and a high water of 20.5 feet (depth of water), in the lower reservoir. The District regularly adjusts the assignment of set point for Wells 5, 6 and 7 in order to balance wear and usage.

The District booster pump station is equipped with three low-flow pumps, three high-flow pumps and a telemetry control system. The pumps are supplied by a 16-inch inlet pipe from the lower reservoir. Two of the low-flow pumps have a capacity of 250 gpm. The capacity of the intermediate pump is 440 gpm. The low flow pumps discharge into a common header that discharges to the Elevated Reservoir. The low-flow pumps are set to operate in sequence based on the water level in the Upper Reservoir.

The three high-flow pumps each have a capacity of 1,750 gpm. The BPS uses up to two high-flow pumps to convey water directly to the distribution system through a 12-inch outlet line. The lead and lag high-flow pumps are set to operate in sequence based on the level of the upper reservoir. The high-flow pumps are called to service only when the three low-flow pumps cannot meet the system demands and the upper reservoir drops below the 24-foot level. The third high flow pump is considered a redundant pump, and will be called if one of the other pumps fails. The BPS pumping set points are presented in Table 7-3.

TABLE 7-3

Booster Station Pump Set Points

Pump	Controlling Reservoir	Pump On Set-Point Height Above Bottom[(1)] of Reservoir	Pump Off Set-Point Height Above Bottom of Reservoir
LF-1	Upper Reservoir	28.6	29.7
LF-2	Upper Reservoir	28.5	29.5
LF-3	Upper Reservoir	28.1	28.5
HF-1[(2)]	Upper Reservoir	24	26.7
HF-2[(2)]	Upper Reservoir	23.9	25.8
HF-3	Upper Reservoir	Redundant Pump	N/A

(1) Bottom of elevated storage volume is at elevation 232.3 (NAVD 88) (228.8 1929 Datum).

(2) High-Flow pump set points have been altered from original design.

ROUTINE AND PREVENTIVE MAINTENANCE

Planning for present and future maintenance of the water system facilities is an important task. The role of maintenance is to preserve the value of the physical infrastructure and ensure that the District can continue to provide a safe and reliable water supply. The most cost-effective method for maintaining a water system is a preventive maintenance (PM) program. Through a planned PM program, the optimum level of maintenance activities can be provided for the least total maintenance cost. The PM program involves defining the tasks to be performed, scheduling the frequency of each task, and then providing the staff necessary to perform the tasks.

Each water system facility is inspected frequently to verify that each component is operating properly. Table 7-4 indicates the frequency at which the District visits, checks or provides maintenance at each of its facilities. During each visit, the site is also checked for damage, vandalism, and intrusion.

TABLE 7-4

Routine Inspection and Maintenance Schedule

Facility	Schedule
Wells	• Visit daily (working days), record pumped volumes, pump run time and well levels in daily well log report. • Well pumps balanced annually.
Valve Exercising	• Locate and operate all water system valves biannually.
Hydrant Operation	• Operate and flow each hydrant annually.
Hydrant Maintenance	• Inspection and repair of water system hydrants. Performed when time is available or when a hydrant fails to operate properly.
Blow-Off/Flushing	• Operate and flush all blow-offs and hydrants on dead-end water mains annually, or as needed to maintain water quality. The District maintains a unidirectional flushing program on a semi-annual basis.
Reservoirs	• Visit daily, record reservoir levels in daily well log report, and check security and site condition. • 5-year interior inspection of each reservoir with cleaning and recoating performed as needed.
Booster Station	• Visit daily and record pump run times in the daily well log report.
Pressure Reducing Valve/Intertie	• Annual inspection and testing of PRV. Valve is rebuilt every five years
Air Relief Valve Maintenance	• Annual inspection of air relief valves in water system.

TELEMETRY AND SCADA SYSTEM

The Telemetry system is monitored regularly to ensure that it is operating correctly. The District's SCADA system monitors and keeps records of many water system parameters including errors and faults in equipment.

SOURCES

All source meters are read daily Monday through Friday. Total flow readings are taken and checked against values obtained through the SCADA system.

STORAGE FACILITIES

An operator visually inspects each reservoir each workday looking for abnormal conditions and evidence of unauthorized entry or vandalism. Reservoir levels are recorded daily. On a quarterly basis, staff thoroughly inspect screens, vents, and exterior surfaces of all reservoirs. The interior of the reservoirs is inspected and cleaned every 5 years or as needed. The interior of both reservoirs were last cleaned in July of 2016. The exterior of the upper reservoir was repainted in 2016.

Gray & Osborne completed an inspection of the upper reservoir in January 2015. The inspection found significant rusting and some corrosion on the inside of the reservoir. The reservoir does not meet current seismic code.

BOOSTER STATIONS

An operator visually inspects the booster station each workday looking for abnormal conditions and evidence of unauthorized entry or vandalism. The inspection includes a check for leaks, excessive vibration, sound, heat and flow rate.

DISTRIBUTION SYSTEM FACILITIES

The District completes maintenance on its distribution facilities in accordance with that outlined in Table 7-4. In addition, if a hydrant is found to be inoperable it is “bagged” and fixed as soon as possible.

The District reads customer meters every other month and replaces malfunctioning meters as needed.

WATER QUALITY

The District collects six routine coliform samples each month. The Coliform Monitoring Plan (Appendix H) presents the sampling locations and protocol. As a result of the previously mentioned positive coliform tests the District installed Kupferle sample stations at all routine and repeat bacteriological test sites. Certified personnel from Water Management collect and analyse the routine bacteriological samples.

MAINTENANCE RECORD SYSTEM

Keeping accurate and up-to-date maintenance records is important for system evaluations and for scheduling preventive maintenance measures. The District maintains information on operation and maintenance procedures performed.

PREVENTIVE MAINTENANCE SCHEDULE

The District's regular preventive maintenance schedule is summarized in Table 7-4.

SPARE PARTS INVENTORY

The District maintains an inventory of parts and supplies, including the appurtenances needed to make emergency system repairs. Local contractors are available to perform more intensive repairs.

OPERATION AND MAINTENANCE MANUALS

In 2015 The District adopted a new Best Management protocol (Appendix M). The Best Management Practices Manual has been updated for this Water System Plan.

The Manual provides an overview of system facilities and their operation. Also discussed is standard procedures for water main repair and new water main installation. Working with WDOH the District developed a sampling plan which includes the normal coliform samples plus additional samples to allow for improved monitoring of the water system.

SAFETY PROCEDURES

An important consideration of any successful maintenance program is the safety of the employees. The District's safety program is in compliance with the Occupational Safety and Health Administration (OSHA) and the Washington State Department of Labor and Industries (WISHA) regulations. The scope of this Plan is not intended to document any form of OSHA or WISHA compliance. The safety program addresses the situations that employees may encounter during the performance of operation and maintenance tasks.

TRAFFIC HAZARDS

Traffic hazards are a frequently occurring safety issue for field employees. Water mains are typically located beneath existing road right-of-way, requiring staff to work near moving traffic. When necessary a traffic control plan is developed and approved by the City of Des Moines prior to initiating the work.

CONFINED SPACES

Water system operation and maintenance staff must periodically enter vaults and empty reservoirs in the course of their duties. Many of these locations are classified as confined spaces due to their configuration and lack of ventilation. The principle hazards associated with confined spaces are oxygen deficiency, explosions, and toxic gases. The Washington State Department of Labor and Industries (L&I) has established regulations governing entrance into confined spaces in WAC 296-62-141. The regulations include the completion of a Confined Space Entry Permit, the establishment of Safe Operating Procedures, and the completion of a Confined Space Pre-Entry Checklist prior to entry into the confined space.

ELECTRICAL AND MECHANICAL EQUIPMENT

The presence of electrical and mechanical equipment at the wells and booster stations present hazards to personnel during the performance of operation and maintenance tasks. Precautions must be taken whenever working on or near booster station mechanical and electrical equipment.

Rubber mats should be placed on the floor in front of all electrical control panels and auxiliary generators. When working on any piece of electrical equipment, the operator should ensure that all switches are opened and tagged, all electrical equipment is grounded, and all exposed wire is taped. All portable power tools, extension cords, and lights should be of the three-wire grounding type.

Other safety precautions that should be observed by personnel are to avoid contact with energized circuits or rotating parts, to avoid bypassing or rendering inoperative any safeguards or protective devices, and to avoid extended exposure in close proximity to machinery with high noise levels.

FIRE HAZARDS

Fires are possible if debris is allowed to accumulate. Precautions should be taken to reduce the possibility of a fire. Oily rags should be kept in tightly sealed metal cans, preferably at a location away from the booster station. All areas should be kept free of clutter or debris, especially if flammable in nature. Gasoline, diesel, and other solvents are kept in fireproof cabinets and should only be used in well-ventilated areas, away from sources of ignition. A carbon dioxide type, dry chemical, or foam fire extinguisher should be permanently mounted at each booster station. The extinguisher should be tagged and checked annually to ensure its operational ability.

RECORD-KEEPING AND REPORTING

Record-keeping and reporting requirements are provided in WAC 246-290-480 for all systems.

CONSUMER CONFIDENCE REPORT (CCR)

The Consumer Confidence Report Rule requires community water system purveyors to prepare and distribute an annual report of water quality analyses to their customers. The District is required to submit the Consumer Confidence Report (CCR) to its customers before July 1 each year.

RECORD-KEEPING REQUIREMENTS

An important part of the water system comprehensive planning process is to evaluate the historical operational and water quality records of a water system. Table 7-5 provides a list of the required operation and water quality records and the minimum retention period for which the purveyor must keep them on file. All records of water quality samples taken by the District are kept on file according to WAC 246-290-480.

TABLE 7-5

Record-Keeping Requirements as defined in WAC 246-290-480

Record Type	Minimum Time Kept on File
Bacteriological	5 years
Turbidity	5 years
Chemical analysis	As long as system is operational
Daily source meter readings	10 years
Other operation and analysis records	3 years
Records of action taken to correct violations	3 years after the last corrective action taken
Records of public notification	3 years after the last corrective action taken
Copies of any written communication regarding sanitary surveys or special purpose investigations (SPI)	10 years after the completion of the sanitary survey or SPI
Project reports, construction documents, inspection reports and approvals	For the life of the facility

In addition to the water quality data in Table 7-5 Construction Completion Reports are kept for all approved construction projects, including water main extensions that are exempt from WDOH review.

REPORTING REQUIREMENTS

Purveyors are required to provide information regarding water quality violations to the DOH within 24 hours if any of the following incidents occur:

- Failure to comply with the primary MCL standards or treatment technique requirements under WAC 246-290.
- Failure to comply with the monitoring requirements of WAC 246-290.
- A violation of a primary MCL.

Additional reporting requirements outlined WAC 246-290 include submittal of monthly reports and other DOH requested forms.

NOTIFICATION PROCEDURES

A procedure for quickly notifying all staff, customers, other utilities, the local health department and DOH is a necessary component of the District's Operation and Maintenance Program. The Emergency Response Plan, adopted in 2015, presents a notification procedure Appendix L.

BACTERIOLOGICAL PRESENCE DETECTION PROCEDURE

Many public water systems will occasionally detect positive coliform samples, mainly as a result of minor contamination in distribution mains or sample taps, or improper bacteriological sampling procedures. However, the persistent detection of coliforms in the water supply, particularly E. coli or fecal bacteria, may require issuing a public boil water notice to ensure the health and safety of the water customers.

WAC 246-290-320 requires water utilities to follow specific procedures in the event coliform bacteria are detected in the water system. These procedures are outlined in Figure 7-1 and in the Emergency Response Plan.

IOC/VOC/SOC PRESENCE DETECTION PROCEDURE

When routine sampling indicates a violation of primary or secondary MCL, then the water purveyor must collect confirmation sample(s) and report the violation to DOH. If DOH determines the violation poses an acute health impact, the purveyor must provide notice of the violation to local radio and TV stations within 24 hours of the violation. If it is determined that the violation does not pose an acute risk, then the purveyor mails a notice to customers within 30 days or waits for a decision as to when the water system can return to service.

EMERGENCY PHONE NUMBERS

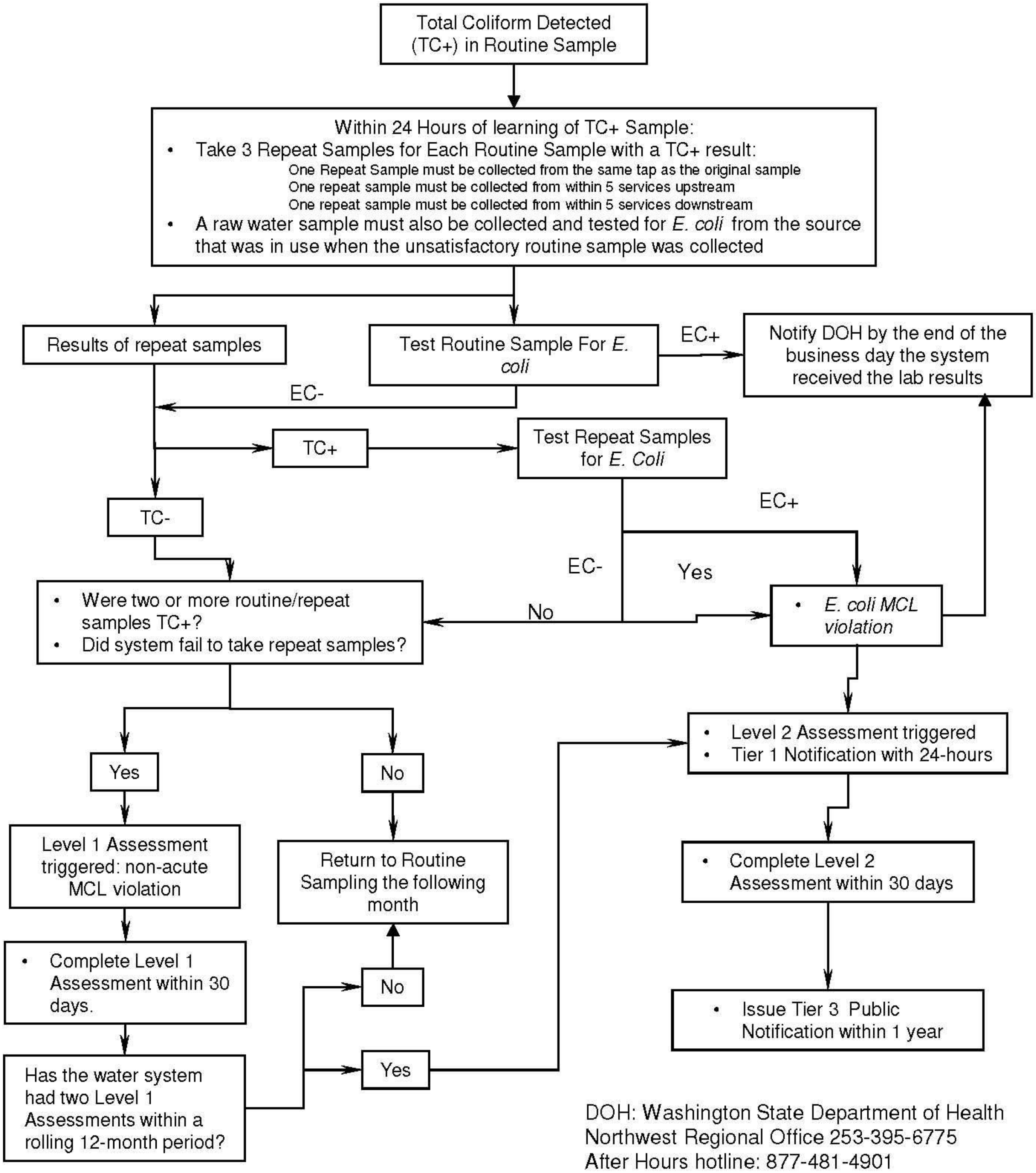
The District maintains a list of after-hours phone numbers for all staff members. A list of materials suppliers and agency contact information is also kept available.

PUBLIC NOTIFICATION

The District maintains a list of both television and radio resources that can be provided with news releases regarding an event requiring public notification during an emergency situation.

EMERGENCY RESPONSE

The District's emergency response plan provides guidelines for the general assessment of emergency situations, including those affecting the water system. The Emergency Response Plan reflects "lessons learned" from the 2013 E. coli event. Major lessons learned include an identification of the roles that each person should assume, consistent "messaging" to customers and field tasks must be completed efficiently and in a timely manner. The Emergency Response Plan is presented in Appendix L.



DOH: Washington State Department of Health
Northwest Regional Office 253-395-6775
After Hours hotline: 877-481-4901

FIGURE 7-1

Bacteriological Detection and Notification Chart

VULNERABILITY ANALYSIS

It is important to estimate the degree to which system facilities may be vulnerable to various types of emergency situations in order to identify system weaknesses. The following sections provide information regarding which facilities would be vulnerable to various types of emergency events and recommended actions that staff could take to help mitigate the problem.

Power Failure

Various types of impacts can cause loss of power. The effects of a power outage are mitigated by the use of an emergency generator at the wells site. The District's facilities are equipped with a 455 kW standby diesel generator and automatic transfer switch capable of running the District's wells, booster station and control systems.

Earthquake

A severe earthquake may have a substantial impact on the water system. Table 7-6 presents potential effects of a severe earthquake on the water system components.

TABLE 7-6

Emergency Response Considerations for an Earthquake

Water System Component	Potential Effects	Recommended Actions
Transmission and Distribution System	Transmission and distribution system mains may be broken and staff ability to respond limited.	Isolate broken sections as they are located. Repair as soon as possible.
Storage Facilities	Reservoirs may be leaking or structurally damaged.	Check each reservoir for structural damage, cracks, and leaks. Seal and drain as required.
Booster Stations	Booster stations may be structurally damaged or mechanical damage to pumps may have occurred.	Check booster stations and shut down pumps as required.

Severe Snowstorm

A severe snowstorm will limit motor vehicle traffic, including the ability of personnel to get to work and to complete rounds. Table 7-7 provides the emergency response procedures for a severe snowstorm.

TABLE 7-7

Emergency Response Considerations for a Severe Snowstorm

Water System Component	Potential Effects	Recommended Actions
Transmission and Distribution System	Transportation for making repairs may be limited.	• Keep chains and other snow gear for maintenance equipment on hand. • Keep valve locations current and available to maintenance personnel. • Contact City to expedite plowing of problem areas.
Storage Facilities	No immediate effect, snow may prevent access.	Clear snow from access roads.
Booster Stations	No immediate effect, snow may prevent access. Power may be lost.	Clear snow from access roads.

Fire

An extensive fire may result in low distribution system pressures and drawing down of the reservoirs. Table 7-8 presents the emergency response considerations for a fire.

TABLE 7-8

Emergency Response Considerations for a Major Fire Emergency

Water System Component	Potential Effects	Recommended Actions
Transmission and Distribution System	Low pressure may result in the extremities of the distribution system depending on the extent of the fire demand.	Coliform monitoring after fire in selected locations with known low pressures.
Storage Facilities	Drawdown will occur with increased demand.	Monitor reservoir levels.
Booster Stations	Additional pumps will be called on.	No action.

Flooding

Heavy snowmelt and/or rains have the potential to cause flooding and landslides in the water system. Table 7-9 presents the emergency response considerations for flooding.

TABLE 7-9

Emergency Response Considerations for Flooding

Water System Component	Potential Effects	Recommended Actions
Transmission and Distribution System	Transmission and distribution mains may be affected by landslides or high water levels. District staff transportation for monitoring system and making repairs may be limited.	Take more frequent bacteriological tests to assure water quality. Observe conditions at bridges and prepare to close off washed out pipes if necessary.
Storage Facilities	No immediate effect.	Monitor and Isolate
Booster Stations	No immediate effect.	Monitor and Isolate

Contamination of the Water Supply

Contamination of the water supply may occur due to such occurrences as main breaks or pollution from an isolated source. Table 7-10 presents the emergency response procedures for contamination of the water supply.

TABLE 7-10

Emergency Response Procedures for Contamination of the Water Supply

Water System Component	Recommended Actions
Transmission and Distribution System	Close valves as required to isolate the contaminated areas and source of contamination. Repair and/or otherwise remove source of contamination. Flush previously contaminated section and test until free of contamination prior to resumption of use.
Storage Facilities	Isolate contaminated reservoir from unaffected portions of the distribution system and decide on method of flushing the contaminant. Consider draining, cleaning, and disinfecting reservoir if water is determined to be unsuitable for consumption. Disinfect reservoir with chlorine in accordance with AWWA standards. Take bacteriological samples and return to service when results are satisfactory.
Booster Stations	Close valves as required to isolate the source of contamination. Repair and/or otherwise remove source of pollution. Flush previously contaminated section and test until free of contamination prior to resumption of use.

CROSS-CONNECTION CONTROL PROGRAM

The District has implemented a Cross-Connection Control Program as required by Washington State DOH in WAC 246-290-490. The District's Cross-Connection Control Program was established by District Resolution 2015-1. A copy of the District's Cross-Connection Control Program is included in Appendix N. The District is responsible for ensuring that all actual and potential cross connections in their service area are eliminated or protected by approved methods or devices.

A cross-connection is any physical arrangement where the potable water supply is connected, directly or indirectly, to any liquid of unknown or unsafe quality that may contaminate the public water supply through backflow. The regulation also requires utilities to develop and implement a comprehensive program to control cross-connections within the system. An acceptable cross-connection control program must address the following elements:

- Establishment of legal authority and program policies;
- Evaluation of premises for cross-connection hazards;
- Elimination and/or control of cross-connections;
- Provision of qualified personnel;
- Inspection and testing of backflow prevention assemblies;
- Quality control of testing process;
- Response to backflow incidents;
- Public education for consumers;
- Record keeping for CCC program.

In addition, other CCC program requirements are:

- Coordination with Local Administrative Authority (LAA), which is the county building or plumbing official regarding CCC activities;
- Prohibition of the return of used water into the public water system (PWS) distribution system; and
- Inclusion of a written CCC program into the Comprehensive Water System Plan.

The District sends reminders out to all owners of cross connection control devices in January that each device needs to tested, regardless of whether it is premise or facility isolation. If the testing results are not received by March the District sends out a second reminder. Fines are incurred starting in June for devices not tested.

NEW AND EXISTING CROSS-CONNECTION DEVICES

The District requires all new and expanding services to install a cross-connection control devices. The type of device is dependent upon the risk factor inherent with the process. Typically, isolation of the customer’s premises through a reduced pressure backflow assembly or a reduced pressure reduced pressure detector assembly is required. The District will assess the cross-connection risk during the application process. The District may then decide to allow a single family or duplex customer to connect directly to the system or to allow any other type of customer to use a double check valve assembly or double check detector assembly as a minimum for premise isolation.

The District currently monitors over 200 backflow prevention assemblies. Every January letters are sent to customers notifying them of their annual backflow assembly testing requirement. All notices are sent with a list of certified backflow assembly testers.

CROSS-CONNECTION CONTROL PROGRAM RECORDKEEPING

A critical program element is the maintenance of accurate records in support of an aggressive cross-connection control program. Testing results for each device are recorded at the District office.

CHAPTER 8

CONSTRUCTION STANDARDS

OBJECTIVE

The objective of this chapter is to document the District's design and construction standards to allow the District to obtain DOH approval to utilize the alternative review process for construction of new and replaced water distribution facilities. If a set of Construction Standards are in an approved Water System Plan, a purveyor needs no further approval from DOH for distribution project reports, construction documents, or installation of distribution reservoirs and storage tanks, booster pump facilities, transmission mains, distribution mains, pipe linings, and tank coatings. Source of supply facilities are not eligible for the alternative review process.

SYSTEM STANDARDS, POLICIES AND PROCEDURES

The District has developed construction standards, for improvements within the public right-of-way and/or easements, improvements required within the right-of-way, proposed right-of-way, or any improvements intended for maintenance by the District.

PROJECT REVIEW PROCEDURES

For water main construction or other system improvements, project reports and construction documents are submitted to the District for review and approval. Construction documents, which do not meet the standards, are returned for resubmittal if the deviation is significant, or returned with corrections noted if the deviation is minor. Construction may not proceed unless the District Engineer has stamped and signed the drawings "approved."

DESIGN AND CONSTRUCTION STANDARDS

Appendix I has copies of the water design and construction standards.

Any improvements not specifically covered by the District's Construction Standards must meet or exceed WSDOT's current version of its *Standard Specification for Road, Bridges, & Municipal Construction,* and any current amendments to said document. The *Standard Specifications* are regularly updated and those updates are assumed to be adopted by the District unless action is taken to the contrary.

CONSTRUCTION INSPECTION PROCEDURES

The District inspects all new projects during and after construction to ensure that the facilities are constructed in accordance with the construction standards. This inspection includes being present during pressure test procedures and, if applicable, disinfection procedures and water quality sampling procedures to ensure that all have been properly performed. As-builts of the final system are to be submitted for each project. Service will not be provided until all requirements are satisfied.

If a Construction Report is required for the project by WAC 246-290-040, the report is to be prepared by the developer for the new development and by the District engineer for other system improvements. New development Construction Reports are submitted to the District for review and approval. System Improvement Construction Reports are submitted to the Department of Health for review and approval.

Construction protocol is discussed in the District’s Best Management Practices presented in Appendix M.

CHAPTER 9

CAPITAL IMPROVEMENT PROGRAM

INTRODUCTION

This Chapter presents the 10-year and 20-year Capital Improvement Plans (CIP) in accordance with the requirements of WAC 246-290-100. Water system capital improvements have been scheduled and prioritized on the basis of water quality concerns, growth, regulatory requirements, component reliability, system benefit, and financial availability. For the proposed projects indentified in this Chapter, preliminary project cost estimates are presented in Appendix O. A water system base map illustrating the location of the proposed improvement projects is included as Figure 9-1.

Other capital improvement projects may arise in the future that are not identified as part of the District's CIP presented in this Chapter. Such projects may be deemed necessary for ensuring water quality, preserving emergency water supply, accommodating transportation improvements proposed by other agencies, or addressing unforeseen problems with the District's water system. Due to budgetary constraints, the construction of these projects may require that the proposed completion date for projects in the CIP be rescheduled. When new information becomes available, the District retains the flexibility to reschedule proposed projects and to expand or reduce the scope of the projects, as best determined by the District's Commissioners. Additionally, future planning efforts by the City of Des Moines or the City of Normandy Park may affect land use zoning and demand distributions within the District. Road work performed by these agencies may force the District to construct or relocate water mains. Future development may create streets or provide alignments and locations of facilities that are different than shown in the Plan. Each capital improvement project will be reevaluated to consider the most recent planning efforts as the proposed completion date for the project approaches.

PROPOSED IMPROVEMENTS YEAR 0 TO 10

P-1: 8TH AVENUE SOUTH (2019)

The District plans to install a new 8-inch water main under 8th Avenue South from South 233rd Street to South 227th Street 8-inch connections from 8th Avenue to the 12-inch water mains on South 225th Street and South 266th Street. This project is prioritized due to recent water main breaks and concerns regarding the integrity of the pipe. The project includes the installation of approximately 1,400 linear feet of 8-inch water main under 8th Avenue South and approximately 100 lineal feet of 8-inch water main under each of South 225th and South 226th. Services and hydrants will be replaced.

Estimated Project Cost $831,000

P-2: 11^TH AVENUE SOUTH

The District plans to replace an existing undersized 6-inch steel water main in the area of 11th Avenue South and South 220th Street. The area near this water main has received a relatively high volume of brown water complaints. This project will consist of an 8-inch ductile iron water main extending south on 11th Avenue South from South 220th Street to South 222nd Street, west on South 222nd Street to 10th Place South, south on 10th Place South to connect with the existing main on South 223rd Street, then continuing south on 11th Avenue South to South 224th Street, and east on South 224th Street to connect at 12th Avenue South. This project will install approximately 1,700 LF of 8-inch ductile iron water main.

Total Project Cost Estimate: $664,000

P-3: ELEVATED RESERVOIR

The District commissioned a report in 2014 to review the maintenance and structural upgrade needs of the elevated reservoir. The report concluded that the reservoir does not meet seismic code and that it needed to be recoated. As an alternative to rehabilitating the reservoir an option was to tear it down and purchase or rent the resulting storage deficit, approximately 150,000 gallons, from Highline Water District. The cost presented includes an assumed present value to rent storage for 20-years from Highline Water. The rental cost will need to be determined based upon a cost analysis study. This project will require specific DOH approval.

Total Project Cost Estimate: $1,033,000

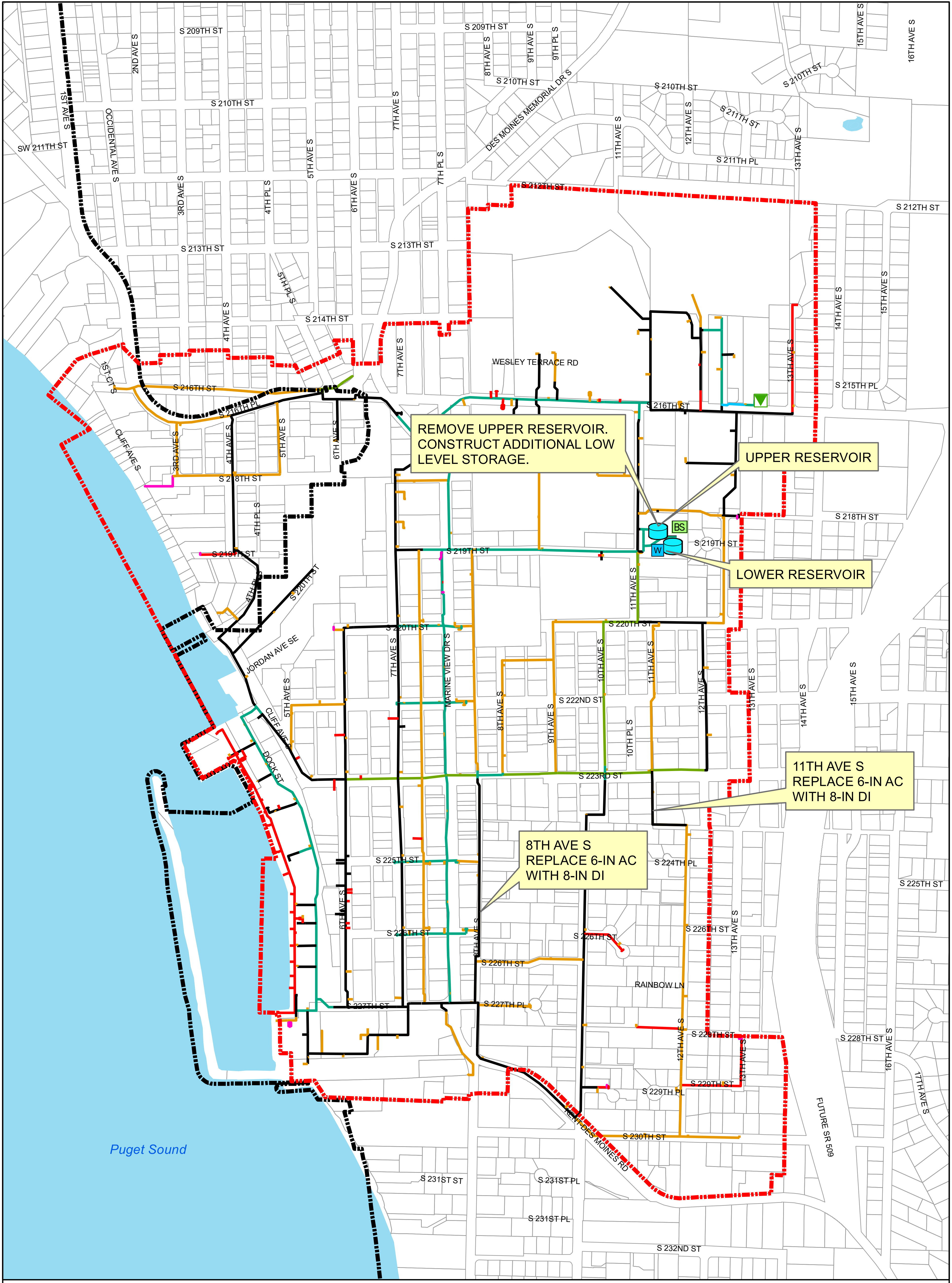
PROPOSED IMPROVEMENTS BEYOND YEAR 10

P-4: NORTH HILL PRESSURE ZONE

The North Hill area of the District currently experiences marginal static pressures during peak hour demands. This is due to the high elevation of this area relative to the District's Elevated Reservoir. The project consists of the installation of two vaults with check valves and a booster pump station to supply domestic pressure. Particulars regarding this project, such as pump sizing, check valve location, and peak hour pressures, will be determined in a predesign report. This project will require specific DOH approval.

Total Project Cost Estimate: $730,000

ATTACHMENT A



REMOVE UPPER RESERVOIR. CONSTRUCT ADDITIONAL LOW LEVEL STORAGE.

UPPER RESERVOIR

LOWER RESERVOIR

11TH AVE S
REPLACE 6-IN AC
WITH 8-IN DI

8TH AVE S
REPLACE 6-IN AC
WITH 8-IN DI

LEGEND

PIPE DIAMETER

- 🟪 UNKNOWN
- 🟥 4-INCH
- 🟧 6-INCH
- ⬛ 8-INCH
- 🟩 10-INCH
- 🟩 12-INCH
- 🟦 14-INCH
- 🟦 16-INCH

- BS BOOSTER STATION
- ● RESERVOIR
- W WELL FIELD
- ▼ HIGHLINE WATER DISTRICT INTERTIE
- ▭ DISTRICT BOUNDARY
- ▭ DES MOINES CITY LIMITS
- ☐ PARCELS

N

Feet
0 300 600 1,200

KING COUNTY WATER DISTRICT #54

WATER SYSTEM PLAN
FIGURE 9-1
CAPITAL IMPROVEMENT PLAN

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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P-5: NEW OFFICE BUILDING

The District's current office building is reaching the end of its useful life span and is undersized for the needs of the District. This project will replace the office building with a larger one on the same site as the existing office. The current building is 864 square feet. The new headquarters is expected to be approximately 1,200 square feet.

Total Project Cost Estimate: $793,000

P-6: MARINE VIEW DRIVE INTERSECTION CROSSING AT 7TH PLACE SOUTH

The District plans to install a new water main to connect the 12-inch water main that crosses the bridge at the north end of the District with the 12-inch water main that runs down South 216th Street. This project will include 170 linear feet of 12-inch water main directional drilled under the intersection. This project will improve flow availability to the northwest portion of the District.

Total Project Cost Estimate: $215,300

P-7: CLIFF AVENUE SOUTH

The District plans to replace an existing water main along Cliff Avenue South from S 223rd Street and 6th Avenue South to Dock Street. This project will involve the installation of 800 LF of 12-inch ductile iron water main. This project will improve available flow in the Marina area.

Total Project Cost Estimate: $406,000

P-8: RAINBOW LANE

The District plans to replace an undersized water main on Rainbow Lane west of 12th Avenue South. This project will consist of replacing the existing 4-inch AC water main with approximately 350 linear feet of new 8-inch ductile iron water main as well as replacing the fire hydrant. This project will improve flow availability and replace aging pipe.

Total Project Cost Estimate: $189,000

P-9: 226TH PLACE SOUTH

The District plans to replace an undersized water main on 226th Place South east of 10th Avenue South. This project will consist of replacing the existing 4-inch AC water main with approximately 350 linear feet of new 8-inch ductile iron water main as well as replacing the fire hydrant. This project will improve flow availability and replace aging pipe.

Total Project Cost Estimate: $205,000

P-10: 13TH AVENUE SOUTH

The District plans to replace an undersized water main on 13th Avenue South north of South 216th Street. This project will consist of replacing the existing 4-inch AC water main with approximately 550 linear feet of new 8-inch ductile iron water main as well as replacing three fire hydrants. This project will improve flow availability and replace aging pipe.

Total Project Cost Estimate: $314,000

P-11: SOUTH 229TH STREET

The District plans to replace an undersized water main on South 229th Street east of 12th Avenue South. This project will consist of replacing the existing 4-inch water main with approximately 650 lineal feet of new 8-inch ductile iron water main as well as replacing two fire hydrants. This project will improve flow availability and replace aging pipe.

Total Project Cost Estimate: $303,000

P-12: SOUTH 216TH STREET FROM 1ST COURT SOUTH TO 6TH AVENUE SOUTH

The District plans to replace an undersized water main on South 216th Street from 1st Court South across 1st Avenue South to 6th Avenue South. This project will consist of replacing the existing 6-inch water main with approximately 1,450 linear feet of new 8-inch ductile iron water main as well as replacing four fire hydrants. This project will improve flow availability and replace aging pipe.

Total Project Cost Estimate: $775,000

CAPITAL IMPROVEMENTS PLAN SCHEDULE

A summary of the District's capital improvement projects is provided in Table 9-1. The schedule of proposed capital improvement projects may change due to unforeseen circumstances or funding availability.

TABLE 9-1

Capital Improvement Plan Summary

Project Number	Project Title	Year to be Completed	Total Estimated 2018 Project Cost
P-1	8th Avenue South – 223rd to 227th	2019	$831,000
P-2	11th Avenue Southeast	2022	$664,000
P-3	Elevated Reservoir	2026	$1,033,000
P-4	North Hill Pressure Zone	2029	$730,000
Projects Past the 10-Year Planning Horizon			
P-5	New Office Building	2031	$1,000,000
P-6	Marine View Drive Int. Crossing at 7th Place South	TBD	$231,000
P-7	Cliff Avenue South	TBD	$406,000
P-8	Rainbow Lane	TBD	$189,000
P-9	226th Place South	TBD	$205,000
P-10	13th Avenue South	TBD	$314,000
P-11	South 229th Street	TBD	$303,000
P-12	South 216th Street from 1st Court to 6th Avenue South	TBD	$775,000
Total			**$6,681,000**

CHAPTER 10

FINANCIAL ANALYSIS

INTRODUCTION

This chapter presents the financial program for the District. This includes the current water rates, historical revenue and expenses and analysis of the District's ability to meet future operating expenses and fund water improvements outlined in the previous chapters.

FINANCIAL STATUS OF EXISTING WATER UTILITY

CURRENT WATER RATES

The District's water rates are based upon customer class and meter size. The monthly bill includes a base rate and a seasonal consumption rate. The base rates, effective January 1, 2019, are given in Table 10-1. The base rate increased by $1.75 per 5/8" x 3/4" meter over 2018. The Capital Facility Charge did not increase. The seasonal consumption rates are given in Table 10-2.

TABLE 10-1

Monthly Rates

Customer Class	Meter Size	Base Rate 2019	Capital Facility Charge 2019
Residential	5/8" or 3/4"	$13.90	$6.50
	1"	$14.40	$10.50
Multi-Family (Per Unit)	Varies	$13.90	Varies(1)
Non-Residential	5/8" or 3/4"	$37.04	$10.50
	1"	$38.41	$18.00
	1-1/2"	$62.84	$35.00
	2"	$110.75	$56.00
	3"	$199.20	$112.00
	4"	$371.19	$175.00
	6"	$739.74	$350.00
	8"	$1,231.14	

(1) Depends on meter size.

TABLE 10-2

Seasonal Water Rates

Consumption Rate	Dates	Rate per 100 Cubic Feet 2011
Summer Water Rates	5/1 through 10/31	$4.10
Winter Water Rates	11/1 through 4/30	$3.80

Water consumption rates increase by 30¢ per CCF during the summer period.

GENERAL FACILITY CHARGE

New customers are required to pay fees to offset the costs to the utility of extending service to the new customer and to cover a new connection's fair share of existing facilities, as well as future improvements. The District general facility charge is $4,000 per equivalent residential unit (ERU).

FINANCIAL ANALYSIS

This section reviews past revenues and expenses in order to analyze the health of the existing system and to provide estimates of the baseline cash flows for the budget projection.

HISTORICAL OPERATING REVENUES AND EXPENSES

This section presents historical operating revenues and expenses from the year 2014 through 2018. This historical data is shown in Table 10-3. Only historical operating cash flows are considered when evaluating the health of the system because operating revenues and expenses occur annually and are expected to continue. Historical capital revenues and expenses are not indicative of future capital cash flows. Therefore, the health of a utility is primarily judged on the ability of monthly rates to fund annual operation and maintenance (O&M) expenses and debt service.

HISTORICAL REVENUE

The District collects the majority of its revenue from water sales. The revenue provides the base revenue for the operation and maintenance of the system. Water use is billed utilizing both a base rate and volume charge (Tables 10-1 and 10-2). The volume charge increases in the summer relative to the winter.

Water utility operating revenues for the years 2014 through 2018 indicate a gross income of approximately $880,000 per year. Historical revenue and expense varies from year to year, Table 10-3. Revenue generated from the Capital Facility Charge component of regular billings is placed into a Debt Reserve Fund for repayment of the bond debt on the Marine View Drive watermain, installed in 2011. The Bond Reserve Fund is maintained at the balance required for debt repayment.

TABLE 10-3

Historical Operations (Cash) Fund

	2014	2015	2016	2017	2018(1)
Start of Year	**$699,823**	**$820,022**	**$784,584**	**$708,561**	**$646,914**
Revenue					
Rates	$838,871	$891,819	$857,900	$882,773	$885,000
Other	$115,794	$107,635	$113,585	$113,618	$115,438
Expense					
O&M	($254,634)	($320,957)	($311,591)	($350,544)	($359,308)
Admin	($353,866)	($409,325)	($436,372)	($410,559)	($426,540)
Net Revenue	($346,165)	($269,172)	($223,522)	($235,288)	($214,590)
Transfer to Capital and Bond	($225,966)	($304,610)	($299,545)	($296,935)	($304,573)
Net Revenue, Incl Transfer					
Year End Cash Balance	**$820,022**	**$784,584**	**$708,561**	**$646,914**	**$556,932**

(1) Data for 2018 is shown as estimated as the District's auditor has not reviewed the year end data.
(2) Increased O&M costs in 2014 reflect the District's meter replacement program.

Projected Operating Revenues are based upon the historical data presented in Table 10-3, assumed rate increases, specific line item data and various assumed factors: inflation, COLA, insurance, etc. These assumptions are presented in Table 10-4.

Table 10-5 shows the summary of projected revenue and expense. Growth in the system is in accordance with that presented in Chapter 2. If additional projected growth occurs the District will realize additional revenue that will allow it to complete capital projects sooner. Assumed base and volume rate increases are in the table; no increase in the $6.50/month capital charge is assumed.

TABLE 10-4

Fund Projection Factors

Projection Factors	
COLA	3.0%
Loan Int	N.A.
Interest on Reserve Balance	2%
Taxes	4.0%
Insurance	6.0%
Inflation	2.5%
R & G	Varies

Specific line item cost assumptions include for example meter replacement, a part of O&M. The cost for meter replacement is anticipated to decrease in 2022 as all meters will have been replaced and the District will ramp down the meter replacement program to replacing those that either are broken or have reached their service life. Included starting in 2019 is a “set-aside” of $50,000/year, indexed to inflation, for emergency repairs.

Table 10-6 presents the Capital Fund projected reserves. Three projects are identified within the 10-year planning period: 8th Avenue South Water Main Replacement (2019), 11th Avenue South Water Main Replacement (2022) and removal of the elevated reservoir (2027). Each of these projects draw the capital reserves down significantly. Both of the first two project have been substantially designed and are shovel ready.

No loans are assumed in the analysis. Obtaining loans for water main replacement projects through typical funding agencies is difficult. The elevated reservoir removal, slated for 2027, may be loan eligible, especially through FEMA, however a significant level of effort is required to be eligible and funding is not assured. Funding of specific projects and the prioritization of projects should be reviewed on an annual basis.

The District should examine long term needs though an asset management program. Though the District has the requisite finances to pay for the identified short-term Capital Improvement Plan, like many utility providers the District faces significant costs over the next 50 years, in order to continue to provide a reliable and robust system in long term.

The District should track all maintenance activities: hydrants rebuilds, valve exercising, meter replacement, etc. to better evaluate and understand system integrity. The tracking could be as simple as keeping the data on a spreadsheet or as complicated as annual payments to a vendor to provide web-based information on a GIS background.

This information is particularly useful to help optimize maintenance but may also be used to better understand the system and help in the prioritization of future projects. Unless the District has significant financial reserves, it will be hard pressed to continue to provide reliable service.

TABLE 10-5

Projected Operations (Cash) Fund

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Assumed Rate Increase (Vol & Base)	10.0%	8.0%	5.0%	5.0%	4.0%	4.0%	4.0%	3.0%	3.0%	3.0%
Start of Year	**$556,932**	**$521,498**	**$469,233**	**$442,287**	**$471,035**	**$518,878**	**$562,009**	**$626,574**	**$674,621**	**$731,421**
Revenue										
Rates	$900,000	$978,300	$1,031,715	$1,087,944	$1,136,248	$1,186,698	$1,239,268	$1,279,793	$1,321,642	$1,364,859
Other	$129,847	$114,980	$117,802	$120,694	$123,657	$126,693	$129,804	$132,992	$136,258	$139,604
Expense										
O&M	($398,000)	($408,725)	($419,741)	($402,597)	($413,509)	($424,719)	($436,235)	($448,066)	($460,221)	($472,709)
Admin	($397,280)	($411,330)	($425,783)	($440,781)	($456,346)	($472,499)	($489,266)	($506,670)	($524,739)	($543,498)
Net Revenue	($234,567)	($273,225)	($303,993)	($365,259)	($390,051)	($416,173)	($443,572)	($458,048)	($472,940)	($488,257)
Transfer to Capital and Bond	($270,000)	($325,490)	($330,939)	($336,511)	($342,208)	($373,042)	($379,008)	($410,001)	($416,139)	($422,427)
Net Revenue, Incl Transfer	($35,433)	($52,265)	($26,947)	$28,748	$47,843	$43,131	$64,564	$48,047	$56,801	$65,831
Year End Cash Balance	**$521,498**	**$469,233**	**$442,287**	**$471,035**	**$518,878**	**$562,009**	**$626,574**	**$674,621**	**$731,421**	**$797,252**

TABLE 10-6

Projected Capital Fund

	2019	2020(1)	2021	2022	2023	2024	2025	2026	2027	2028
Start of Year	**$763,530**	**$1,059,236**	**$470,729**	**$690,203**	**$180,951**	**$409,160**	**$667,237**	**$929,937**	**$1,214,484**	**$221,589**
Revenue										
Transfer from Operations	$200,000	$205,000	$210,125	$215,378	$220,763	$226,282	$231,939	$237,737	$243,681	$249,773
General Facility Charge	$288,933	$62,296	$40,757	$40,357	$39,957	$39,557	$39,158	$25,029	$24,941	$24,852
Capital Facility Charge on Bills	$70,000	$70,490	$70,814	$71,133	$71,446	$71,760	$72,069	$72,263	$72,459	$72,654
Miscellaneous Income	$22,500	$22,500	$22,500	$22,500	$22,500	$22,500	$22,500	$22,500	$22,500	$22,500
Expense										
Capital Expense	($30,000)	($820,538)		($732,932)					($1,290,075)	
Debt Payment	($235,727)	($158,255)	($154,722)	($155,689)	($156,456)	($157,023)	($157,965)	($152,982)	($146,400)	($146,400)
Net Revenue	$295,706	($588,507)	$219,474	($509,253)	$228,210	$258,076	$262,700	$284,547	($992,896)	$303,379
End of Year Balance	**$1,059,236**	**$470,729**	**$690,203**	**$180,951**	**$409,160**	**$667,237**	**$929,937**	**$1,214,484**	**$221,589**	**$524,968**

(1) Project for 8th Avenue South assumes cost share with City of asphalt overlay.

Figure 10-1 below is a graphical exhibit of the financial tables presented above.

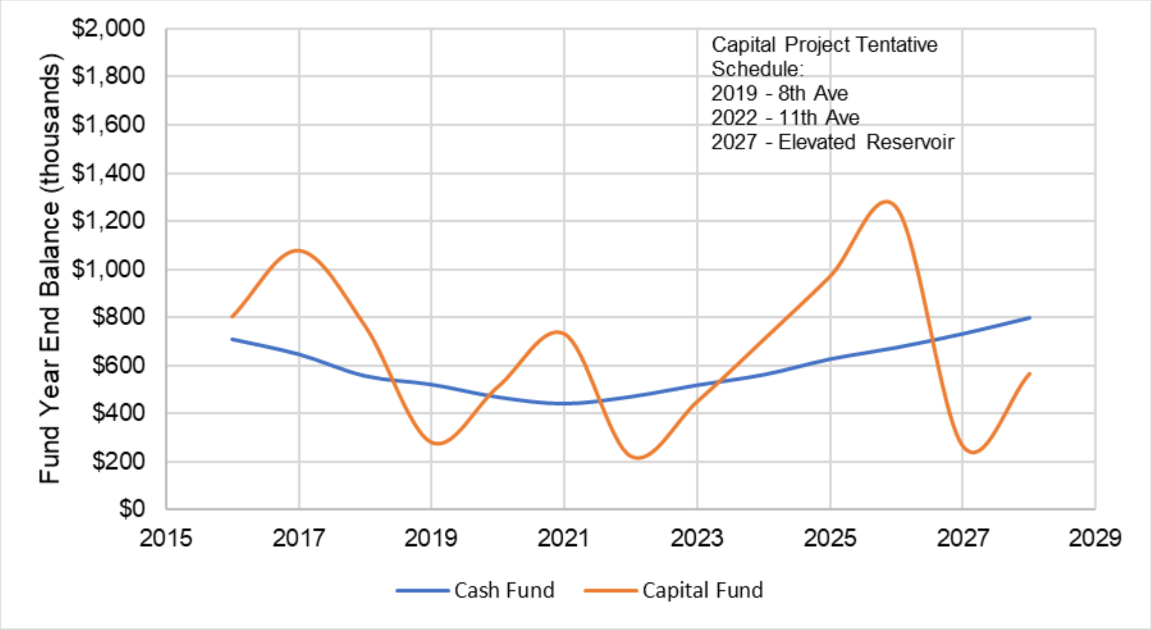

FIGURE 10-1

Estimated Fund Reserves

FUNDING SOURCE ALTERNATIVES

Several funding source alternatives are available to the District for the financing of projects in the CIP. Such alternative are listed below and followed by a brief description.

Grants:	King County Community Development Block Grant (CDBG) US Economic Development Administration (US EDA) US EPA State and Tribal Assistance Grant (STAG)
Loans:	Public Works Trust Fund (PWTF) Community Economic Revitalization Board (CERB) Drinking Water State Revolving Fund (DWSRF) USDA Rural Development (RD)
Bonds:	Revenue Bonds
Other:	Utility Local Improvement Districts

KING COUNTY COMMUNITY DEVELOPMENT BLOCK GRANT (CDBG)

The Community Development Block Grant program is a competitive source of federal funding for a broad range of community development projects. A primary requirement of the CDBG program is that the project must principally benefit at least 51 percent of the low-to-moderate income residents of the project area. The County typically receives about $3.5 million in federal funds per funding cycle. CDBG has two programs including General Purpose and Planning Only. The General Purpose program provides grant funds for the design, construction, or reconstruction of water and sewer systems up to the amount of $750,000. The Planning Only program includes projects such as comprehensive plans, community development plans, capital improvement plans, and other plans such as land use and urban environmental design, economic development, floodplain and wetlands management, transportation, and utilities. Planning Only grants are limited to $24,000 for a single applicant or $40,000 for a joint applicant.

PUBLIC WORKS TRUST FUND (PWTF)

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

PWTF has three loan programs including, Pre-Construction, Construction, and Emergency. PWTF loan terms are summarized in Table 10-7. In recent years the Public Works Trust Fund offerings have been limited as the State budget has been restricted. The Pre-Construction Loan program has received $2,700,000 for the current biennium. Applications are received every other month until funding is exhausted. There is a $1,000,000 maximum per jurisdiction.

The Emergency Loan program has received $5,000,000 for the current biennium. Applications are received on at anytime. There is a $1,000,000 maximum per jurisdiction.

Currently there is no funding in Construction Loan program.

A local match is not required to receive funding, but it is recommended to increase chances of receiving funding.

TABLE 10-7

PWTF Preconstruction and Emergency Loan Terms

Interest Rate/Term	Loan Limit
0.67%, 5 years	$1,000,000
1.34%, 5-20 years	

An applicant must have a long-term plan for financing its public works needs. Eligible public works projects include streets and roads, bridges, storm sewers, sanitary sewer collection and treatment systems, and domestic water.

Since substantially more trust fund dollars are requested than are available, local jurisdictions must compete for the available funds.

COMMUNITY ECONOMIC REVITALIZATION BOARD (CERB)

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

The CERB loan limit is $2,000,000 with rates of 1 to 3 percent and a 20-year term. The interest rate is tied to the debt service coverage ratio.

Eligible projects include public facilities that are required by private sector expansion.

DRINKING WATER STATE REVOLVING FUND (DWSRF)

In 1996, Congress established the Drinking Water State Revolving Fund through the reauthorization of the federal Safe Drinking Water Act. The program is managed by both the Washington State Department of Health. The purpose of the program is to provide low-interest loans to assist publicly- and privately-owed water systems improve drinking water and protect public health. The program offers Construction and Emergency funding. Construction funding is "aimed at increasing public health protection".

Eligible publicly owned water systems include city and county governments, public utility districts, and special purpose districts. Privately owned systems are eligible as long as they are Group A systems.

Eligible projects include the following:

- Water systems that will receive a water quality benefit from the project;
- Planning and design costs;
- Water conservation projects;
- Reservoirs (clear wells) that are part of a treatment process;
- Distribution reservoirs (finished water);

Maximum award per single water system is $3,000,000. DWSRF requires a 1 percent loan fee, but no local match. The interest rate varies from 1.75 to 2.25 percent with a 20-year loan term.

US ECONOMIC DEVELOPMENT ADMINISTRATION (US EDA)

US EDA offers competitive grants up to $1 million for projects within Region 10. Projects are selected locally by an economic development district and submitted to Congress for competitive selection among other regions in the US. Similar to CERB, applicants must have an industrial partner ready to proceed or a feasibility study that establishes realistic job creation.

US EPA STATE AND TRIBAL ASSISTANCE GRANT

Local jurisdictions within the state of Washington can apply to the State and Tribal Assistance Grant program through the office of their local Congressional representative. The Congressional representative will work to add the project as a line item to the VA/HUD Appropriations Bill. Applicants can obtain grant funds up to approximately $2 million.

REVENUE BONDS

The most common source of funds for construction of major utility improvements is the sale of revenue bonds. These are tax-free bonds issued by a municipality. The major source of funds for debt service on revenue bonds is from monthly service charges. In order to make qualify to sell revenue bonds marketable to investors, the bonds typically have contractual provisions for the city to meet debt coverage requirements. The District must show that its annual net operating income (gross income less operation and maintenance expenses) is must be equal to or greater than a factor, typically 1.2 to 1.4 times the annual debt service on all par debt. If a coverage factor has not been specified it will be determined at the time of any future bond issues.

UTILITY LOCAL IMPROVEMENT DISTRICTS

Another potential source of funds for improvements can be obtained through the formation of Utility Local Improvement Districts (ULIDs) involving a special assessment made against properties benefiting by the improvements. ULID bonds are further backed by a legal claim to the revenues generated by the utility, similar to revenue bonds.

Typically, ULIDs are formed by the city at the written request (by petition) of the property owners within a specific section of the District's service area. Upon receipt of a sufficient number of signatures or petitions, and acceptance by the city council, the local improvement area is formed. Each separate property in the ULID is assessed in accordance with the special benefits the property receives from the water system improvements. A District wide ULID could form part of a financing package for large-scale capital projects that benefit all residents in the service area. ULID participants have the option of paying their assessment immediately upon receipt, thereby reducing the portion of the costs financed by the ULID bonds.

The advantages of ULID financing, as opposed to rate financing, to the property owner include:

- The ability to avoid interest costs by early payment of assessments.

- If the ULID assessment is paid in installments, it may be eligible to be deducted from federal income taxes.

- Low-income senior citizens may be able to defer assessment payments until the property is sold.

- Some Community Block Grant funds are available to property owners with incomes near or below poverty level. Funds are available only to reduce assessments.

The major disadvantage to the ULID process is that it may be politically difficult to approve formation. The ULID process may be stopped if 40 percent of the property owners protest its formation. Also, there are significant legal and administrative costs associated with the ULID process, which increases total project costs by approximately 30 percent over other financing options.

APPENDIX A

WSDOH SUBMITTAL FORM

Washington State Department of
Health
Environmental Public Health
Office of Drinking Water

ATTACHMENT A

Water System Plan Submittal Form

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

King County Water District No. 54	39950	King County Water District No. 54	
1. Water System Name	PWS ID# or Owner ID#	Water Systems Owner's Name	
Eric Clarke	(206) 878-7210	Manager	
Contact Name for Utility	Phone Number	Title	
922 219 St	Des Moines	Wa	98198-6344
Contact Address	City	State	Zip
Warren Perkins, P.E.	(206) 284-0860	Project Manager	
2. Project Engineer	Phone Number	Title	
1130 Rainier Ave South # 300	Seattle	Wa	98144
Project Engineer Address	City	State	Zip
3. Billing Contact Name (required if not the same as #1)	Billing Phone Number	Billing Fax Number	
Billing Address	City	State	Zip

4.	How many services are presently connected to your system?	_755_______________	
5.	Is your system expanding (*circle what applies:* seeking to extend service area or increase number of approved connections)?	☐ Yes	☒ No
6.	If the number of services is expected to increase, how many *new* connections are proposed in the next six years?	________________	
7.	If your system is private-for-profit, is it regulated by the State Utilities and Transportation Commission?	☐ Yes	☒ No
8.	Is the system located in a Critical Water Supply Service Area (i.e., have a Coordinated Water System Plan)?	☒ Yes	☐ No
9.	Is your system a customer of a wholesale water system?	☐ Yes	☒ No
10.	Will your system be pursuing additional water rights from the Department of Ecology in the next 20 years?	☐ Yes	☒ No
11.	Is your system proposing a new intertie?	☐ Yes	☒ No
12.	Do you have projects currently under review by us?	☐ Yes	☒ No
13.	Are you requesting distribution main project report and construction document submittal exception and if so, does the WSP contain standard construction specifications for distribution mains?	☒ Yes	☐ No
14.	The water system is responsible for sending a copy of the WSP to adjacent utilities for review or a letter notifying them that a copy of the WSP is available for their review and where the review copy is located. Has this been completed?	☒ Yes	☐ No
15.	The purveyor is responsible for sending a copy of the WSP to all local governments within the service area (county and city planning departments, etc.). Has this been completed?	☒ Yes	☐ No
16.	Are you proposing a change in the place of use of your water right?	☐ Yes	☒ No
17.	What is the last year of the plan approval period (the year the shortest WSP projection is made)?	_2037____________	

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

King County, Highline Water District, City of Des Moines, City of Normandy Park, and Midway Sever District

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

Please enclose the following number of copies of the WSP:

3 copies for Northwest and Southwest Regional Offices **OR 2** copies for Eastern Regional Office (We will send one copy to Ecology)
1 additional copy if you answered "yes" to question 7. _____4__ Total copies attached

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

☒ Northwest Drinking Water Operations
Department of Health
20425 72nd Avenue South, Suite 310
Kent, WA 98032-2358
253-395-6750

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

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

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

DOH Form 331-397-F (Updated 01/17)

WSP Checklist

	Content Description	*Must Be Submitted (√)	(Page #) in WSP
Chapter 1	**Description of Water System**		
	• Ownership and Management	(√)	1-1
	• System History and Background	(√)	1-1, 1-2, 1-3
	• Inventory of Existing Facilities	(√)	1-4 thru 1-9
	• Related Plans (e.g., CWSP, local land use plans)	(√)	1-9, 1-10
	• Service Area and Characteristics	(√)	1-2, 1-3
	• Agreement (signed in accordance with CWSP)	( )	
	• Map	(√)	Fig 1-2
	• Service Area Policies (Including SMA policy and conditions of service)	(√)	1-10, 1-11
Chapter 2	**Basic Planning Data**		
	• Current Population, Number of Service Connections, and ERUs	(√)	2-1, 2-2
	• Current Water Use and Data Reporting	(√)	2-3 thru ,2-12
	• Current and Future Land Use	(√)	1-2, 1-3, Fig1-3
	• Future Population and Number of Service Connections and ERUs (6 and 20 years)	(√)	2-14,2-15, 2-16
	• Future Water Use (Demand forecast for 6 and 20 years)	(√)	2-16
Chapter 3	**System Analysis**		
	• System Design Standards	(√)	3-2 thru 3-14, 4-4, 4-5
	• Water Quality Analysis	(√)	3-7, 3-11, 3-14
	• System Inventory, Description and Analysis	(√)	4-5 thru 4-13
	• Source	(√)	4-5 thru 4-8, 1-5
	• Treatment	( )	
	• Storage	(√)	4-8 thru 4-12
	• Distribution System/Hydraulics	(√)	4-13 thru 4-17
	• Summary of System Deficiencies	(√)	4-12,4-16,4-17
	• Analysis of Possible Improvement Projects	(√)	4-17
Chapter 4	**Conservation Program and Source of Supply Analysis**		
	• Conservation Program	(√)	5-1, 5-2
	• Water Right Assessment	(√)	4-5 thru 4-7
	• Source of Supply Analysis and evaluation of supply alternatives	( )	
	• Water Supply Reliability Analysis With Water Shortage Response Plan	(√)	6-5
	• Interties	( )	1-4, 1-10
Chapter 5	**Source Water Protection (Check One or Both)**		
	• Wellhead Protection Program	( )	6-4 thru 6-4, Appendix K
	• Watershed Control Program	( )	6-4 thu 6-6, Appendix K
Chapter 6	**Operation and Maintenance Program**		
	• Water System Management and Personnel	(√)	7-2,
	• Operator Certification	(√)	7-2
	• Routine Operating Procedures, Preventive Maintenance and Record Keeping	(√)	7-3 thru 7-9
	• Water Quality Sampling Procedures (Comprehensive Monitoring Plan)	(√)	7-10
	• Coliform Monitoring Plan	(√)	7-10
	• Emergency Response Program	(√)	Appendix L, 7-10,
	• Safety Procedures	(√)	7-7, 7-8
	• Cross-Connection Control Program	(√)	7-16, 7-17
	• Service Reliability in accordance with WAC 246-290-420	( )	
Chapter 7	**Distribution Facilities Design and Construction Standards**		
	• Standard Construction Specification for Distribution Mains	( )	
	• Design and Construction Standards for distribution Related Projects	( )	
Chapter 8	**Improvement Program**		
	• Capital Improvement Schedule (6 and 20 years)	(√)	9-5
	•		

ATTACHMENT A

Chapter 9	**Financial Program**		
	• Summary of past income and expenses	(√)	10-2, 10-3
	• Balanced Operating Budget (1 year if >1,000 connections / 6 year if < 1,000 connections)	(√)	10-3 thru 10-
	• Demonstration of revenue and cash flow stability to fund CIP and emergency improvements	(√)	10-5
	• Rate Structure that considers affordability of rates and water conservation	(√)	10-4,10-6
	• Systems < 1,000 connections may do DOH Financial Viability Test to complete above reqs.	( )	
	• UTC Financial Viability and Feasibility Test (for UTC regulated systems)	( )	
Chapter 10	**Miscellaneous Documents**		
	• For Community Systems, Meeting of the Consumers (date and description)	( )	
	• County/Adjacent Utility Correspondence	(√)	
	• Documentation of State Environmental Policy Act (SEPA) Compliance	( )	
	• Agreements	( )	
	• Satellite Management Program	( )	

* Requirement will be determined at the pre-plan conference.

APPENDIX B

WSDOH WATER FACILITIES INVENTORY

ATTACHMENT A

WATER FACILITIES INVENTORY (WFI) FORM

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

ONE FORM PER SYSTEM

Quarter: 1
Updated: 02/01/2017
Printed: 2/27/2019
WFI Printed For: On-Demand
Submission Reason: Treatment Update

RETURN TO: Central Services - WFI, PO Box 47822, Olympia, WA, 98504-7822

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
39950 4	KING COUNTY WATER DISTRICT #54	KING	A	Comm

6. PRIMARY CONTACT NAME & MAILING ADDRESS

ERIC D. CLARKE [MANAGER]
,

7. OWNER NAME & MAILING ADDRESS

KING COUNTY WATER DIST. #54
ERIC D. CLARKE
922 S 219TH ST
DES MOINES, WA 98198

8. OWNER NUMBER: 002995

MANAGER

STREET ADDRESS IF DIFFERENT FROM ABOVE

ATTN
ADDRESS
CITY STATE ZIP

STREET ADDRESS IF DIFFERENT FROM ABOVE

ATTN
ADDRESS
CITY STATE ZIP

9. 24 HOUR PRIMARY CONTACT INFORMATION		10. OWNER CONTACT INFORMATION	
Primary Contact Daytime Phone:	(206) 878-7210	Owner Daytime Phone:	(206) 878-7210
Primary Contact Mobile/Cell Phone:	(206) 396-2246	Owner Mobile/Cell Phone:	(206) 396-2246
Primary Contact Evening Phone:	(xxx)-xxx-xxxx	Owner Evening Phone:	(xxx)-xxx-xxxx
Fax:	E-mail: xxxxxxxxxxxxxxxxxxxx	Fax: (206) 824-1909	E-mail: xxxxxxxxxxxxxxxxxxxx

11. SATELLITE MANAGEMENT AGENCY - SMA (check only one)

☒ Not applicable (Skip to #12)
☐ Owned and Managed
☐ Managed Only
☐ Owned Only

SMA NAME: ____________________ SMA Number:

12. WATER SYSTEM CHARACTERISTICS (mark all that apply)

☐ Agricultural
☒ Commercial / Business
☒ Day Care
☒ Food Service/Food Permit
☒ 1,000 or more person event for 2 or more days per year
☒ Hospital/Clinic
☒ Industrial
☒ Licensed Residential Facility
☒ Lodging
☐ Recreational / RV Park
☒ Residential
☒ School
☐ Temporary Farm Worker
☒ Other (church, fire station, etc.): ____________________

13. WATER SYSTEM OWNERSHIP (mark only one)

☐ Association
☐ City / Town
☐ County
☐ Federal
☐ Investor
☐ Private
☒ Special District
☐ State

14. STORAGE CAPACITY (gallons)

910,000

15	16 SOURCE NAME	17 INTERTIE	18 SOURCE CATEGORY										19 USE			20	21 TREATMENT						22 DEPTH	23	24 SOURCE LOCATION			
Source Number	LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL	WELL FIELD	WELL IN A WELL FIELD	SPRING	SPRING FIELD	SPRING IN SPRINGFIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANENT	SEASONAL	EMERGENCY	SOURCE METERED	NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	DEPTH TO FIRST OPEN INTERVAL IN FEET	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE
S01	WELL # 4 AAB181		X										X			Y	X						305	100	NW SE	08	22N	04E
S02	WELL # 5 AAB182		X										X			Y	X						206	480	NW SE	08	22N	04E
S03	406506/HIGHLINE	40650 6													X	Y	X							3600	NW SE	08	22N	04E
S04	WELL #6 AAB183		X										X			Y	X						336	350	NW SE	08	22N	04E
S05	WELL #7 AFC525		X										X			Y	X						327	320	NW SE	08	22N	04E

ATTACHMENT A

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
39950 4	KING COUNTY WATER DISTRICT #54	KING	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)		2015	Unspecified
A. Full Time Single Family Residences (Occupied 180 days or more per year)	498		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	0		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	0		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	1517		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	160	160	
28. TOTAL SERVICE CONNECTIONS		2175	

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 or more days per year? 5037

30. PART-TIME RESIDENTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?												
B. How many days per month are they present?												

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?												
B. How many days per month is water accessible to the public?												

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students daycare children and/or employees are present each month?												
B. How many days per month are they present?												

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
* Requirement is exception from WAC 246-290	6	6	6	6	6	6	6	6	6	6	6	6

34. NITRATE SCHEDULE	QUARTERLY	ANNUALLY	ONCE EVERY 3 YEARS
(One Sample per source by time period)			

35. Reason for Submitting WFI:

☐ **Update - Change** ☐ **Update - No Change** ☐ **Inactivate** ☐ **Re-Activate** ☐ **Name Change** ☐ **New System** ☐ **Other** ____________

36. I certify that the information stated on this WFI form is correct to the best of my knowledge.

SIGNATURE: ____________________ **DATE:** ____________________

PRINT NAME: ____________________ **TITLE:** ____________________

Error: Subreport could not be shown.

ATTACHMENT A

ATTACHMENT A

Washington State Department of
Health
Division of Environmental Health
Office of Drinking Water

Water Facilities Inventory (WFI)

Report Create Date: 2/27/2019

Water System Id(s): 39950

Print Data on Distribution Page: ALL

Print Copies For: DOH Copy

Water System Name: ALL

County: -- Any --

Region: ALL

Group: ALL

Type: ALL

Permit Renewal Quarter: ALL

Water System Is New: ALL

Water System Status: ALL

Water Status Date From: ALL **To:** ALL

Water System Update Date From: ALL **To:** ALL

Owner Number: ALL

SMA Number: ALL

SMA Name: ALL

Active Connection Count From: ALL **To:** ALL

Approved Connection Count From: ALL **To:** ALL

Full-Time Population From: ALL **To:** ALL

Water System Expanding Services: ALL

Source Type: ALL

Source Use: ALL

WFI Printed For: On-Demand

APPENDIX C

WATER RIGHTS AND
WATER RIGHTS SELF-ASSESSMENT

Water Right Self-Assessment Form for Water System Plans

331-372 • 1/13/2017

All water right permits, claims, and certificates must be evaluated in a water right self-assessment for all sources used to supply the water system. The self-assessment compares the parameters and other limitations of existing water rights against current and forecasted water production, as described in your water system plan, to determine whether the rights are adequate to serve your system's current and future water needs.

You must account for all sources of supply and total quantities of water withdrawn from the source. If you purchase water from another purveyor through a non-emergency intertie, you must complete the INTERTIES section of the self-assessment.

A Note on Exempt Wells

If you're seeking DOH approval of a new Group A or Group B water system using an exempt well, you must complete the self-assessment, although certain fields will not apply. Talk to your DOH regional planner about using the Water Right Self-Assessment form for a Small Water System Management Program instead of this version.

Local governments must ensure that an adequate potable water supply is available from the exempt well before issuing a building permit. Before developing a permit exempt well, check with your local authorities on their criteria for establishing an adequate potable water supply for your planned public water system.

Water Right Parameters

Below is a brief description of the parameters associated with a typical water right. For the self-assessment, you only need to describe the last two bulleted items if they apply to your water rights.

Source Type – this refers to whether the source is surface water, groundwater or a spring.

Source Location – this refers to the location of points of groundwater withdrawal or surface water diversion for each right.

Purpose of Use – this refers to the type of use, such as municipal water supply, community domestic, industrial or agricultural purposes.

Place of Use – this describes where water can be put to beneficial use under the right. Under the 2003 Municipal Water Law, RCW 90.03.386, the place of use for a water right held for municipal water supply purposes may be the system's service area as identified in an approved water system plan or small water system management program. See Ecology Policy 2030 for information on how Ecology administers the Municipal Water Law.

Period of Use – this refers to time-of-year limitations in which the water right may be put to use. If any water right has a time-of-year limitation, please include this information in the INTERRUPTIBLE WATER RIGHTS section.

Provisions or Limiting Conditions – this refers to any provisions or conditions placed on the water right. If a water right has a limiting condition or other provision, such as a collection and reporting requirement, other than a time-of year limitation, include this information in the ADDITIONAL COMMENTS section at the bottom of the self-assessment and in the water system plan narrative.

See Ecology Policy 1040 for more information on water right terminology. If you have questions about your water rights, please contact the Ecology regional office in your area.

Completing the Water Right Self-Assessment Form

The self-assessment is a Word document to allow users to make changes or to expand the document. You may use another format, if preferred, as long as all required information is included. Below is a description of all fields and how to complete them. This form is divided into four different sections. Each section is described in the headings below.

See the column identifiers (A, B, C, etc) at the bottom of each column for guidance in completing the necessary calculations.

Water Right Permit, Certificate, or Claim Number: This number is assigned by Ecology when a permit application is filed. It's listed at the top of the permit or certificate. For water right claims, this is the registration number stamped in the lower left hand corner of the claim form.

WFI Source #: Identify the individual sources (e.g. well #1, well #2) as defined on the DOH Water Facilities Inventory form. If a water right is associated with multiple sources, list all sources in the same row in this column. If a source is associated with multiple water rights, identify each water right on a separate row.

If you have any source(s) that is not currently being used (categorized as standby, back-up, or emergency), and the source has an associated water right that is not listed in column #1, please include the source and water right information in the ADDITIONAL COMMENTS section. This will identify that the source is still intended for a beneficial use under RCW 90.03.015(4). See Ecology Policy 1040.

EXISTING WATER RIGHTS SECTION *(olive green color, top section)*

This section refers to existing water rights. It does not include any water right applications that have been submitted to Ecology.

Primary Qi (Instantaneous Quantity): This is also known as instantaneous flow rate. It's the amount of water allowed to be taken under the right from the source during a period of peak operation. For surface water, this is generally expressed in terms of cubic feet per second (cfs). For groundwater, this is generally expressed in terms of gallons per minute (gpm). One cfs equals 448.8 gpm. Please indicate the units of measurement you are using for each source. If there are situations where the flow rate will be limited (e.g. limitations established on the source when other sources are utilized), please note them in the ADDITIONAL COMMENTS section in the form and in the WSP narrative.

Non-Additive Qi: This term was formally known as "supplemental." Your water rights may use the old terminology. See Ecology Policy 1040 for more information. Not all water rights have non-additive quantities. If a water right has non-additive Qi quantities, include the non-additive quantity in this field. This is generally listed in the "quantity, type of use, period of use" section on both permits and certificates. *Non-additive quantities should not be included in the primary Qi totals.*

Primary Qa (Annual Quantity): This is the amount of water that can be taken from the source under the right on an annual basis. It's usually expressed in terms of acre-feet. An acre-foot is the amount of water necessary to submerge an acre of land to a depth of one foot. One acre-foot equals 43,560 cubic feet or 325,851 gallons of water.

Non-Additive Qa: This term was formerly known as "supplemental." Your water rights may use the old terminology. See Ecology Policy 1040 for more information. Not all water rights have non-additive quantities. If a water right has non-additive Qa quantities, include the non-additive quantity in this field. This is generally listed in the "quantity, type of use, period of use" section on both permits and certificates. *Non-additive quantities should not be included in the primary Qa totals.*

CURRENT SOURCE PRODUCTION SECTION *(light green color, top section)*

This section refers to how much water is withdrawn from the source under each water right for the most recent full calendar year. You will need to determine any excess or deficiency for each water right after calculating how much water was withdrawn compared to how much water is allowed under each water right. If demand has decreased over past years, you may wish to include historic maximum production information in the ADDITIONAL COMMENTS section. This will provide a more complete picture of the use of your water rights.

Use the water use data and demand projections from your water system plan to define current and projected water needs. You can determine if you'll need additional water rights based on the comparison of existing water rights, current water production, and projected 10- and 20-year needs.

Total Qi (Instantaneous Quantity): This refers to the total maximum instantaneous flow rate withdrawn from the source under each water right during the most recent calendar year. For surface water, this is expressed in terms of cubic feet per second (cfs). For groundwater, this is expressed in terms of gallons per minute (gpm). One cfs equals 448.8 gpm.

Current Excess or Deficiency (Qi): Please calculate the excess or deficiency for each water right after comparing the total amount withdrawn against each water right. Please use parentheses for deficient amounts.

Total Qa (Annual Quantity): This refers to the total volume of water withdrawn from each source under each water right during the most recent calendar year. It's usually expressed in acre-feet.

Current Excess or Deficiency (Qa): Please calculate the excess or deficiency for each water right after comparing the total amount withdrawn against each water right. Please use parentheses for deficient amounts.

10-YEAR FORECASTED SOURCE PRODUCTION SECTION *(light blue color, top section)*

This section refers to how much water you project to withdraw from each source in ten years as determined in your water system plan. Please complete this section in the same manner (using the same units of measurement) as the current source production section using your 10-year forecasted amounts.

20-YEAR FORECASTED SOURCE PRODUCTION SECTION *(darker blue color, top section)*

This section refers to how much water you project to withdraw from each source in twenty years as determined in your water system plan. Please complete this section in the same manner (using the same units of measurement) as the current source production section using your 20-year forecasted amounts. If you are unable to provide 20-year forecasts for each source, you may choose to include the combined 20-year total at the bottom.

PENDING WATER RIGHTS SECTION *(second section of form)*

Please complete this section for any water right applications that have been submitted to Ecology. Please include the application number, whether it's a new or a change application, the date submitted, and the total quantities requested.

INTERTIES SECTION *(third section of form)*

This section must be completed by purveyors who purchase any amount of wholesale water. If your system sells water to another public water system, include the quantity sold in the CURRENT SOURCE PRODUCTION section.

Purchasers of wholesale water must account for all water obtained through the intertie for non-emergency supply purposes. This is to ensure that all sources of supply are considered when evaluating whether new water rights are needed within 20 years.

Please identify the maximum quantity of water, expressed in the same manner as the above sections, allowed under each intertie contract. If there are limiting conditions or temporary agreements that effect the long-term use of the intertie, you must account for such limiting conditions when evaluating the current and forecasted water supply needs in your water system plan.

Finally, purchasers of wholesale water are responsible for ensuring that the underlying water right (held by the purveyor selling water) are adequate for such use. You should confirm that the selling system has accounted for the wholesale area in their water system plan to ensure that the water right authorizes the distribution of water through the intertie.

INTERRUPTIBLE WATER RIGHTS SECTION *(bottom section of form)*

This section refers to water rights that have an annual time-of-year interruption. Please complete this section for any water right listed in the above fields that has a time-of-year interruption. Please include the water right number, describe the limitation, and the time period of interruption. Purveyors with interruptible rights should develop a water shortage response plan as part of their water system plan to describe how demand will be met during periods of interruption through aggressive demand-side conservation, fixing leaks or other means.

ADDITIONAL COMMENTS SECTION *(bottom section of form)*

If the system has any source that is not currently being used on a regular basis (such a source may be categorized as stand-by, back-up, emergency), you should identify the source in this section if the source has an associated water right that is not listed in the above sections. The purpose is to identify that such water rights are still intended for a future beneficial use as required under RCW 90.03.015(4). See Page 2, Item 9 (b) in ECY Policy 2030. For these water rights, please briefly describe the future intended use of the source and when you expect to utilize the water right. This does not refer to sources categorized as seasonal sources.

You should also include any other comments in this section that will explain aspects of your water right portfolio that are not identified above.

Water Right Self-Assessment Form for Water System Plan

Mouse-over any link for more information. Click on any link for more detailed instructions.

Water Right Permit, Certificate, or Claim # *If water right is interruptible, identify limitation in yellow section below	WFI Source # If a source has multiple water rights, list each water right on separate line	Existing Water Rights Qi= Instantaneous Flow Rate Allowed (GPM) Qa= Annual Volume Allowed (Acre-Feet/Year) This includes wholesale water sold				Current Source Production – Most Recent Calendar Year Qi = Max Instantaneous Flow Rate Withdrawn (GPM) Qa = Annual Volume Withdrawn (Acre-Feet/Year) This includes wholesale water sold				10-Year Forecasted Source Production (determined from WSP) This includes wholesale water sold				20-Year Forecasted Source Production (determined from WSP) This includes wholesale water sold			
		Primary Qi Maximum Rate Allowed	Non-Additive Qi Maximum Rate Allowed	Primary Qa Maximum Volume Allowed	Non-Additive Qa Maximum Volume Allowed	Total Qi Maximum Instantaneous Flow Rate Withdrawn	Current Excess or (Deficiency) Qi	Total Qa Maximum Annual Volume Withdrawn	Current Excess or (Deficiency) Qa	Total Qi Maximum Instantaneous Flow Rate in 10 Years	10-Year Forecasted Excess or (Deficiency) Qi	Total Qa Maximum Annual Volume in 10 Years	10-Year Forecasted Excess or (Deficiency) Qa	Total Qi Maximum Instantaneous Flow Rate in 20 Years	20-Year Forecasted Excess or (Deficiency) Qi	Total Qa Maximum Annual Volume in 20 Years	20-Year Forecasted Excess or (Deficiency) Qa
(1) Cert. 1, 45-D #78	Well 1 (Source # N/A), 6 (Source # 04)	150		896	244	443	1407	371.1	884.9	537	1313	411	845	564	1286	433	823
(2) Cert. 1, 36-A	Well 2 (Source # N/A), 6 (Source # 04)	300			490												
(3) Cert. 6, 2765-A	Well 3 (Source # N/A), 6 (Source # 04)	250			490.6												
(4) Cert. 13, 6076-A	Well 4 (Source 01), 7 (Source 07)	650			162												
(5) G1-23881-C	Well 5 (Source 02)	500		360													
(6) Cert. 2, 597-D #751	-	75				-	75	-	15	-	75	-	0	-	75	-	
(7) Cert. 4, 1677-A	-	100				-	100	-	48	-	100	-	0	-	100	-	
	TOTALS =	2025		1256		443	1582	371.1	947.9	537	1488	411	845	568	1457	433	823
Column Identifiers for Calculations:		A		B		C	=A-C	D	=B-D	E	= A-E	F	=B-F	G	=A-G	H	=B-H

Footnotes: Total annual water right Qa = 896 + 360 ac-ft/yr. Wells 6 & 7 operate under the Water right for Well 5.

PENDING WATER RIGHT APPLICATIONS: Identify any water right applications that have been submitted to Ecology.

Application Number	New or Change Application?	Date Submitted	Quantities Requested			
			Primary Qi	Non-Additive Qi	Primary Qa	Non-Additive Qa
G1-26306A	New	August 29, 1991	350 gpm		565 ac-ft/yr	

INTERTIES: Systems receiving wholesale water complete this section. Wholesaling systems must include water sold through intertie in the current and forecasted source production columns above.

Name of Wholesaling System Providing Water	Quantities Allowed In Contract		Expiration Date of Contract	Currently Purchased Current quantity purchased through intertie				10-Year Forecasted Purchase Forecasted quantity purchased through intertie				20-Year Forecasted Purchase Forecasted quantity purchased through intertie			
	Maximum Qi Instantaneous Flow Rate	Maximum Qa Annual Volume		Maximum Qi Instantaneous Flow Rate	Current Excess or (Deficiency) Qi	Maximum Qa Annual Volume	Current Excess or (Deficiency) Qa	Maximum Qi 10-Year Forecast	Future Excess or (Deficiency) Qi	Maximum Qa 10-Year Forecast	Future Excess or (Deficiency) Qa	Maximum Qi 20-Year Forecast	Future Excess or (Deficiency) Qi	Maximum Qa 20-Year Forecast	Future Excess or (Deficiency) Qa
1															
2															
3															
TOTALS =															
Column Identifiers for Calculations:	A	B		C	=A-C	D	=B-D	E	=A-E	F	=B-F	G	=A-G	H	=B-H

INTERRUPTIBLE WATER RIGHTS: Identify limitations on any water rights listed above that are interruptible.

Water Right #	Conditions of Interruption	Time Period of Interruption
1		
2		
3		

ADDITIONAL COMMENTS:

APPENDIX D

INTERLOCAL AGREEMENTS

ATTACHMENT A

HIGHLINE WATER DISTRICT
King County, Washington

FIRE PROTECTION AND EMERGENCY INTERTIE AGREEMENT

This Agreement is entered into this 5th day of July, 2000, hereinafter referred to as "Anniversary Date" between Highline Water District, hereinafter "Highline" and King County Water District No. 54, hereinafter "District No. 54".

1. **Highline and District No. 54 are each municipal corporations organized and operating consistent with the laws of the State of Washington.**
2. **The State of Washington, Department of Health, encourages water service agreements between adjacent water utilities.**
3. **District No. 54, as reported by its consultant, currently has an approximate storage deficit of .5 million gallons.**
4. **Highline and District No. 54 presently have an eight-inch (8") automatically-operated connection between the districts, located at 9th Avenue South and South 216th Street, hereinafter referred to as "Intertie".**
5. **The rate structure of Highline specifies the costs of providing water for certain classes of users.**
6. **At least one boundary of Highline is parallel with and abuts at least one boundary of District No. 54.**
7. **Highline and District No. 54 wish to enter into a Fire Protection and emergency Intertie Agreement to serve the customers of District No. 54.**

NOW THEREFORE, IT IS AGREED AS FOLLOWS:

1. **Operation of Intertie. The Intertie will be for one-way flow only from Highline to District No. 54, and will only benefit District No. 54. Except as provided in this Agreement, this Intertie shall be operational on a year-round basis.**

2. **Limitations on Use of Water from Intertie. District No. 54 shall limit the use of the water obtained through the Intertie for fire fighting purposes, emergency use and special maintenance purposes as defined below:**

EXHIBIT A

a. <u>Fire Fighting Purposes.</u> In the event District No. 54 storage tank and well pumping capacities are inadequate to combat a fire from mains within District No. 54, water from the Intertie may be used for the purpose of fighting the fire.

b. <u>Emergency Use.</u> Water from the Intertie may be used in the event of a power outage, a pump system mechanical failure, or a rupture in the distribution system which impairs District No. 54's ability to maintain its storage tank capacity for fire fighting purposes, and consumption by the public. The emergency shall terminate upon restoration of the electrical power and the repair to the pump(s) and damaged distribution system.

c. <u>Special Maintenance Purposes.</u> Water from the Intertie may be used when the 250,000 gallon reservoir near 219th and 11th Avenue South is temporarily removed from service for maintenance, painting or decontamination.

3. <u>Maintenance, Repair and Inspections.</u>

a. District No. 54 shall be responsible for inspections and maintenance of the Intertie. Subject to the written approval of Highline, District No. 54 may hire an independent contractor to conduct the necessary inspections and maintenance. Highline's approval shall not be unreasonably withheld and shall not be construed to create any liability for Highline for the acts or omissions of District No. 54's independent contractor.

b. District No. 54, or its approved representative, shall inspect the Intertie annually, or more often as required, and shall advise Highline, in writing, of the results of the inspections. District No. 54 shall pay all costs to repair the Intertie as necessary to insure its proper functioning, and shall advise Highline, in writing, of its maintenance and repair activities on at least an annual basis.

c. The parties agree that emergency repairs to the intertie may be performed by either party without notice provided that notice is given to the other party as soon as reasonably possible. The costs of any emergency repairs undertaken by Highline shall be promptly reimbursed by District No. 54.

4. Notice.

a. District No. 54 will notify Highline of any changes in their storage deficit. At this time a new rate will be negotiated within 30 days of District No. 54's knowledge of such change.

b. District No. 54 shall notify Highline within a ten (10) day period after use of the Intertie for fire fighting purposes, emergency use or special maintenance purposes stating the nature of the use, the date and time of use and the quantity of water used.

5. Charges for intertie and Water Supplied by Highline.

a. District No. 54 shall pay Highline for use of water through the Intertie system based on Highline's published commercial/residential consumption rate in effect on the date the water is used by District No. 54. Thus, using the rates in effect at the present time, District No. 54 will pay $2.20 per 100 cubic feet for water used during the winter months (October through May) and $2.94 per each 100 cubic feet of water used during the summer months (June through September).

b. In addition to the charge for water consumption, District No. 54 will pay Highline the sum of $300.00 per month for intertie connection privileges and for supplemental standby storage. This month rate shall commence on July 1, 2000 and shall be paid in advance in two (2) equal semi-annual payments on July 1, 2000, and on January 1, 2001, and on the same day(s) of each year thereafter during the initial term and option terms of this Agreement.

c. The monthly rate shall be paid until such time as District No. 54 no longer requires supplemental storage.

d. In the event of non-payment by District No. 54 within sixty (60) days of the due date of payment, an additional late charge of ten percent (10%) of the amount past due shall be added to the required payment by District No. 54.

e. If Highline is unable to obtain an agreement with the City of Seattle to reduce or waive demand charges to Highline caused by use of water in accordance with this Agreement, and should any of the ten peak days used to calculate the demand charge be coincidental with a day in which water was taken through the South 216th Street Intertie, then District No. 54 shall calculate and pay within 30 days their portion, if any, of the demand charge.

6. <u>Indemnification</u>.

   a. Each party shall at all times be solely responsible and liable for the equipment and facilities maintained or operated by such party, and for the act or the failure to act, of its personnel that occur or arise in any way out of the performance of this Agreement. Each party shall save and hold the other party harmless from all costs, expenses, losses and damages, including cost of defense, arising from its use of equipment and facilities maintained or operated by such party, or incurred as a result of any acts or omissions of such party's personnel relating to the performance of this Agreement.

   b. Highline makes no guarantees or assurances as to water availability, water quality, pressure, or volume, at any given time relating to the Intertie. The duty of Highline to provide water under the provisions of this Agreement is a duty owed to the public generally, and by entering into this Agreement, Highline does not incur a special duty to District No. 54 or to the customers of District No. 54. It is understood and agreed that Highline makes no warranties or assurances as to water availability, pressure, or volume at any given time relating to the Intertie.

   c. It is understood that if Highline's water service to the Intertie is temporarily interrupted for repair, emergency or for any other reason, Highline is not obligated to provide an alternative source of water supply.

7. <u>Terms</u>.

   a. This Agreement, except for the water rate, shall be reviewed annually and shall continue indefinitely unless either party notifies the other of its intention not to continue or to renegotiate this Agreement by giving six (6) months' written notice prior to the end of each annual anniversary date.

b. This Agreement is contingent upon written approval by Seattle Public Utilities. This Agreement will expire upon expiration of the current Water Purveyor Contract between Highline Water District and Seattle Public Utilities, and shall also be subject to any additional amendments made to such Water Purveyor Contract.

8. Dispute Resolution.

a. If a dispute arises out of or relates to this Agreement, or the breach of it, and if the dispute cannot be settled through negotiations, the parties agree first to try in good faith to settle the dispute by mediation under the rules and regulations of the Washington Association of Sewer and Water Districts, or Washington Arbitration and Mediation Services, Inc., before resorting to arbitration, litigation or some other dispute resolution procedure.

Dated this 2ND day of AUGUST, 2000.

HIGHLINE WATER DISTRICT

Peggy S. Bosley

By: Peggy S. Bosley

Its: General Manager

WATER DISTRICT NO. 54

By:

Its: Superintendent/Manager

ATTACHMENT A

Serving the Southwest Metropolitan Area since 1946

June 2, 2014

King County Water District 54
922 S 219th St
Des Moines, WA 98198

Dear WS Operator:

The Ground Water Rule regulation went into effect in 2009. The purpose of this letter is to inform you about compliance with the Ground Water Rule when you are receiving water from Highline Water District (HWD). The rule is intended to detect ground water contamination through water quality testing.

When you receive water from HWD through your interties with us, your water system can receive water produced from our ground water sources. Since this is possible - your water system needs to understand the requirements that apply. The requirements are as follows:

1. If any of your sampling locations that could have received ground water through interties with HWD has a positive coliform result, then two things must happen:

   1a HWD must be informed of the positive result within 24 hours. In this communication we both will need to determine if any water was provided to you through the intertie and which wells were in service at the time. If ground water from our wells could have reached you, then see 1b below.

   1b HWD must collect untreated water samples from the operating wells and analyze them for *E.coli.*

2. If the untreated well sample is positive for *E.coli,* then all the utilities that receive the ground water must carry out public notification within 24 hours which is a Tier 1 notification.

HWD is required to provide this information to you as part of our compliance plan for the Ground Water Rule and our Coliform Monitoring Plan. The Washington State Department of Health has indicated that a reference to this letter needs to be included in your Coliform Monitoring Plan.

If you have any question, please feel free to contact me at 206-592-8920 or mbecker@highlinewater.org.

M. Becker

Mike Becker
Operations Supervisor
Highline Water District

For next
Comp Plan

23828 30th Ave. S. ▪ Kent, WA 98032 ▪ (206) 824-0375

ATTACHMENT A

WATER DISTRICT NO. 54
KING COUNTY, WASHINGTON
RESOLUTION 2014-3

A RESOLUTION relating to an interlocal agreement between Highline Water District and King County Water District No. 54.

WHEREAS, Chapter 39.34 RCW permits public agencies to enter into agreements with one another for joint or cooperative action, and,

WHEREAS, King County Water District No. 54 desires to enter into an interlocal agreement to have Highline Water District provide King County Water District No. 54 with operational and maintenance services which may include routine, non-routine and emergency type work as needed;

BE IT RESOLVED by the Board of Commissioners of King County Water District No. 54 as follows:

Section 1. Attached hereto as Exhibit "1". and incorporated by reference herein, is an interlocal agreement between Highline Water District, herein after called "District" and King County Water District No. 54, herein after called WD 54, the terms and conditions of which are approved by the Commissioners of King County Water District No. 54.

Section 2. Eric Clarke, the WD 54 Manager is hereby authorized to sign in duplicate a copy of Exhibit "1" and return the signed original copy, as well as a copy of this Resolution to Highline Water District.

Section 3. The interlocal agreement will become effective when both parties sign and return a copy of Exhibit "1".

PASSED at the regular meeting of the Board of Commissioners of King County Water District No. 54 this 3rd day of June, 2014

John H Rayback

John H. Rayback, President

Alli Larkin

Alli Larkin, Secretary

Victor L. Pennington II, Commissioner

original

AGREEMENT FOR SERVICES

The Agreement ("Agreement") is made and entered into by and between Highline Water District, a Washington municipal corporation ("District"), and King County Water District No. 54, a Washington municipal corporation ("WD 54"), (individually a "Party" and collectively the "Parties") for the purposes set forth below.

1 RECITALS

1.01 The District owns and operates a water utility system and provides water service to the Highline area in King County, Washington. WD 54 also owns and operates a water system and provides water service to an area located primarily within the City of Des Moines in King County, Washington. A portion of WD 54's service area is adjacent to the District's service area.

1.02 WD 54 desires to receive assistance from the District to operate and maintain its water system. The District is willing to provide such assistance on certain terms and conditions as set forth herein provided the District has sufficient resources available.

1.03 Therefore, the Parties, in consideration of the following terms and conditions, now agree as follows:

2 DISTRICT SERVICES

2.01 Scope of Services. The District agrees to provide certain utility services to WD 54 as described and set forth on **Exhibit A** attached hereto and incorporated herein in full by this reference ("Scope of Services - Operational and Maintenance Services").

2.02 Compensation and Payment. WD 54 shall pay the District for the time, materials and equipment third party costs and fees for the District to provide the Operational and Maintenance services referenced on **Exhibit A** in accordance with the schedule of rates and charges set forth in **Exhibit B** attached hereto and incorporated herein by this reference. Such compensation shall be payable in the following manner:

a. The District shall submit a detailed monthly billing to WD 54 for all services provided describing the services rendered, fees charged and expenses incurred by District during the previous month in accordance with the Scope of Services and schedule of rates and charges set forth in **Exhibit B**.

b. WD 54 shall pay the District's monthly invoice within thirty (30) days of receipt. In the event WD 54 fails to pay any invoice within thirty (30) days of receipt, such unpaid invoice shall bear interest at the rate of one (1) percent per month until the amount of such unpaid invoice, plus interest thereon shall be paid in full.

2.03 Schedule of Work. District shall commence the performance of its services under this Agreement on the Effective Date and shall provide the utility services to WD 54 as described on **Exhibit A**.

2.04 Change in Scope of Services. WD 54 may request changes or modifications in the Scope of Services to be performed under this Agreement. Any such change or modification shall be in writing and agreed to by the Parties. The compensation for the changes or modifications shall be on the same terms and conditions as set forth in paragraph 2.02 above or in a manner otherwise mutually agreed to by the Parties.

2.05 Control and Status of Personnel. District personnel and equipment used to provide the services under this Agreement shall remain under the exclusive direction and control of the District. All privileges, immunities, rights, duties and benefits of the District's officers and employees shall apply while those officers and employees are performing the services under this Agreement, unless otherwise provided by law.

2.06 Agreement Term. The term of this Agreement shall from the Effective Date to and through December 31, 2015 ("Term"), unless thereafter renewed or extended by the Parties on terms and conditions as agreed to by the Parties; provided, either Party may terminate this Agreement for any reason upon twenty (20) days prior written notice to the other Party as provided herein.

2.07 Insurance. During the Term of this Agreement, WD 54 shall procure and have in effect, at its sole expense, Commercial General Liability insurance policy(s) that will fully protect the District from any and all losses, costs, and damages, from insurance companies that have an A.M. Best's rating of A:VII or better and who are approved by the Insurance Commissioner of the State of Washington pursuant to Title 48 RCW. The minimum requirements are stated below. A copy of a Certificate of Liability Insurance shall be provided to the District before the District will approve and execute the Agreement. The minimum types and limits of insurance required are as follows:

1. Commercial General Liability
    - $3,000,000 each occurrence Bodily Injury and Property Damage
    - $3,000,000 General Aggregate
    - $3,000,000 Employers liability (Stop Gap) per accident/disease
2. Automobile Liability
    - $2,000,000 per accident Bodily Injury and Property Liability covering:
        - o Any owned automobile
        - o Hired automobiles
        - o Non-owned automobile

WD 54's insurance policies shall not contain deductible or self-insured retentions in excess of $10,000, unless approved by the District. The Commercial General Liability policy(s) must be endorsed for ongoing and completed operations to:

a. Specifically name the District, its elected and appointed officers, officials, and employees and agents as additionally insureds.

b. The coverages provided by WD 54's insurance policies shall be primary to any insurance maintained by the District, except as respects to losses attributable to the sole negligence of the District. Any insurance that might cover this Agreement that is maintained by the District shall be in excess of the WD54'sinsurance and shall not contribute with it.

c. Such insurance shall be with insurance companies that have an A.M. Best's rating of "A VII" or better, and who are approved by the Insurance Commissioner of the State of Washington pursuant to Title 48 RCW.

d. The contractual coverage of WD 54's insurance policies shall be sufficiently broad enough to insure the provisions of the indemnity set forth in Section 2.08 herein.

e. Nothing contained in these insurance requirements shall be construed as limiting the extent of WD 54's responsibility for payment of damages resulting from WD 54's operations or negligence related to this Agreement.

2.08 Indemnity. WD 54 agrees to indemnify, defend and hold the District and its elected and appointed officers, officials, employees and agents (collectively "the District") harmless from any and all losses, claims, demands, payments, suits, liabilities or judgments of every nature and description brought or recovered against the District for damages to persons or property relating to or arising out of this Agreement (collectively referred to as "Damages"), except to the extent any Damages resulted from the sole negligence of the District.

2.09 No Third-Party Rights. This Agreement is for the benefit of WD 54 and the District and no person or entity shall have any rights under this Agreement as a third-party beneficiary or otherwise.

2.10 Notices. Any notice to be given, document to be delivered or payment to be made by either Party to the other shall be delivered in person or mailed by certified mail and addressed to the District or WD54 at the following addresses:

District:
Highline Water District
Attn: General Manager
23828 – 30th Ave. S.
Kent, WA 98032

WD 54:
King County Water District No. 54
Attn: General Manager
922 S. 219th Street
Des Moines, WA 98198

Any Party may by written notice to the other designate a different address for such notice.

2.11 Effective Date. This Agreement shall take effect upon the approval of this Agreement by the Board of Commissioners of both Parties ("Effective Date"). Each Party shall approve this Agreement by appropriate resolution and shall provide the other Party with a copy of same. Each Party represents to the other that it has the full power and authority to enter into this Agreement and that the individual executing this Agreement on behalf of the respective Party is authorized to do so.

2.12 Attorney's Fees. Should either Party commence any legal action relating to the provisions of this Agreement, the prevailing party shall be awarded judgment for all costs of litigation, including, but not limited to, costs, expert witness fees and reasonable attorney's fees, including all such costs and fees incurred on appeal.

2.13 Right of Entry. WD 54 shall provide right of entry for District to all WD 54 owned water system facilities as necessary for the District to perform the services provided for herein.

2.14 Entire Agreement. This Agreement contains the entire understanding between the Parties and shall supersede any prior understanding, agreements or course of dealing between the Parties relative to the District providing certain utility services to WD54. There are no other representations, agreements, arrangements, or understandings, oral or written, between the Parties relating to the subject matter of this Agreement. No amendment to this Agreement shall be valid unless made in writing and executed by the Parties.

2.15 WD 54 Responsibilities. WD 54 agrees to operate and maintain its water system in accordance with applicable King County and State of Washington Department of Health statutes, rules and regulations. All permits and/or jurisdictional approvals for the services shall be the responsibility of WD54 at their sole expense.

HIGHLINE WATER DISTRICT
("District")

By: Matt Everett
Its: General Manager

Dated: 6/4/14

KING COUNTY WATER DISTRICT NO. 54
("WD 54")

By:
Its: General Manager

Dated: 6-4-14

EXHIBIT A
SCOPE OF SERVICES
OPERATIONAL AND MAINTENANCE SERVICES

The District shall provide water system operational and maintenance support to WD54 as requested provided the District has sufficient resources available to perform the Work. Services may include routine, non-routine and emergency type work.

For the purposes of this Agreement, Work shall be defined as follows:

- Routine – operational or maintenance work conducted on a predictable or repetitive schedule that typically does not involve excavation or use of heavy equipment. Work may include but not limited to: main flushing, leak detection, water quality testing, hydrant repair, meter reading, locating, inspection, responding to customer's requests or inquiries, etc.
- Non-Routine – operational or maintenance work conducted on a case-by-case basis and typically involves excavation and/or the use of heavy equipment. Work may include but not limited to new water appurtenance installations, service or hydrant replacements, main connections, etc.
- Emergency – operational, maintenance, or repair work that is necessary to prevent a threat to public health, safety or property and/or failure to repair would result in the loss of continuity of water system operation. Examples may include main breaks, water quality events, loss of water source, etc.

EXHIBIT B
COMPENSATION AND PAYMENT

All work, labor, materials, equipment, and third party costs shall be billed on a time-and-materials basis at their direct expense PLUS a Ten Percent (10%) Administrative Fee.

Labor and Equipment

Labor and Equipment rates shall be as identified in Highline Water District Codebook Section 6.04 Table 5 in effect at the time of the Work. All labor and equipment rates are subject to change established by the District's Board of Commissioners. The District will provide a minimum 30-day notice to WD 54 of changes to the District's Labor and Equipment Rates.

District labor provided outside of normal District working hours (7:00 a.m. to 3:30 p.m. Summer; 7:30 a.m. to 4:00 p. m. Winter) shall be billed at the District's Overtime Rate (1.5 times Labor Rate).

District overtime labor after normal working hours shall be compensated as follows:

- Staff who are called, but do not actually go out, shall record time actually spent on the call. Each call will be rounded to the next minute; at the end of the day, all such minutes will be added and rounded to the next quarter hour and billed at the Overtime Rate.
- For callouts, a minimum of Two (2) hours shall be billed at the Overtime Rate.
- For callouts where heavy equipment is used, a minimum of Four (4) hours will be billed. Heavy equipment is defined as operating the backhoe and dump truck.

Materials

Materials shall be billed at their direct cost, including any shipping and handling fees.

Third Party Costs

Any third party costs associated with this Agreement shall be billed at their direct expense.

Written Estimates and Authorization for Work

For Non-Routine work, the District will prepare an estimate of anticipated project costs for review and approval by WD54. WD54 shall approve the estimate in writing prior to authorization to proceed. The estimate is for budgetary purposes only and WD54 shall be responsible for all final charges to perform the Work.

For Routine and Emergency work, WD54 may give verbal authorization.

ATTACHMENT A

WATER DISTRICT NO. 54
KING COUNTY, WASHINGTON
RESOLUTION No. 2000-6

A RESOLUTION relating to a mutual aid agreement between King County Water District No. 54 and Lakehaven Utility District.

WHEREAS Chapter 39.34 RCW permits public agencies to enter into agreements with one another for joint or cooperative action, and,

WHEREAS, the Lakehaven Utility District and King County Water District No. 54 desire to enter into an agreement to provide the other public agency assistance in the event of emergencies;

NOW THEREFORE;

BE IT RESOLVED by the Board of Commissioners of King County Water District No 54 as follows:

Section 1. Attached hereto as Exhibit "A", and incorporated by reference herein, is a Mutual Aid Agreement between The Lakehaven Utility District, herein after called LUD, and King County Water District No. 54, herein after called District 54, the terms and conditions of which are approved by the Commissioners of King County Water District No. 54.

Section 2. Rolfe Pedersen , the General Manager, and Robert J. Verzani, the attorney for District 54, are hereby authorized to sign in duplicate a copy of Exhibit "A" and forward a signed copy and a certified copy of this Resolution to LUD for their acceptance.

Section 3. The Mutual Aid Agreement will become effective when LUD approves and returns to District 54 a signed copy of Exhibit "A".

PASSED at a regular meeting of the Board of Commissioners of Water District No. 54 this 18th day of April, 2000.

Carl J Mealy
Carl Mealy, President

Robert N. Ricketts
Robert N. Ricketts

H.M. Foote, Jr
H. M. Foote Jr.

ATTACHMENT A

LAKEHAVEN UTILITY DISTRICT

31627 - 1st Avenue South • P.O. Box 4249 • Federal Way, Washington 98063
Federal Way: 253-941-1516 • Tacoma: 253-927-2922 • Fax: 253-839-9310

June 13, 2000

Rolfe Pedersen, General Manager
Water District No. 54
922 South 219th Street
Des Moines, Washington 98198

Subject: Mutual Aid Agreement

Dear Mr. Pedersen:

Enclosed is an executed copy of the Mutual Aid Agreement we have been working on between our Districts along with the Resolution the Board of Commissioners adopted on June 8, 2000 supporting the execution of the Mutual Aid Agreement.

We would like to set up a meeting with you and your staff to meet our staff and provide you with telephone numbers and equipment information.

We look forward to working with you and your team. Please call me at 253 946-5405 and I will set up the meeting to exchange information.

Sincerely,

Donald Perry

Donald T. Perry
General Manager
Lakehaven Utility District

ATTACHMENT A

LAKEHAVEN UTILITY DISTRICT
King County, Washington

Resolution No. 2000-922

A RESOLUTION of the Board of Commissioners authorizing the General Manager to execute the "Sewer and Water Agency Mutual Aid Agreement".

WHEREAS, the District is a special purpose water/sewer district providing utility services within and without King County, and

WHEREAS, other such municipal utilities provide water and/or sewer service in the region, and

WHEREAS, under state law, public agencies may contract with each other to provide services, and

WHEREAS, in times of disaster or other emergency, utilities may be able to assist other such utilities in responding to, and managing, a disaster or other emergency, and

WHEREAS, the District has been presented with an opportunity to create reciprocal emergency aid agreements with two local utilities

WHEREAS, believing the same to be in the best interests of the District and its customers:

NOW THEREFORE, **BE IT RESOLVED** as follows:

1. The General Manager is hereby authorized to sign the "Mutual Aid Agreement" between the District and King County Water District No. 54 and between the District and Southwest Suburban Sewer District, substantially in the form as attached hereto as Exhibits "A" and "B".
2. In authorizing the execution of these agreements, it is the Board of Commissioner's intent that the District participates fully in the provision of mutual aid for the benefit of both District customers and the customers of the utilities contracting with the District.

ADOPTED by the Board of Commissioners of Lakehaven Utility District, King County, Washington, at an open public meeting this 8th day of June, 2000.

ATTEST:

[illegible] J. Tweddle
President and Commissioner ✓ Yea Nay Abstain

Donald L. Miller
Vice President and Commissioner ✓ Yea Nay Abstain

Thomas M. Jovanovich
Secretary and Commissioner ✓ Yea Nay Abstain

NOT PRESENT
Commissioner Yea Nay Abstain

Edward C. Stewart
Commissioner ✓ Yea Nay Abstain

Approved as to form:
General Counsel

ATTACHMENT A

MUTUAL AID AGREEMENT BETWEEN THE LAKEHAVEN UTILITY DISTRICT AND KING COUNTY WATER DISTRICT 54

Whereas, RCW Chapter 39.34 authorizes sewer and water agencies to contract with each other to provide services; and

Whereas, The Lakehaven Utility District (herein after called LUD) and King County Water District 54 (herein after called District 54) desire to enter into an agreement to provide assistance in the event of emergencies

Now therefor; LUD and District 54 agree to the following:

Definitions:
Agency is defined as LUD or District 54.
Agencies are defined as LUD and District 54.

1. **Request for Assistance**. Either LUD or District 54, through its designated official, may request the other to send resources to deal with a disaster or an emergency. A request for assistance may be oral or written. If the request is oral, it shall be confirmed in writing by the designated official as soon as practicable after the request. Each request shall describe the equipment, personnel, expertise and other resources that are needed to address the disaster or emergency.
2. **Definition of Disaster or Emergency**. A disaster or emergency is an event or situation which (1) demands immediate action to preserve public health or protect life or property or (2) reaches such a dimension or degree or destructiveness as to warrant the Governor of the State of Washington to declare a state of emergency.
3. **Response to Request**. The responding agency, through its designated official, shall, as soon as possible, determine whether resources are available to respond to the request for disaster or emergency assistance. Following the determination, the responding agency's designated official shall, as soon as possible, advise the requesting agency of the availability of resources and, if resources are available the approximate time when such will be provided. The judgement of the responding agency's designated official shall be final as to the availability of resources. A responding agency shall not be liable to the requesting agency or any person or entity for failing to respond to a request for assistance or providing resources.
4. **Control of Resources**. Resources of the responding agency that are made available to the requesting agency shall, whenever possible, remain under the control and direction of the responding agency. The requesting agency shall coordinate the activities or resources of the responding agency. The responding agency shall retain the right to withdraw some or all of its resources whenever they are needed by the responding agency. Notice of intention to withdraw shall be communicated to the requesting agency's designated official, or the official's designee, as soon as possible.

5. **Status of Personnel**. All privileges, immunities, rights, duties and benefits of officers and employees of the responding agency shall apply while those officials and employees are performing functions and duties within the requesting agency's service area, unless otherwise provided by law.
6. **Indemnification**. An agency shall defend, hold harmless and indemnify the other agency, and their officers and employees, from any and all claims, suits or actions, including the cost of defense, arising from the willful or negligent acts and omissions of its own officers and employees while operating under this agreement.
7. **Insurance**. An agency shall maintain insurance for the activities of its resources while operating outside or the agency under this Agreement, which insurance shall be at least equal to the insurance the agency maintains for the activities of its resources while operating within the agency.
8. **Cost Reimbursement**. The requesting agency shall reimburse the responding agency for the cost of providing assistance. The reimbursement shall be based upon the responding agency's schedule of hourly or daily rates for personnel and costs of equipment. Reimbursement shall be made within 30 days after receipt by the requesting agency or an itemized voucher of costs.
9. **Operational Procedures**. The agencies shall establish operational, cost reimbursement and planning procedures for carrying out this Agreement.
10. **Authorization, Effective Date, Duration**. An agency shall authorize and approve this agreement by resolution. This agreement shall be effective upon adoption or authorizing resolutions by the two agencies and shall remain in effect as long the two agency resolutions are in effect. Upon adoption of an authorizing resolution and execution of this agreement, an agency shall send a certified copy of the resolution and agreement to the other agency.
11. **Termination**. This agreement shall remain binding upon an agency until it repeals the authorization resolution. Upon adoption of a repealing resolution, the agency shall send a certified copy of the resolution to the other agency. Withdrawal from this agreement shall not relieve the withdrawing agency for obligations assumed under this agreement prior to the effective date of the withdrawal.
12. **No Third Party Rights**. This Agreement is for the benefit of both agencies and no person or entity shall have any rights under this Agreement as a third party beneficiary.

Lakehaven Utility District
General Manager

Rolfe Pedersen
Water District 54
General Manager

As to Form:

Lakehaven Utility District Attorney

Water District 54 Attorney

ATTACHMENT A

WATER DISTRICT NO. 54
KING COUNTY, WASHINGTON
RESOLUTION No. 2000- 9

A RESOLUTION relating to a mutual aid agreement between King County Water District No. 54 and King County Water District No. 125.

WHEREAS Chapter 39.34 RCW permits public agencies to enter into agreements with one another for joint or cooperative action, and,

WHEREAS, King County Water District No. 125 and King County Water District No. 54 desire to enter into an agreement to provide the other public agency assistance in the event of emergencies;

NOW THEREFORE;

BE IT RESOLVED by the Board of Commissioners of King County Water District No 54 as follows:

Section 1. Attached hereto as Exhibit "A", and incorporated by reference herein, is a Mutual Aid Agreement between King County Water District No. 125, herein after called District No. 125 and King County Water District No. 54, herein after called District 54, the terms and conditions of which are approved by the Commissioners of King County Water District No. 54.

Section 2. Rolfe Pedersen , the General Manager is hereby authorized to sign in duplicate a copy of Exhibit "A" and forward a signed copy and a certified copy of this Resolution to Midway for their acceptance.

Section 3. The Mutual Aid Agreement will become effective when District No. 125 approves and returns to District 54 a signed copy of Exhibit "A".

PASSED at a regular meeting of the Board of Commissioners of Water District No. 54 this 16th day of May, 2000.

Carl J Mealy
Carl Mealy, President

Robert N. Ricketts
Robert N. Ricketts

H. M. Foote Jr.

ATTACHMENT A

RUSSELL AU
Superintend
ANN WILS
Office Mana

Water District No. 125, King County

Telephone: 242-9547
FAX: 248-1744

P.O. Box 68147, Riverton Hts. Br.

Office: 2849 South 1

SEATTLE, WASHINGTON 98168

April 13, 2000

MUTUAL AID AGREEMENT

This MUTUAL AID AGREEMENT is by and between Water District 54 and Water District 125 each a municipal corporation organized under the laws of the state of Washington, and Hereinafter called "District".

Recitals:
RCW Chapter 39.34 authorizes sewer and water agencies contract with each other to provide services.
The agencies desire to provide resources to any agencies that request assistance to handle a disaster or emergency.

Agreement:
The District agrees as follows:

1. Request for assistance.
A District, through its designated official, may request the other District to send resources to deal with a disaster, emergency or unexpected event in which a District does not have then available sufficient personnel or equipment to complete within a reasonable period of time. A request may be oral or written; if the request is oral, it shall be confirmed within writing soon as practicable after the request. Each request shall describe the equipment, personnel, expertise and other resources that are needed to address the situation.

2. Definition of disaster or Emergency.
A disaster or emergency is an event or situation which demands immediate action to preserve public health or protect life or property.

ATTACHMENT A

3. Response to request.

The responding agency, through its designated official, shall, as soon as possible determine whether resources are available to respond to the request for assistance. Following the determination, the responding District official shall, as soon as possible, advise the requesting District of the availability of resources and, if resources are available, the approximate time when such should be provided. The judgment of the responding District official shall be final as to the as to the availability of resources. A responding district shall not be liable to the requesting District or any person or entity for failing to respond to a request for assistance or provide services.

4. Control of Resources.

Resources of the responding District that are made available to the requesting District shall, whenever possible, remain under the control and direction of the responding District. The responding District shall retain the right to withdraw some or all of its resources wherever they are needed by the responding District. Notice of intention to withdraw shall be communicated in a timely manner.

5. Status of Personnel.

All privileges, immunities, rights, duties and benefits of officers and employees of the responding District shall apply while those officers and employees are performing functions and duties with the requesting District.

6. Indemnification.

A district shall defend, hold harmless and indemnify the other District, and it's officers and employees, from any and all claims, suits, or actions, including the costs of defense, arising from the willful or negligent acts and omissions of its own officers and employees while operating under this agreement.

7. Insurance.

Each District shall provide and maintain insurance of it's own resources and officers and employees while operating under this agreement.

8. Cost Reimbursement.

The requesting District shall reimburse the responding District for the cost of providing assistance. Reimbursement shall include wages of officers and employees equipment costs. Ninety (90) days shall be the terms for payment of services rendered.

9. Operational Procedures.

The agencies shall establish operation, cost reimbursement and planning procedures for carrying out this agreement.

10. Authorization: Effective Date; Duration.
Each District shall authorize and approve this agreement by resolution. This Agreement shall be effective upon adoption or authorization by resolutions by both Districts and shall remain in effect as long as both resolutions are in effect

11. Termination.
This agreement shall remain binding upon a District until it repeals the authorizing resolution. Upon adoption of a repealing resolution,, the District shall send a certified copy of the resolution to the other District. Termination shall not relieve the withdrawing party from obligations assumed under this agreement prior to the effective date of withdrawal.

12. No Third Party Rights.
This Agreement is for the benefit of the two Districts and no other person or entity shall have rights under this Agreement as a third party.

King Co Water District 54
by: Rolfe Pedersen
Rolfe Pedersen, Manager

Date: 16-MAY-2000

King Co Water District 125
by: Russ Austin
Russ Austin, Manager

Date: 4-13-00

ATTACHMENT A

WATER DISTRICT NO. 54
KING COUNTY WASHINGTON
RESOLUTION NO. 2000-10

A Resolution relating to accepting a Mutual Aid Agreement with Washington Association of Sewer and Water Districts.

RECITALS:

WHEREAS, King County Water District No. 54 is a member of the Washington Association of Sewer and Water Districts, "Association", and

WHEREAS, The Association has available for its members a Mutual Aid Agreement, and

WHEREAS, Water District No. 54 desires to accept the terms of the Agreement;

NOW THEREFORE IT IS HEREBY RESOLVED BY THE BOARD OF COMMISSIONERS OF WATER DISTRICT NO. 54 AS FOLLOWS:

Section 1. Attached hereto, consisting of two pages is a Washington Association of Sewer and Water Districts Mutual Aid Agreement.

Section 2. The terms and conditions of this Agreement are hereby accepted by Water District No. 54.

Section 3. Rolfe Pedersen, the District Superintendent, be and he is hereby directed to sign as the Authorized Representative in the Agreement and to forward an executed copy and a copy of this Resolution to the Association.

PASSED at a regular meeting of the Commissioners of Water District No. 54 this 13th day of June 2000.

Carl J Mealy
Carl J. Mealy, President

Robert N. Ricketts
Robert J. Ricketts

H. M. Foote, J
H. M. Foote Jr.

ATTACHMENT A

WASHINGTON ASSOCIATION OF SEWER AND WATER DISTRICTS

SEWER & WATER AGENCY MUTUAL AID AGREEMENT

THIS MUTUAL AID AGREEMENT is by and between all sewer and water agencies that have authorized this agreement under the procedures of this agreement.

Recitals:

A. RCW Chapter 39.34 authorizes sewer and water agencies to contract with each other to provide services.

B. The agencies desire to provide resources to any other agencies that request assistance to handle a disaster or emergency.

Agreement

It is agreed by the agencies as follows:

1. **Request for Assistance.** An agency, through its designated official, may request another agency to send resources to deal with a disaster or emergency. A request for assistance may be oral or written. If the request is oral, it shall be confirmed in writing by the designated official as soon as practicable after the request. Each request shall describe the equipment, personnel, expertise and other resources that are needed to address the disaster or emergency.

2. **Definition of Disaster or Emergency.** A disaster or emergency is an event or situation which (1) demands immediate action to preserve public health or protect life or property or (2) reaches such a dimension or degree of destructiveness as to warrant the Governor of the State of Washington to declare a state of emergency.

3. **Response to Request.** The responding agency, through its designated official, shall, as soon as possible, determine whether resources are available to respond to the request for disaster or emergency assistance. Following the determination, the responding agency's designated official shall, as soon as possible, advise the requesting agency of the availability of resources and, if resources are available, the approximate time when such will be provided. The judgement of the responding agency's designated official shall be final as to the availability of resources. A responding agency shall not be liable to the requesting agency or any person or entity for failing to respond to a request for assistance or provide resources.

4. **Control of Resources.** Resources of the responding agency that are made available to the requesting agency shall, whenever possible, remain under the control and direction of the responding agency. The requesting agency shall coordinate the activities of resources of the responding agency. The responding agency shall retain the right to withdraw some or all of its resources whenever they are needed by the responding agency. Notice of intention to withdraw shall be communicated to the requesting agency's designated official, or the official's designee, as soon as possible.

5. **Status of Personnel.** All privileges, immunities, rights, duties and benefits of officers and employees of the responding agency shall apply while those officers and employees are performing functions and duties within the requesting agency', unless otherwise provided by law.

6. **Indemnification.** An agency shall defend, hold harmless and indemnify all other agencies, and their officers and employees, from any and all claims, suits or actions, including the cost of defense, arising from the willful or negligent acts and omissions of its own officers and employees while operating under this agreement.

7. **Insurance.** An agency shall maintain insurance for the activities of its resources while operating outside of the agency under this Agreement, which insurance shall be at least equal to the insurance the agency maintains for the activities of its resources while operating within the agency.

8. **Cost Reimbursement.** The requesting agency shall reimburse the responding agency for the cost of providing assistance. The reimbursement shall be based upon the responding agency's schedule of hourly or daily rates for personnel and costs of equipment. Reimbursement shall be made within 90 days after receipt by the requesting agency of an itemized voucher of costs.

9. **Operational Procedures.** The agencies shall establish operational, cost reimbursement and planning procedures for carrying out this Agreement.

10. **Authorization: Effective Date: Duration.** An agency shall authorize and approve this agreement by resolution. This Agreement shall be effective upon adoption or authorizing resolutions by two agencies and shall remain in effect as long as two or more authorizing resolutions are in effect. Upon adoption of an authorizing resolution and execution of this agreement, an agency shall send a certified copy of the resolution and agreement to the Washington Association of Sewer and Water Districs. The Association shall maintain a list of all agencies and shall send an updated list to all agencies whenever an agency is added or eliminated from the list.

11. **Termination.** This agreement shall remain binding upon an agency until it repeals the authorizing resolution. Upon adoption of a repealing resolution, the agency shall send a certified copy of the resolution to the Washington Association of Sewer and Water Districts. Withdrawal from this agreement shall not relieve the withdrawing agency from obligations assumed under this agreement prior to the effective date of the withdrawal.

12. **No Third Party Rights.** This Agreement is for the benefit of the agencies and no person or entity shall have any rights under this Agreement as a third party beneficiary.

KING COUNTY WATER DISTRICT NO. 54
Agency Name
922 South 219th Street, Des Moines
King County, Washington
Rolfe Pedersen
Rolfe Pedersen Authorized Representative
June 13, 2000 6-13-2000
Date

WATER DISTRICT NO. 54
KING COUNTY, WASHINGTON
RESOLUTION NO. 2009-2

A RESOLUTION relating to the adoption of the Mutual Aid and Assistance Agreement of Washington State for Intrastate Washington Water/Wastewater Agency Response Network – hereafter "WARN".

WHEREAS, King County Water District No.54 ("The District") is a municipal corporation providing water utility service pursuant to Title 57 RCW; and

WHEREAS, the District previously adopted an Emergency Response Plan by Resolution 2002-1 dated January 8, 2002, which includes as an appendix the Vulnerability Assessment Report; and

WHEREAS, the District previously adopted the WASWD Mutual Aid Agreement by Resolution 2000-10 dated June 13, 2000, as well as agreements with King County Water District No.125 adopted by Resolution 2000-9 dated May 16, 2000 and Lakehaven Utility District adopted by Resolution 2000-6 dated April 18, 2000; and

WHEREAS, The District Board of Commissioners has reviewed the Mutual Aid Assistance Agreement for Washington State for Intrastate Water/Wastewater Agency Response Network (WARN) in the form attached hereto as Exhibit A and incorporated herein by this reference ("Mutual Aid Agreement"), and

WHEREAS, the Board of Commissioners finds that it is in the best interest of the District to participate in mutual aid with other public utilities to coordinate response activities and share resources during emergencies; now therefore,

BE IT RESOLVED, by the Board of Commissioners of King County Water District No. 54, King County Washington, as follows:

1. The Mutual Aid Agreement in the form attached hereto as Exhibit A is hereby approved and the District Manager is authorized to sign the Mutual Aid Agreement on behalf of the District
2. The District Manager is hereby appointed as the Authorized Official and the District Office Manager is hereby appointed as the Alternate Authorized Official for actions to be taken on behalf of the District under the Mutual Aid Agreement.
3. The District Manager is authorized to appoint a District staff member to serve as the District's representative on the Washington State WARN Regional Committee and to vote on the District's behalf on matters that may come before the Regional Committee.
4. District staff are directed to implement the terms of the Mutual Aid Agreement, to transmit a certified copy of the executed Resolution and an original Mutual Aid Agreement to the Washington State WARN Statewide Committee Chair, and to advise the Regional Committee of the names of the District's designated Authorized Official, Alternate Authorized Official and the District staff member to serve as the

ATTACHMENT A

District's representative on the Washington State WARN Regional Committee.

PASSED at a regular meeting of the Board of Commissioners of King County Water District No. 54 this 15th day of September 2009.

Alli Larkin

Alli Larkin, President

John H. Rayback, Commissioner

David E. Gilkey, Commissioner

APPENDIX E

POLICIES AND RESOLUTIONS

ATTACHMENT A

WATER DISTRICT NO. 54
KING COUNTY, WASHINGTON
RESOLUTION 2019 -4

A RESOLUTION relating to providing a response to request for service in a Timely and Reasonable manner.

WHEREAS, King County Water District No. 54 (KCWD 54) periodically receives request for water service, and

WHEREAS, KCWD 54 is within the South King County Coordinated Water System Plan area, and

WHEREAS, RCW 70.116 .060 governs water service within a Critical Water Supply area defines timely service, and

WHEREAS, KCWD 54 desires to be in compliance with the RCW, NOW THEREFORE

BE IT RESOLVED by the Board of Commissioners of King County Water District No. 54 the following:

Timely Service – KCWD 54 will issue, or deny, a Certificate of Water Availability to applicants that have submitted, in writing, credible and complete applications within 120 days of receipt.

Reasonable – The KCWD 54 shall consider the extension of water service reasonable if the City confirms that the proposed project complies with applicable zoning and land use planning.

Written confirmation of the receipt of a credible and complete request for a Certificate of Water Availability will be issued within 14 days; or if a submission is not credible or complete, KCWD 54 will identify the shortcomings in writing within 14 days. Fire Flow analysis and or peak hour pressure analysis, if required, will be performed within 60 days of receipt of a credible and complete request. Included in the fire flow analysis shall be identification of needed modifications to the system, if any. Written response to a credible and complete request for a Certificate of Water Availability shall be made in accordance with the time frame set forth above.

The developer is responsible for all costs to extend KCWD 54 system to serve the proposed development with reliable service meeting all Washington State Department of Health criteria and including the provision of fire flow as may be required by the Fire District, City or County.

PASSED at a regular meeting of the Board of Commissioners on King County Water District No. 54 this 1st day of October 2019

Yoshiko Grace Matsui, President

Kristi Van Gasken, Commissioner

James Langston, Commissioner

WATER DISTRICT NO. 54
KING COUNTY, WASHINGTON
RESOLUTION NO. 2018-2

A RESOLUTION relating to rate schedules and defining certain conditions for providing public water services and providing for shut-off notices and locking meters, and amending Resolution 2016-4.

WHEREAS, pursuant to RCW 57.08 the Board of Commissioners is empowered to establish periodic rates for the furnishing of water, and

WHEREAS, in order to ensure the District will be able to take care of the costs of maintenance and operation and all other charges necessary for efficient and proper operation of the water system, and

WHEREAS, believing rates established herein are fair and equitable and will enable the district to meet its financial requirements, Now, therefore:

BE IT RESOLVED by the Board of Commissioners of King County Water District No. 54 as follows:

SECTION 1. BILLINGS

A. All billings for water service shall be on a bi-monthly basis, and shall be made on the last day of each even numbered month.

B. The District shall bill the owner or tenant of the property served for all charges for water supplied or services provided by the District.

C. The property owner may designate another party to whom all billings are to be sent.

1. Current recipients of billings who are not property owner will be deemed by the District to be the owner's designee, and will continue to be billed by the District unless the property owner notifies the District, in writing, that the billing should be changed.

D. At the request of the property owner, and at a bi-monthly cost of $5.00 for each additional billing, the District will send billings to tenants or other parties, as designated by the property owner. The property owner shall remain liable for all charges not paid by the tenant or other party.

SECTION 2. RATES

The rate schedule for water service is as follows:

A. Single Family Residence:

1. Residences served by a 5/8" or 3/4" meter: a minimum monthly base charge of $13.90 together with the water consumption charges set forth in sub-section 2-H, below.
2. Residences served by a 1"meter: a minimum monthly base charge of $14.40 together with the water consumption charges set forth in sub-section H, below.
3. Any request for meters larger than 1" will be charged at the non-residential rate, together with the water consumption charges set forth in sub-section H below.

B. Multiple Family Residence:

1. Defined as two or more separate units of space, each unit of which is intended for occupancy by an individual family, which are served by a single water meter.
2. A minimum monthly base charge per unit of $13.90 together with the water consumption charge set forth in sub-section H, below:

C. Other premises Used for Residential Purposes:

Each and any unit not described above which is used as a residence shall pay the Multiple Family Residence rate set forth in sub-section B, above, together with the water consumption charge set forth in sub-section H below. Where the facility if also used for non-residential purposes, it shall also be assessed under the provisions of sub-section E. below.

D. Premises Used for Non-Residential Purposes:

A minimum monthly base charge, based upon the size of the water meter as indicated in Section E, below, together with the consumption charge set forth in sub-section H below.

E. Non-Residential Minimum Monthly Base Charge:

METER SIZE	MINIMUM MONTHLY CHARGE
5/8" & 3/4"	$ 37.04
1"	$ 38.41
1-1/2"	$ 62.84
2"	$ 110.75
3"	$ 199.20
4"	$ 371.19
6"	$ 739.74
8"	$1,231.14

F. Fire/Sprinkler Lines:

Fire lines/sprinklers lines to all properties shall be metered and charged as herein set forth. Each fire line/sprinkler line shall be equipped with District approved meters and valves to detect unauthorized water use through fire/sprinkler lines. Each line to a building sprinkler system shall be charged a monthly charge, according to size:

LINE SIZE	MONTHLY CHARGE
1"	$ 12.00
2"	$ 24.00
3"	$ 36.00
4"	$ 48.00
5"	$ 60.00
6"	$ 72.00
7"	$ 84.00
8"	$ 96.00

G. Irrigation Systems:

For separately metered irrigation water, the monthly minimum base charge shall be based upon the size of the irrigation meter and the classification of the premises served (i.e. Residential or Non-Residential), together with the water consumption charge set forth below.

H. Water Consumption Charge:

1. Summer usage: $4.10 per 100 cubic feet (ccf) or fraction thereof, of water consumed.
2. Winter usage: $3.80 per 100 cubic feet (ccf) or fraction thereof, of water consumed.

I. Definitions:

The following definitions shall apply to the establishment of water rates:

1. Summer Usage: Water usage billed the six months from May 1 through October 31, inclusive;
2. Winter usage: Water usage billed for the six months from November 1 through April 30, inclusive.

J. Bulk Water:

The rates and conditions for tank trucks, power sweepers and general contractors acquiring bulk water for special projects will be as follows:

1. $6.00 for each thousand gallons or fraction thereof, with a minimum monthly charge of $35.00.
2. All customers purchasing bulk water shall complete, in duplicate, a District application form which shall contain information setting forth the name and billing address and contact information for the customer and a description of the equipment used to transport the water.
3. All truck water tanks shall have back flow prevention devices and shall meet the specifications established by the District.
4. Water shall be drawn only from hydrants which are designated in writing by the District manager.
5. Bulk water customers shall be required to maintain a fifty ($50.00) Dollar non-refundable deposit with the District for a period of time in which they seek to draw bulk water.

SECTION 3. CONDITIONS:

Certain conditions for water service are hereby declared to be as followed:

A. Separate parcels: Each separate parcel of property shall be served by a separate meter.

B. Separate meters: Each single family residence shall be served by a separate water meter.

C. Base Charges: The minimum monthly base charge set forth in Section 2 will be billed on all water meters set in place adjacent to property served or to be served by the District.

1. If property owner requests a temporary suspension of water service, the meter shall be padlocked by the District. When a meter is padlocked by the District, no monthly base charge will be assessed until the water service is restored and a $60.00 turn on fee will be charged.
2. If water service to a parcel of property is no longer desired, the meter and service pipe shall be removed and no minimum monthly fee will be charged. However, fees will be charged when or if water service is restored.

D. Ownership of Meters and Mains: All water meters and main lines shall be the property of Water District No. 54. Property will not be served through private meters.

E. Responsibility For Lines Beyond Meters: It is the property owner's responsibility to maintain all water lines serving his property on the property owner's side of the meter, including, but not limited to, any backflow or cross connection devices to avoid contamination of water. Failure to maintain lines or devices may result in the District shutting off water to the premises by locking the meter. Unlocking of meters after corrections have been made will be subject to applicable fee schedules.

F. Change in Use: The property owner shall notify the District in advance of any changes in use of the property. Any change in use may require a water availability certificate.

G. Change in Ownership: The property owner shall notify the District whenever there is a change in ownership of the property, with a different owner to be billed for water service. There shall be a one-time $10.00 administrative fee to the new owner for the expense incurred by the District in changing its records for billing purposes.

H. Delinquency Provisions:

1. 30 Days Due: All bills for water charges and water supplied are due on receipt and become delinquent if not paid within thirty (30) days of the date of mailing.
2. Penalty – 10%: Billings for water charges and water supplied shall be subject to a ten (10%) present penalty if payment is not received by the District within forty five (45) days of mailing of the bill.
3. 70 Days – Notice of Delinquency: In the event the water bill and accrued penalties are not paid within seventy (70) days after billing, a Notice of Delinquency will be mailed to the account address. This Notice shall set forth the date, which will be seven (7) days from the date of the mailing, when a shut-off Notice will be posted upon the premises unless the customer pays to the District the total of all charges for water and penalties which have accrued prior to the mailing of the Notice of Delinquency.
4. Shut-Off Notice: If the water bill is not paid on or before the date specified in the Notice of Delinquency, a Shut-off Notice will be affixed to the premises and the customer will be charged a forty five ($45.00) Dollar service fee. Unless the total unpaid water bill, penalties, and service fee is paid within twenty four (24) hours of affixing the Shut-off Notice on the premises, the water meter to the premises will be locked and an additional "locking fee" will be charged in accordance with Section 3. J. 1 below. Upon payment in full of the total amount owing, the water meter lock will be removed.
5. Lien and Foreclosure: Seventy (70) days after water charges are delinquent, the District may certify the delinquencies to the King County Recorder and the charges and any penalties added thereto and interest thereon at the rate of the prime lending rate of the District's bank plus four (4) percentage points per year shall be a lien against the property upon which the service was received, subject only to the lien for general taxes. The District shall have the right to foreclose this lien under the provisions of RCW 57.08.081.

I. Extraordinary Circumstances: The District shall have the right to impose the following charges for extraordinary services. All charges shall be paid prior to receiving further water service or, upon customer's request, may be added to the next regular water billing:

CIRCUMSTANCE	CHARGE
1. Locking meter for non-payment or bill improper maintenance of line and service beyond meter:	
a. Residential	$ 60.00
b. Commercial	$ 100.00

2. Destruction and/or removal of padlock for obtaining water: $ 750.00
3. Repair or replacement of meter which has been damaged by customer:
   a. Hourly labor rate and material cost with a minimum charge of: $ 150.00
4. Request by owner to lock or unlock meter during regular business hours:
   a. Turn off and lock No Charge
   b. Remove lock and turn on $ 60.00
5. Request by owner to lock or unlock meter after regular business hours:
   a. Lock or turn off Not available
   b. Remove lock and turn on $ 150.00 Plus hourly labor cost
6. Unauthorized water delivery hookup designed to circumvent District Resolutions: $750.00 Per occurrence
7. A charge of $25.00 shall be made for preparing special billings or closing billings separate from the regular billing cycle. If the billing requires a special meter reading, the charge shall be $50.00. When multiple closing billing are requested, such as when real estate closing dates are changed and changed billings are required, the foregoing charges will be assessed for each service rendered.
8. A charge of $50.00 shall be made for obstruction of meter which prevents normal reading of meters, including, but not limited to parking of vehicles on or over the meters, or placing dirt, debris, or other difficult to move objects on or over the meters.
9. Charges not otherwise specifically provided for shall be charged as set forth in other current District Resolutions.

SECTION 4. EFFECTIVE DATE

This Resolution shall become effective on November 1, 2018.

PASSED at a regular meeting of the Board of Commissioners of Water District No. 54 this 2nd day of October, 2018

President Yoshiko Grace Matsui

Secretary James Langston

Commissioner Kristi Van Gasken

ATTACHMENT A

WATER DISTRICT NO. 54
KING COUNTY, WASHINGTON
RESOLUTION 2016-3

A RESOLUTION relating to the adoption of an Operation and Maintenance Best Management Practices Manual.

WHEREAS, the District needs to formalize its Operation and Maintenance Best Management Practices Manual, **NOW, THEREFORE:**

BE IT RESOLVED by the Board of Commissioners of King County Water District No. 54 as follows:

1. The Operation and Maintenance Best Management Practices Manual with updates suggested by the Department of Health dated July 2016 and approved at the Commissioner meeting held on August 2, 2016 as referenced in the minutes of that meeting is hereby adopted as the official Operation and Maintenance Best Management Practices Manual of this District. Copy is attached to this resolution.

2. Versions in prior Resolutions herewith are hereby repealed.

PASSED at a regular meeting of the Board of Commissioners of King County Water District No. 54 this 2nd day of August 2016.

Yoshiko Grace Matsui, President

John Rayback, Secretary

James Langston, Commissioner

ATTACHMENT A

WATER DISTRICT NO. 54
KING COUNTY, WASHINGTON
RESOLUTION 2016-2

A RESOLUTION relating to the adoption of an Emergency Response Plan Manual.

WHEREAS, the District needs to formalize it's emergency response plan, **NOW, THEREFORE:**

BE IT RESOLVED by the Board of Commissioners of King County Water District No. 54 as follows:

The Emergency Response Plan Manual approved at the Commissioner meeting held on June 7, 2016 as referenced in the minutes of that meeting is hereby adopted as the official Emergency Response Plan Manual of this District, copy is attached to this resolution.

PASSED at a regular meeting of the Board of Commissioners of King County Water District No. 54 this 7th day of June 2016.

Yoshiko Grace Matsui, President

John Rayback, Secretary

Jim Langston

James Langston, Commissioner

ATTACHMENT A

WATER DISTRICT NO. 54
KING COUNTY, WASHINGTON
RESOLUTION 2015-2

A RESOLUTION relating to the adoption of an Employees Personnel Manual.

WHEREAS, the District needs to formalize it's employee's benefits and policies and procedures, **NOW, THEREFORE:**

BE IT RESOLVED by the Board of Commissioners of King County Water District No. 54 as follows:

The Employee Personnel Manual approved in sections at three Commissioner meetings held on February 17, 2015, March 17, 2015 and April 7, 2015 as referenced in the minutes of those meetings is hereby adopted as the official Employee Personnel Manual of this District.

PASSED at a regular meeting of the Board of Commissioners of King County Water District No. 54 this 21st day of April, 2015.

John Rayback, President

Alli Larkin, Secretary

Matthew Mahaffey, Commissioner

WATER DISTRICT NO. 54
KING COUNTY, WASHINGTON
RESOLUTION 2015-1

A RESOLUTION relating to the implementation of fees in the enforcement of the Cross Connection Control Policy, and repealing Resolution 2014-4.

WHEREAS, Water District No. 54, hereinafter called "District" or "Purveyor", has by Resolution adopted a Cross Connection Control Policy, and

WHEREAS, the District, in compliance with the requirements of the Washington State Department of Health (WAC 246-290-490), has determined that all commercial and multi-family customers require the installation of backflow prevention assemblies, commonly referred to as a Reduced Pressure Backflow Assembly, "RPBA" or a Double Check Valve Assembly, "DCVA" or a derivative thereof, and

WHEREAS, the customer is required to (a) have tested upon installation, annually thereafter or when requested by the Purveyor, after repair and after relocation his RPBA or DCVA installed to protect the Purveyor's distribution system, (b) have testing done by a Purveyor approved and State Department of Health currently certified Backflow Assembly Tester, "BAT", (c) have the RPBA or DCVA tested following the procedures approved by the Washington State Department of Health, and (d) submit to the Purveyor the results of the test(s) on the Purveyor supplied test report form, called "Test Report", within the time period specified by the Purveyor, Now, therefore;

BE IT RESOLVED by the Board of Commissioners of King County Water District No. 54 as follows:

1. Installation: Customers of the District are prohibited from operating a water line that requires a backflow assembly without first obtaining a certification that such an assembly is installed on such water line, that the assembly is operating properly, and that the line is safe from contaminating District water.

2. Date of Filing: Each required customer shall file the Test Report annually, no later than (12) months after the last report certifying that the assembly is operating properly. The District recognizes that different customers will have different reasons for having backflow assemblies installed, and it is the District's intent that customer usage may determine when each backflow assembly shall be tested, so long as tests are done at least annually, or more often if directed by the District. Assemblies are to be tested by the end of June each year unless alternate timing is agreed to in writing by the District.

3. First Notice to Customer: On or before the end of February, or prior to the month the Test Report is due, the District shall notify each required customer that their annual Test Report is due before June 30th of said year, and said First Notice shall require the customer to file the Test Report.

4. Second Notice to Customer: Before the month a Test Report from the customer is due (typically the first or second week of June), the District shall notify each required customer, whose report has not been received, that their annual Test Report has not been filed with the District, and Second Notice shall require the customer to file the Test Report before June 30th, or action will commence to shut off the water to the premises.

5. Late Filing Fees: Late filing of the Test Reports shall incur, and each customer shall pay, late fees for the filing of the Test Report performed by a Backflow Assembly Tester as follows:

a. Twenty five ($25.00) Dollars if filed within thirty (30) days after the Test Report was due. Reports are considered late if not filed with the District by June 30th of each year.

b. If a Test Report is not filed with the District by June 30th each year, or within 30 days after the expiration of alternate filing times agreed to in writing by the District, the customer's water will be shut off, and will not be turned on until requested by a Certified Backflow Tester so that required tests can be made, and charges for turning the water service back on will be incurred pursuant to other Resolutions, together with the foregoing charges for late filing of the Test Reports.

c. Failure to pay late filing fees in a timely manner may be cause to shut off water service, and water service will not be restored until all fees are paid.

6. Termination of Requirement for Reports: When a customer intends to defer or terminate operation of a line that requires a backflow assembly, they must notify the District in writing of such deferment prior to the annual reporting requirement. If a customer gives the District such notice, and is later found to be operating the line without having notified the District in writing and obtaining and filing the required Test Report, the water service to that customer shall be shut off to protect the District's water, and will not be turned back on except pursuant to section 5. D. above.

7. Assembly Failure: When a backflow assembly fails to meet the requirements of the Washington State Department of Health, the line shall not be operated until the failure has been corrected, and the backflow assembly does meet the requirements of the Department of Health. A temporary written waiver may be obtained from the District, at the District's option, but late fees will still be assessed.

8. Prohibited Actions: Activating or using a water service without required backflow assemblies and proper certifications is prohibited, and may be subject to a One Hundred ($100.00) Dollar non-compliance charge and immediate shutoff of water to the premises. If more than one customer is served by this water line and service cannot be shut off, a non-compliance charge of One Hundred ($100.00) Dollars per billing cycle will be added to the water bill until an approved assembly has been installed, tested and a Test Report is filed with the District.

9. Superseding: All resolutions in conflict herewith are hereby repealed.

10. Effective Date: This resolution will become effective on October 7, 2014.

PASSED at a regular meeting of the Board of Commissioners of King County Water District No. 54 this 7th day of October, 2014.

John H Rayback

John H. Rayback, President

Alli Larkin

Alli Larkin, Secretary

Matthew T. Mahaffey

WATER DISTRICT NO. 54
KING COUNTY, WASHINGTON
RESOLUTION NO. 2011-1

A **RESOLUTION** relating to the installation or modification of water service connections for unimproved and improved single family residential, commercial and multi-family properties provided the service does not increase, extend or expand the District's distribution and transmission system.

BE IT RESOLVED by the Board of Commissioners of King County Water District No. 54 as follows:

Section 1. All requests for water service for an unimproved property or a request for the remodel or expansion of an existing water service for single family residential, multi-family or commercial properties shall begin with the applicant completing a Water Availability/Fire Flow Analysis Application and paying the required fee. This application shall be forwarded to the District's Engineer for flow and water velocity analysis within the waterline adjacent to the applicant's property.

Section 2. The District Engineer, based on information provided by the applicant shall determine the meter size and meter type (compound, positive displacement, etc) based on proposed water use.

Section 3. All single service residential customers shall complete a district provided questionnaire to determine if backflow protection devices will be required for the service.

Section 4. All new customer and existing customers requiring an increase in service size, adding additional residential or commercial units shall be charged for a capital facilities charge for each new unit, which charge will require payment in full prior to the installation of a new or upgraded meter service installation.

Section 5. Customers can choose between a District installation or a licensed private contractor installation approved and inspected by District personnel.

PASSED at a regular meeting of the Board of Commissioners of King County Water District No. 54 this 21 day of JUNE 2011.

Alli Larkin
President Alli Larkin

John H Rayback
Commissioner John Rayback

Commissioner ~~David~~ Gilkey

ATTACHMENT A

WATER DISTRICT NO. 54
KING COUNTY, WASHINGTON
RESOLUTION 2011-6

A RESOLUTION appointing Patti Clayton as the Auditing Officer for the purpose of authorizing the issuance of electronic transactions prior to Board of Commissioners approval.

WHEREAS, there may be circumstances when the Board of Commissioners of King County Water District No. 54 does not meet prior to a day in which they would need to approve vouchers for the District's electronic transfers;

WHEREAS, there is a need by the District to process electronic payments in a timely and consistent manner;

WHEREAS, it would be of financial benefit to appoint an Auditing Officer to certify the interfund transfer voucher approval document for the correct and certified submission of electronic payments vouchers to the King County Finance Office without awaiting a Commissioners meeting to authorize specific payments;

WHEREAS, RCW 42.24.180 authorizes the issuance of warrants/electronic transfers before approval of the vouchers by the Board of Commissioners in order to expedite the payment of claims;

WHEREAS, the District's Interfund Transfer Voucher Approval Document establishes the necessary purchasing and disbursing procedures that implements effective internal control for issuance of electronic transfers as required by RCW 42.24.180;

THEREFORE BE IT RESOLVED, that the Board of Commissioners of King County Water District No. 54 does hereby authorize Patti Clayton as the Auditing Officer to submit electronic transfers for payment and disbursement in accordance with the District's InterfundTransfer Voucher Approval Document prior to the Board taking action to approve said claims;

ADOPTED by the Board of Commissioners of King County Water District No. 54 at a regular meeting held on this 20th day of December 2011.

ATTEST:

Robert J Verzani

By: Robert J. Verzani
Attorney for
King County Water District No. 54

Alli Larkin

President Alli Larkin

John H Rayback

Commissioner John Rayback

Commissioner Victor L. Pennington II

R2011-6

ATTACHMENT A

WATER DISTRICT NO. 54
KING COUNTY, WASHINGTON
RESOLUTION NO. 2000- 3

A RESOLUTION relating to and adopting a form and the procedure for issuing and obtaining Developers Extension Agreements.

WHEREAS, from time to time, the improvement of real property by a Developer involves an extension or an addition to the existing District facilities, and

WHEREAS, the District requires certain developmental standards be met, and

WHEREAS, the District incurs costs in processing, and approving plans and inspections for the development of real property; now therefore;

BE IT RESOLVED by the Board of Commissioners of King County Water District No. 54 as follows:

Section 1. The Developer or its agent, for each development within the District which involves an addition or modification to the District's existing water main distribution system, shall file an Application for a Developers Extension Agreement on forms provided by the District.

Section 2. If it is determined by the Manager and Engineer for the District an Agreement is required, a Developers Extension Agreement, shall be executed by the Developer, or its agent, and the manager for Water District No. 54 and the required deposits shall be made as set forth in the Developers Extension Agreement, a copy of which is attached hereto as "Exhibit A".

PASSED at a regular meeting of the Board of Commissioners of King County Water District No. 54 this 4 day of April 2000..

Carl J. Mealy
President Carl Mealy

Robert N. Ricketts
Commissioner Robert N. Ricketts

H. M. Foote
Commissioner Mike Foote

APPENDIX F

WATER QUALITY DATA

ATTACHMENT A

Washington State Department of Health
Environmental Public Health
Office of Drinking Water

Water Quality Monitoring Schedule

System: KING COUNTY WATER DISTRICT #54
Contact: Eric Clarke

PWS ID: 39950 4
Group: A - Comm

Region: NORTHWEST
County: KING

NOTE: To receive credit for compliance samples, you must fill out laboratory and sample paperwork completely, send your samples to a laboratory accredited by Washington State to conduct the analyses, AND ensure the results are submitted to DOH Office of Drinking Water. There is often a lag time between when you collect your sample, when we credit your system with meeting the monitoring requirement, and when we generate the new monitoring requirement.

Coliform Monitoring Requirements

	Jul 2018	**Aug 2018**	**Sep 2018**	**Oct 2018**	**Nov 2018**	**Dec 2018**	**Jan 2019**	**Feb 2019**	**Mar 2019**	**Apr 2019**	**May 2019**	**Jun 2019**
Coliform Monitoring Population	5037	5037	5037	5037	5037	5037	5037	5037	5037	5037	5037	5037
Number of Routine Samples Required	6	6	6	6	6	6	6	6	6	6	6	6

- Collect samples from representative points throughout the distribution system.
- Collect required repeat samples following an unsatisfactory sample. In addition, collect a sample from each operating groundwater source.
- For systems that chlorinate, record chlorine residual (measured when the coliform sample is collected) on the coliform lab slip.

Chemical Monitoring Requirements

Distribution Monitoring

Test Panel/Analyte	*# Samples Required*	*Compliance Period*	*Frequency*	*Last Sample Date*	*Next Sample Due*	
Lead and Copper	20	Jan 2016 - Dec 2018	standard - 3 year	08/11/2015	***Aug 2018***	
Asbestos	1	Jan 2011 - Dec 2019	standard - 9 year	07/08/2009	***Jul 2018***	

Notes on Distribution System Chemical Monitoring

For *Lead and Copper*:
- Collect samples from the COLD WATER side of a KITCHEN or BATHROOM faucet that is used daily.
- Before sampling, make sure the water has sat unused in the pipes for at least 6 hours, but no more than 12 hours (e.g. overnight).
- If you are sampling from a faucet that has hot water, make sure cold water is the last water to run through the faucet before it sits overnight.
- If your sampling frequency is annual or every 3 years, collect samples between June 1 and September 30.

For *Asbestos:* Collect the sample from one of your routine coliform sampling sites in an area of your distribution system that has asbestos concrete pipe.

Water Quality Monitoring Schedule

Source Monitoring

- Collect ‘source’ chemical monitoring samples from a tap after all treatment (if any), but before entering the distribution system.
- Washington State grants monitoring waivers for various test panels /analytes. Please note that we may require some monitoring as a condition of some waivers. We have granted complete waivers for dioxin, endothal, glyphosate, diquat, and insecticides.
- Nitrate, arsenic, iron, and other individual inorganics are included as part of a Complete Inorganic (IOC) analysis when it is collected.

Source S01 WELL # 4 AAB181 Well Use - Permanent Susceptility - Moderate

Test Panel/Analyte	*# Samples Required*	*Compliance Period*	*Frequency*	*Last Sample Date*	*Next Sample Due*
Nitrate	1	Jan 2018 - Dec 2018	standard - 1 year	04/20/2018	
Complete Inorganic (IOC)	1	Jan 2011 - Dec 2019	waiver - 9 year	05/13/2010	May 2019
Manganese	1	Jan 2017 - Dec 2019	standard - 3 year	04/08/2015	Sep 2019
Volatile Organics (VOC)	1	Jan 2014 - Dec 2019	waiver - 6 year	04/20/2017	
Herbicides	1	Jan 2014 - Dec 2022	waiver - 9 year	05/15/2018	
Pesticides	0	Jan 2017 - Dec 2019	waiver - 3 year	05/13/2009	
Soil Fumigants	0	Jan 2017 - Dec 2019	waiver - 3 year		
Gross Alpha	1	Jan 2014 - Dec 2019	standard - 6 year	12/20/2017	
Radium 228	1	Jan 2014 - Dec 2019	standard - 6 year	12/20/2017	

Source S02 WELL # 5 AAB182 Well Use - Permanent Susceptility - Low

Test Panel/Analyte	*# Samples Required*	*Compliance Period*	*Frequency*	*Last Sample Date*	*Next Sample Due*
Nitrate	1	Jan 2018 - Dec 2018	standard - 1 year	04/20/2018	
Complete Inorganic (IOC)	1	Jan 2011 - Dec 2019	waiver - 9 year	05/13/2010	May 2019
Manganese	1	Jan 2017 - Dec 2019	standard - 3 year	04/08/2015	Oct 2019
Volatile Organics (VOC)	1	Jan 2014 - Dec 2019	waiver - 6 year	05/16/2013	May 2019
Herbicides	1	Jan 2014 - Dec 2022	waiver - 9 year	05/15/2018	
Pesticides	0	Jan 2017 - Dec 2019	waiver - 3 year	05/13/2009	
Soil Fumigants	0	Jan 2017 - Dec 2019	waiver - 3 year		
Gross Alpha	1	Jan 2014 - Dec 2019	standard - 6 year	12/20/2017	
Radium 228	1	Jan 2014 - Dec 2019	standard - 6 year	12/20/2017	

Water Quality Monitoring Schedule

Source Monitoring

- Collect 'source' chemical monitoring samples from a tap after all treatment (if any), but before entering the distribution system.
- Washington State grants monitoring waivers for various test panels /analytes. Please note that we may require some monitoring as a condition of some waivers. We have granted complete waivers for dioxin, endothal, glyphosate, diquat, and insecticides.
- Nitrate, arsenic, iron, and other individual inorganics are included as part of a Complete Inorganic (IOC) analysis when it is collected.

Source S04 WELL #6 AAB183 Well Use - Permanent Susceptility - Low

Test Panel/Analyte	*# Samples Required*	*Compliance Period*	*Frequency*	*Last Sample Date*	*Next Sample Due*
Nitrate	1	Jan 2018 - Dec 2018	standard - 1 year	05/15/2018	
Complete Inorganic (IOC)	1	Jan 2011 - Dec 2019	waiver - 9 year	05/15/2018	
Manganese	1	Jan 2017 - Dec 2019	standard - 3 year	05/15/2018	
Volatile Organics (VOC)	1	Jan 2014 - Dec 2019	waiver - 6 year	04/08/2015	
Herbicides	1	Jan 2014 - Dec 2022	waiver - 9 year	05/15/2018	
Pesticides	0	Jan 2017 - Dec 2019	waiver - 3 year	04/14/2015	
Soil Fumigants	0	Jan 2017 - Dec 2019	waiver - 3 year		
Gross Alpha	1	Jan 2014 - Dec 2019	standard - 6 year	05/06/2015	
Radium 228	1	Jan 2014 - Dec 2019	standard - 6 year	05/06/2015	

Source S05 WELL #7 AFC525 Well Use - Permanent Susceptility - Low

Test Panel/Analyte	*# Samples Required*	*Compliance Period*	*Frequency*	*Last Sample Date*	*Next Sample Due*
Nitrate	1	Jan 2018 - Dec 2018	standard - 1 year	04/20/2018	
Complete Inorganic (IOC)	1	Jan 2011 - Dec 2019	waiver - 9 year	05/13/2010	May 2019
Manganese	1	Jan 2017 - Dec 2019	standard - 3 year	05/13/2010	May 2019
Volatile Organics (VOC)	1	Jan 2014 - Dec 2019	waiver - 6 year	05/15/2018	
Herbicides	1	Jan 2014 - Dec 2022	waiver - 9 year	04/19/2016	
Pesticides	0	Jan 2017 - Dec 2019	waiver - 3 year	10/31/2005	
Soil Fumigants	0	Jan 2017 - Dec 2019	waiver - 3 year		
Gross Alpha	1	Jan 2014 - Dec 2019	standard - 6 year	05/06/2015	
Radium 228	1	Jan 2014 - Dec 2019	standard - 6 year	05/06/2015	

Water Quality Monitoring Schedule

Other Information

Other Reporting Schedules	*Due Date*
Submit Consumer Confidence Report (CCR) to customers and ODW (Community systems only):	07/01/2018
Submit CCR certification form to ODW (Community systems only):	10/01/2018
Submit Water Use Efficiency report online to ODW and to customers (Community and other municipal water systems only):	07/01/2018
Send notices of lead and copper sample results to the customers sampled:	30 days after you receive the laboratory results
Submit Certification of customer notification of lead and copper results to ODW:	90 days after you notify customers

Special Notes

None

Northwest Regional Water Quality Monitoring Contacts

For questions regarding chemical monitoring:	Steve Hulsman: (253) 395-6777 or Steve.Hulsman@doh.wa.gov
For questions regarding DBPs:	Steve Hulsman: (253) 395-6777 or Steve.Hulsman@doh.wa.gov
For questions regarding coliform bacteria and microbial issues:	Carol Stuckey or Ingrid Salmon: (253) 395-6775: or carol.stuckey@doh.wa.gov or ingrid.salmon@doh.wa.gov

Additional Notes

The information on this monitoring schedule is valid as of the date in the upper left corner on the first page. However, the information may change with subsequent updates in our water quality monitoring database as we receive new data or revise monitoring schedules. There is often a lag time between when you collect your sample and when we credit your system with meeting the monitoring requirement.

We have not designed this monitoring schedule to display all compliance requirements. The purpose of this schedule is to assist water systems with planning for most water quality monitoring, and to allow systems to compare their records with DOH ODW records. Please be aware that this monitoring schedule does not include constituents that require a special monitoring frequency, such as monitoring affiliated with treatment.

Any inaccuracies on this schedule will not relieve the water system owner and operator of the requirement to comply with applicable regulations.

If you have any questions about your monitoring requirements, please contact the regional office staff listed above.

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ATTACHMENT A

★2,3 GA Rad

INORGANIC CHEMICALS (IOCS) REPORT

System ID No: 399504
System Name: King County Water District #54
Lab/Sample No: 08932258
Date Collected: 05-13-10
DOH Source No: S01
Multiple Source Nos: N/A
Sample Type: B
Sample Purpose: C
Date Received: 05-13-10
Date Reported: 05-17-10
Supervisor: LM
County: King
Date Digested: NA
Group: [✓ A] B Other
Sample Location: well #4
Send Results & Bill To: King County Water District #54
922 So 219th street
Des Moines, WA 98198
Remarks: AK106R

DOH#	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS Trigger?	EXCEEDS MCL?	Method / Analyst	
	EPA REGULATED									
4	Arsenic	<0.002	mg/L	0.002	0.01	0.01	NO	NO	200.8	MB
5	Barium	<0.1	mg/L	0.1	2	2			200.8	MB
6	Cadmium	<0.002	mg/L	0.002	0.005	0.005			200.8	MB
7	Chromium	<0.01	mg/L	0.01	0.1	0.1			200.8	MB
11	Mercury	<0.0005	mg/L	0.0005	0.002	0.002			200.8	MB
12	Selenium	<0.005	mg/L	0.005	0.05	0.05			200.8	MB
110	Beryllium	<0.003	mg/L	0.003	0.004	0.004			200.8	MB
111	Nickel	<0.04	mg/L	0.04	0.1	0.1			200.8	MB
112	Antimony	<0.005	mg/L	0.005	0.006	0.006			200.8	MB
113	Thallium	<0.002	mg/L	0.002	0.002	0.002			200.9	MB
116	Cyanide	<0.05	mg/L	0.05	0.2	0.2			4500-CNF	RL
19	Fluoride	<0.2	mg/L	0.2	2	4			300.0	RL
114	Nitrite - N	<0.2	mg/L	0.5	0.5	1			300.0	RL
20	Nitrate - N	<0.2	mg/L	0.5	5	10			300.0	RL
161	Total Nitrate/Nitrite	<0.4	mg/L	0.5	5	10	↓	↓	300.0	RL
	EPA REGULATED (Secondary)									
8	Iron	<0.1	mg/L	0.1	0.3	0.3	NO	NO	3111B	MB
10	Manganese	0.06	mg/L	0.01	0.05	0.05	YES	YES	200.8	MB
13	Silver	<0.01	mg/L	0.01	0.1	0.1	NO	NO	200.8	MB
21	Chloride	4	mg/L	20	250	250			300.0	RL
22	Sulfate	12	mg/L	10	250	250			300.0	RL
24	Zinc	<0.2	mg/L	0.2	5	5	↓	↓	200.8	MB
	STATE REGULATED									
14	Sodium	8	mg/L	5					200.8	MB
15	Hardness	87	mg/L	10					2340C	MB
16	Conductivity	166	umhos/cm	10	700	700	NO	NO	2510B	ST
17	Turbidity	0.2	NTU	0.1	1		NO		2130B	ST
18	Color	<5.0	color units	5	15	15	NO	NO	2120B	ST
26	Total Dissolved Solids	NA	mg/L	150	500	500	—	—	2540C	—
	STATE UNREGULATED									
9	Lead	<0.001	mg/L	0.001					200.8	MB
23	Copper	<0.02	mg/L	0.02					200.8	MB

COMMENTS: FC-28

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ATTACHMENT A

#2,GA/Rad 228

INORGANIC CHEMICALS (IOCS) REPORT

System ID No: 399504
System Name: King County Water District #54
Lab/Sample No: 08932259
Date Collected: 05-13-10
DOH Source No: S02
Multiple Source Nos: N/A
Sample Type: B
Sample Purpose: C
Date Received: 05-13-10
Date Reported: 05.17.10
Supervisor: LW
County: King
Date Digested: NA
Group: [✓ A] B Other
Sample Location: Well #5
Send Results & Bill To: King County Water Dist #54
922 South 219th Street
Des Moines, WA 98198
Remarks:

DOH#	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS		Method / Analyst	
	EPA REGULATED						Trigger?	MCL?		
4	Arsenic	<0.002	mg/L	0.002	0.0~~5~~1	0.0~~5~~1	NO	NO	200.8	
5	Barium	<0.1	mg/L	0.1	2	2			200.8	
6	Cadmium	<0.002	mg/L	0.002	0.005	0.005			200.8	
7	Chromium	<0.01	mg/L	0.01	0.1	0.1			200.8	
11	Mercury	<0.0005	mg/L	0.0005	0.002	0.002			200.8	
12	Selenium	<0.005	mg/L	0.005	0.05	0.05			200.8	
110	Beryllium	<0.003	mg/L	0.003	0.004	0.004			200.8	
111	Nickel	<0.04	mg/L	0.04	0.1	0.1			200.8	
112	Antimony	<0.005	mg/L	0.005	0.006	0.006			200.8	
113	Thallium	<0.002	mg/L	0.002	0.002	0.002			200.9	
116	Cyanide	<0.05	mg/L	0.05	0.2	0.2			4500-CNF	
19	Fluoride	<0.2	mg/L	0.2	2	4			300.0	
114	Nitrite - N	<0.2	mg/L	0.5	0.5	1			300.0	
20	Nitrate - N	<0.2	mg/L	0.5	5	10			300.0	
161	Total Nitrate/Nitrite	<0.4	mg/L	0.5	5	10	↓	↓	300.0	
	EPA REGULATED (Secondary)									
8	Iron	<0.1	mg/L	0.1	0.3	0.3	NO	NO	3111B	
10	Manganese	0.05	mg/L	0.01	0.05	0.05			200.8	
13	Silver	<0.01	mg/L	0.01	0.1	0.1			200.8	
21	Chloride	4	mg/L	20	250	250			300.0	
22	Sulfate	12	mg/L	10	250	250			300.0	
24	Zinc	<0.2	mg/L	0.2	5	5	↓	↓	200.8	
	STATE REGULATED									
14	Sodium	9	mg/L	5					200.8	
15	Hardness	92	mg/L	10					2340C	
16	Conductivity	172	umhos/cm	10	700	700	NO	NO	2510B	
17	Turbidity	<0.1	NTU	0.1	1		NO		2130B	
18	Color	<5.0	color units	5	15	15	NO	NO	2120B	
26	Total Dissolved Solids	NA	mg/L	150	500	500	—	—	2540C	—
	STATE UNREGULATED									
9	Lead	<0.001	mg/L	0.00~~2~~1					200.8	
23	Copper	<0.02	mg/L	0.02					200.8	

COMMENTS: FC-28

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ØD, 3, Herb

INORGANIC CHEMICALS (IOCS) REPORT

System ID No: 399504
System Name: King County Water District 54
Lab/Sample No: 08900213
Date Collected: 05-15-18
DOH Source No: S04
Multiple Source Nos: NA
Sample Type: B
Sample Purpose: C
Date Received: 05-15-18
Date Reported: 05-30-18
Supervisor: mB
County: King
Date Digested: NA
Group: [✓ A] B Other
Sample Location: Well 6
Remarks:
Send Results & Bill To: KCWD #54
922 South 219th Street
Des Moines, WA 98198

DOH#	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS Trigger?	EXCEEDS MCL?	Method	Analyst
	EPA REGULATED									
4	Arsenic	<0.001	mg/L	0.001	0.01	0.01	NO	NO	200.8	JRC
5	Barium	< 0.1	mg/L	0.1	2	2	↓	↓	200.8	JRC
6	Cadmium	< 0.001	mg/L	0.001	0.005	0.005	↓	↓	200.8	JRC
7	Chromium	< 0.007	mg/L	0.007	0.1	0.1	↓	↓	200.8	JRC
11	Mercury	<0.0002	mg/L	0.0002	0.002	0.002	↓	↓	200.8	JRC
12	Selenium	< 0.002	mg/L	0.002	0.05	0.05	↓	↓	200.8	JRC
110	Beryllium	< 0.0003	mg/L	0.0003	0.004	0.004	↓	↓	200.8	JRC
112	Antimony	< 0.003	mg/L	0.003	0.006	0.006	↓	↓	200.8	JRC
113	Thallium	< 0.001	mg/L	0.001	0.002	0.002	↓	↓	200.8	JRC
116	Cyanide	<0.01	mg/L	0.01	0.2	0.2	↓	↓	4500-CNF	MJL
19	Fluoride	<0.20	mg/L	0.2	2	4	↓	↓	300.0	MJL
114	Nitrite - N	<0.1	mg/L	0.1	0.5	1	↓	↓	300.0	MJL
20	Nitrate - N	<0.2	mg/L	0.2	5	10	↓	↓	300.0	MJL
161	Total Nitrate/Nitrite	<0.4	mg/L	0.5	5	10	↓	↓	300.0	MJL
	EPA REGULATED (Secondary)									
8	Iron	<0.1	mg/L	0.1		0.3		NO	3111B	JRC
10	Manganese	0.050	mg/L	0.01		0.05		↓	200.8	JRC
13	Silver	< 0.01	mg/L	0.1		0.1		↓	200.8	JRC
21	Chloride	2.5	mg/L	20		250		↓	300.0	MJL
22	Sulfate	2.3	mg/L	50		250		↓	300.0	MJL
24	Zinc	< 0.2	mg/L	0.2		5		↓	200.8	JRC
	STATE REGULATED									
14	Sodium	11.4	mg/L	5					200.8	JRC
15	Hardness	56.0	mg/L	10					2340C	JRC
16	Conductivity	134.0	umhos/cm	70		700		NO	2510B	MJL
17	Turbidity	0.60	NTU	0.1					2130B	MJL
18	Color	<5	color units	15		15		NO	2120B	MJL
26	Total Dissolved Solids	NA	mg/L	100		500			2540C	
111	Nickel	<0.005	mg/L	0.005					200.8	JRC
	STATE UNREGULATED									
9	Lead	<0.001	mg/L	0.001					200.8	JRC
23	Copper	<0.02	mg/L	0.02					200.8	JRC

COMMENTS: FC28

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ATTACHMENT A

INORGANIC CHEMICALS (IOCS) REPORT

System ID No: 399504 System Name: King County Water District #54
Lab/Sample No: 089 32260 Date Collected: 05-13-10 DOH Source No: S05
Multiple Source Nos: N/A Sample Type: B Sample Purpose: C
Date Received: 05-13-10 Date Reported: 05-17-10 Supervisor: WL
County: King Date Digested: NA Group: [✓ A] B Other
Sample Location: Well # 7
Send Results & Bill To: King County Water Dist #54
922 South 219th St
Des Moines WA 98198
Remarks:

DOH#	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS Trigger?	EXCEEDS MCL?	Method	Analyst
	EPA REGULATED									
4	Arsenic	<0.002	mg/L	0.002	0.05	0.05	NO	NO	200.8	MB
5	Barium	<0.1	mg/L	0.1	2	2			200.8	MB
6	Cadmium	<0.002	mg/L	0.002	0.005	0.005			200.8	MB
7	Chromium	<0.01	mg/L	0.01	0.1	0.1			200.8	MB
11	Mercury	<0.0005	mg/L	0.0005	0.002	0.002			200.8	MB
12	Selenium	<0.005	mg/L	0.005	0.05	0.05			200.8	MB
110	Beryllium	<0.003	mg/L	0.003	0.004	0.004			200.8	MB
111	Nickel	<0.04	mg/L	0.04	0.1	0.1			200.8	MB
112	Antimony	<0.005	mg/L	0.005	0.006	0.006			200.8	MB
113	Thallium	<0.002	mg/L	0.002	0.002	0.002			200.9	MB
116	Cyanide	<0.05	mg/L	0.05	0.2	0.2			4500-CNF	RL
19	Fluoride	<0.2	mg/L	0.2	2	4			300.0	RL
114	Nitrite - N	<0.2	mg/L	0.5	0.5	1			300.0	RL
20	Nitrate - N	<0.2	mg/L	0.5	5	10			300.0	RL
161	Total Nitrate/Nitrite	<0.4	mg/L	0.5	5	10	↓	↓	300.0	RL
	EPA REGULATED (Secondary)									
8	Iron	<0.1	mg/L	0.1	0.3	0.3	NO	NO	3111B	MS
10	Manganese	0.06	mg/L	0.01	0.05	0.05	YES	YES	200.8	MS
13	Silver	<0.01	mg/L	0.01	0.1	0.1	NO	NO	200.8	MB
21	Chloride	3	mg/L	20	250	250			300.0	RL
22	Sulfate	3	mg/L	10	250	250			300.0	RL
24	Zinc	<0.2	mg/L	0.2	5	5	↓	↓	200.8	MB
	STATE REGULATED									
14	Sodium	11	mg/L	5					200.8	MB
15	Hardness	56	mg/L	10					2340C	MB
16	Conductivity	130	umhos/cm	10	700	700	NO	NO	2510B	
17	Turbidity	0.2	NTU	0.1	1				2130B	
18	Color	<5.0	color units	5	15	15	↓	NO	2120B	
26	Total Dissolved Solids	NA	mg/L	150	500	500	—	—	2540C	—
	STATE UNREGULATED									
9	Lead	<0.001	mg/L	0.002					200.8	MB
23	Copper	<0.02	mg/L	0.02					200.8	MB

COMMENTS: FC28

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INORGANIC CHEMICALS (IOC's) REPORT For LEAD & COPPER

System ID No.: 399504
System Name: King County Water District 54
DOH Source No: S93 (LCR)
Sample Type: A
Sample Purpose: C
Date Received: 08-11-15
Date Reported: 08-18-15
Supervisor:
Date Analyzed: 08-17-15
Analyst: JMB
Group: A
County: King
Sample Location: (see table below)

Send To:
King County Water District 54
922 S 219th Street
Des Moines, WA 98198

Bill To:
AK106R

DOH #	23 (Copper)	9 (Lead)
State Reporting Level (SRL)	0.02 mg/L	0.001 mg/L
Action Level (AL)	1.3 mg/L	0.015 mg/L
Test Method	200.8	200.8

Lab Sample No.	Date Collected	Site/Location	Copper (mg/L)	Lead (mg/L)
08955147	08-11-15	22426 12th Avenue South	0.04	0.002
08955148	08-11-15	22320 10th Avenue	<0.02	<0.001
08955149	08-11-15	1220 South 230th	<0.02	<0.001
08955150	08-11-15	1120 Rainbow Lane	0.04	0.003
08955151	08-11-15	22220 10th Place	0.03	<0.001
08955152	08-11-15	22022 11th Avenue South	0.03	0.002
08955153	08-11-15	21842 12th Avenue	<0.02	<0.001
08955154	08-11-15	21814 12th Avenue	0.04	0.007
08955155	08-11-15	206 South 216th	<0.02	<0.001
08955156	08-11-15	401 South 216th	<0.02	<0.001
08955157	08-11-15	21646 3rd Avenue	<0.02	<0.001
08955158	08-11-15	21550 1st Court	<0.02	<0.001
08955159	08-11-15	22022 6th Avenue	0.06	0.002
08955160	08-11-15	21404 13th Avenue	<0.02	<0.001
08955161	08-11-15	21405 13th Avenue	<0.02	<0.001

NOTES:

1mg/L is equivalent to 1 ppM

AL (Federal Action Levels): are 0.015 mg/L for Lead and 1.3 mg/L for Copper. If the concentrations exceed these levels, contact your regional DOH office for further information.

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

NA (Not Analyzed): In the RESULTS column indicates this compound was not included in the current analysis.

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

< : Indicates less than.

Comments: **08958049**
Lead & Copper

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INORGANIC CHEMICALS (IOC's) REPORT For LEAD & COPPER

System ID No.: 399504	System Name: King County Water District 54	
DOH Source No: S93 (LCR)	Sample Type: A	Sample Purpose: C
Date Received: 08-11-15	Date Reported: 08-18-15	Supervisor:
Date Analyzed: 08-17-15	Analyst: JMB	Group: A
County: King		Sample Location: (see table below)

Send To:
King County Water District 54
922 S 219th Street
Des Moines, WA 98198

Bill To:
AK106R

DOH #	23 (Copper)	9 (Lead)
State Reporting Level (SRL)	0.02 mg/L	0.001 mg/L
Action Level (AL)	1.3 mg/L	0.015 mg/L
Test Method	200.8	200.8

Lab Sample No.	Date Collected	Site/Location	Copper (mg/L)	Lead (mg/L)
08955162	08-11-15	22220 7th Avenue	0.05	0.006
08955163	08-11-15	922 South 219th Street	0.07	0.003
08955164	08-11-15	21810 11th Avenue	0.04	0.003
08955165	08-11-15	1035 S 224th	<0.02	0.001
08955166	08-11-15	22505 6th Avenue South	0.08	<0.001

NOTES:

1mg/L is equivalent to 1 ppM

AL (Federal Action Levels): are 0.015 mg/L for Lead and 1.3 mg/L for Copper. If the concentrations exceed these levels, contact your regional DOH office for further information.

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

NA (Not Analyzed): In the RESULTS column indicates this compound was not included in the current analysis.

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

< : Indicates less than.

Comments: **08958049**
Lead & Copper

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SYNTHETIC ORGANIC CHEMICALS (SOC's) ANALYSIS REPORT
EPA TEST METHOD - EPA 515.1
WA DOH TEST PANEL: HERB1

System ID No.: 399504
System Name: King County Water District #54
Lab/Sample No.: 08984910
Date Collected: 04/19/16
DOH Source No.: S05
Multiple Source Nos.: N/A
Sample Type: B
Sample Purpose: C
Date Received: 04/19/16
Date Analyzed: 04/21/16
Analyst: RL
Date Extracted: 09/20/16
Date Reported: 04/22/16
Supervisor:
County: King
Group: A
Sample Location: Well #7 - Wellhead
Send To: KCWD #54
922 S 219th St
Des Moines, WA 98198
Remarks:

DOH #	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS	
		EPA REGULATED					Trigger?	MCL?
37	2,4 - D	ND	ug/L	0.5	0.5	70	NO	NO
38	2,4,5 - TP (Silvex)	ND	ug/L	1.0	1.0	50	NO	NO
134	Pentachlorophenol	ND	ug/L	0.20	0.20	1	NO	NO
137	Dalapon	ND	ug/L	5.0	5.0	200	NO	NO
139	Dinoseb	ND	ug/L	1.0	1.0	7	NO	NO
140	Picloram	ND	ug/L	0.5	0.5	500	NO	NO
		EPA UNREGULATED						
135	2,4 - DB	ND	ug/L	1.0				
138	Dicamba	ND	ug/L	0.2				
223	Acifluorfen	ND	ug/L	2.0				
224	Chloramben	ND	ug/L	0.2				
225	DCPA Acid Metabolites (A)	ND	ug/L	0.1				
226	3,5-Dichlorobenzoic Acid	ND	ug/L	0.5				
228	4 - Nitrophenol	ND	ug/L	0.5				

NOTES:

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

Trigger Level: DOH Drinking Water response level.

MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.

NA (Not Analyzed): In the RESULTS column indicates this compound was not included in the current analysis.

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

< : Indicates less than.

Comments:

Method 515.1: Herbicides

ATTACHMENT A

WATER MANAGEMENT LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

VOLATILE ORGANIC CHEMICALS (VOC's) ANALYSIS REPORT
EPA TEST METHOD - EPA 524.2
WA DOH TEST PANEL: VOC1

System ID No.: 399504
System Name: King County Water District #54
Lab/Sample No.: 08974884
Date Collected: 04/08/15
DOH Source No.: S04
Multiple Source Nos.: N/A
Sample Type: B
Sample Purpose: C
Date Received: 04/08/15
Date Analyzed: 04/13/15
Analyst: LHL
Date Reported: 08/04/15
Supervisor:
County: King
Group: A
Sample Location: Well #6
Send To: King County Water District #54
922 South 219th St
Des Moines, WA 98198
Remarks:

CORRECTION OF REPORT DATED 04/14/15

DOH #	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS Trigger?	EXCEEDS MCL?
	EPA REGULATED							
45	Vinyl Chloride	ND	ug/L	0.5	0.5	2	NO	NO
46	1,1 - Dichloroethylene	ND	ug/L	0.5	0.5	7	NO	NO
47	1,1,1 - Trichloroethane	ND	ug/L	0.5	0.5	200	NO	NO
48	Carbon Tetrachloride	ND	ug/L	0.5	0.5	5	NO	NO
49	Benzene	ND	ug/L	0.5	0.5	5	NO	NO
50	1,2 - Dichloroethane	ND	ug/L	0.5	0.5	5	NO	NO
51	Trichloroethylene	ND	ug/L	0.5	0.5	5	NO	NO
52	1,4 - Dichlorobenzene	ND	ug/L	0.5	0.5	75	NO	NO
56	Dichloromethane	ND	ug/L	0.5	0.5	5	NO	NO
57	trans-1,2 - Dichloroethylene	ND	ug/L	0.5	0.5	100	NO	NO
60	cis-1,2 - Dichloroethylene	ND	ug/L	0.5	0.5	70	NO	NO
63	1,2 - Dichloropropane	ND	ug/L	0.5	0.5	5	NO	NO
66	Toluene	ND	ug/L	0.5	0.5	1000	NO	NO
67	1,1,2 - Trichloroethane	ND	ug/L	0.5	0.5	5	NO	NO
68	Tetrachloroethylene	ND	ug/L	0.5	0.5	5	NO	NO
71	Chlorobenzene	ND	ug/L	0.5	0.5	100	NO	NO
73	Ethylbenzene	ND	ug/L	0.5	0.5	700	NO	NO
76	Styrene	ND	ug/L	0.5	0.5	100	NO	NO
84	1,2 - Dichlorobenzene	ND	ug/L	0.5	0.5	600	NO	NO
95	1,2,4 - Trichlorobenzene	ND	ug/L	0.5	0.5	70	NO	NO
160	Total Xylenes	ND	ug/L	0.5	0.5	10000	NO	NO
74	m/p Xylenes (MCL for Total)	ND	ug/L	0.5	0.5		NO	
75	o - Xylene (MCL for Total)	ND	ug/L	0.5	0.5		NO	
	TRIHALOMETHANES							
27	Chloroform	ND	ug/L	0.5	0.5		NO	
28	Bromodichloromethane	ND	ug/L	0.5	0.5		NO	
29	Chlorodibromomethane	ND	ug/L	0.5	0.5		NO	
30	Bromoform	ND	ug/L	0.5	0.5		NO	
31	TOTAL Trihalomethanes	ND	ug/L	NA	NA	80		NO

Water Management Laboratories, Inc.
1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

DOH #	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS	
EPA UNREGULATED (Continued)							Trigger?	MCL?
53	Chloromethane	**ND**	ug/L	0.5	0.5		NO	
54	Bromomethane	**ND**	ug/L	0.5	0.5		NO	
58	1,1 - Dichloroethane	**ND**	ug/L	0.5	0.5		NO	
72	1,1,1,2 - Tetrachlroroethane	**ND**	ug/L	0.5	0.5		NO	
78	Bromobenzene	**ND**	ug/L	0.5	0.5		NO	
79	1,2,3 - Trichloropropane (Confirm by 504.1)	**ND**	ug/L	0.5	0.5		NO	
81	o - Chlorotoluene	**ND**	ug/L	0.5	0.5		NO	
85	Fluorotrichloromethane	**ND**	ug/L	0.5	0.5		NO	
86	Bromochloromethane	**ND**	ug/L	0.5	0.5		NO	
89	1,3,5 - Trimethylbenzene	**ND**	ug/L	0.5	0.5		NO	
91	1,2,4 - Trimethylbenzene	**ND**	ug/L	0.5	0.5		NO	
92	s - Butylbenzene	**ND**	ug/L	0.5	0.5		NO	
93	p - Isopropyltoluene	**ND**	ug/L	0.5	0.5		NO	
94	n - Butylbenzene	**ND**	ug/L	0.5	0.5		NO	
96	Napthalene	**ND**	ug/L	0.5	0.5		NO	
102	EDB (Confirm by 504.1)	**ND**	ug/L	0.5	0.5		NO	
103	DBCP (Confirm by 504.1)	**ND**	ug/L	0.5	0.5		NO	
162	Dichlorodifluoromethane	**ND**	ug/L	0.5	0.5		NO	
N/A	MTBE	**ND**	ug/L	0.5	0.5		NO	

NOTES:

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

Trigger Level: DOH Drinking Water response level. Systems with compounds detected at concentrations in excess of this level may need to take additional samples. Contact your regional DOH office for further information.

MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.

NA (Not Analyzed): In the RESULTS column indicates this compound was not included in the current analysis.

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

< : Indicates less than.

Comments:

Method 524.2: VOC's

WATER MANAGEMENT LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

ATTACHMENT A

SYNTHETIC ORGANIC CHEMICALS (SOC's) ANALYSIS REPORT
EPA TEST METHOD - EPA 525.2
WA DOH TEST PANEL: PEST1

System ID No.: 399504
System Name: King County Water District #54
Lab/Sample No.: 08984107
Date Collected: 04/14/15
DOH Source No.: S03
Multiple Source Nos.: N/A
Sample Type: B
Sample Purpose: C
Date Received: 04/14/15
Date Analyzed: 04/30/15
Analyst: LHL
Date Extracted: 04/17/15
Date Reported: 05/01/15
Supervisor:
County: King
Group: A
Sample Location: Well #6
Send To: King County Water District #54
922 South 219th Street
Des Moines, WA 98198
Remarks:

DOH #	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS	
		EPA REGULATED					Trigger?	MCL?
33	Endrin	ND	ug/L	0.05	0.05	2	NO	NO
34	Lindane (BHC-gamma)	ND	ug/L	0.04	0.04	0.2	NO	NO
35	Methoxychlor	ND	ug/L	10	10	40	NO	NO
36	Toxaphene	ND	ug/L	1	1	3	NO	NO
117	Alachlor	ND	ug/L	0.4	0.4	2	NO	NO
119	Atrazine	ND	ug/L	0.5	0.5	3	NO	NO
120	Benzo(a)pyrene	ND	ug/L	0.04	0.04	0.2	NO	NO
122	Chlordane (total)	ND	ug/L	0.4	0.4	2	NO	NO
124	Di(ethylhexyl)adipate	ND	ug/L	1.3	1.3	400	NO	NO
125	Di(ethylhexyl)phthalate	ND	ug/L	1.3	1.3	6	NO	NO
126	Heptachlor	ND	ug/L	0.09	0.09	0.4	NO	NO
127	Heptachlor epoxide	ND	ug/L	0.1	0.1	0.2	NO	NO
128	Hexachlorobenzene	ND	ug/L	0.5	0.5	1	NO	NO
129	Hexachlorocyclopentadiene	ND	ug/L	0.5	0.5	50	NO	NO
133	Simazine	ND	ug/L	0.15	0.15	4	NO	NO
134	Pentachlorophenol	ND	ug/L	0.2	0.2	1	NO	NO
153	PCB (as total arochlors)	ND	ug/L	0.2			NA	NA
173	Arochlor 1221	ND	ug/L	100			NA	NA
174	Arochlor 1232	ND	ug/L	2.5			NA	NA
175	Arochlor 1242	ND	ug/L	1.5			NA	NA
176	Arochlor 1248	ND	ug/L	0.5			NA	NA
177	Arochlor 1254	ND	ug/L	0.5			NA	NA
178	Arochlor 1260	ND	ug/L	1.0			NA	NA
180	Arochlor 1016	ND	ug/L	0.4			NA	NA
		EPA UNREGULATED						
121	Butachlor	ND	ug/L	0.4			NA	NA
123	Dieldrin	ND	ug/L	0.1			NA	NA
130	Metolachlor	ND	ug/L	1			NA	NA
131	Metribuzin	ND	ug/L	0.2			NA	NA
132	Propachlor	ND	ug/L	0.1			NA	NA
254	Fluorene	ND	ug/L	0.2			NA	NA
179	Bromacil	ND	ug/L	0.2			NA	NA

ATTACHMENT A

WATER
MANAGEMENT
LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

SYNTHETIC ORGANIC CHEMICALS (SOC's) ANALYSIS REPORT
EPA TEST METHOD - EPA 515.1
WA DOH TEST PANEL: HERB1

System ID No.: 399504
System Name: King County Water Dist. No 54
Lab/Sample No.: 08984107
Date Collected: 04-14-15
DOH Source No.: S03
Multiple Source Nos.: N/A
Sample Type: B
Sample Purpose: C
Date Received: 04-14-15
Date Analyzed: 04-21-15
Analyst: JGH
Date Extracted: 04-16-15
Date Reported: 04-23-15
Supervisor:
County: King
Group: A
Sample Location: Well #6
Send To: King County Water District No 54
922 South 219th St.
Des Moines, WA 98198
Remarks:

DOH #	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS	
		EPA REGULATED					Trigger?	MCL?
37	2,4 - D	**ND**	ug/L	0.5	0.5	70	NO	NO
38	2,4,5 - TP (Silvex)	**ND**	ug/L	1.0	1.0	50	NO	NO
134	Pentachlorophenol	**ND**	ug/L	0.20	0.20	1	NO	NO
137	Dalapon	**ND**	ug/L	5.0	5.0	200	NO	NO
139	Dinoseb	**ND**	ug/L	1.0	1.0	7	NO	NO
140	Picloram	**ND**	ug/L	0.5	0.5	500	NO	NO
		EPA UNREGULATED						
135	2,4 - DB	**ND**	ug/L	1.0				
138	Dicamba	**ND**	ug/L	0.2				
223	Acifluorfen	**ND**	ug/L	2.0				
224	Chloramben	**ND**	ug/L	0.2				
225	DCPA Acid Metabolites (A)	**ND**	ug/L	0.1				
226	3,5-Dichlorobenzoic Acid	**ND**	ug/L	0.5				
228	4 - Nitrophenol	**ND**	ug/L	0.5				

NOTES:

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

Trigger Level: DOH Drinking Water response level.

MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.

NA (Not Analyzed): In the RESULTS column indicates this compound was not included in the current analysis.

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

< : Indicates less than.

Comments:

Method 515.1: Herbicides

WATER MANAGEMENT LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

ATTACHMENT A

SYNTHETIC ORGANIC CHEMICALS (SOC's) ANALYSIS REPORT
EPA TEST METHOD - EPA 515.1
WA DOH TEST PANEL: HERB1

System ID No.: 399504
System Name: King County Water Dist. No 54
Lab/Sample No.: 08984107
Date Collected: 04-14-15
DOH Source No.: S04
Multiple Source Nos.: N/A
Sample Type: B
Sample Purpose: C
Date Received: 04-14-15
Date Analyzed: 04-21-15
Analyst: JGH
Date Extracted: 04-16-15
Date Reported: 05-22-15
Supervisor:
County: King
Group: A
Sample Location: Well #6

Send To: King County Water District No 54
922 South 219th St.
Des Moines, WA 98198

Remarks:

CORRECTION OF REPORT DATED 04/23/15

DOH #	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS	
		EPA REGULATED					Trigger?	MCL?
37	2,4 - D	**ND**	ug/L	0.5	0.5	70	NO	NO
38	2,4,5 - TP (Silvex)	**ND**	ug/L	1.0	1.0	50	NO	NO
134	Pentachlorophenol	**ND**	ug/L	0.20	0.20	1	NO	NO
137	Dalapon	**ND**	ug/L	5.0	5.0	200	NO	NO
139	Dinoseb	**ND**	ug/L	1.0	1.0	7	NO	NO
140	Picloram	**ND**	ug/L	0.5	0.5	500	NO	NO
		EPA UNREGULATED						
135	2,4 - DB	**ND**	ug/L	1.0				
138	Dicamba	**ND**	ug/L	0.2				
223	Acifluorfen	**ND**	ug/L	2.0				
224	Chloramben	**ND**	ug/L	0.2				
225	DCPA Acid Metabolites (A)	**ND**	ug/L	0.1				
226	3,5-Dichlorobenzoic Acid	**ND**	ug/L	0.5				
228	4 - Nitrophenol	**ND**	ug/L	0.5				

NOTES:

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

Trigger Level: DOH Drinking Water response level.

MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.

NA (Not Analyzed): In the RESULTS column indicates this compound was not included in the current analysis.

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

< : Indicates less than.

Comments:

Method 515.1: Herbicides

ATTACHMENT A

WATER
MANAGEMENT
LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

RADIONUCLIDE ANALYSIS REPORT

System ID No.: 399504
System Name: King County Water District 54
Lab Sample No.: 08991908
Date Collected: 05-06-15
DOH Source No: S04
Multiple Source Nos.: N/A
Sample Type: B
Sample Purpose: C
County: King
Group: A
Analyst: TA
Date Received: 05-06-15
Date Reported: 08-04-15
Supervisor:
Sample Location: Well 6

Send To: King County Water District 54
922 South 219th
Des Moines, WA 98198

Comments:

CORRECTION OF REPORT DATED 06-17-15

DOH #	ANALYTES	ANALYSIS DATE	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS		METHOD
			EPA REGULATED					Trigger	MCL	
165	Gross Alpha	05-19-15	ND	pCi/L	3.0	3.0	15.0	NO	NO	EPA 900.0: RL-GPC-001
166	Radium 228	06-02-15	ND	pCi/L	1.0	1.0	5.0*	NO	NO	EPA 904.0: RL-RA-001
42	Gross Beta	NA	NA	pCi/L	4.0	4.0	50.0	NA	NA	EPA 900.0: RL-GPC-001
39	Radium 226	NA	NA	pCi/L	1.0	1.0	5.0*	NA	NA	EPA 903.1
N/A	Radon 222	NA	NA	pCi/L	50.0	N/A	300	NA	NA	EPA 913.0

NOTES:

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

MDL (Minimum Detection Level) Lowest valid detection level.

MCL (Federal Maximum Contaminant Level): Levels found above this amount should take steps to mitigate levels and/or confer with DOH.

NA (Not Analyzed): In the RESULTS column indicates this compound was not included in the current analysis.

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

* A Maximum Contaminant Level of 5pCi/L total is allowed for Radium 226 & Radium 228

Comments:

TA NO: J5E120421-13

ATTACHMENT A

WATER
MANAGEMENT
LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

RADIONUCLIDE ANALYSIS REPORT

System ID No.: 399504	System Name: King County Water District 54	
Lab Sample No.: 08991908	Date Collected: 05-06-15	DOH Source No: S03
Multiple Source Nos.: N/A	Sample Type: B	Sample Purpose: C
County: King	Group: A	Analyst: TA
Date Received: 05-06-15	Date Reported: 06-15-15	Supervisor:
Sample Location: Well 6		
Send To: King County Water District 54 922 South 219th Des Moines, WA 98198	Comments:	

DOH #	ANALYTES	ANALYSIS DATE	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS		METHOD
								Trigger	MCL	
				EPA REGULATED						
165	Gross Alpha	05-19-15	ND	pCi/L	3.0	3.0	15.0	NO	NO	EPA 900.0: RL-GPC-001
166	Radium 228	06-02-15	ND	pCi/L	1.0	1.0	5.0*	NO	NO	EPA 904.0: RL-RA-001
42	Gross Beta	NA	NA	pCi/L	4.0	4.0	50.0	NA	NA	EPA 900.0: RL-GPC-001
39	Radium 226	NA	NA	pCi/L	1.0	1.0	5.0*	NA	NA	EPA 903.1
N/A	Radon 222	NA	NA	pCi/L	50.0	N/A	300	NA	NA	EPA 913.0

NOTES:

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

MDL (Minimum Detection Level) Lowest valid detection level.

MCL (Federal Maximum Contaminant Level): Levels found above this amount should take steps to mitigate levels and/or confer with DOH.

NA (Not Analyzed): In the RESULTS column indicates this compound was not included in the current analysis.

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

* A Maximum Contaminant Level of 5pCi/L total is allowed for Radium 226 & Radium 228

Comments:

TA NO: JE5120421-13
WA LAB NO: 028

ATTACHMENT A

WATER MANAGEMENT LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

RADIONUCLIDE ANALYSIS REPORT

System ID No.: 399504
System Name: King County Water District 54
Lab Sample No.: 08991909
Date Collected: 05-06-15
DOH Source No: S04
Multiple Source Nos.: N/A
Sample Type: B
Sample Purpose: C
County: King
Group: A
Analyst: TA
Date Received: 05-06-15
Date Reported: 06-15-15
Supervisor: LM
Sample Location: Well 7

Send To: King County Water District 54
922 South 219th St.
Des Moines, WA 98198

Comments:

DOH #	ANALYTES	ANALYSIS DATE	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS		METHOD
				EPA REGULATED				Trigger	MCL	
165	Gross Alpha	05-19-15	ND	pCi/L	3.0	3.0	15.0	NO	NO	EPA 900.0: RL-GPC-001
166	Radium 228	06-02-15	ND	pCi/L	1.0	1.0	5.0*	NO	NO	EPA 904.0: RL-RA-001
42	Gross Beta	NA	NA	pCi/L	4.0	4.0	50.0	NA	NA	EPA 900.0: RL-GPC-001
39	Radium 226	NA	NA	pCi/L	1.0	1.0	5.0*	NA	NA	EPA 903.1
N/A	Radon 222	NA	NA	pCi/L	50.0	N/A	300	NA	NA	EPA 913.0

NOTES:

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

MDL (Minimum Detection Level) Lowest valid detection level.

MCL (Federal Maximum Contaminant Level): Levels found above this amount should take steps to mitigate levels and/or confer with DOH.

NA (Not Analyzed): In the RESULTS column indicates this compound was not included in the current analysis.

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

* A Maximum Contaminant Level of 5pCi/L total is allowed for Radium 226 & Radium 228

Comments:

TA NO: JE5120421-14
WA LAB NO: 028

ATTACHMENT A

WATER
MANAGEMENT
LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

RADIONUCLIDE ANALYSIS REPORT

System ID No.: 399504
System Name: King County Water District 54
Lab Sample No.: 08991909
Date Collected: 05-06-15
DOH Source No: S05
Multiple Source Nos.: N/A
Sample Type: B
Sample Purpose: C
County: King
Group: A
Analyst: TA
Date Received: 05-06-15
Date Reported: 08-04-15
Supervisor:
Sample Location: Well 7

Send To: King County Water District 54
922 South 219th St.
Des Moines, WA 98198

Comments:

CORRECTION OF REPORT DATED 06-17-15

DOH #	ANALYTES	ANALYSIS DATE	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS		METHOD
								Trigger	MCL	
	EPA REGULATED									
165	Gross Alpha	05-19-15	ND	pCi/L	3.0	3.0	15.0	NO	NO	EPA 900.0: RL-GPC-001
166	Radium 228	06-02-15	ND	pCi/L	1.0	1.0	5.0*	NO	NO	EPA 904.0: RL-RA-001
42	Gross Beta	NA	NA	pCi/L	4.0	4.0	50.0	NA	NA	EPA 900.0: RL-GPC-001
39	Radium 226	NA	NA	pCi/L	1.0	1.0	5.0*	NA	NA	EPA 903.1
N/A	Radon 222	NA	NA	pCi/L	50.0	N/A	300	NA	NA	EPA 913.0

NOTES:

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

MDL (Minimum Detection Level) Lowest valid detection level.

MCL (Federal Maximum Contaminant Level): Levels found above this amount should take steps to mitigate levels and/or confer with DOH.

NA (Not Analyzed): In the RESULTS column indicates this compound was not included in the current analysis.

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL

* A Maximum Contaminant Level of 5pCi/L total is allowed for Radium 226 & Radium 228

Comments:

TA NO: J5E120421-14

ATTACHMENT A

WATER MANAGEMENT LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

RADIONUCLIDE ANALYSIS REPORT

System ID No.: 399504
System Name: King County Water District #54
Lab Sample No.: 08992555
Date Collected: 04/20/17
DOH Source No: S01
Multiple Source Nos.: N/A
Sample Type: B
Sample Purpose: C
County: King
Group: A
Analyst: TA
Date Received: 04/20/17
Date Reported: 02/21/19
Supervisor:
Sample Location: Well #4

Send To: King County Water District #54
922 South 219th St
Des Moines, WA 98198

Comments:

Correction of Report Dated 07/03/17.

DOH #	ANALYTES	ANALYSIS DATE	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS		METHOD
								Trigger	MCL	
EPA REGULATED										
165	Gross Alpha	06/28/17	ND	pCi/L	3					EPA 900.0: RL-GPC-001
166	Radium 228	06/07/17	ND	pCi/L	1					EPA 904.0: RL-RA-001
42	Gross Beta*	NA	NA	pCi/L	4	50	50	NA	NA	EPA 900.0: RL-GPC-001
39	Radium 226**	NA	NA	pCi/L	1					EPA 903.1
109	Radon	NA	NA	pCi/L						EPA 913.0

NOTES:

pCi/L: picocuries per Liter (a measure of radioactivity)

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington State Department of Health (DOH).

MCL (Federal Maximum Contaminant Level): Levels found above this amount should check with DOH

NA (Not Analyzed / Not Applicable): In the RESULTS column indicates this compound was not included in the current analysis or not applicable

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

* The MCL for beta particle and photon radioactivity from man-made radionuclides is the average annual concentration which shall not producean annual dose equivalent to the total body or any internal organ greater than four millirems per year (mrem/yr)

** A Maximum Contaminant Level of 5pCi/L total is allowed for Radium 226 & Radium 228

Comments: **TA NO: J7D240410-2 ; WA LAB NO: 028**

ATTACHMENT A

WATER
MANAGEMENT
LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

RADIONUCLIDE ANALYSIS REPORT

System ID No.: 399504	System Name: King County Water District #54	
Lab Sample No.: 08992555	Date Collected: 04/20/17	DOH Source No: S01
Multiple Source Nos.: N/A	Sample Type: B	Sample Purpose: I
County: King	Group: A	Analyst: TA
Date Received: 04/20/17	Date Reported: 07/03/17	Supervisor:
Sample Location: Well #4		
Send To: King County Water District #54 922 South 219th St Des Moines, WA 98198	Comments:	

DOH #	ANALYTES	ANALYSIS DATE	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS		METHOD
				EPA REGULATED				Trigger	MCL	
165	Gross Alpha	06/28/17	ND	pCi/L	3					EPA 900.0: RL-GPC-001
166	Radium 228	06/07/17	ND	pCi/L	1					EPA 904.0: RL-RA-001
42	Gross Beta*	NA	NA	pCi/L	4	50	50	NA	NA	EPA 900.0: RL-GPC-001
39	Radium 226**	NA	NA	pCi/L	1					EPA 903.1
109	Radon	NA	NA	pCi/L						EPA 913.0

NOTES:

pCi/L: picocuries per Liter (a measure of radioactivity)

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington State Department of Health (DOH).

MCL (Federal Maximum Contaminant Level): Levels found above this amount should check with DOH

NA (Not Analyzed / Not Applicable): In the RESULTS column indicates this compound was not included in the current analysis or not applicable

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

* The MCL for beta particle and photon radioactivity from man-made radionuclides is the average annual concentration which shall not producean annual dose equivalent to the total body or any internal organ greater than four millirems per year (mrem/yr)

** A Maximum Contaminant Level of 5pCi/L total is allowed for Radium 226 & Radium 228

Comments:

TA NO: J7D240410-2
WA LAB NO: 028

ATTACHMENT A

WATER
MANAGEMENT
LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

RADIONUCLIDE ANALYSIS REPORT

System ID No.: 399504
System Name: King County Water District #54
Lab Sample No.: 08992556
Date Collected: 04/20/17
DOH Source No: S02
Multiple Source Nos.: N/A
Sample Type: B
Sample Purpose: I
County: King
Group: A
Analyst: TA
Date Received: 04/20/17
Date Reported: 07/03/17
Supervisor:
Sample Location: Well #5

Send To: King County Water District #54
922 South 219th St
Des Moines, WA 98198

Comments:

DOH #	ANALYTES	ANALYSIS DATE	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS		METHOD
				EPA REGULATED				Trigger	MCL	
165	Gross Alpha	06/28/17	ND	pCi/L	3					EPA 900.0: RL-GPC-001
166	Radium 228	06/07/17	ND	pCi/L	1					EPA 904.0: RL-RA-001
42	Gross Beta*	NA	NA	pCi/L	4	50	50	NA	NA	EPA 900.0: RL-GPC-001
39	Radium 226**	NA	NA	pCi/L	1					EPA 903.1
109	Radon	NA	NA	pCi/L						EPA 913.0

NOTES:

pCi/L: picocuries per Liter (a measure of radioactivity)

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington State Department of Health (DOH).

MCL (Federal Maximum Contaminant Level): Levels found above this amount should check with DOH

NA (Not Analyzed / Not Applicable): In the RESULTS column indicates this compound was not included in the current analysis or not applicable

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

* The MCL for beta particle and photon radioactivity from man-made radionuclides is the average annual concentration which shall not producean annual dose equivalent to the total body or any internal organ greater than four millirems per year (mrem/yr)

** A Maximum Contaminant Level of 5pCi/L total is allowed for Radium 226 & Radium 228

Comments:

TA NO: J7D240410-3
WA LAB NO: 028

ATTACHMENT A

WATER
MANAGEMENT
LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

RADIONUCLIDE ANALYSIS REPORT

System ID No.: 399504	System Name: King County Water District #54	
Lab Sample No.: 08992556	Date Collected: 04/20/17	DOH Source No: S02
Multiple Source Nos.: N/A	Sample Type: B	**Sample Purpose: C**
County: King	Group: A	Analyst: TA
Date Received: 04/20/17	**Date Reported: 02/21/19**	Supervisor:
Sample Location: Well #5		
Send To: King County Water District #54 922 South 219th St Des Moines, WA 98198	Comments:	

Correction of Report Dated 07-03-17.

DOH #	ANALYTES	ANALYSIS DATE	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS		METHOD
				EPA REGULATED				Trigger	MCL	
165	Gross Alpha	06/28/17	ND	pCi/L	3					EPA 900.0: RL-GPC-001
166	Radium 228	06/07/17	ND	pCi/L	1					EPA 904.0: RL-RA-001
42	Gross Beta*	NA	NA	pCi/L	4	50	50	NA	NA	EPA 900.0: RL-GPC-001
39	Radium 226**	NA	NA	pCi/L	1					EPA 903.1
109	Radon	NA	NA	pCi/L						EPA 913.0

NOTES:

pCi/L: picocuries per Liter (a measure of radioactivity)

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington State Department of Health (DOH).

MCL (Federal Maximum Contaminant Level): Levels found above this amount should check with DOH

NA (Not Analyzed / Not Applicable): In the RESULTS column indicates this compound was not included in the current analysis or not applicable

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

* The MCL for beta particle and photon radioactivity from man-made radionuclides is the average annual concentration which shall not producean annual dose equivalent to the total body or any internal organ greater than four millirems per year (mrem/yr)

** A Maximum Contaminant Level of 5pCi/L total is allowed for Radium 226 & Radium 228

Comments: TA NO: J7D240410-3 ; WA LAB NO: 028

ATTACHMENT A

WATER MANAGEMENT LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

RADIONUCLIDE ANALYSIS REPORT

System ID No.: 399504	System Name: King County Water District # 54	
Lab Sample No.: 08992610	Date Collected: 12-20-17	DOH Source No: S01
Multiple Source Nos.: N/A	Sample Type: B	Sample Purpose: C
County: King	Group: A	Analyst: TA
Date Received: 12-20-17	Date Reported: 01-17-18	Supervisor:
Sample Location: Wellhead		
Send To: King County Water District # 54 922 S 219th St Des Moines, WA 98198	Comments:	

DOH #	ANALYTES	ANALYSIS DATE	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS		METHOD
EPA REGULATED								Trigger	MCL	
165	Gross Alpha	01-09-18	ND	pCi/L	3					EPA 900.0: RL-GPC-001
166	Radium 228	01-12-18	ND	pCi/L	1					EPA 904.0: RL-RA-001
42	Gross Beta*	NA	NA	pCi/L	4	50	50	NA	NA	EPA 900.0: RL-GPC-001
39	Radium 226**	NA	NA	pCi/L	1					EPA 903.1
109	Radon	NA	NA	pCi/L						EPA 913.0

NOTES:

pCi/L: picocuries per Liter (a measure of radioactivity)

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington State Department of Health (DOH).

MCL (Federal Maximum Contaminant Level): Levels found above this amount should check with DOH

NA (Not Analyzed / Not Applicable): In the RESULTS column indicates this compound was not included in the current analysis or not applicable

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

* The MCL for beta particle and photon radioactivity from man-made radionuclides is the average annual concentration which shall not producean annual dose equivalent to the total body or any internal organ greater than four millirems per year (mrem/yr)

** A Maximum Contaminant Level of 5pCi/L total is allowed for Radium 226 & Radium 228

Comments:

TA NO: J7L270402-1
WA LAB NO: C565

ATTACHMENT A

WATER
MANAGEMENT
LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

RADIONUCLIDE ANALYSIS REPORT

System ID No.: 399504
System Name: King County Water District # 54
Lab Sample No.: 08992611
Date Collected: 12-20-17
DOH Source No: S02
Multiple Source Nos.: N/A
Sample Type: B
Sample Purpose: C
County: King
Group: A
Analyst: TA
Date Received: 12-20-17
Date Reported: 01-17-18
Supervisor:
Sample Location: Wellhead

Send To: King County Water District # 54
922 S 219th St
Des Moines, WA 98198

Comments:

DOH #	ANALYTES	ANALYSIS DATE	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS		METHOD
								Trigger	MCL	
EPA REGULATED										
165	Gross Alpha	01-09-18	ND	pCi/L	3					EPA 900.0: RL-GPC-001
166	Radium 228	01-08-18	ND	pCi/L	1					EPA 904.0: RL-RA-001
42	Gross Beta*	NA	NA	pCi/L	4	50	50	NA	NA	EPA 900.0: RL-GPC-001
39	Radium 226**	NA	NA	pCi/L	1					EPA 903.1
109	Radon	NA	NA	pCi/L						EPA 913.0

NOTES:

pCi/L: picocuries per Liter (a measure of radioactivity)

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington State Department of Health (DOH).

MCL (Federal Maximum Contaminant Level): Levels found above this amount should check with DOH

NA (Not Analyzed / Not Applicable): In the RESULTS column indicates this compound was not included in the current analysis or not applicable

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

* The MCL for beta particle and photon radioactivity from man-made radionuclides is the average annual concentration which shall not producean annual dose equivalent to the total body or any internal organ greater than four millirems per year (mrem/yr)

** A Maximum Contaminant Level of 5pCi/L total is allowed for Radium 226 & Radium 228

Comments:

TA NO: J7L270402-2
WA LAB NO: C565

ATTACHMENT A

WATER
MANAGEMENT
LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

DISINFECTION BYPRODUCTS (HAA's) ANALYSIS REPORT
EPA TEST METHOD - EPA 552.2
WA DOH TEST PANEL: HAA5

System ID No.: 399504
System Name: King County Water District #54
Lab/Sample No.: 08985270
Date Collected: 09-14-16
DOH Source No.: S92
Multiple Source Nos.: N/A
Sample Type: A
Sample Purpose: C
Date Received: 09-14-16
Date Analyzed: 09-16-16
Analyst: JGH
Date Extracted: 09-16-16
Date Reported: 09-19-16
Supervisor:
County: King
Group: A
Sample Location: 227th South Dock Ave

Send To: King County Water District #54
922 South 219th St
Des Moines, WA 98198

Remarks:

DOH #	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS	
		EPA REGULATED					Trigger?	MCL?
411	Monochloroacetic Acid	**ND**	ug/L	2.0				
412	Dichloroacetic Acid	**1.3**	ug/L	1.0				
413	Trichloroacetic Acid	**ND**	ug/L	1.0				
414	Monobromoacetic Acid	**ND**	ug/L	1.0				
415	Dibromoacetic Acid	**ND**	ug/L	1.0				
416	HAA's Total	**1.3**	ug/L	15.0		60		NO
		EPA UNREGULATED						
417	Bromochloroacetic Acid	**ND**	ug/L	1.0		NA		

NOTES:

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

Trigger Level: DOH Drinking Water response level.

MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.

NA (Not Analyzed): In the RESULTS column indicates this compound was not included in the current analysis.

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

< : Indicates less than.

Comments:

Method 552.2: HAA's

WATER MANAGEMENT LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

ATTACHMENT A

DISINFECTION BYPRODUCTS (HAA's) ANALYSIS REPORT
EPA TEST METHOD - EPA 552.2
WA DOH TEST PANEL: HAA5

System ID No.: 399504
System Name: King County Water District #54
Lab/Sample No.: 08985271
Date Collected: 09-14-16
DOH Source No.: S92
Multiple Source Nos.: N/A
Sample Type: A
Sample Purpose: C
Date Received: 09-14-16
Date Analyzed: 09-16-16
Analyst: JGH
Date Extracted: 09-16-16
Date Reported: 09-19-16
Supervisor:
County: King
Group: A
Sample Location: 13th Ave South
Send To: King County Water District #54
922 South 219th St
Des Moines, WA 98198
Remarks:

DOH #	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS	
		EPA REGULATED					Trigger?	MCL?
411	Monochloroacetic Acid	**ND**	ug/L	2.0				
412	Dichloroacetic Acid	**1.1**	ug/L	1.0				
413	Trichloroacetic Acid	**ND**	ug/L	1.0				
414	Monobromoacetic Acid	**ND**	ug/L	1.0				
415	Dibromoacetic Acid	**ND**	ug/L	1.0				
416	HAA's Total	**1.1**	ug/L	15.0		60		NO
		EPA UNREGULATED						
417	Bromochloroacetic Acid	**ND**	ug/L	1.0		NA		

NOTES:

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

Trigger Level: DOH Drinking Water response level.

MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.

NA (Not Analyzed): In the RESULTS column indicates this compound was not included in the current analysis.

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

< : Indicates less than.

Comments:

Method 552.2: HAA's

WATER
MANAGEMENT
LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

ATTACHMENT A

DISINFECTION BYPRODUCTS (HAA's) ANALYSIS REPORT
EPA TEST METHOD - EPA 552.2
WA DOH TEST PANEL: HAA5

System ID No.: 399504
System Name: King County Water District #54
Lab/Sample No.: 08984504
Date Collected: 08/26/15
DOH Source No.: S92
Multiple Source Nos.: N/A
Sample Type: A
Sample Purpose: C
Date Received: 08/26/15
Date Analyzed: 08/27/15
Analyst: RL
Date Extracted: 08/27/15
Date Reported: 08/28/15
Supervisor:
County: King
Group: A
Sample Location: Harbor Master's Office (North)

Send To: King County Water District #54
922 S 219th St
Des Moines, WA 98198

Remarks:

DOH #	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS	
		EPA REGULATED					Trigger?	MCL?
411	Monochloroacetic Acid	**ND**	ug/L	2.0				
412	Dichloroacetic Acid	**ND**	ug/L	1.0				
413	Trichloroacetic Acid	**1.4**	ug/L	1.0				
414	Monobromoacetic Acid	**ND**	ug/L	1.0				
415	Dibromoacetic Acid	**ND**	ug/L	1.0				
416	HAA's Total	**1.4**	ug/L	15.0		60		NO
		EPA UNREGULATED						
417	Bromochloroacetic Acid	**ND**	ug/L	1.0		NA		

NOTES:

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

Trigger Level: DOH Drinking Water response level.

MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.

NA (Not Analyzed): In the RESULTS column indicates this compound was not included in the current analysis.

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

< : Indicates less than.

Comments:

Method 552.2: HAA's

WATER
MANAGEMENT
LABORATORIES INC.

ATTACHMENT A

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

DISINFECTION BYPRODUCTS (HAA's) ANALYSIS REPORT
EPA TEST METHOD - EPA 552.2
WA DOH TEST PANEL: HAA5

System ID No.: 399504
System Name: King County Water District #54
Lab/Sample No.: 08984505
Date Collected: 08/26/15
DOH Source No.: S92
Multiple Source Nos.: N/A
Sample Type: A
Sample Purpose: C
Date Received: 08/26/15
Date Analyzed: 08/27/15
Analyst: RL
Date Extracted: 08/27/15
Date Reported: 08/28/15
Supervisor:
County: King
Group: A
Sample Location: 21516 13th Ave S

Send To: King County Water District #54
922 S 219th St
Des Moines, WA 98198

Remarks:

DOH #	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS	
							Trigger?	MCL?
		EPA REGULATED						
411	Monochloroacetic Acid	**ND**	ug/L	2.0				
412	Dichloroacetic Acid	**1.8**	ug/L	1.0				
413	Trichloroacetic Acid	**1.6**	ug/L	1.0				
414	Monobromoacetic Acid	**ND**	ug/L	1.0				
415	Dibromoacetic Acid	**ND**	ug/L	1.0				
416	HAA's Total	**3.4**	ug/L	15.0		60		NO
		EPA UNREGULATED						
417	Bromochloroacetic Acid	**1.6**	ug/L	1.0		NA		

NOTES:

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

Trigger Level: DOH Drinking Water response level.

MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.

NA (Not Analyzed): In the RESULTS column indicates this compound was not included in the current analysis.

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

< : Indicates less than.

Comments:

Method 552.2: HAA's

WATER MANAGEMENT LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

ATTACHMENT A

DISINFECTION BYPRODUCTS (HAA's) ANALYSIS REPORT
EPA TEST METHOD - EPA 552.2
WA DOH TEST PANEL: HAA5

System ID No.: 399504
System Name: King County Water District #54
Lab/Sample No.: 08983574
Date Collected: 09/09/14
DOH Source No.: S92
Multiple Source Nos.: N/A
Sample Type: A
Sample Purpose: C
Date Received: 09/09/14
Date Analyzed: 09/12/14
Analyst: RL
Date Extracted: 09/12/14
Date Reported: 09/16/14
Supervisor:
County: King
Group: A
Sample Location: Dock St - Marina

Send To: King County Water District #54
922 S 219th St
Des Moines, WA 98198

Remarks:

DOH #	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS	
							Trigger?	MCL?
EPA REGULATED								
411	Monochloroacetic Acid	**ND**	ug/L	2.0				
412	Dichloroacetic Acid	**ND**	ug/L	1.0				
413	Trichloroacetic Acid	**ND**	ug/L	1.0				
414	Monobromoacetic Acid	**ND**	ug/L	1.0				
415	Dibromoacetic Acid	**ND**	ug/L	1.0				
416	HAA's Total	**ND**	ug/L	15.0		60		NO
EPA UNREGULATED								
417	Bromochloroacetic Acid	**ND**	ug/L	1.0		NA		

NOTES:

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

Trigger Level: DOH Drinking Water response level.

MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.

NA (Not Analyzed): In the RESULTS column indicates this compound was not included in the current analysis.

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

< : Indicates less than.

Comments:

Method 552.2: HAA's

WATER
MANAGEMENT
LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

ATTACHMENT A

DISINFECTION BYPRODUCTS (HAA's) ANALYSIS REPORT

EPA TEST METHOD - EPA 552.2

WA DOH TEST PANEL: HAA5

System ID No.: 399504
System Name: King County Water District #54
Lab/Sample No.: 08983575
Date Collected: 09/09/14
DOH Source No.: S92
Multiple Source Nos.: N/A
Sample Type: A
Sample Purpose: C
Date Received: 09/09/14
Date Analyzed: 09/12/14
Analyst: RL
Date Extracted: 09/12/14
Date Reported: 09/16/14
Supervisor:
County: King
Group: A
Sample Location: 21516 13th Ave S

Send To: King County Water District #54
922 S 219th St
Des Moines, WA 98198

Remarks:

DOH #	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS	
		EPA REGULATED					Trigger?	MCL?
411	Monochloroacetic Acid	ND	ug/L	2.0				
412	Dichloroacetic Acid	ND	ug/L	1.0				
413	Trichloroacetic Acid	ND	ug/L	1.0				
414	Monobromoacetic Acid	ND	ug/L	1.0				
415	Dibromoacetic Acid	ND	ug/L	1.0				
416	HAA's Total	ND	ug/L	15.0		60		NO
		EPA UNREGULATED						
417	Bromochloroacetic Acid	ND	ug/L	1.0		NA		

NOTES:

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

Trigger Level: DOH Drinking Water response level.

MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.

NA (Not Analyzed): In the RESULTS column indicates this compound was not included in the current analysis.

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

< : Indicates less than.

Comments:

Method 552.2: HAA's

APPENDIX G

CONSUMER CONFIDENCE REPORT

ATTACHMENT A

King County Water District #54 serves downtown Des Moines and the southern portion of Normandy Park.

KING COUNTY WATER DISTRICT #54

Annual Drinking Water Report

We at King County Water District #54 are pleased to present to you this year's Annual Water Quality Report for 2017

This report is designed to inform you about the quality water and services we deliver to you every day. Our constant goal is to provide you with a safe and dependable supply of drinking water. We want you to understand the efforts we make to continually improve the water process and protect our water resources. We are committed to ensuring the quality of your water.

Each year we provide an updated water quality report that summarizes where our drinking water comes from, and how it is tested, monitored and protected in accordance with the Federal Safe Drinking Water Act. Each report covers the prior calendar year.

Much of this information is technical, but we have tried to make an effort to keep it clear, useful and readable for you our valued customer.

Our water is drawn from four wells in the Highline Aquifer. This aquifer is overlain by 130 to 165 feet of glacial drift, which acts as a natural filter.

We have a source water protection plan available for review at our office. This provides more information such as potential sources of contamination.

We're pleased to report that our drinking water is safe and meets federal and state requirements.

For your Health

King County Water District #54 routinely monitors for constituents in your drinking water according to Federal and State laws.

The following tables show the results of our monitoring for the period of January 1st to December 31st, 2017, although not all of the following test results are from 2017 testing.

All drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some constituents. The presence of constituents does not necessarily indicate that the water poses a health risk.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbiological contaminants are available from the Safe Drinking Water Hotline (800-426-4791).

MCL's (Maximum Contaminant Level) are set at very stringent levels. To understand the possible health effects described for many regulated constituents, a person would have to drink 2 liters of water every day at the MCL level for a lifetime to have a one-in-a-million chance of having the described health effect.

For more info about contaminants and potential health effects can be obtained by calling the EPA Safe Drinking Water Hotline at (800)426-4791.

Meetings:

Our regularly scheduled meeting time is 4:00 PM at our office on the first and third Tuesdays of every month

ATTACHMENT A

Working Hard For You

The United States Environmental Protection Agency (EPA) sets the National standards for public drinking water quality to ensure that tap water is safe to drink. Water District #54 adds no chemicals to our water. The water is drawn from wells and delivered to your home or business. The District goes above and beyond what the State requires on monitoring to ensure that Water District #54's water passes all regulated testing.

To protect public health, EPA and the Washington State Department of Health establish maximum contaminants levels and the specific actions required if levels of certain contaminants are exceeded, including public notification. (Food and Drug Administration regulations establish limits for contaminants in bottled water.)

Water Use Efficiency

The Department of Heath and the Department of Ecology have been working together to work with water utilities to conserve water, therefore, we are required to have a Water Use Efficiency (WUE) plan. This requires us to state goals and how we plan to achieve these goals.

As part of these goals we strive to pump less water and to have each individual user use less water.

In the last few years we have been very consistent in the water used per single-family homes. For 2017 we used about 160 gallons per single family home. Our 5 year average is consistent at that same number.

The Department of Ecology has set the water use efficiency goal of less than 10% for unaccounted for water. We are continuing to change old inefficient meters. The new meters are touch read, which allows the meter reader to touch a pad on the meter box with an electronic device which transfers the usage to a digital display. If you've noticed a round pad on your meter box lid you have a new meter. The round pad is the new touch read pad. We are working to replace all of the meters throughout the District so they will have these new touch pads.

What are IOC's?

Inorganic Chemicals are considered to be of a mineral, not biological. Typical inorganic compounds include: Carbon monoxide, carbon dioxide, carbonates, cyanides among many others.

Microbiological Contaminants

Total Coliform: The Total Coliform Rule requires water systems to meet a stricter limit for coliform bacteria. Coliform bacteria are usually harmless, but their presence in water can be an indication of disease-causing bacteria. If coliform bacteria are found, special follow-up tests are done to determine if harmful bacteria are present in the water supply. If this limit is exceeded, the water supplier must notify the public by mail within 30 days.

Fecal Coliform/E.Coli: Fecal Coliforms and E.Coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, and people with severely compromised immune systems. The water supplier must notify the public by newspaper, television or radio within 24 hours.

Inorganic Contaminants

Nitrates: Nitrate in drinking water at levels above 10 parts per million is a health risk for infants of less than six months of age. High nitrate levels in drinking water can cause blue baby syndrome. Nitrate levels may rise quickly for short periods of time because of rainfall or agricultural activity. If you are caring for an infant you should ask advice from your health care provider. As a precaution we always notify physicians and health care providers in this area if there is ever a higher than normal level of nitrates in the water supply.

What are Radionuclides's?

Radionuclide is the testing for radio active mineral in water which is found in rocks and soil predominately found in the Northeast part of the state. When uranium decays, it changes into different elements that are also radioactive, including radon, a gas that is known to cause cancer. The main concern for uranium in drinking water is harm to the kidneys.

Radon is most hazardous when inhaled, not when ingesting. High radon levels in drinking water may suggest elevated radon in indoor air.

Manganese

Manganese is considered a secondary contaminant by the Environmental Protection Agency (EPA). Manganese does not cause disease from being consumed. It is however a nuisance. Even in low levels it will cause the staining of porcelain fixtures and laundry. Food cooked in water containing high levels of manganese may become discolored, but the off color does not mean it is not safe to eat or drink. Manganese may give water an unusual taste and odor that has been described as "musty" or "metallic". Manganese deposits consist of a black powder that does not dissolve in water, it builds up in tanks, and in distribution lines in a water system. When there is a change in water pressure or some disruption in the water system, manganese deposits are knocked loose from the pipe, causing the water to become cloudy or brown.

TEST RESULTS (Measured at the Source)

Inorganic Chemicals (IOC's)	Violation Y/N	Level Detected	Unit	MCL	SRL	Explanation
Arsenic	N	0.001	Mg/L	.01	.002	Found in natural deposits underground
Iron	N	0.3	Mg/L	0.3	0.1	Makes up 5% of earths crust
Manganese	Y	0.10	Mg/L	0.05	0.01	Naturally occurring, found in air, food, soil & water
Nitrate	N	<0.2	Mg/L	10	.5	Found in fertilizer, manure & liquid waste

Tested Compound	Violation Y/N	Level Detected	Unit	Action Level	# of Homes over AL	Explanation
Lead	N	0.007	Mg/L	0.015	0	Corrosion of household plumbing
Copper	N	0.07	Mg/L	1.13	0	Corrosion of household plumbing

Additional Testing	Level Detected	Explanation
pH value	7.5 to 7.8	pH value of 7 is neutral. Values under 7 indicates acidity and over 7 indicates alkalinity

In the table above you will find many terms and abbreviations you might not be familiar with. To help you better understand these terms we've provided the following definitions:

Parts per million (ppm) or Milligrams per liter (Mg/L) - one part per million corresponds to one minute in two years or a single penny in $10,000.

State Reporting Limit (SRL) - The limit at which the State Department of Health must be notified.

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

Picouries per liter (PciI/L) - this is the measurement of radioactivity in the water.

Non-regulated (NR) - items not regulated by the state.

< - Indicates 'less than'.

ATTACHMENT A

Presorted Standard
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Permit No. 4136

King County Water District #54
922 South 219th Street
Des Moines, WA 98198
(206) 878-7210

System ID: 399504
System Operator: Eric Clarke
kcwd54.org

The District is owned by the ratepayers and managed through a Board of Commissioners elected by the ratepayers.

Board of Commissioners:
Yoshiko Grace Matsui
Kris Van Gasken
James Langston

Miscellaneous District Info

Routine Sampling: Every month, 30 water samples are drawn to test for coliform bacteria and in 2017 we had no violations.

Permanent sample stations have been installed throughout the District for the routine samples to be drawn from, as well as follow-up sample sites. We have hired a professional lab to take the monthly samples to ensure that the utmost care is taken while sampling

The District is required by the DOH to perform 72 routine coliform samples. These sample are based upon the population within the water district. In addition, the water district drew 200+ extra samples. These were done to try and determine where the system needs to be flushed.

If you have any questions about this report or concerning your water utility, please contact the office at: (206) 878-7210. If you want to learn more, please attend any of our regularly scheduled meetings. They are held at 4:00 pm on the 1st and 3rd Tuesdays of each month at the District office.

Additional Samples: In addition to the routine water sample the District performs heterotrophic plate count (HPC) tests. This measures a broad group of microorganisms that are commonly found in drinking water. These test results are used as a tool to track the concentration of these “background” microorganisms in our distribution system. The Environmental Protection Agency (EPA) has determined that a well operated water system with a well maintained distribution system should have HPC counts of populations less than 500 colonies per milliliter (ml). A sample with a count higher than 500 Colony-Forming Units (CFU) per milliliter is considered undesirable and should be investigated to determine the cause.

The District performs a minimum of 28 of these HPC tests per month. If the colony count is higher than 20 we immediately flush the area which lowers the count.

The District also performs 12 manganese samples a month throughout the District as well as the wells and pumping facilities. If the counts are higher than the state maximum contaminate level the District will flush the area to lower the count.

APPENDIX H

COLIFORM MONITORING PLAN

Coliform Monitoring Plan for: King County Water District #54

A. System Information

Plan Date: 10/8/2019

Water System Name King County Water District #54	**County** King	**System I.D. Number** 399504
Name of Plan Preparer Eric Clarke	**Position** District Manager	**Daytime Phone** 206-878-7210
Sources: DOH Source Number, Source Name, Well Depth, Pumping Capacity	SO1 Well #4 – 328 ft, 40 gpm (emergency) SO2 Well #5 – 245 ft, 280 gpm SO3 Highline Water District – 3,600 gpm (intertie) SO4 Well #6 – 375 ft, 310 gpm SO5 Well #7 – 379 ft, 320 gpm	
Storage: List and Describe	Lower Reservoir – 660,000 gallons Upper Reservoir – 250,000 gallons Total Storage – 910,000 gallons	
Treatment: Source Number & Process	None	
Pressure Zones: Number and name	1 zone (263 ft elevation change)	
Population by Pressure Zone	5,037	
Number of Routine Samples Required Monthly by Regulation:	6	
Number of Sample Sites Needed to Represent the Distribution System:	6+	
***Request DOH Approval of Triggered Source Monitoring Plan?**	**Yes** ☐ **No** ☒	

*If approval is requested a fee will be charged for the review.

The District currently does not provide disinfection treatment. Flow paced chlorination is possible through the facilities constructed in 2014.

B. Laboratory Information

Laboratory Name Water Management Laboratories	**Office Phone** 253-531-3121 **After Hours Phone** 253-841-0732
Address 1515 80th St E Tacoma, WA 98404	**Cell Phone** 253-312-1651 or 253-691-6691 **Email** christa@watermanagementlabs.com or customerservice@watermanagement.com
Hours of Operation Mon – Fri 8:00 am – 5:00 pm Sat 9:00 am – 12 pm	
Contact Name Christa Garrettson	
Emergency Laboratory Name Seattle Public Utilities Water Quality Lab	**Office Phone** 206-684-7834 **After Hours Phone** 206-684-7407
Address 800 S. Stacy St. Seattle, WA 98134	**Cell Phone** 206-559-8517 **Email** winsome.robinsonwilliams@seattle.gov
Hours of Operation Mon – Sun 7:00 am - 5:00 pm (Samples need to be in between 7 am and 1 pm)	
Contact Name Wiley Harper (pgr 206-559-8517)	

C. Wholesaling of Groundwater

	Yes	No
We are a consecutive system and purchase groundwater from another water system.	☐	☒
If yes, Water System Name: Highline Water District – Emergency Intertie Contact Name: Jeremy Delmar Telephone Numbers Office **206-592-8904** After Hours **206-824-0375**		
We sell groundwater to other public water systems.	☐	☒

D. Routine, Repeat, and Triggered Source Sample Locations*

Location/Address for **Routine Sample Sites**	Location/Address for **Repeat Sample Sites**	Groundwater Sources for **Triggered Sample Sites****
Northwest 1 A. 21625 5th Avenue South	B. 218th and 5th Avenue South C. 216th and 5th Avenue South	All Sources
Northeast 2 A. 21508 13th Avenue South	B. 21434 13th Avenue South C. 21524 13th Avenue South	All Sources
Middle West 3 A. 22336 6th Avenue South	B. 22320 6th Avenue South C. 22352 6th Avenue South	All Sources
Middle East 4 A. 21803 12th Avenue South	B. 21810 11th Avenue South – (District Shop) C. 21833 12th Avenue South	All Sources
Southwest 5 A. South 227th Street and Dock Street Anthony's Restaurant	B. 22307 Dock Avenue South Meter Hot Box C. 227th and 6th Avenue South	All Sources
Southeast 6 A. 22624 12th Avenue South	B. 226th and 12th Avenue South C. 22630 12th Avenue South	All Sources
Additional Sample Station Locations	A. 820 South 219th Street	All Sources

*NOTE: If you need more than three routine samples to cover the distribution system, attach additional sheets as needed.

**** When you collect the repeats, you must sample every groundwater source that was in use when the original routine sample was collected.**

Important Notes for Sample Collector

1) The district at a minimum will collect 6 samples per month.
2) Samples will be collected at points that are representative of the conditions within the distribution system.
3) Where tastes, odors, and color may be a problem, samples may be taken more often.
4) The district has six routine samples locations.
5) The district through its distribution system has access to numerous alternative sample locations.

Sampling Procedure

1) Select a designated sampling station. Designated sampling stations are strategically located throughout the District. Do not collect samples from fire hydrants, janitor sinks, laboratory sinks and drug store sinks, etc.
2) Select a faucet that has no leaks.
3) Draw water from the sample station until you are sure that the water in the service line has been draw out and fresh water is coming from the main.
4) Close faucet and disinfect with proper disinfectant (using Bacdown Detergent Disinfectant).
5) Open faucet and let run at least 5 minutes or longer. Slow water down to a small stream.
6) Open sample bottle. (Provided by Water Management Laboratory of Tacoma, WA). Avoid touching lid of bottle or inside of cap.
7) Fill bottle to top, do not overfill, or dump water out.
8) Firmly replace cap.
9) Report form (provided by testing Laboratory) will be filled out immediately after taking a sample.
10) After samples have been drawn, they are immediately transported to Water Management Laboratory.
11) When reports are returned to the district office, the reports will be reviewed and if approved by the Manger, put into the proper file.

Additional Sampling

The District collects water samples at various locations in the system as follows:

- **Wells –** Twice a month, approximately 1 week before and 1 week after routine coliform samples, District personnel will draw samples from all operating wells (4, 5, 6, and 7). The samples will be analyzed for coliform.

- **Reservoirs –** Monthly samples will be drawn from a sample tap at the booster station and from a sample tap on the discharge outflow line from the upper reservoir. These samples will be analyzed for coliform and Heterotrophic Plate Counts. Quarterly manganese samples will be drawn from three discrete depths in the reservoir. One sample will be from near the bottom, one sample from the middle and one from near the water surface.

- **Repeat Sample Locations –** North and west repeat sites (two total) will be sampled on odd-numbered months and south and east repeat sites (two total) will be sampled on even-numbered months. These samples will be analyzed for coliform and HPC.

Coliform Positive Sample

All District personnel and their contractors shall, at a minimum follow, these procedures:

- In the event of a coliform-positive test result, the operator is required to take three repeat samples within 24 hours of notification from the laboratory (original sample site, one upstream, and one downstream). On the same day, take samples from all wells with the pumps running and both reservoirs. For the samples from the wells, check the box "Raw Water Source Sample" on the laboratory slip and include the source number. In the "Special Instructions" section of the form, write "Raw Groundwater-E. Coli Count needed."

- If any repeat sample or source sample is positive for coliform, contact the District Manager and the Department of Health's Northwest Regional Office Coliform Program at (253) 395-6775 immediately for instructions.

The District contracts with Water Management Laboratory (WML) for the collection of routine water samples for coliform testing. WML has its own protocol.

The following is the District's protocol for collecting coliform and HPC samples. This protocol has been instituted to reduce the potential of sample contamination.

Protocol and Equipment List

Equipment Needed

- Key to enter sampling stations
- Pump sprayer filled with Bacdown Detergent Disinfectant, mixed one part Bacdown to nine parts water
- Sampling station pump (used to evacuate flushed water out of sample station after WML has drawn sample)
- Sample bottles provided by WML
- Latex surgical gloves
- Cooler

Procedure Preparation for Test Station Prior to Drawing Samples

1) Unlock the sample station door.
2) Remove the rubber plug from the sample port and from the drain port.
3) Open the drain port valve. Using the pump sprayer (filled with Bacdown Detergent Disinfectant), fill the sample station through the drain port. When full, close the drain port and replace the rubber cap.
4) Replace the cap over the test port.
5) Thoroughly spray down the inside and outside of the test station, including the spill pad.
6) Close and lock the test station.

Routine samples are typically drawn on the second Tuesday of each month. Sample station preparation, in advance of the collection of routine samples will be completed 1 to 2 working days before routine samples are drawn (i.e., Friday or Monday). The determination of which day is in part dependent upon the weather forecast and other scheduled or unscheduled work. If poor weather is predicted which may delay the sampling, the station preparation will be conducted on Monday. If District personnel collects the sample the sampling protocol from those sites is as follows.

Procedure for Coliform and HPCs from Test Stations

1) No investigative sampling will be done on windy or rainy days. Repeat samples under the total coliform rule must be collected within 24 hours regardless of the weather conditions.
2) Unlock the sample station and open the door.
3) Remove the rubber plug in the sample port and the rubber cap on the drain port.
4) Spray Bacdown Detergent Disinfectant into the sample port and spray the outside of the sample port. Continue to spray the sample port as needed to keep it wet with Bacdown Detergent Disinfectant for the next 3 to 5 minutes.
5) Open the drain port. Open the sample port by turning the handle counterclockwise until it stops. Water will be flowing from both ports. Let the water run for 5 minutes.
6) If the sample station is frozen, use a propane torch and gently thaw the riser pipe. Do not use the flame on the sample spout.
7) While the sample station is flowing, fill out the required information on the sample bottle and sample form. DO NOT open the sample bottle prior to taking the sample.
8) Slow the flow from the sample port to a small stream (1 gpm). Put on a pair of laboratory gloves. Spray Bacdown Detergent Disinfectant onto the gloves and rinse off.
9) Hold the sample bottle about 3 to 6 inches away from the sample port. Remove the sample bottle lid being careful not to touch the inside of the lid or bottle. **Keep the lid facing down. If you touch the lid or the inside of the bottle, get another bottle.**
10) Put the bottle under the stream of water and fill it to the shoulder of the bottle.

If at any time you are not completely satisfied with the sample, empty the bottle and return the empty bottle to the laboratory. DO NOT REUSE THE BOTTLE. Get a new bottle and repeat the procedure.

11) Replace the lid immediately and secure the sample form around the bottle with a rubber band.
12) Place the sample bottle in the cooler and keep it cool until it is delivered to the laboratory.
13) Shut off the sample port and pump the standing water from the station using the hand pump. Close the drain port and replace the rubber plug and rubber cap.

14) Close the door and lock the station.
15) Samples **MUST** be delivered to the laboratory the same day they are taken.

Procedure for Coliform and HPCs from Locations that Are Not Equipped with Stations

If repeat sites are to have samples drawn, staff will request permission of the home or business owner (all repeat sample sites are exterior taps) that we wish to draw repeat samples from their location. Staff will follow routine coliform monitoring procedures starting with disinfection of the sample tap and local area with Bacdown Detergent Disinfectant and running water for 10 minutes. Then shut off the tap and disinfect the tap and local area again and run the water for an additional 5 minutes before slowing the stream to 1 gpm. Run water for an additional 2 minutes before drawing samples. Remember to keep the sample bottle lid facing down, draw the sample, and immediately cap the bottle. Properly fill out laboratory paperwork when sampling is complete, rubber band it to the bottle, and immediately deliver the samples to the laboratory. Samples **MUST** be delivered on the same business day.

E. Routine Sample Rotation Schedule

Month	Routine Site(s)	Month	Routine Site(s)
January	All 6 sites sampled monthly	July	All 6 sites sampled monthly
February	All 6 sites sampled monthly	August	All 6 sites sampled monthly
March	All 6 sites sampled monthly	September	All 6 sites sampled monthly
April	All 6 sites sampled monthly	October	All 6 sites sampled monthly
May	All 6 sites sampled monthly	November	All 6 sites sampled monthly
June	All 6 sites sampled monthly	December	All 6 sites sampled monthly

F. Level 1 and Level 2 Assessment Contact Information

Name Eric Clarke	**Office Phone** 206-878-7210 **After Hours Phone** 206-396-2246
Address 922 S 219th St Des Moines, WA 98198	**Email** eric.clarke@kcwd54.org

G. *E. coli*-Present Sample Response

Distribution System *E. coli* Response Checklist

Background Information	**Yes**	**No**	**N/A**	**To Do List**
We inform staff members about activities within the distribution system that could affect water quality.	☒	☐	☐	☐
We document all water main breaks, construction & repair activities, and low pressure and outage incidents.	☒	☐	☐	☐
We can easily access and review documentation on water main breaks, construction & repair activities, and low pressure and outage incidents.	☒	☐	☐	☐
Our Cross-Connection Control Program is up-to-date.	☒	☐	☐	☐
We test all cross-connection control devices annually as required, with easy access to the proper documentation.	☒	☐	☐	☐
We routinely inspect all treatment facilities for proper operation.	☒	☐	☐	☐
We identified one or more qualified individuals who are able to conduct a Level 2 assessment of our water system.	☒	☐	☐	☐
We have procedures in place for disinfecting and flushing the water system if it becomes necessary.	☒	☐	☐	☐
We can activate an emergency intertie with an adjacent water system in an emergency.	☒	☐	☐	☐
We have a map of our service area boundaries.	☒	☐	☐	☐
We have consumers who may not have access to bottled or boiled water.	☒	☐	☐	☐
There is a sufficient supply of bottled water immediately available to our customers who are unable to boil their water.	☒	☐	☐	☐
We have identified the contact person at each day care, school, medical facility, food service, and other customers who may have difficulty responding to a Health Advisory.	☒	☐	☐	☐
We have messages prepared and translated into different languages to ensure our consumers will understand them.	☒	☐	☐	☐
We have the capacity to print and distribute the required number of notices in a short time period.	☒	☐	☐	☐
Policy Direction	**Yes**	**No**	**N/A**	**To Do List**
We have discussed the issue of *E. coli*-present sample results with our policy makers.	☒	☐	☐	☐
If we find *E. coli* in a routine distribution sample, the policy makers want to wait until repeat test results are available before issuing advice to water system customers.	☒	☐	☐	☐

(Cont.)

Distribution System *E. coli* Response Checklist

Potential Public Notice Delivery Methods	**Yes**	**No**	**N/A**	**To Do List**
It is feasible to deliver a notice going door-to-door.	☒	☐	☐	☐
We have a list of all of our customers' addresses.	☒	☐	☐	☐
We have a list of customer telephone numbers or access to a Reverse 9-1-1 system.	☒	☐	☐	☐
We have a list of customer email addresses.	☒	☐	☐	☐
We encourage our customers to remain in contact with us using social media.	☐	☒	☐	☐
We have an active website we can quickly update to include important messages.	☒	☐	☐	☐
Our customers drive by a single location where we could post an advisory and expect everyone to see it.	☐	☒	☐	☐
We need a news release to supplement our public notification process.	☒	☐	☐	☐

Distribution System *E. coli* Response Plan

If we have *E. coli* in our distribution system we will immediately:

1. Call DOH.
2. Collect repeat and triggered source samples per Part D. Collect additional investigative samples as necessary.
3. Inspect our water system facilities, including treatment plants for proper operation.
4. Interview staff to determine whether anything unusual was happening in the water system service area, especially since the previous month's sample(s).
5. Review new construction activities, water main breaks, and pressure outages that may have occurred during the previous month.
6. Review Cross-Connection Control Program status.
7. Discuss with DOH whether to issue a Health Advisory based on the findings of steps 3-6.

E. coli-Present Triggered Source Sample Response Checklist – All Sources

Background Information	**Yes**	**No**	**N/A**	**To Do List**
We review our sanitary survey results and respond to any recommendations affecting the microbial quality of our water supply.	☒	☐	☐	☐
We address any significant deficiencies identified during a sanitary survey.	☒	☐	☐	☐
There are contaminant sources within our Wellhead Protection Area that could affect the microbial quality of our source water, and	☐	☒	☐	☐
If yes, we can eliminate them.	☐	☐	☒	☐
We routinely inspect our well site(s).	☒	☐	☐	☐
We have a good raw water sample tap installed at each source.	☒	☐	☐	☐
After we complete work on a source, we disinfect the source, flush, and collect an investigative sample.	☒	☐	☐	☐
Public Notice	**Yes**	**No**	**N/A**	**To Do List**
We discussed the requirement for immediate public notice of an *E. coli*-present source sample result with our water system's governing body (board of directors or commissioners) and received direction from them on our response plan.	☒	☐	☐	☐
We discussed the requirement for immediate public notice of an *E. coli*-present source sample result with our wholesale customers and encouraged them to develop a response plan.	☐	☐	☒	☐
We have prepared templates and a communications plan that will help us quickly distribute our messages.	☒	☐	☐	☐

E. coli-Present Triggered Source Sample Response Checklist – All Sources

Alternate Sources	**Yes**	**No**	**N/A**	**To Do List**
We can stop using this source and still provide reliable water service to our customers.	☒	☐	☐	☐
We have an emergency intertie with a neighboring water system that we can use until corrective action is complete (perhaps for several months).	☒	☐	☐	☐
We can provide bottled water to all or part of the distribution system for an indefinite period.	☒	☐	☐	☐
We can quickly replace our existing source of supply with a more protected new source.	☐	☒	☐	☐
Temporary Treatment	**Yes**	**No**	**N/A**	**To Do List**
This source is continuously chlorinated, and our existing facilities can provide 4-log virus treatment (CT = 6) before the first customer. If yes, at what concentration? 0.5 mg/L	☒	☐	☐	☐
We can quickly introduce chlorine into the water system and take advantage of the existing contact time to provide 4-log virus treatment to a large portion of the distribution system.	☒	☐	☐	☐
We can reduce the production capacity of our pumps or alter the configuration of our storage quantities (operational storage) to increase the amount of time the water stays in the system before the first customer to achieve CT = 6.	☐	☐	☒	☐
We can alter the demand for drinking water (maximum day or peak hour) through conservation messages to increase the time the water is in the system prior to the first customer in order to achieve 4-log virus treatment with chlorine.	☐	☐	☒	☐

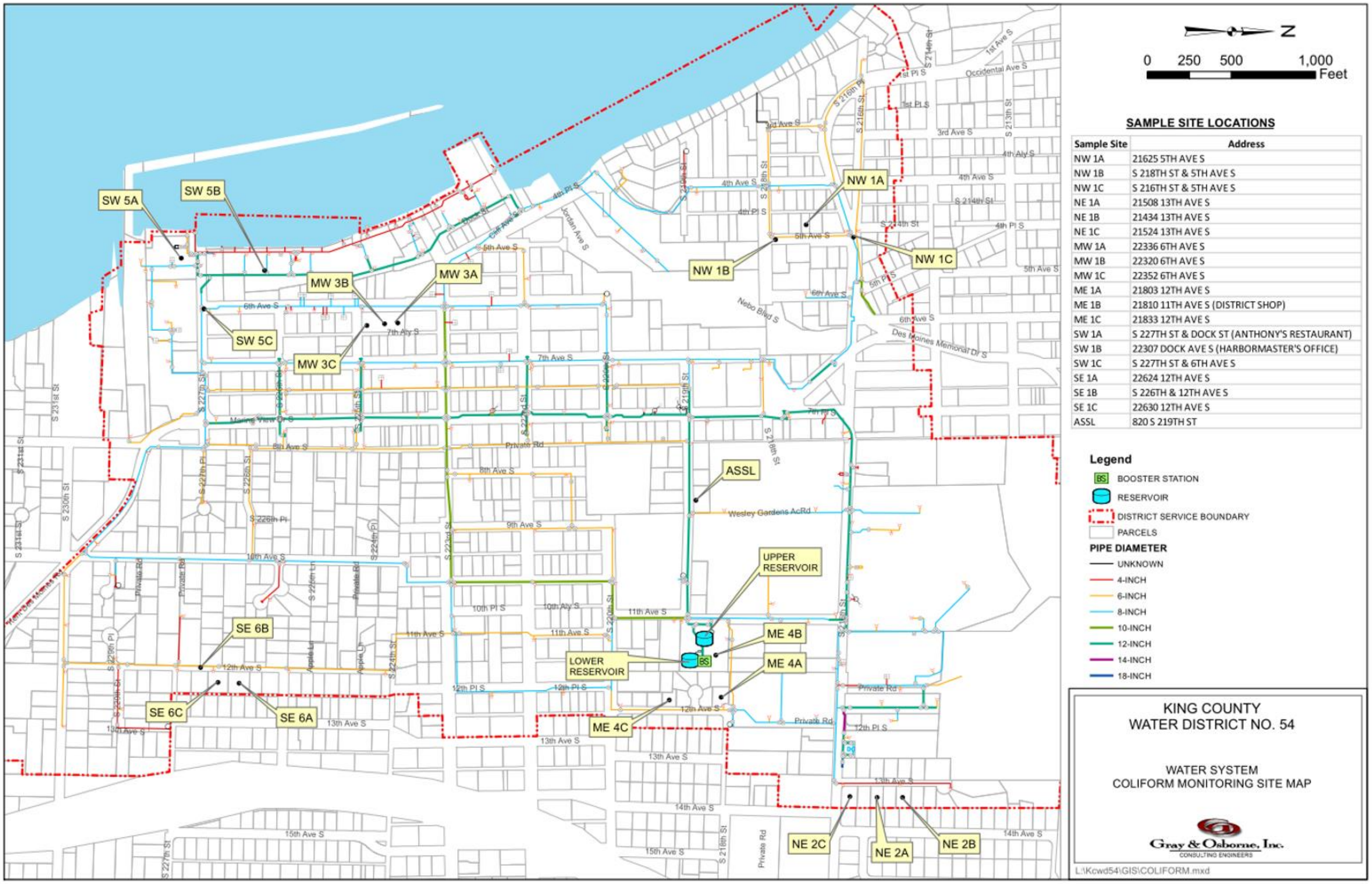
*NOTE: If your system has multiple sources, you may want to complete a separate checklist for each source.

E. coli-Present Triggered Source Sample Response Plan – All Sources

If we have *E. coli* in ANY Source water we will immediately:

1. Call DOH.
2. Distribute required notice. Advise everyone to boil her or his water prior to consumption until further notice.
3. Interview staff.
4. Locate a source of bottled water to supply nonresidential customers with a long-term supply of bottled water for individuals who can’t boil their water.
5. In concert with DOH, begin work on corrective action plan to provide 4-log virus treatment of the source.

H. System Map



SAMPLE SITE LOCATIONS

Sample Site	Address
NW 1A	21625 5TH AVE S
NW 1B	S 218TH ST & 5TH AVE S
NW 1C	S 216TH ST & 5TH AVE S
NE 1A	21508 13TH AVE S
NE 1B	21434 13TH AVE S
NE 1C	21524 13TH AVE S
MW 1A	22336 6TH AVE S
MW 1B	22320 6TH AVE S
MW 1C	22352 6TH AVE S
ME 1A	21803 12TH AVE S
ME 1B	21810 11TH AVE S (DISTRICT SHOP)
ME 1C	21833 12TH AVE S
SW 1A	S 227TH ST & DOCK ST (ANTHONY'S RESTAURANT)
SW 1B	22307 DOCK AVE S (HARBORMASTER'S OFFICE)
SW 1C	S 227TH ST & 6TH AVE S
SE 1A	22624 12TH AVE S
SE 1B	S 226TH & 12TH AVE S
SE 1C	22630 12TH AVE S
ASSL	820 S 219TH ST

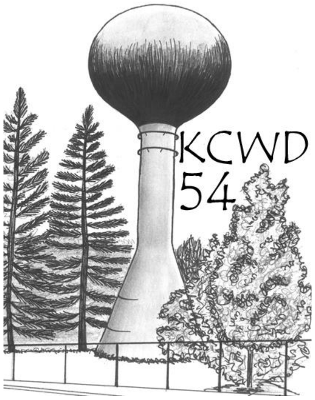
APPENDIX I

DESIGN AND CONSTRUCTION STANDARDS

ATTACHMENT A

KING COUNTY WATER DISTRICT NO. 54

KING COUNTY **WASHINGTON**



WATER SYSTEM DESIGN AND CONSTRUCTION STANDARDS

G&O #18422
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Gray & Osborne, Inc.
CONSULTING ENGINEERS

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MISCELLANEOUS FORMS

STANDARD DETAILS

GENERAL

The standards established by this chapter are intended to represent the minimum standards for the design and construction of water system facilities. Greater or lesser requirements may be mandated by Water District 54 (District) due to localized conditions. Extensions, connections or modifications to the existing system shall be in compliance with the State Department of Health, District and City of Des Moines standards.

For developer extension improvements shall be completed as determined by the District Engineer to mitigate impacts caused by the development.

DEVELOPER AND CONTRACTOR AGREEMENT REQUIREMENTS

All land and building developers, their contractors and others, whether persons or entities, constructing water systems, or additions thereto, to be connected to existing waterlines of the District, shall, as a prerequisite to securing approval for the construction of such system, apply for a Developer Extension Agreement. Contractors working on a District sponsored or let project shall have an executed a construction contract with the District.

DEFINITIONS

City – City of Des Moines, Washington

Contractor – If the project is sponsored or let by the District, the District will prepare plans and specifications as a part of a construction contract for that projects.

District – The King County Water District No. 54, or its designated representative.

Developer – The project's sponsor or designee employed by or contracted by the land owner to act as the Developer.

Developer Extension Agreement – An agreement between the District and the Developer.
Engineer – The Engineer under contract to the District.

Work – All work associated with the water main extension.

DESIGN STANDARDS

The design of water system improvements shall depend on their type and local site conditions. The design elements of water system improvements shall conform to District Standards as set forth herein.

For Developer sponsored extensions detailed engineering plans shall be submitted to the District for review. Such Plans shall provide the locations, size, and type of the proposed water system and points of connection. (See Drawing Standards). District Standard Details shall be used, unless an alternate detail is approved by the District. All Plans submitted to the District for review shall be completed by an engineer licensed in the State of Washington.

Computations and other data used for design of the water system shall be submitted to the District for approval.

The plans and specifications of the proposed project may also be subject to the approval of the State of Washington Department of Health, the King County Fire Marshal, City of Des Moines (pursuant to the City Road Standards), King County Surface Water Design Manual, and the City of Des Moines code as may be applicable.

Material and installation specifications shall contain appropriate requirements that have been established by the industry in its technical publications, such as ASTM, AWWA, WPCF, and APWA standards. Material and construction standards are set forth in this document.

Unless otherwise approved or required by the District the water main and fittings shall be cement lined ductile iron, pipe class as shown below. The minimum nominal size for water mains shall be 8 inches, unless otherwise approved/required by District Engineer. All pipe installations, including service lines, shall be in accordance with District standards.

Water Main Thickness

Class	Pipe Diameter
Class 52	4" through 14"
16" and larger	Class 50

EXCEPTIONS:

- 6-inch hydrant spools and pipelines located beneath rock or retaining walls shall be Class 53.
- Short runs of smaller diameter pipe may be allowed on dead end runs, for example on cul-de-sacs, provided that there are no fire hydrants and hydraulic modeling shows that water pressure will be meet all requirements during peak hour demand.

Water mains shall be laid only in rights-of-ways (existing or future), or easements which shall be shown on the Plans. A street is normally not considered dedicated until the plat which created it has been officially filed with the County Auditor. If District facilities are to be in easements the easements shall be recorded by King County prior to the District accepting the project.

The minimum separation for sanitary sewer and storm sewer lines parallel to the District water mains is 10 feet. In addition, the water main shall be 18 inches above the sewer and storm main. The minimum separation for all perpendicular crossings is 18 inches, with the sewer and storm mains passing under the water main. Under special circumstances the separation may be reduced with approval from the District. Special construction may be required such as placement of CDF between the utilities.

All water main distribution pipeline construction shall have a minimum 36-inch cover. Mains shall generally be located 10 feet north or east of street centerline. Water mains shall be extended to the far property line(s) of the property being served. Off-site extensions may be required to hydraulically loop existing and new systems. Oversizing of water mains may be required to be installed per District's current Water System Comprehensive Plan.

Easements shall be a minimum of 15 feet in width. The water main shall be a minimum of 5 feet from the edge of the easement.

One water sample station is required for developments consisting of one to ten lots. One additional station is required to be furnished and installed for each additional 50 lots or portions thereof.

Fire hydrants are generally required approximately every 500 feet in residential areas, and every 300 feet in commercial areas. However, fire hydrants shall be furnished and installed at all locations as specifically mandated by the local fire marshal and/or per Appendix C of the International Fire Code.

Fire hydrants on dead end streets and roads shall be located within approximately 250 feet from the frontage center of the farthest lot, or less if the Fire Code or Fire Marshal requires it. Distances required herein shall be measured linearly along the street, road or easement as applicable.

Pipes connecting hydrants to mains shall be at least 6 inch in diameter and be less than 50 feet in length.

Valves shall be installed on each leg of all tees and crosses except fire hydrant tees. Inline valves shall be on the water main at intervals of 500 feet or less in commercial or multi-family areas and 1,000 feet or less in single-family areas (or as otherwise approved by the District).

Dead end lines are not permitted except when in the District's opinion it would be impractical to extend the line at a future date. Water mains on proposed cul-de-sacs or dead-end roads shall extend to the plat line beyond the end of the road to neighboring property for a convenient future connection. Extension to an existing water main to create a hydraulic loop is generally required. Dead end water mains, if allowed, shall be terminated with line size tees with 6-inch side outlets, thrust blocks, and a blowoff assembly or fire hydrant from a 6-inch outlet. Blowoff assemblies shall be 2 inch for 8-inch diameter water mains and 4 inch for water mains larger than 8-inch diameter.

Bends shall be included in the design as needed to maintain proper depth and spacing from other utilities. Bends shall be utilized so as not to exceed allowable deflection at pipe joints in accordance with pipe manufacturer's recommendations.

Thrust blocking and/or restrained joints with appropriate restrained length of pipe shall be required at all fittings and bends in accordance with the District standards and conditions.

Water meters and water meter boxes shall be within the right-of-way or easement abutting, and parallel to the right-of-way. Service pressure reducing valves are required if the static water pressure exceeds 80 psi. The service pressure reducing valves shall be located on the private property side of the water meter.

All commercial, multi-family, industrial and irrigation services shall include a DOH approved backflow prevention device located immediately behind and on the property side of the water service box.

Special construction, such as restrained joint pipe or high density polyethylene pipe may be required in site sensitive areas identified by Developer or District.

DRAWING STANDARDS

The drawings shall be referenced to NAVD 1988 and NAD 83/91 and shall include at a minimum three existing utility features such as sanitary or storm sewer manholes or catch basins, water valves or fire hydrants or County/State monuments.

a. Cover sheet showing entire property and location of improvements.

b. Existing and proposed location of streets, curb, gutter and sidewalk, rights-of-way, easements, property lines, utilities and improvements

c. Legal Description of the property to be served.

d. Stationing or pipe lengths for all improvements to be constructed.

e. Existing and proposed grades of streets, easements and areas of improvements.

f. Match lines and title blocks for each sheet.

g. North arrow and engineering scale on each sheet.

h. Horizontal scale of 1"=20' (or as otherwise approved by District).

i. Construction drawings shall be signed and dated by a Professional Engineer registered in the State of Washington.

j. Standard notes for water system construction shall be included with construction drawings.

k. Approval block for District signature shall be included on each sheet of the water utility construction drawings.

APPROVED FOR CONSTRUCTION
WATER DISTRICT NO. 54

By: ________________________ Date:____________________

Title: ___________________

l. The District's Standard Details for water system construction shall be included in with construction drawings as appropriate.

m. All Plans shall be in ink on a reproducible bond paper 22" x 34", one-half size 11" x 17". Additionally, the Plans shall be submitted electronically in PDF file format. All existing and proposed utility improvements shall be shown. All new or proposed water improvements shall be depicted by a heavy solid line. All existing water improvements shall be depicted by a thin or dashed line. All Plans shall be plan view and profile drawings to show relationship to other underground utilities and where the water line shall cross railroad tracks, streets, rivers and drainage ditches and any other places where it would clarify construction. When more than one sheet is required to cover all of the construction area, an overall drawing will be required. Plan drawings shall be prepared in a manner consistent with industry standards based on the scales and details set forth herein, provided that the District may require additional details and different scales in its sole discretion.

n. All information including, but not limited to, lot lines, buildings, rights-of-way, other utilities, contours, etc., shall be shown. All valves, fire hydrants, fittings, bends and other appurtenances shall be called out and fully located by stationing along centerline of street, or base line of easements, etc.

o. Drawing symbols and line types shall conform to the APWA WSDOT CAD Standards.

CONSTRUCTION REQUIREMENTS

Except as otherwise noted herein, all work shall be accomplished as recommended in applicable American Water Works District (AWWA) Standards, and according to the recommendations of the manufacturer of the material or equipment concerned.

A Preconstruction Conference is required prior to beginning staking or construction. The conference must precede the beginning of construction and include the District, the Developer, contractor, design engineer, utilities, and the agency issuing the permits. Plan approvals and permits must be in hand prior to the conference. The Preconstruction Conference shall be scheduled by the Developer.

Work shall be performed only by contractors experienced in laying public water mains.

The District may cause the Plans to be modified by the Developer before or during the course of construction in the event of changes in circumstances, land use, zoning, unforeseen conditions, or for any other reasonable cause to ensure proper facility construction in accordance with the District’s policies and standards or other regulatory directives from Federal, State, or Local agencies. Developer shall have no recourse against District in such event for recovery of increased construction or related costs resulting from modifications to the Plans.

Prior to final inspection, all water mains shall be tested and disinfected. Testing and disinfection shall occur after installation of service lines.

SURVEY STAKING

All surveying and staking shall be performed by an engineering or surveying firm employed by the Developer and capable of performing such work. The engineer or surveyor directing and/or performing such work shall be currently licensed by the State of Washington to perform said tasks.

The Developer shall be responsible for all construction. All staking shall be inspected by the District prior to construction.

The minimum staking of water systems shall be as follows:

A. Stake alignment every 100 feet. Staking shall be sufficient to satisfy District Water Superintendent.

B. Stake locations of all proposed fire hydrant, blowoff, air-vacuum release valves, valves, meters, etc.

The Developer shall provide a minimum of 24 hours advance notice in writing to the District requesting that the construction staking be inspected. Working operations may be suspended by the District, without liability to District, for such brief and reasonable time, as may be required, for the giving of lines and grades, and the taking of measurements.

The Developer shall not proceed with construction until such time as the construction staking has been completed and inspected by District.

Any restaking, for whatever reason, as well as additional staking which the District may desire, will be performed promptly by Developer. The District may, but is not required, to evaluate the effectiveness of survey controls and require it to be strengthened at Developer’s expense if it is found to be in adequate in District’s sole judgment. All control staking shall remain in place throughout the duration of the project. Any control staking that is moved or disturbed shall be reinstalled prior to completion of the work.

In the event of questions or discrepancies in survey control points, the Developer’s engineer shall evaluate the control points and require substantiation when it determines necessary. If District consents, District’s engineer may perform the staking at Developer’s request and cost. The District’s engineer may review all survey and staking work performed by Developer’s surveyor.

All stakes, benchmarks, and reference points shall be carefully preserved by the Developer. In the case of their destruction by the Developer or Developer’s Contractor or any of his employees, such stakes and marks will be replaced at the Developer’s expense.

Prior to acceptance of the work, District may, at Developer’s expense, use a locating device to inspect the alignments and locations of all pipe and other facilities installed by Developer. Upon written request from Developer, the District may, in writing, relieve Developer from performing such portions of the foregoing requirements relating to staking which District deems burdensome and unnecessary.

ACCESS

The District at all times shall have access to the Work and to the locations where the Work is in preparation. The Developer at all times shall maintain proper facilities for such access. Where applicable, the Developer shall also provide proper facilities for access to all Work sites for inspections by representatives of Federal, State, and local regulatory agencies.

UTILITY TRENCH EXCAVATION

Clearing and grubbing where required shall be performed within the easement or public right-of-way as permitted by the District and/or governing agencies. Debris resulting from the clearing and grubbing shall be disposed of by the Developer in accordance with the terms of all applicable permits.

Trenches shall be excavated to the line and depth designated by the District to provide a minimum of 36 inches of cover over a water pipe. Except for unusual circumstances where approved by the District, the trench sides shall be excavated vertically and the trench width shall be excavated only to such widths as are necessary for adequate working space and in compliance with all safety requirements of the prevailing agencies. The trench shall be kept free from water until joining is complete. Surface water shall be diverted so as not to enter the trench. The Developer shall maintain sufficient pumping equipment on the job to ensure that these provisions are carried out.

The Developer shall perform all excavation of every description and whatever substance encountered and boulders, rocks, roots and other obstructions shall be entirely removed or cut out to the width of the trench and to a depth 6 inches below storm line grade. Where materials are removed from below the pipeline grade, the trench shall be backfilled to grade with material satisfactory to the District and thoroughly compacted.

Trenching and shoring operations shall not proceed more than 100 feet in advance of pipe laying without specific written approval of the District, and shall be in conformance with Washington Industrial Safety and Health Administration (WISHA) and Office of Safety and Health Administration (OSHA) Safety Standard.

BACKFILLING

The bedding course shall be completed in such a manner that the pipe will have bearing along the entire length of the barrel. The bell holes shall be excavated with hand tools to sufficient size to facilitate the construction of pipe joints.

Backfilling and surface restoration shall closely follow installation of pipe so that not more than 100 feet is left exposed during construction hours without approval of the District and the permitting Agency. Selected material shall be placed and compacted around and under the utility pipe by hand tools. Special precautions should be provided to protect the pipe to a point 12 inches above the crown of the pipe. Backfill shall be compacted to 95 percent of the maximum density. The Developer shall have the backfill material tested for gradation and compaction by a certified soil laboratory in accordance with District and City requirements.

At a minimum the upper 6 inches of the trenches within rights-of-way shall be completed with Crushed Surfacing Base Course (1-1/4 inch minus) below the asphalt. The backfill and compaction shall be done to the satisfaction of the agency having jurisdiction. The

City of Des Moines trench and subgrade backfill, and compaction requirements shall apply.

At a minimum, trench sections longitudinal to the roadway shall be completed with Bank Run Gravel for Trench Backfill or suitable excavated material as determined by the District. Trench sections crossing existing roadways shall be backfilled and compacted with 100 percent Crushed Surfacing Base Course. The District may require CDF backfill for utility trenches crossing under roads based upon localized conditions and traffic loading. All excess material shall be loaded and hauled to waste.

Road restoration shall be per requirements of the governing agency. Developer shall become familiar with all City, County, State and District conditions of required permits, and shall adhere to all conditions and requirements.

INSPECTION

The District shall exercise full right of inspection of all excavating, construction, and pipe laying, backfilling, etc. The District shall be notified two working days prior to commencing any work in the right-of-way or public easements. The District is authorized to and may issue immediate Stop Work Orders in the event of noncompliance with this chapter and/or any of the terms and provisions of the permit or permits issued here under.

Timely notification by the Developer or Contractor is essential for the District to verify through inspection that the work meets the standard. Failure to notify in a timely manner may oblige the District to arrange appropriate sampling and testing after-the-fact, with certification, by a professional engineer. Costs of such testing and certification shall be borne by the developer. At the time that such action is directed by the District Water Superintendent, he may prohibit or limit further work on the development until all directed tests have been completed and corrections made to the satisfaction of the Engineer.

Inspection and test of work and materials shall be in accordance with District and other regulatory requirements and standards, and shall be strictly for the benefit of the District. No approvals, comments or suggestions issued by the District shall be construed to relieve the Developer of any obligations under the Contract. All construction shall be subject to full time inspection at the sole discretion of the District and other regulatory agencies at the sole cost of Developer.

The following scheduled inspections and tests shall be conducted by the District or designee:

- Start of construction inspection.
- Scheduled inspections during the course of the work.
- Bacteriological Testing (Note: The District’s representative shall collect bacteriological samples after the extension has passed all pressure tests.)
- Final inspection.
- End of Warranty Period inspection (to be conducted at least two weeks prior to expiration of Warranty Period).

Inspection of all water works and associated trenching and backfill will be done by the District. Unless otherwise instructed by the District, construction events which require monitoring or inspection, are identified as follows:

- Clearing and Temporary Erosion/Sedimentation Control. One working days’ notice prior to initial site work.
- Utility Installation. One working days’ notice prior to trenching, water utility installation and backfill.
- Crushed Surfacing Placement. One working days’ notice to check placement and compaction of crushed surfacing base course and top course.
- Paving. Three working days’ notice in advance of paving with asphalt or Portland cement concrete.

The Developer shall give the District timely notice when the state of the Work is such that a scheduled inspection and test can be conducted. When the inspection and test is to be conducted by authorities other than the District, the Developer shall coordinate all inspection arrangements through the District.

The Developer shall furnish such samples, testing, and labor as may be required for the District to make a thorough inspection and examination of materials to be used in the Work. Failure on the part of the District to condemn or reject inferior material or work shall not be construed to be acceptance of the materials or the work.

The District shall have the right to reject materials and workmanship which are defective, or to require their correction. Rejected workmanship shall be promptly corrected, and rejected materials shall be removed from the premises.

Should it be necessary for the District, prior to final acceptance of the work, to make an inspection or reinspection of Work already completed by removing or tearing out any portion thereof, the Developer shall on request, promptly furnish all necessary facilities, labor and materials to do so.

The Developer is responsible for all costs of inspection and testing for District to determine that the installation of the Extension is performed in accordance with all District standards and requirements.

Other scheduled inspections and tests may be required to comply with District standards, laws, or ordinances. Some inspections and tests may be conducted by a person or firm designated by the District who has special expertise in the kind of work to be inspected.

Prior to final approval of construction, a visual inspection of the job site will be made by the District. Restoration of the area shall be complete with all improvements being restored to their original or superior condition.

WATER MAIN INSTALLATION

Pipe and fittings shall be loaded and unloaded using hoists and slings in a manner to avoid shock or damage, and under no circumstances shall they be dropped, skidded, or rolled against other pipe. Damaged pipe shall be rejected, and the Developer shall immediately place damaged pipe apart from the undamaged and shall remove the damaged pipe from the site within 24 hours. All water pipe shall be delivered to the site with both ends capped. The caps shall remain securely on the pipe until it is installed, except as noted below.

Pipe shall be stacked in such a manner as to prevent damage to the pipe, to prevent dirt and debris from entering the pipe, and to prevent any movement of the pipe. The bottom tiers of the stack shall be kept off the ground on timbers, rails, or other similar supports.

The pipe and fittings shall be inspected for defects before installation. All lumps, blisters and excess coal tar coating shall be removed from the bell and spigot end of each pipe, and the outside of the spigot and the inside of the bell shall be wire-brushed and wiped clean and dry, and free from oil and grease before the pipe is laid.

Every precaution shall be taken to prevent foreign material from entering the pipe while it is being offloaded, stored and installed in place. After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with select backfill tamped under it. Precaution shall be taken to prevent dirt from entering the joint space. At times when pipe laying is not in progress, the open end(s) of pipe shall be closed by a watertight plug. If water is in the trench when work resumes, the seal shall remain in place until the trench is pumped completely dry. No pipe shall be laid in water or when trench conditions are unsuitable.

Cut in connections shall not be made on Fridays, weekends, holidays, or the day before holidays. All tapping sleeves and tapping valves shall be pressure tested prior to making connection to existing mains.

The cutting of pipe for inserting fittings or closure pieces shall be done in a neat and workmanlike manner, without damage to the pipe or cement lining, and so as to leave a smooth end at right angles to the axis of the pipe. When pipe lengths are cut, the outer edge shall be beveled to prevent damage to the gasket during jointing of pipes.

Pipe shall be laid with bell ends facing in the direction of the laying, unless directed otherwise by the District. Wherever it is necessary to deflect pipe from a straight line, the amount of deflection allowed shall not exceed pipe manufacturer's recommendations.

For connection of mechanical joints, the socket, plain end of each pipe and gasket shall be cleaned of dirt before jointing, and shall be jointed according to manufacturer's directions. Bolts shall be tightened alternately at top, bottom and sides, so pressure on gasket is even.

For connection of push-on joints, the jointing shall be done according to manufacturer's recommendations, with special care used in cleaning gasket seat to prevent any dirt or sand from getting between the gasket and pipe. Lubricant to be used on the gasket shall be non-toxic and free from contamination. When a pipe length is cut, the outer edge of the cut shall be beveled with a file to prevent injury to the gasket during jointing.

Valves, fittings, plugs and caps shall be set and jointed to pipe in the manner per manufacturers recommendations. All dead ends on new mains shall be closed with dead end M.J. caps.

Fittings shall be "blocked" with poured-in-place concrete, with a firm minimum bearing against an undisturbed earth wall. Timber blocking will not be permitted. Thrust blocks shall be poured as soon as possible after setting the fittings in place to allow the concrete to "set" before applying the pressure test. The concrete thrust blocks shall be in place before beginning the pressure test. Anchor blocks shall be allowed to set sufficiently to develop the necessary bond strength between the reinforcing rods and the concrete anchor before beginning the pressure test.

The Developer shall notify the District and obtain approval from the District prior to any water shut-off or turn-on, affecting the water system, a minimum of 48 hours in advance.

WATER PIPE TESTING AND DISINFECTING

All pipelines shall be tested and disinfected prior to acceptance of work. A water hydrant meter shall be required and procured from the District for all water utilized for flushing pipelines. All pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose and piping, and measuring equipment necessary for performing the test shall be furnished, installed and operated by the Developer. Feed for the pump shall be from a graduated container, so that the actual amount of "makeup" water can be measured periodically during the test period.

The pipeline shall be backfilled sufficiently to prevent movement of the pipe under pressure. All thrust blocks shall be in place and time allowed for the concrete to cure before testing. Where permanent blocking is not required, the Developer shall furnish and install temporary blocking.

Either calcium hypochlorite granules shall be added to each section of new water main, or liquid chlorine solution may be added when filing the pipe, to achieve a free chlorine concentration of 50 mg/L or more. If calcium granules are used, granules shall be added to each pipe spool as it is installed. The chlorine granules shall be added in the proportions indicated in the table below (see Standard Specifications, Section 7-09.3(24)D).

Calcium Hypochlorite (65 Percent Chlorine) Addition Per 100 Feet of Pipe

Pipe Diam. (Inches)	**Quantity**	
	Grams	**Ounces**
4	0.67	0.02
6	1.52	0.05
8	2.70	0.09
10	4.22	0.15
12	6.07	0.21

All closure fittings shall be swabbed with a 5 percent chlorine solution of chlorine immediately prior to installation per AWWA Standard C651.

All of the new piping, valves and blocking shall have been installed, disinfected and tested up to the point of cutting into existing lines before the crossover is made. The crossover to the existing system shall be in full readiness, including the cut and sized specials. Forty-eight-hour notice shall be given the District in advance of the planned “cut-ins.”

As soon as pipe is secured against movement under pressure, it may be filled with water. New water mains are only filled using an approved backflow prevention assembly. If chlorine granules are used the water main is filled from the lower elevation end, so that as the water main is filled the chlorine is contacted and dissolved and the chlorine is spread relatively uniformly through the length of the new water main.

The chlorinated water shall remain in contact with the new system for a minimum of 24-hours. After 24-hours, water may be added to the water main for the purposes of pressure testing. Pressure testing must also include testing against valves.

After the pipe is filled and all air expelled, it shall be pumped to a test pressure of 150 psi in excess of the working pressure, and not less than 225 psi, and this pressure shall be maintained for a period of not less than 30 minutes to ensure the integrity of the thrust and anchor blocks. **The Developer is cautioned regarding pressure limitations on**

butterfly valves. All tests shall be made with the hydrant auxiliary gate valves open and pressure against the hydrant valve. Hydrostatic tests shall be performed on every complete section of water main between two valves, and each valve shall withstand the same test pressure as the pipe with no pressure active in the section of pipe beyond the closed valve.

In addition to the hydrostatic pressure test, a leakage test shall be conducted on the pipeline. The leakage test shall be conducted at 150 psi for a period of not less than 60 minutes. The quantity of water lost from the main shall not exceed the number of gallons per hour determined by the formula:

$$L = \frac{SD(P)^{0.5}}{266{,}600}$$

in which

L = Allowable leakage, gallons/hour
N = Length of pipeline tested
D = Nominal diameter of the pipe in inches
P = Average test pressure during the leakage test, psi

The water main shall be pumped to the requisite pressure and allowing the water main to sit for 15 minutes. After 15 minutes have passed the amount of makeup water to pump the system back to the requisite is measured.

Defective materials or workmanship, discovered as a result of the tests, shall be replaced by the Developer at the Developer's expense. Whenever it is necessary to replace defective material or correct the workmanship, the tests shall be rerun at the Developer's expense until a satisfactory test is obtained.

If the pressure test fails and retesting of the water main is required, the Developer shall flush the water main with a water chlorine bleach solution (1 gallon of 5 percent bleach to 1,000 gallons of water). The volume of new water pumped into and through the water main shall be a minimum of three times the pipe volume.

After successful pressure testing, and additional chlorine contact if necessary, the water main shall be thoroughly flushed to remove all super chlorinated water from the new water main. A minimum of five pipe volumes shall be a minimum of flushed out of the water main. After flushing, samples are collected for bacteriological analysis.

In all disinfection processes, the Developer shall take particular care in flushing and wasting the chlorinated water from the mains to assure that the flushed and chlorinated water does no physical or environmental damage to property, streams, storm sewers or any waterways. Complete removal of chlorine from the water used for testing and flushing is required.

District employees only will be allowed to operate existing and new tie-in valves. The Developer's forces are expressly forbidden to operate any valve on any section of line, which has been accepted by the District.

All of the new piping, valves and blocking shall have been installed, disinfected and tested up to the point of cutting into existing lines before the crossover is made. The crossover to the existing system shall be in full readiness, including the cut and sized specials. Forty-eight-hour notice shall be given the District in advance of the planned "cut-ins."

BACKFLOW PREVENTION AND SPRINKLER SYSTEMS

All water systems connected to the public water system shall have backflow prevention as required by WAC 248-54-285.

All fire sprinkler systems as mandated/proposed/or required by the local fire marshal and/or District Ordinance that have a fire department connection shall have backflow prevention as required by WAC 248-54-285.

Building sprinkler systems may be required based on Building Codes/Fire Marshall requirements.

CONNECTION TO SYSTEM

Physical connection of the Extension to the District's water system shall not be made until:

a. Satisfactory water quality and pressure tests of the Extension have been made.

b. The Developer has applied in writing to the District for permission to make the connection not less than 4 working days prior to the time requested.

c. All work to date conforms to the terms of this Agreement.

d. The Developer has received written approval from the District.

e. The connection must be made in the presence of the District. Notwithstanding the foregoing, District may shut the valve at the connection point of the Extension and withhold the flow of water to the property until final acceptance of the Extension is granted by District.

f. No connection shall be made on Fridays.

WATER QUALITY

It shall be the Developer’s responsibility to maintain acceptable water quality standards within the Extension throughout the term of the Agreement. This may be done in one of two ways:

a. An adequate number of connections to the Extension are in service to ensure water system turnover; or

b. A mutually agreed upon flushing program is in place to ensure water system turnover in which case the following shall apply:

    (1) All flushing water must be metered.

    (2) All flushed water must be disposed of using accepted best management practices.

    (3) Flushing shall be done by Developer’s staff with prior notification to the District.

SERVICE CONNECTIONS

Water meter services and meter boxes shall be within road right-of-way or easements. A water meters and water meter boxes shall be set to final grade and all adjustments shall be made prior to final pressure testing of the system. Service inlet shall be centered at inlet end of box and faced toward outlet end of box parallel with long sides.

All meters shall be installed by the District, and the Developer shall pay the current meter installation charge.

All new buildings and residences with a static water pressure of greater than 80 psi, shall include in their water service a suitable pressure reducing valve to protect the plumbing from excessive pressures. The service PRV shall be located downstream of the meter and shall be privately owned.

Individual services to each property shall be installed and connected to the new water mains. New services from existing mains will be installed by the District. The Developer shall be responsible for permitting, traffic control, excavation to expose main, shoring to protect District employees, backfilling trench, and completion of all restoration.

Upon completion of the installation of the water main (before testing and disinfection) services shall be installed by connecting to the water main and extending the service line to the property line as shown on the Standard Details or approved equal. Larger service lines shall be of the type and style as designated in the approved Plans.

All single family residential shall be provided with a meter setter including a check valve. All services other than single family residential shall be provided with Washington State-approved backflow prevention located immediately behind and on the property side of the water service box. Irrigation, residential single-family fire meters, duplex, and multi-family residential connections shall require double check valve assemblies (DCVA). All other connections shall require reduced pressure backflow assemblies (RPBA). Commercial fire sprinkler system, if unmetered shall require reduced pressure detector assemblies (RPDA).

All irrigation using chemical feed, or water features, including decorative ponds, pools and fountains requiring make-up water shall be protected from backflow into the public water supply by a **minimum** of an approved air-gap to be located at the fill point of the pond or water feature. This “air-gap” shall be inspected by the District prior to filling. In all instances, the water supply used for filling purposes shall be protected by a double check valve assembly (DCVA) installed behind the meter for new construction or retrofitted as close as practical on modified systems.

Service lines between the main and the property line shall be placed at a trench depth sufficient to maintain a 3'-0" cover over the top of the service line for its full length, taking into consideration the final finished grade of the proposed street and the final finished grade of any storm ditches.

Upon completion of each service line as indicated herein, the Developer shall flush the service line to remove the debris that may interfere with the future meter installation, and further verify that the service line has full pressure and flow to the meter box.

RECORD DRAWINGS

The Developer who installs systems which will be deeded to the District, shall submit record drawings to the District within 14 calendar days after completion of the work. Record drawings shall on 22" x 34" bond paper and shall be stamped, signed and dated by an engineer currently licensed in the State of Washington. A Washington State Department of Health Construction Completion Report shall be completed by an engineer currently licensed in the State of Washington. Drawings shall show locations of all facilities and appurtenances to within 0.5 feet of actual location.

In the event that the Developer or his/her representatives does not have qualified personnel to furnish the record drawings required by this section, he shall advise the District in order that necessary field measurement may be taken during construction for the preparation of record drawings. All costs of such field inspection and measurement, to include the preparation of the record drawings, shall be at the sole expense of the Developer.

ACCEPTANCE OF IMPROVEMENTS

The District shall not accept developer constructed improvements incrementally. All aspects of the water system improvements must be complete, clean, inspected, and as-built drawings submitted in AutoCAD, PDF and hard copy form, prior to District acceptance of improvements, release of performance sureties and operation of the new system. Prior to acceptance, all improvements shall be in good working order and shall have passed all testing requirements. All dedications, easements, or other legal documentation shall be complete and recorded prior to final acceptance of the project improvements.

FINISHING AND CLEANUP

Before acceptance of the water system construction all other work on the project that may impact the water system, such as backfilling, paving and utility trenching must be completed.

Where all or portions of the utility is in undeveloped areas, the entire area which has been disturbed by the construction shall be shaped so that upon completion the area will present a uniform appearance, blending into the contour of the adjacent properties. All other requirements outlined previously shall be met.

Castings for valves, vaults and other water installations, which have been covered with the asphalt material, shall be cleaned to the satisfaction of the District.

MATERIALS

SUBMITTALS

The Developer shall obtain approval of materials to be used from the District prior to commencement of construction work. The Developer shall submit cut sheets and other information as appropriate for the proposed materials, for approval by the District prior to installation.

WATER MAINS AND FITTINGS

All materials shall be new and undamaged. Water mains to be installed unless otherwise approved (or required) in writing by the District Engineer shall be cement lined ductile iron pipe for all sizes.

All pipe shall be delivered to the site with pipe plugs securely in place in the pipe. The plugs shall remain in place until the pipe is in the trench and is ready to be installed. Only the plugs at the end of the pipes being jointed shall be removed. The plug at the far end of the pipe shall remain in place until the next joint is made.

The ductile iron pipe shall conform to ANSI/AWWA C151/A21.51-91 Standards, and current amendments thereto, except the ductile iron pipe shall be thickness Class 52 for 4-inch through 14-inch-diameter pipe (except for 6-inch hydrant spools which shall be Cl. 53) and Class 50 for 16 inch and larger. Grade of iron shall be a minimum of 60-42-10. The pipe shall be cement lined to a minimum thickness of 1/16 inch, and the exterior shall be coated with an asphaltic coating. Each length shall be plainly marked with the manufacturer's identification, year case, thickness, class of pipe and weight.

Type of joint shall be mechanical joint or push-on type, employing a single gasket, such as "Tyton," except where otherwise calling for flanged ends. Bolts furnished for mechanical joint pipe and fittings shall be high strength ductile iron, with a minimum tensile strength of 50,000 psi.

Restrained joint pipe, where shown on the Plans shall be push-on joint pipe with "Fast Tight" gaskets as furnished by U.S. Pipe or equal for 12-inch diameter and smaller pipe and "TR FLEX" as furnished by U.S. Pipe or equal for 16-inch and 24-inch diameter pipes. The restrained joint pipe shall meet all other requirements of the non-restrained pipe.

All pipe shall be jointed by the manufacturer's standard coupling, be all of one manufacturer, be carefully installed in complete compliance with the manufacturer's recommendations.

Joints shall be "made up" in accordance with the manufacturer's recommendations. Standard joint materials, including rubber ring gaskets, shall be furnished with the pipe. Material shall be suitable for the specified pipe size and pressures.

All fittings shall be short-bodied, ductile iron complying with applicable ANSI/AWWA C110 or C153 Standards for 350 psi pressure rating for mechanical joint fittings and 250 psi pressure rating for flanged fittings. All fittings shall be cement lined and either mechanical joint or flanged, as indicated on the Plans.

Fittings in areas shown on the Plans for restrained joints shall be mechanical joint fittings with a mechanical joint restraint device. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1 and shall be EBAA Iron, Inc., MEGALUG, Star Pipe Products, or approved equal.

All couplings shall be ductile iron mechanical joint sleeves.

VALVES

All valves 14 inch and larger shall generally be furnished and installed as butterfly valves. All valves 12 inch and smaller shall generally be furnished and installed as resilient seat gate valves.

The valves shall be set with stems vertical. The axis of the valve box shall be common with the axis projected off the valve stem. The tops of the adjustable valve boxes shall be set to the existing or established grade, whichever is applicable.

All valves with operating nuts located more than 4'-0" below finished grade shall be equipped with extension stems to bring the operating nut to within 18 inches of the finished grade.

At the top of the extension stem, there shall be a 2-inch standard operating nut, complete with a centering flange that closely fits the 5-inch pipe encasement of the extension stem. The valve box shall be set in a telescoping fashion around the 5-inch pipe cut to the correct length to allow future adjustment up or down.

Each valve shall be provided with an adjustable two-piece cast iron valve box of 5-inches minimum inside diameter. Valve boxes shall have a top section with an 18-inch minimum length. The valve boxes and covers shall be Olympic Foundry No. 940 or equal.

Valves located in easements or outside of paved areas shall have concrete collars with a minimum size of 2'-0" diameter by 4-inches thick.

Resilient-Seated Gate Valves

The gate valves shall be ductile iron body valves, iron disk completely encapsulated with polyurethane rubber and bronze, non-rising stem with “O” ring seals conforming to AWWA C509 or C515. The valves shall open counter-clockwise and be furnished with 2-inch square operating nuts except valves in vaults shall be furnished with handwheels. All surfaces, interior and exterior shall be fusion bonded epoxy coated, acceptable for potable water.

For applications with working pressure above 175 psi, a valve rated as 250 psi or higher shall be used.

Valves shall be Mueller A-2360 Series, M&H 515 Series, or approved equal.

Butterfly Valves

Butterfly valves shall be ductile iron body of the tight closing rubber seat type with rubber seat either bonded to the body or mechanically retained in the body with no fasteners or retaining hardware in the flowstream. The valves shall meet the full requirements of AWWA C504, Class 150B except the valves shall be able to withstand 200 psi differential pressure without leakage. The valves may have rubber seats mechanically affixed to the valve vane. Where threaded fasteners are used, the fasteners shall be retained with a locking wire or equivalent provision to prevent loosening. Rubber seats attached to the valve vane shall be equipped with stainless steel seat ring integral with the body, and the body internal surfaces shall be epoxy coated to prevent tuberculations buildup, which might damage the disc-mounted rubber seat.

No metal-to-metal sealing surfaces shall be permitted. The valves shall be bubble-tight at rated pressures with flow in either direction, and shall be satisfactory for applications involving valve

operations after long periods of inactivity. Valve discs shall rotate 90 degrees from the full open position to the tight shut position.

Butterfly valves shall be Henry Pratt Company "*Groundhog,*" M&H, or Mueller "*Lineseal III.*"

Tapping Sleeves and Tapping Valves

The tapping sleeves shall be rated for a working pressure of 250 psi minimum and furnished complete with joint accessories. Tapping sleeves shall be constructed in two sections for ease of installation and shall be assembled around the main without interrupting service.

Mechanical joint style sleeves shall be ductile iron and comply with AWWA C110. Ductile iron mechanical joint style sleeves are required for all size-on-size connections. Mechanical joint sleeves shall be cast by Clow, Dresser, Mueller, Tyler, U.S. Pipe or approved equal.

Fabricated steel style sleeves shall be fusion bonded epoxy-coated, acceptable for potable water. Fabricated steel style sleeves will not be allowed for size-on-size connections.

Tapping valves shall be provided with a standard mechanical joint outlet for use with ductile iron pipe and shall have oversized seat rings to permit entry of the tapping machine cutters. In all other respects, the tapping valves shall conform to the resilient seat gate valves herein specified with regards to operation and materials.

The tapping sleeve and valve shall be tested to 100 psi (air) prior to tapping the main.

The installation contractor for the tapping sleeves and valves shall be approved by the District.

Valves shall be offloaded and stored in a manner similar to pipe to prevent damage and to prevent dirt and debris from entering the valve.

VALVE MARKERS

Water valve marker posts shall be concrete for each valve outside of asphalt.

Markers shall be placed at the edge of the right-of-way opposite the valve and set so as to leave 2'-0" of the post exposed above grade. The distance in feet and inches to the valve shall be clearly stenciled on the side facing the valve in black numerals 2 inches in height.

PRESSURE REDUCING AND RELIEF VALVES

When water main pressure exceeds 100 psi, an approved pressure reducing valve with an approved pressure relief device shall be installed to reduce the pressure to 60 psi or lower. Pressure reducing valve stations shall generally consist of a large and a small valve for high flow and low flow periods. Pressure reducing valve stations shall be approved by the District on a case by case basis.

If the static pressure in the water main at the service line connection exceeds 80 psi a service PRV shall be installed on the property side of the water meter.

FIRE HYDRANTS

All fire hydrants shall be approved by the National Board of Fire Underwriters and conform to AWWA Specification C502, break-away type, in which the valve will remain closed if the barrel is broken. The hydrant barrel shall have a diameter of not less than 8-1/2 inches, and the valve diameter shall be not less than 5-1/4 inches. Each hydrant shall be equipped with two 2-1/2-inch hose ports (National Standard Thread), and one 4-1/2-inch pumper connection (National Standard Thread), with permanent 5-inch Storz hydrant adaptor and Storz blind cap installed on each pumper port. Each hydrant shall be equipped with a suitable positive acting drain valve and 1-1/4-inch pentagonal operating nut (counter-clockwise opening). A blue pavement marker shall be furnished and installed in the pavement in front of each hydrant.

The holding spools between the gate valve and fire hydrant shall be made from 6-inch Class 53 ductile iron pipe, 0.34-inch wall thickness. The hydrant and gate valve shall be anchored in place using holding spools and mechanical joint restraint device. Holding spools with length in excess of 17 feet shall be supplied with an M. J. sleeve and mechanical joint restraint device.

The fire hydrants shall be painted per the Standard Details.

<u>Between the time that the fire hydrant is installed and the completed facility is placed in operation, the fire hydrant shall at all times be wrapped in burlap, or covered in some other suitable manner to clearly indicate that the fire hydrant is not in service.</u>

BLOWOFFS AND AIR RELIEF ASSEMBLIES

Two-inch or 4-inch blowoff assemblies shall be installed at the terminus of all dead-end water mains. Blowoffs utilized by the Developer for flushing the water main shall be sufficient size to obtain 3 feet per second velocity in the main. Temporary blowoffs shall be removed and replaced with a suitably sized watertight brass plug.

Two-inch air and vacuum release valves shall be installed at principal high points in the system.

The installation of these items shall include connection piping, gate valve, valve box, and all accessories. Valve markers shall be optional with District.

ATTACHMENT A

MISCELLANEOUS FORMS

Developer Extension Agreement
Bill of Sale

Agreement No. _________________

DEVELOPER EXTENSION AGREEMENT

THIS AGREEMENT, entered into in duplicate between the **WATER DISTRICT NO. 54**, King County, a municipal corporation of the State of Washington, hereinafter referred to as the "District" and ____ , hereinafter referred to as "Developer".

WITNESSETH:

WHEREAS, the District operates and maintains a water distribution system within its boundaries which can serve property of Developer, and

WHEREAS, Developer desires to construct certain water mains and appurtenances at its own cost to serve Developer's property, for delivery to and operation by the District,

NOW, THEREFORE, IT IS HEREBY AGREED that:

1. The land for which domestic water service is requested and to which this Agreement applies, is realty in King County, Washington, legally described in Exhibit "A", attached hereto and by this reference incorporated herein. By executing this Agreement, Developer represents and warrants that it is the owner of record of the above-described property. If such representation of ownership is invalid, this Agreement shall be void. Developer agrees that the District may require Developer to furnish a title report for the property at Developer's expense.

2. All legal descriptions shall be furnished by the Developer and shall be stamped and signed by a professional engineer or professional land surveyor licensed in the State of Washington. Each description shall be accompanied by a drawing which graphically depicts the legal description.

3. The Developer has paid the required deposit as set forth in Resolution No. 1999-8, or any subsequent amendment thereto. Said deposit shall be held against actual expenses, including all bacteriological testing and sampling. The District shall determine, on a regular basis, its actual costs associated with the project and shall submit to Developer, if and at such time as its expenses exceed the deposit herein, an invoice to repay the District for actual costs in excess of the amount previously collected will be provided by the District. Payment shall be due upon receipt of said invoice. Prior to project acceptance, the District shall estimate its expenses through the one-year maintenance guarantee period and shall issue an invoice to cover such anticipated expenditures, including contingency in the amount of $500.00. Payment of said invoice shall be a condition of final project acceptance. In the event that the deposit exceeds the District's actual expenses, the District shall issue to the Developer, at project closing, a refund of such unused amounts.

4. In the event this Agreement is not executed and returned, along with the above-referenced charges, within six (6) months from the date of transmittal of same to the Developer, which date of transmittal is ________________________ , the Agreement shall be void and a new Developer Extension Application, along with application fee, will be required.

5. In the event work and construction described herein is not commenced within six (6) months from the date plans and specifications have been approved, this Agreement shall be void and of no force or effect whatsoever. In the event that work has commenced within the time period specified herein, construction shall be completed on or before ______________________. If construction is not completed by such date, this Agreement shall be void and of no force or effect whatsoever.

6. It is agreed by the parties that time is of the essence in all matters relating to the performance of this Agreement.

7. The District's consulting engineers shall review final plans and specifications for water main construction to be performed by the Developer under this Agreement. If preliminary plans are not deemed acceptable by the District, Developer shall be obligated to revise the plans and specifications in accordance with design standards deemed acceptable by the District. After Developer has been notified in writing by the District that final plans and specifications have been approved, Developer and Developer's contractor shall meet with District representatives for a preconstruction conference before construction is commenced. The Developer shall submit mylar originals and duplicate reproducible mylar originals prior to the preconstruction conference.

8. Developer agrees that it shall be responsible for providing to the District accurate and reliable information concerning the actual location of the facilities constructed. In furtherance of this obligation, Developer shall procure from its design engineer, _____________________________ , or such other licensed engineer or surveyor that will be consulting on the construction phase of the project, a written statement, which shall be submitted to the District prior to the preconstruction conference, warranting and guaranteeing that accurate data will be collected during construction of the facilities to enable the engineer to submit actual and reliable "as-built" locations to the District. Developer shall cause such engineer to submit to the District, prior to the plan review and preconstruction conference, a certificate of insurance and a copy of an endorsement to the engineer's Errors and Omissions policy. The limits for Errors and Omissions Insurance shall not be less than $1,000,000.00 for each claim; $1,000,000.00 aggregate. At the conclusion of construction and prior to and as a condition of acceptance, the engineer shall deliver to the District its certification that it has made periodic field investigations and measurements during construction and that the "as-built" drawings submitted to the District, which drawings shall be provided on diskette in AutoCAD format and on original or fixed-line photo mylar, are accurate and reliable. The District shall have the right to approve any change in the consulting engineer or surveyor during the project and Developer agrees that the District may refuse any change in the consulting engineer or surveyor or may condition the same on re-submittal of the warranty of location described above. No approval of any new engineer or surveyor shall be unreasonably withheld by the District.

9. The Developer will make application for __________________________________ 'Right-of-way Construction Permit'. Developer acknowledges familiarity with the provisions of such Right-of-way Construction Permit and agrees that it or its contractor's failure to comply with any of the provisions of the permit shall entitle the District, in addition to the right to enforce any other remedy available to __________________________________ as the permitting party, to immediately stop all construction activity on the right-of-way until the violation or violations have been eliminated and corrected to the satisfaction of the District and the District should not be held liable for any damages, either direct or indirect, for the delay and expense of such work stoppage. Developer shall procure all other state, county and city licenses or permits.

10. In the event an easement is required over realty other than realty described in Paragraph No. 1 herein, such easement, in form acceptable to the District, together with title report or other sufficient proof of ownership of such realty, shall be delivered to the District prior to the preconstruction conference. Developer shall be obligated to obtain a written release from any property owner across whose property construction is performed pursuant to the grant of an easement, sufficient to indicate that the site restoration on the easement is satisfactory and complete.

11. Prior to the preconstruction conference, Developer shall deliver to the District a restoration performance bond in the sum of $____________________, conditioned that Developer will restore to the satisfaction of the District, and state, county, and city agencies as applicable, all work to be performed hereunder in public rights-of-way and District easements. Form and contents of bond shall be determined by the District.

12. Construction shall be performed in accordance with District approved plans and specifications and only under the supervision of workers or craftsmen experienced in the installation of water mains and the related work.

13. By execution of this Agreement, the District does not guarantee water service will be provided to realty described herein. In the event that any District facilities, such as storage tanks, wells, and water transmission mains, become utilized beyond their design or approved capacity or become inoperable for any cause, the District reserves the right to refuse any connections which would use such facility until remedial action has been completed, and the District shall not be liable for any direct or consequential damages which occur to Developer arising out of such District refusal to connect or time delay necessary to take remedial action.

14. The Developer and its agents agree to indemnify and hold the District and its consulting engineers harmless from any and all claims which may be assessed against the District as a result of the construction or maintenance of the work described in this Agreement prior to acceptance by the District. The Developer shall maintain in full force and effect during the construction period, the following insurance:

a. Commercial General Liability Insurance with bodily injury and property damage limits of not less than:

$1,000,000.00 Each Occurrence

$2,000,000.00 General Aggregate

$2,000,000.00 Products-Completed Operations Aggregate Limit

b. Business Auto Liability coverage for all owned, non-owned, and hired autos with bodily injury and property damage limits of not less than:

$1,000,000.00 Each Accident

A certificate of insurance and a copy of an endorsement to the Developer's Commercial General Liability Insurance policy, showing the District and its consulting engineers as additional insured as respects the work to be performed under this Agreement, shall be provided prior to the preconstruction conference. Thirty (30) days written notice shall be given to the District for cancellation or expiration of this insurance.

15. Developer shall notify the District the date work and construction described in this Agreement will commence, and said notice shall be given not less than 72 hours (not including Saturday, Sunday, or national holidays) prior to such date. No water facility shall be covered prior to inspection. After work is commenced, it shall vigorously, consistently, and in a first-class workmanlike manner be carried to completion. Developer shall maintain at the construction area at all times during construction, a representative to whom District notices may be given regarding construction. Said representative shall be designated in writing by the Developer before start of work. Developer may request inspections during construction upon two (2) days notice to the District.

16. Testing of water facilities shall be performed as required by the District and only after satisfactory tests have been completed and witnessed by the District's designated agent, will the work be accepted. Developer agrees that at such time as the District has performed inspection of the water connections and has delivered itemized punch lists to Developer and/or Developer's contractor, that the project will be pursued to final completion, including the performance of all necessary site restoration.

17. Upon completion of construction, Developer or contractor shall deliver to the District a bond in the amount of ten percent (10%) of construction costs or $5,000.00, whichever is greater, that a reliable contractor will make and pay for repairs necessary within one (1) year from the date of acceptance of said construction, arising from faulty labor or material. Form of bond is to be approved by attorney for the District. Developer shall also deliver a Bill of Sale for water mains and appurtenances installed and constructed pursuant to this Agreement, together with permanent easements for their location in a form acceptable to the District.

18. Upon completion of construction, Developer shall submit, for acceptance and approval of the District, a statement of monies and/or other accounting of monies expended to perform construction described herein, together with such other engineering records and data as may be required by the District.

19. In the event Developer requests and the District provides water meters for the realty described herein, prior to District's acceptance of work, Developer agrees to be solely responsible for any loss or damage to such water meters or their installation, which occurs prior to said acceptance of work by the District.

20. Work and construction performed under this Agreement shall not be connected to the District's water system until all provisions and requirements of this Agreement and District Resolutions, on the part of the Developer, have been fully complied with.

21. The District and Developer agree that in carrying out the terms of this contract, the Developer shall be acting as an independent contractor and in no respect shall Developer be deemed an agent or partner of Water District No. 54.

22. Developer shall not assign this contract without the written consent of the District.

23. The District shall provide water service following the District's acceptance of the water distribution system for operation and maintenance and upon payment of the connection charges as set forth and in accordance with District Resolution No. 1999-1. Said connection charges shall consist of the Capital Facilities Charge (CFC), Meter Installation Charge and any other such charges levied in accordance with said District Resolution No. 1999-7 or amendments thereto or any other applicable District Resolution at time service is requested.

24. Partial waiver or waiver by acquiescence by the District of any provision or condition of this Agreement shall not be a waiver of any other provision or condition of this Agreement.

25. This Agreement shall constitute an easement and servitude upon the property described herein and shall be binding upon the heirs, assigns and successors in interest to the Developer. This Agreement shall constitute an equitable lien against property described herein and in the event of nonperformance by Developer, as stated herein, the District may foreclose said lien in the manner authorized by law.

26. This writing constitutes the full and only agreement between the parties, there being no promises, agreements or understandings, written or oral, except as herein set forth, or as hereinafter may be amended in writing.

27. Upon execution of this Agreement, the parties agree in the event either of them is required to enforce any provision or provisions of this Agreement against the other, that the prevailing party shall be entitled, in addition to all other amounts to which it is otherwise entitled by this Agreement, to its actual attorney's fees and costs, including those incurred on appeal.

WITNESS our hands and seals.

WATER DISTRICT NO. 54
King County, Washington

By ___________________________________

____
District Manager

Its___________________________________

Date__________________________________

STATE OF WASHINGTON)
) **ss:**
County of King)

On this day personally appeared before me ____ (grantor or grantors), to me known to be the individual, or individuals described in and who executed the within and foregoing instrument, and acknowledged that he/she/they signed the same as his/her/their free and voluntary act and deed, for the uses and purposes herein mentioned. Given under my hand and official seal this _____ day of ____________ 20___.

Date __________________________________

(seal)

Notary Public in and fore the state of
Washington, residing at _______________,

____
Notary Public

____
Title
My appointment expires_______________

STATE OF WASHINGTON)
) ss:
County of King)

On this ______ day of _______________, 20___, before me personally appeared ____, to me known to be the ____ of the corporation that executed the within and foregoing instrument, and acknowledged said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that he/she/they are authorized to execute said instrument and that the seal affixed is the corporate seal of said corporation.

Signature of Officer(s):

____ ____

____ ____
Date Date

In witness whereof I have hereunto set my hand and affixed my official seal the day and year first above written.

(seal)

Notary Public in and fore the state of
Washington, residing at ___________________,

____
Notary Public

____
Title
My appointment expires __________________

Return Address:

King County Water District No. 54
922 South 219th Street
Des Moines, WA 98188

KING COUNTY WATER DISTRICT NO. 54
BILL OF SALE
FOR WATER FACILITIES

KNOW ALL MEN BY THESE PRESENTS: That the undersigned party of the first part, thereafter designated "Vendor" for good and valuable consideration does by these presents grant, bargain, sell and deliver unto KING COUNTY WATER DISTRICT NO. 54, 922 South 219th Street, Des Moines, of King County, Washington, party of the second part, hereafter designated as "Vendee", the following described personal property, to wit:

Mains, for which the cost was $__________________________.

Service lines for which the cost was $______________.

Hydrants, for which the cost was $________________________.

And, that the cost of Engineering was $___________________, located on the real property described on Exhibit "A", attached hereto and incorporated herein by reference.

TO HAVE AND TO HOLD the same unto the Vendee, its successors and assigns forever. And the Vendor, jointly and severally, and their respective successors and assigns, covenant and agree to and with the said property, and has good right and authority to sell the same and that it will, and does hereby warrant and agree to defend the sale thereof hereby made unto the Vendee, its successors and assigns, against all and every person or persons whomsoever, lawfully claiming or to claim the same.

Vendor further guarantees the said facilities are fit for purposes intended, i.e., as for use as a water distribution system including distribution and supply lines adequate for the service intended.

IN WITNESS WHEREOF, Vendor has hereunto set their hand this _____ day of_______, 20 _______.

____ ____________________________________

____ ____________________________________

STATE OF WASHINGTON)
)
County of King)

I certify that I know or have satisfactory evidence that __________________________ and ______________________________ signed this instrument, on oath stated that they are authorized to execute the instrument and acknowledge it as the ______________________ and _______________________ of ____ to be the free and voluntary act of such parties for the uses and purposes mentioned in the instrument.

Dated:______________________

____
Notary Public_______________________
Title_________________________________
My Appointment Expires____________

ATTACHMENT A

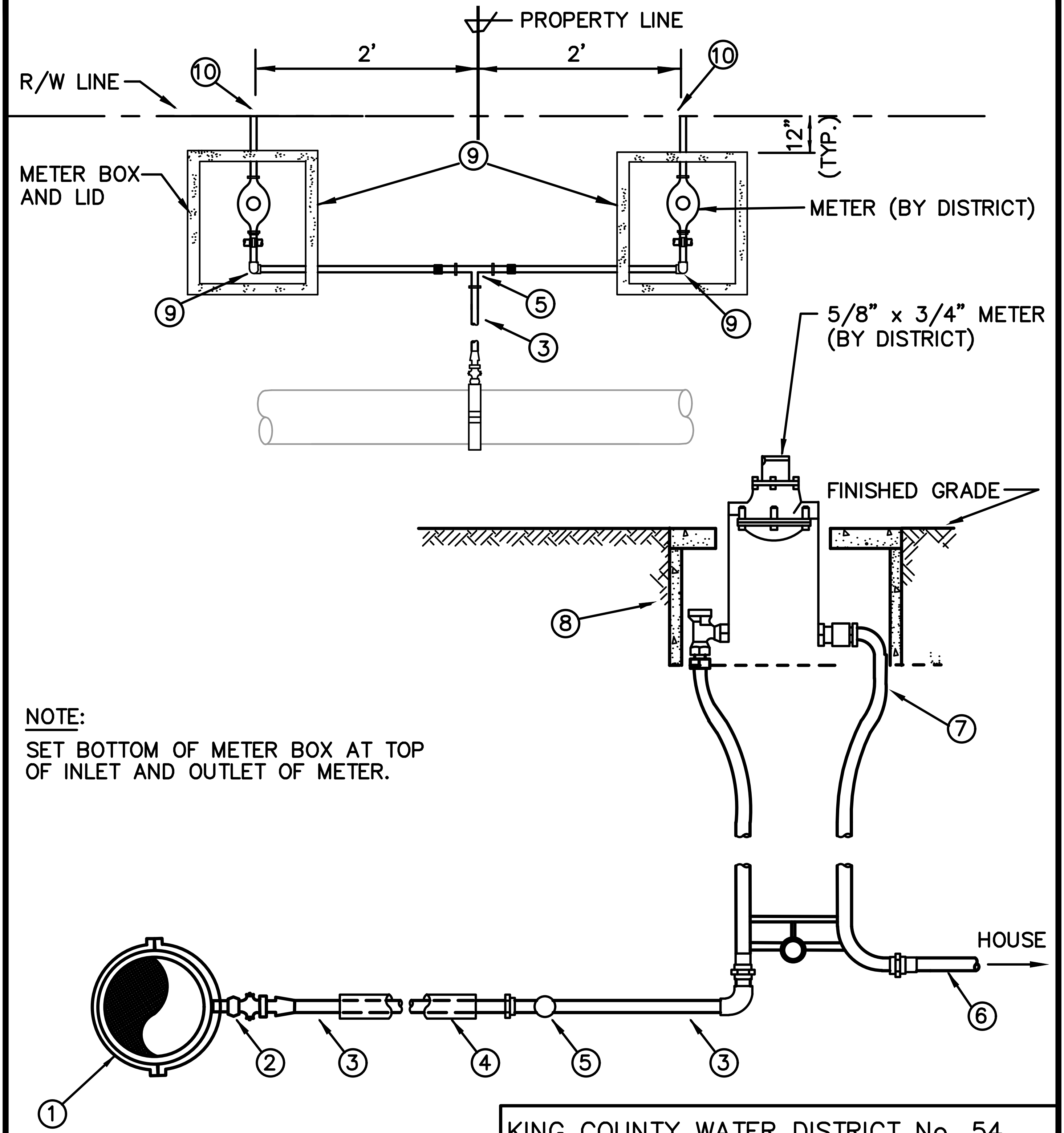
STANDARD DETAILS

ATTACHMENT A

King County Water District No. 54
Standard Details
Revised September 2019

Detail Number	Title
1-WAT	1” and Smaller Water Service
2-WAT	1 ½” & 2” Water Service
3-MM	Meter and Meter Vault Assembly 3” Through 10”
AIR-RLS	Air & Vacuum Release Assembly
ANCH-BLO	Anchor Block
BLOW-OFF	Below Ground 2” Blow-Off Assembly
BLOW-OFF2	Permanent End-Line Blow Off Assembly
CUT-CONN	Cut in Connection
DBL-CHCK	“Individual” Double Check Assembly
DCD-BPA	Double-Check Detector Backflow Prevention Assembly
DUCT-PIP	Thrust Restraint for Ductile Iron Pipe
FIRE-HYD	Fire Hydrant Installation (Extruded Curb)
FIRE-HYD2	Fire Hydrant Installation (Curb, Gutter, Sidewalk)
FIRE-HYD3	Fire Hydrant Relocation
FIRE-HYD4	Fire Hydrant Location in Cut or Fill
FIRE-HYD5	Fire Hydrant Guard Post Installation
FIRELINE	Fire Line Connection
PRSD	Pressure Reducing Station
RPBA	Reduced Pressure Backflow Assembly ¾” to 2”
RPBA	Reduced Pressure Backflow Assembly 3” and Larger
SSTSRIGIDP	Trench Section for Rigid Pipe
TAP-CONN	Wet or Hot Tap Connection
THR-BLO	Concrete Thrust Block
THR-BLO2	Thrust Block Detail
TYP-UTIL	Typical Utility Crossing
WA-MAIN	Water Main Depth Requirements
WAT-SAMP	Water Sampling Station
WAT-VALV	Water Valve Stem Extension

ATTACHMENT A



NOTE:
SET BOTTOM OF METER BOX AT TOP OF INLET AND OUTLET OF METER.

KING COUNTY WATER DISTRICT No. 54

1" AND SMALLER WATER SERVICE

APPROVED:

BY DISTRICT DATE

DWG. NO.
1–WAT

DATE:	DRWN:	CHKD:	SCALE:
04/2018	P.G.M.	W.W.P.	NONE

KCWD 54

PAGE 1 OF 2

LEGEND

① ROMAC SADDLE SINGLE STRAP (101NS) FOR PIPE DIAMETERS LESS THAN 8" OTHERWISE DOUBLE SADDLE STRAP.

② 1" MIP X CTS COMPRESSION JOINT CORP STOP EQUAL TO MUELLER 110 OR EQUAL

③ 1" TYPE K COPPER PIPE

④ INSTALL SERVICE LINE IN 2" PVC GUARD PIPE (SCH–80) WHEN CROSSING ROADWAY (3' MINIMUM BEYOND AND BENEATH PAVEMENT SECTION)

⑤ 1" BRASS TEE FORD T444 SERIES OR EQUAL, IF DOUBLE SERVICE ALLOWED.

⑥ WATER SERVICE TO HOUSE

⑦ 1" VERTICAL IN–HORIZONTAL OUT COPPER SETTER. MUELLER E–05 OR FORD 70–80 SERIES INCLUDING ANGLE BALL VALVE AND CHECK VALVE

⑧ METER BOX – FOGTITE NO.1 DRILLED FOR TRPL HOLE FOR TOUCH READ METERS, H20 LOADING. SET FLUSH WITH FINISHED GRADE.

⑨ 1" STREET ELL, FORD L66 SERIES OR EQUAL

⑩ PROVIDE APPROVED WATERTIGHT PLUG UNTIL CONNECTION TO PRIVATE SYSTEM IS MADE.

NOTE:
DUAL SERVICE NOT ALLOWED IF STATIC PRESSURE AT METER LESS THAN 45 PSI

L:\Kcwd54\Standard Details\1–WAT–REV.dwg, 3/11/2019 10:19 AM, WARREN PERKINS

KING COUNTY WATER DISTRICT No. 54

1" AND SMALLER WATER SERVICE

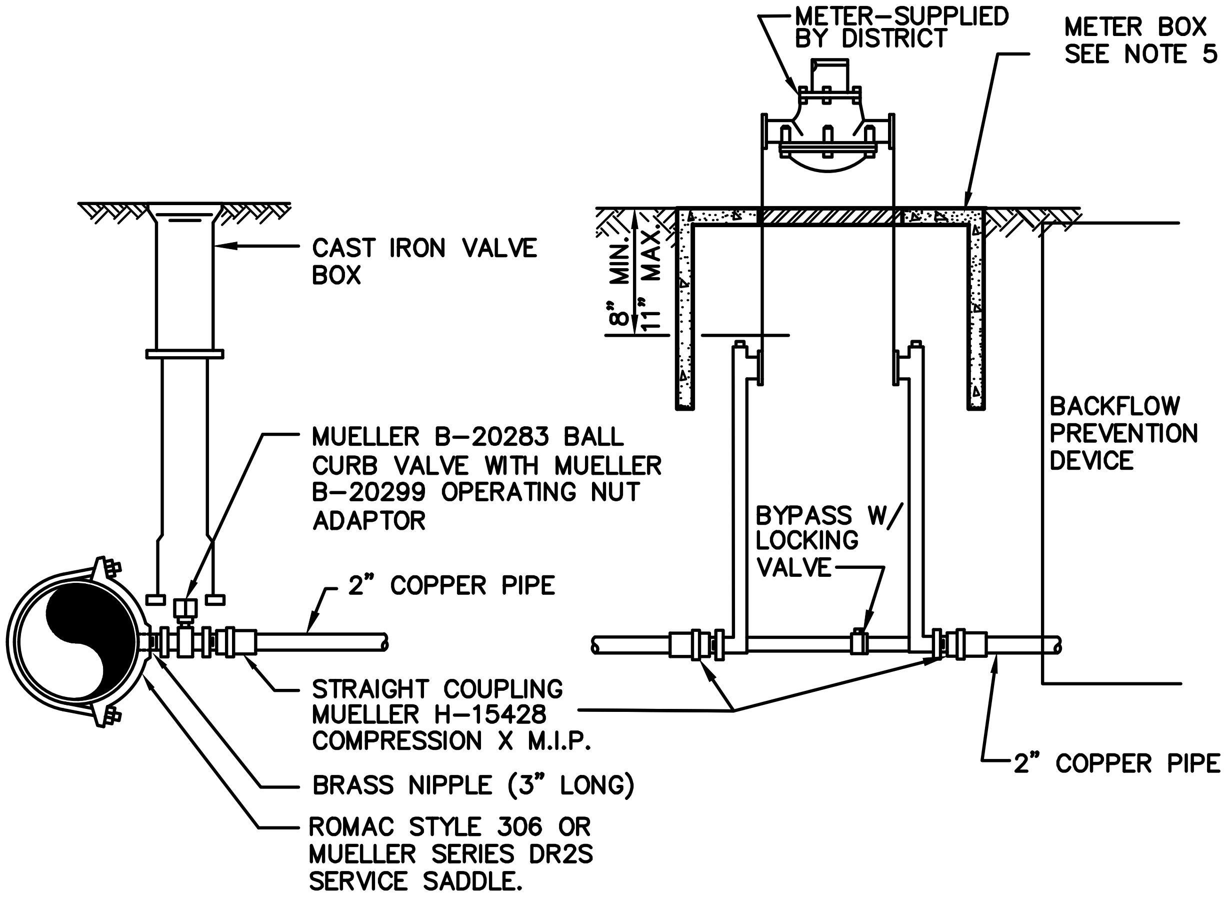
KCWD 54

APPROVED:

BY DISTRICT DATE

DWG. NO.
1–WAT

DATE:	DRWN:	CHKD:	SCALE:
04/2018	P.G.M.	W.W.P.	NONE



NOTES:

1. COPPER PIPE SHALL BE TYPE L.
2. INDIVIDUAL SERVICES REQUIRED FOR EACH STRUCTURE.
3. METER SETTER MUELLER H-1423 OR FORD 70 SERIES. WITH LOCKING BYPASS.
4. METER BOX - FOGTITE NO.2 WITH STEEL LID AND DRILLED FOR TRPL HOLE FOR TOUCH READ. BOX SHALL BE H-20 LOAD RATED WHERE REQUIRED.
5. ESMT PROVIDED TO DISTRICT TO AND AROUND METERS LOCATED OUTSIDE R/W.
6. ALL SERVICES SHALL HAVE WASHINGTON STATE APPROVED RPBA FOR BACKFLOW PREVENTION. CONFIRM LOCATION OF ASSEMBLY WITH DISTRICT. INITIAL AND ANNUAL TEXTING REQUIRED. MULTIFAMILY ALLOWED TO USE DCVA IN LIEU OF RPBA.

KING COUNTY WATER DISTRICT No. 54

1 1/2" & 2" WATER SERVICE

KCWD 54

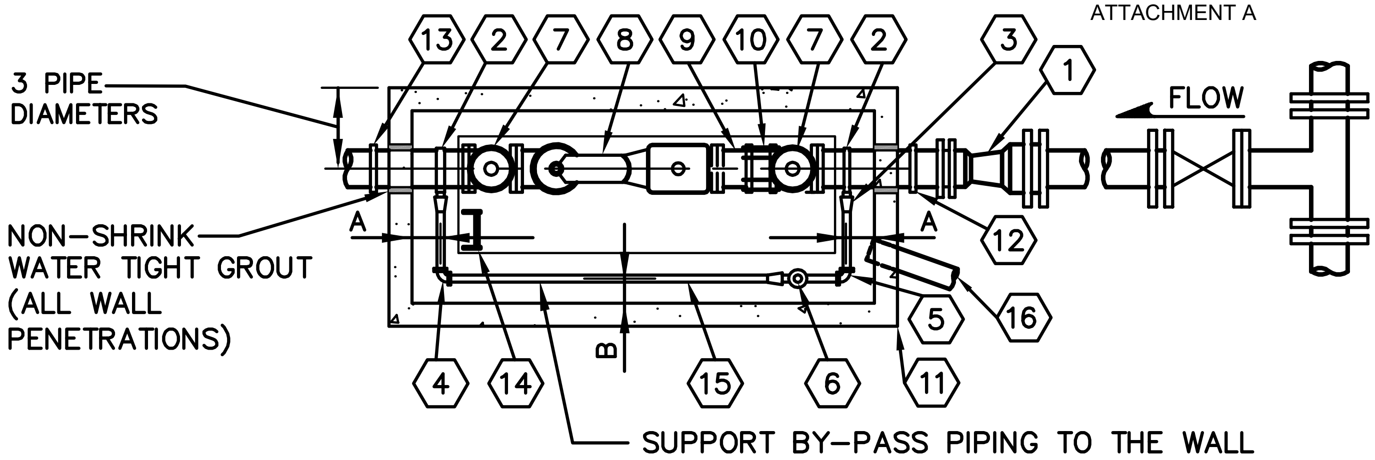
APPROVED:

BY DISTRICT DATE

DWG. NO.
2-WAT

DATE:	DRWN:	CHKD:	SCALE:
04/2018	P.G.M.	W.W.P.	NONE

ATTACHMENT A



PLAN

1. REDUCER, M.J.
2. SINGLE STRAP SERVICE CLAMP, ROMAC 101 WITH IPS TAP, OR EQUAL (1 1/2" OR 2" BYPASS, 4-INCH AND LARGER BYPASS REQUIRES D.I. TEE).
3. FITTINGS AS REQUIRED.
4. BEND CPLG COPPER TO COPPER MUELLER H-15525, OR EQUAL.
5. BEND CPLG, COPPER TO OUTSIDE I.P. THREAD MUELLER H-15530, OR EQUAL.
6. BALL VALVE WITH PADLOCK WING OR LOCK CAP, FORD B21-444W OR B21-666 WITH LOCK CAP OR B21-777 WITH LOCK CAP. SIZED TO LINE.
7. RESILIENT SEAT GATE VALVE, FL X FL SIZED TO METER.
8. 3" TO 10" SENSUS METER FOR IRRIGATION SERVICES AND 3" TO 10" COMPOUND METER IF FOR DOMESTIC SERVICE.
9. D.I. PIPE SPOOL FL X PE LENGTH TO FIT.
10. FL CPLG. ADAPT.
11. PRECAST CONCRETE VAULT, UTILITY VAULT OR EQUAL, SEE PAGE 2 FOR SIZING AND REQUIREMENTS.
12. MEGA-LUG FOLLOWER INSTALLED ON INFLOW SIDE OF VAULT WITH CONCRETE THRUST BLOCK OR SHACKLE TO THRUST BLOCK TO PREVENT MOVEMENT IF METER IS REMOVED. (BLOCK NOT SHOWN)
13. DIELECTRIC CPLG. TO BUILDING SERVICE. SIZE AS REQUIRED.
14. GALV. STEEL OR ALUMINUM LADDER. SECURE TO VAULT LID AND FLOOR. COORDINATE LOCATION FOR ACCESS.
15. BY-PASS (SIZE BY TABLE BELOW).
16. 4" PVC TO CATCH BASIN OR DAYLIGHT. WHERE GRAVITY DRAIN IS NOT FEASIBLE, PROVIDE SUMP, ELECTRICAL SERVICE AND PUMP WITH DISCHARGE TO SURFACE DRAIN. PUMP SHALL BE 1/2 HP ZOELLER M-53, WITH CHECK VALVE ON DISCHARGE LINE.
17. ALL PIPES AND FITTTINGS 4-INCH OR LARGER SHALL BE DI., CL 52.

METER SIZE	MAIN-LINE	BYPASS	A	B
3"	4" DI.	2" COPPER	9"	4"
3"	4" DI.	2" COPPER	9"	4"
4"	6" DI.	4" DI.	9"	4"
6"	8" DI.	4" DI.	14"	6"
8"	10" DI.	8" DI.	16"	6"

NOTES:

SEE PAGE 2 FOR ELEVATION AND NOTES.

KING COUNTY WATER DISTRICT No. 54

METER AND METER VAULT
ASSEMBLY 3" THROUGH 10"

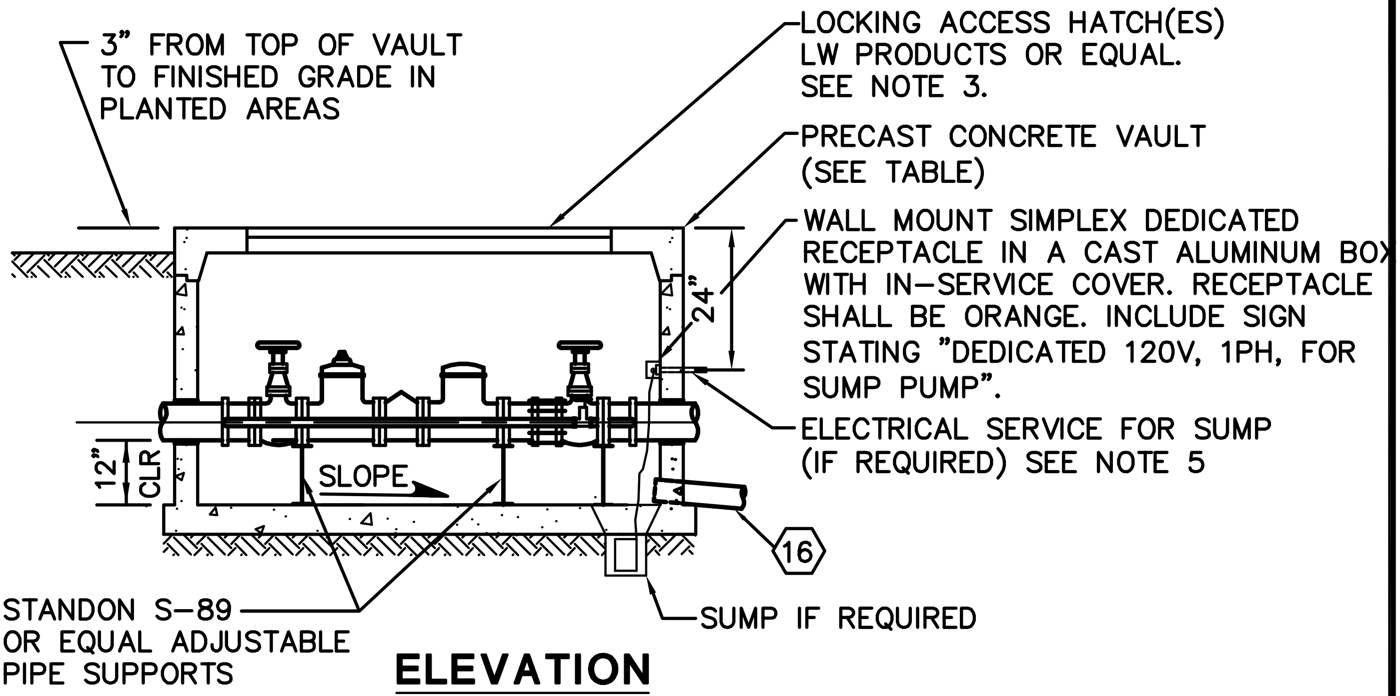
APPROVED:

BY DISTRICT DATE

DWG. NO.
3-MM

DATE: 12/2010
DRWN: J.S.M.
CHKD: W.W.P.
SCALE: NONE

ATTACHMENT A



ELEVATION

SEE DETAIL V-W16A FOR CALLOUTS

METER SIZE	MAIN-LINE	MINIMUM I/S VAULT DIM. L	x W	x H	UTILITY VAULT CO APPROVED MODEL	MIN. HATCH OPENING
3"	4" DI.	8'-4"	4'-4"	3'-4"	4484-LA	3' x 6'
4"	4" DI.	8'-4"	4'-4"	3'-4"	4484-LA	3' x 6'
6"	6" DI.	10'-6"	5'-0"	6'-2"	5106-LA	3' x 6'
8"	8" DI.	12'-0"	6'-0"	6'-6"	612-LA	3' x 6'
10"	10" DI.	14'-0"	8'-0"	6'-6"	814-LA	3' x 6'

NOTES:

1. WASHINGTON STATE APPROVED REDUCED PRESSURE BACKFLOW PREVENTOR REQUIRED. SEE RPBA-2. CONFIRM INSTALLATION WITH DISTRICT. INITIAL AND ANNUAL TEST REQUIRED.
2. METER SHALL BE INSTALLED SUCH THAT IT CAN BE READ WITHOUT ENTERING VAULT WITH ACCESS HATCH OPEN.
3. COORDINATE ORIENTATION OF HATCH(ES) TO PROVIDE CLEAR VERTICAL ACCESS TO METER ASSEMBLY, AND WITH LADDER LOCATION. VERIFY WITH DISTRICT.
4. DRAIN DRAIN HATCH(ES) TO VAULT FLOOR WITH PVC PIPE AND FITTINGS.
5. 3/4" (MINIMUM) PVC SCH-40 CONDUIT. WIRING SHALL BE COMPLETELY SEALED 120V, UNDER GROUND. CONTRACTOR TO SEAL CONDUIT PENETRATION WITH NON-SHRINK GROUT. (NOT REQUIRED IF GRAVITY VAULT DRAIN PROVIDED).
6. ESMT TO BE PROVIDED TO DISTRICT AROUND METERS LOCATED OUTSIDE RIGHT-OF-WAY.
7. SEE PAGE 1 FOR PLAN AND NOTES.

KING COUNTY WATER DISTRICT No. 54

METER AND METER VAULT
ASSEMBLY 3" THROUGH 10"

KCWD
54

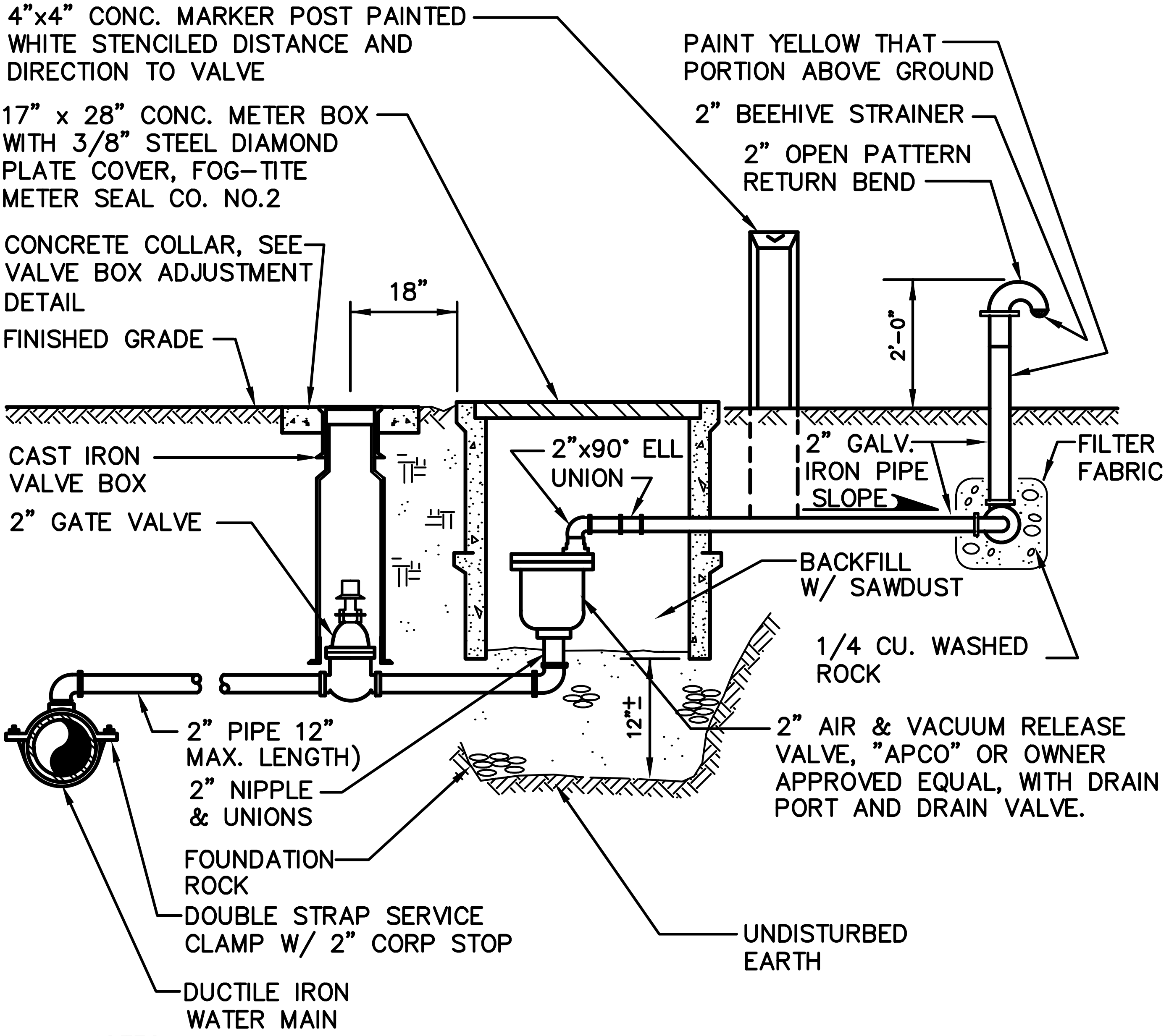
APPROVED:

BY DISTRICT DATE

DWG. NO.
3-MM

DATE:	DRWN:	CHKD:	SCALE:
12/2010	J.S.M.	W.W.P.	NONE

ATTACHMENT A



NOTES:

1. GATE VALVE: AWWA RESILIENT SEAL, THRD x THRD WITH OPERATING NUT
2. ALL PIPING BETWEEN DOUBLE STRAP SADDLE AND INLET SIDE OF COMBINATION AIR & VAC ASSEMBLY SHALL BE BRASS
3. TAP MAIN AT SYSTEM HIGH POINT. LOCATION TO BE APPROVED BY THE DISTRICT
4. PAINT PORTION ABOVE GROUND WITH TWO COATS PRESERVATIVE BRAND No. 43-616 YELLOW

KING COUNTY WATER DISTRICT No. 54

AIR & VACUUM RELEASE ASSEMBLY

KCWD 54

APPROVED:

BY DISTRICT DATE

DWG. NO.
AIR-RLS

DATE:	DRWN:	CHKD:	SCALE:
10/2019	J.S.M.	W.W.P.	NONE

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ATTACHMENT A

TYPE "A" BLOCKING

FOR 11 1/4°–22 1/2°–30° VERTICAL BENDS

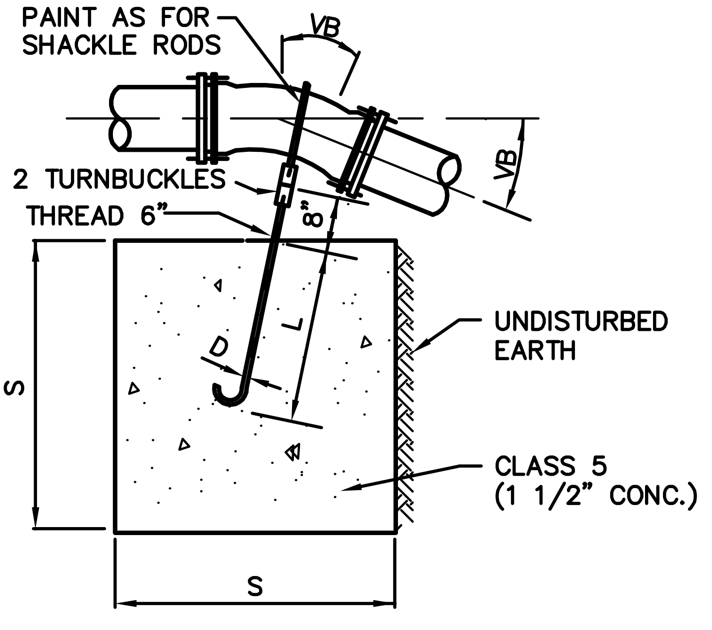
		VB		S	D	L
PIPE SIZE NOMINAL DIAMETER– INCHES	TEST PRESSURE PSI	VERTICAL BEND DEGREES	No. OF CU. FT. OF CONC. BLOCKING	SIDE OF CUBE LIN. FT.	DIAM. OF SHACKLE RODS (2) INCHES	DEPTH OF RODS IN CONCRETE LIN. FT.
4"	300	11 1/4	8	2	5/8"	1.5
		22 1/2	11	2.2		2.0
		30	17	2.6		
6"	300	11 1/4	11	2.2	5/8"	2.0
		22 1/2	25	2.9		
		30	41	3.5		
8"	300	11 1/4	16	2.5	5/8"	2.0
		22 1/2	47	3.6		
		30	70	4.1	3/4"	2.5
12"	250	11 1/4	32	3.2	5/8"	2.0
		22 1/2	88	4.5	7/8"	3.0
		30	132	5.1		
16"	225	11 1/4	70	4.1	7/8"	3.0
		22 1/2	184	5.7	1 1/8"	4.0
		30	275	6.5	1 1/4"	
20"	200	11 1/4	91	4.5	7/8"	3.0
		22 1/2	225	6.1	1 1/4"	4.0
		30	330	6.9	1 3/8"	4.5
24"	200	11 1/4	128	5.0	1"	3.5
		22 1/2	320	6.8	1 3/8"	4.5
		30	480	7.9	1 7/8"	5.5

TYPE "B" BLOCKING

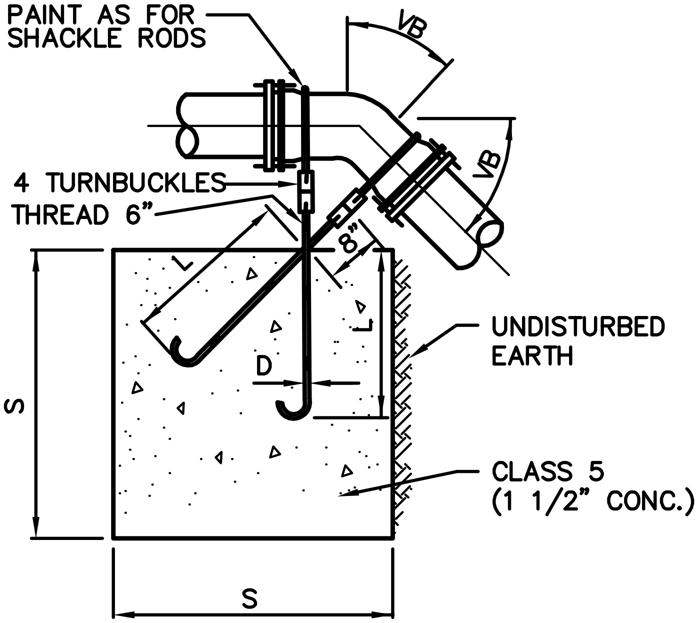
FOR – 45° VERTICAL BENDS

		VB		S	D	L
4"	300	45	30	3.1	5/8"	2.0
6"			68	4.1		
8"			123	5.0		
12"	250		232	6.1	3/4"	2.5
16"	225		478	7.8	1 1/8"	4.0
20"	200		560	8.2	1 1/4"	
24"			820	9.4	1 3/8"	4.5

THIS TABLE REPRESENTS THE "MINIMUM" CONSTRUCTION STANDARD. APPROPRIATELY SIZED ANCHOR BLOCKS BASED ON EXISTING AND LOCAL CONDITIONS ARE REQUIRED.



TYPE "A" BLOCKING



TYPE "B" BLOCKING

KING COUNTY WATER DISTRICT No. 54

ANCHOR BLOCK

KCWD 54

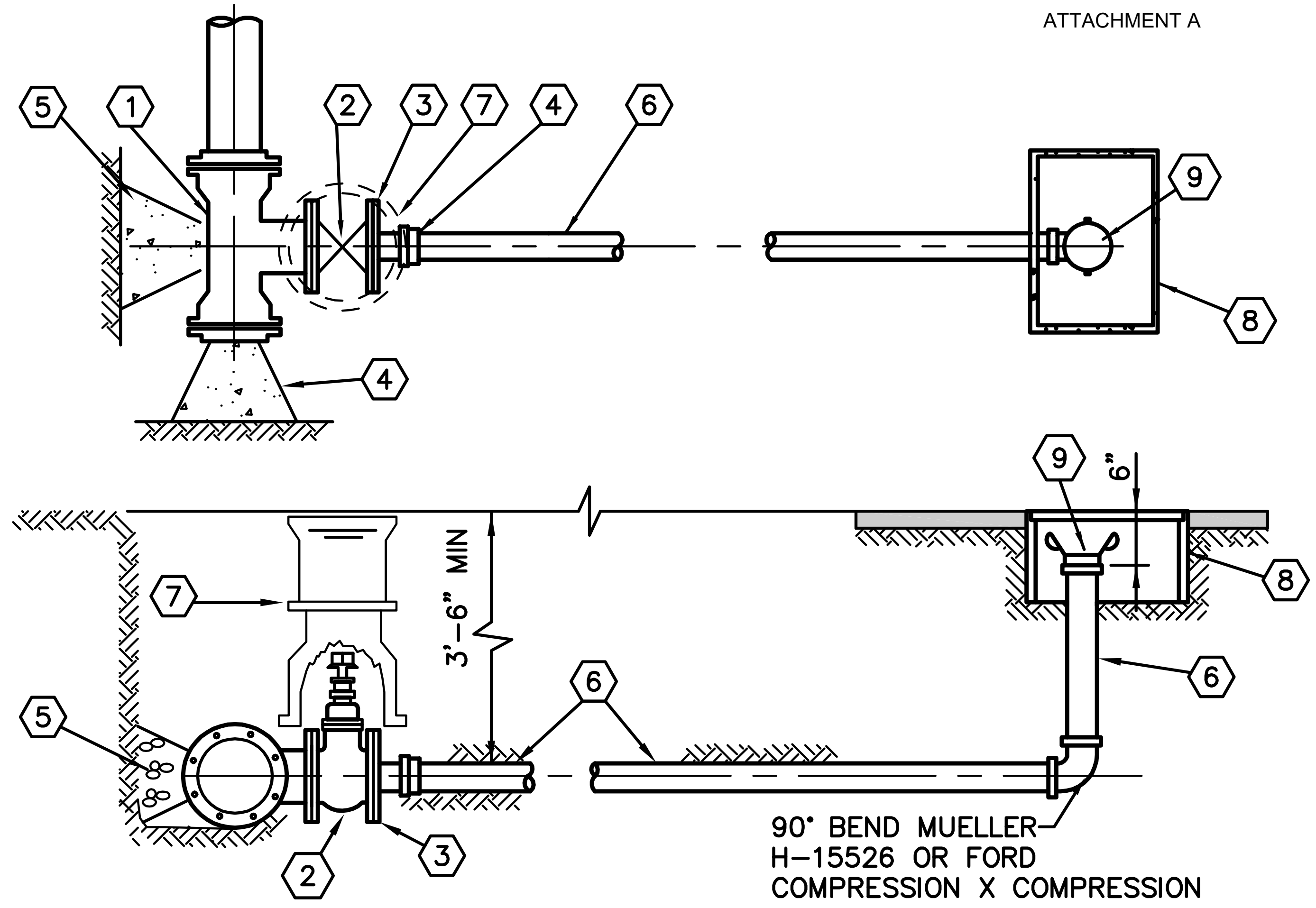
APPROVED:

BY DISTRICT DATE

DWG. NO.
ANCH–BLO

DATE:	DRWN:	CHKD:	SCALE:
12/2010	J.S.M.	W.W.P.	NONE

ATTACHMENT A



1. MJ X MJ X 4" FL D.I. TEE.
2. 4" AWWA RESILIENT SEAT GATE VALVE, FL X FL, WITH OPERATING NUT.
3. 4" BLIND FLANGE, TAPPED FOR 2" FOR 6" AND 8" MAINS. MAINS LARGER THAN 8" SHALL END IN A FIRE HYDRANT.
4. STRAIGHT COUPLING COMPRESSION TO M.I.P. MUELLER No. H–15428 FOR BLIND FLANGE
5. CONCRETE THRUST BLOCK.
6. 2" TYPE K COPPER PIPE.
7. CAST IRON VALVE BOX PER VB–1
8. METER BOX. BERG VAULT CO. OF WASH NO. 2 CONCRETE OR FOGTITE NO. 9. BOX SHALL BE H–20 LOAD RATED.
9. ALUMINUM CAM–LOCK AND CAP. DRILL 1/8" HOLE IN CAP. (PLASTIC CAM LOCK FITTING NOT ALLOWED)

NOTES

1. INSTALL DIELECTRIC COMPOUNDS FOR SEPARATION AT DISSIMILAR METALS.

KING COUNTY WATER DISTRICT No. 54

BELOW GROUND
2" BLOW–OFF ASSEMBLY

KCWD 54

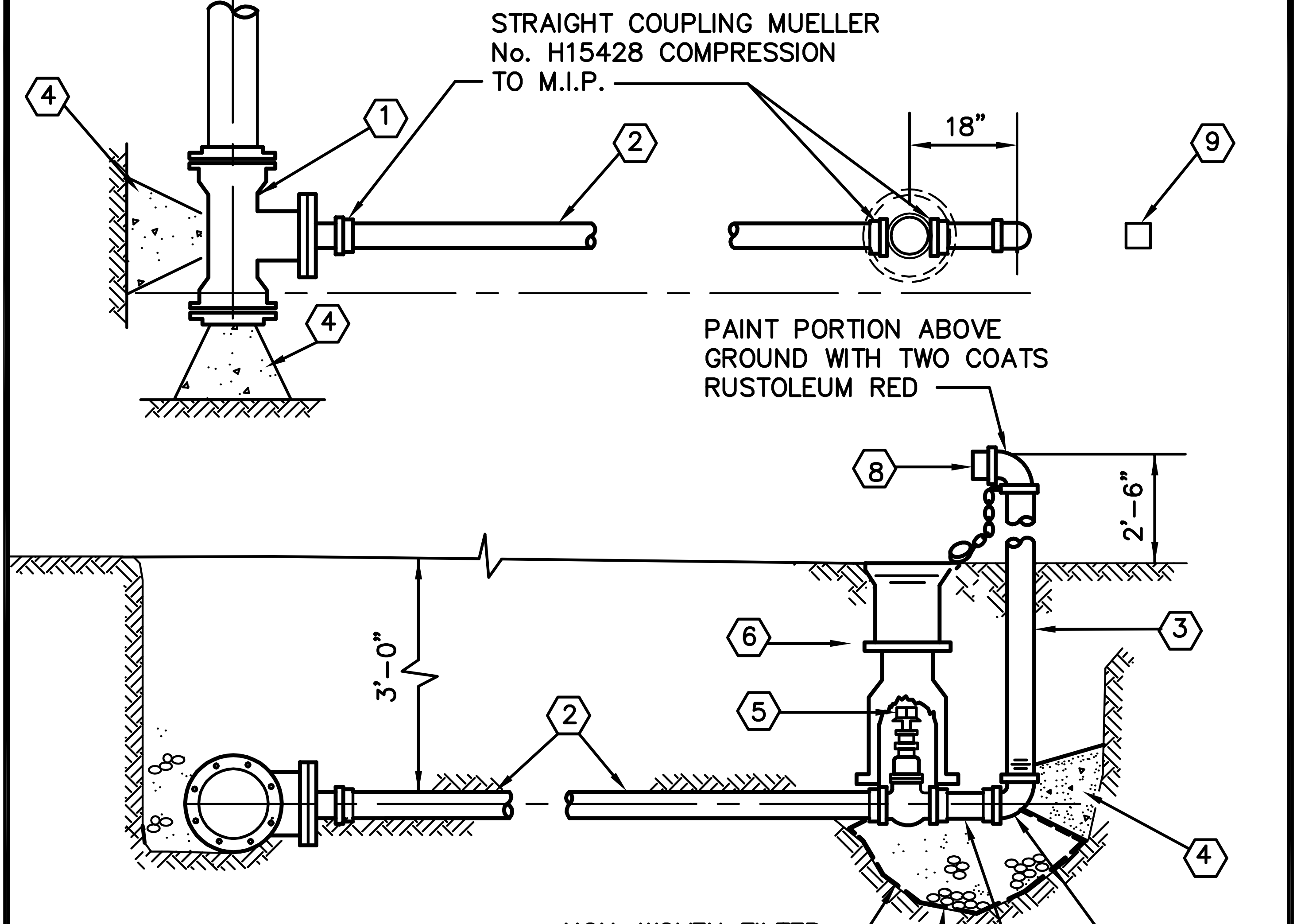
APPROVED:

BY DISTRICT DATE

DWG. NO.
BLOW–OFF

DATE: 12/2010	DRWN: J.S.M.	CHKD: W.W.P.	SCALE: NONE

ATTACHMENT A



1. MJ X MJ X 6" FL D.I. TEE WITH REDUCING FLANGE TAPPED 2" AND MJ PLUG.
2. 2" TYPE "K" COPPER PIPE.
3. 2" GALVANIZED IRON PIPE.
4. CONCRETE THRUST BLOCK.
5. 2" AWWA RESILIENT SEAT GATE VALVE, THD X THD, WITH OPERATING NUT.
6. CAST IRON VALVE BOX
7. 1/4 CUBIC YARD WASHED GRAVEL POCKET.
8. 2" x 2-1/2" HOSE THREADS BRASS INSERT WITH CAP AND CHAIN
9. VALVE MARKER POST

NOTES:

1. TURN NOZZEL TOWARDS ROADSIDE DITCH
2. INSTALL DIELECTRIC COUPLINGS AT DISSIMILAR METALS.
3. TEMPORARY BLOWOFFS INSTALLED FOR FLUSHING WATERMAIN SHALL BE SIZED TO PROVIDE 2.5fps VELOCITY IN MAIN LINE.

KING COUNTY WATER DISTRICT No. 54

PERMANENT END-LINE
BLOW OFF ASSEMBLY

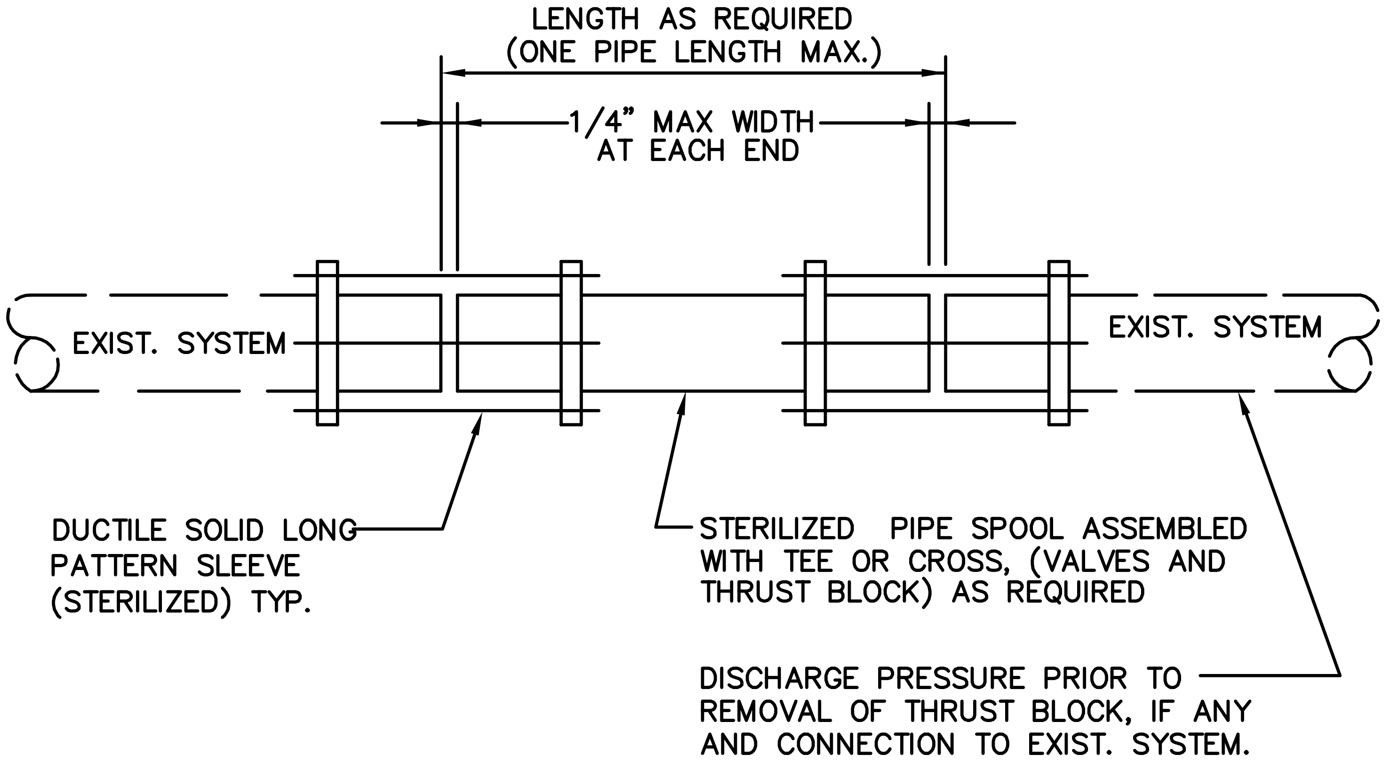
APPROVED:

BY DISTRICT DATE

DWG. NO.
BLOW-OFF2

DATE:	DRWN:	CHKD:	SCALE:
12/2010	J.S.M.	W.W.P.	NONE

ATTACHMENT A



NOTE:

1. NO DEFLECTION SHALL BE ALLOWED AT EITHER COUPLING.
2. CUT–IN CONNECTIONS ON STEEL PIPE TO USE D.I. x O.D. STEEL TRANSITION COUPLINGS ROMAC OR EQUAL.
3. IN–LINE VALVE(S) IN EXISTING SYSTEM MAY BE REQUIRED AT THE SOLE DISCRETION OF THE DISTRICT AT ALL NEW INTERTIE LOCATIONS. (NOTE: VALVE(S) ARE NOT SHOWN ABOVE FOR CLARITY)

KING COUNTY WATER DISTRICT No. 54

CUT IN CONNECTION

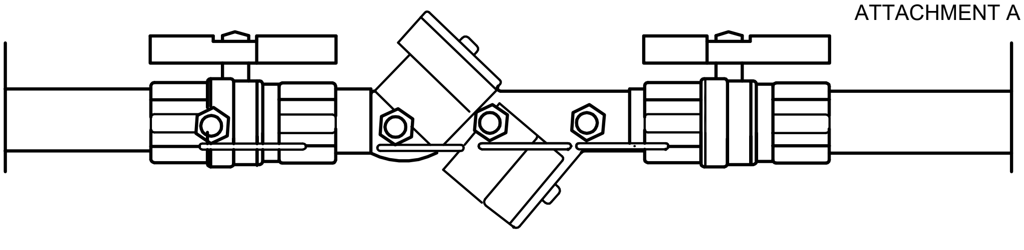
APPROVED:

BY DISTRICT DATE

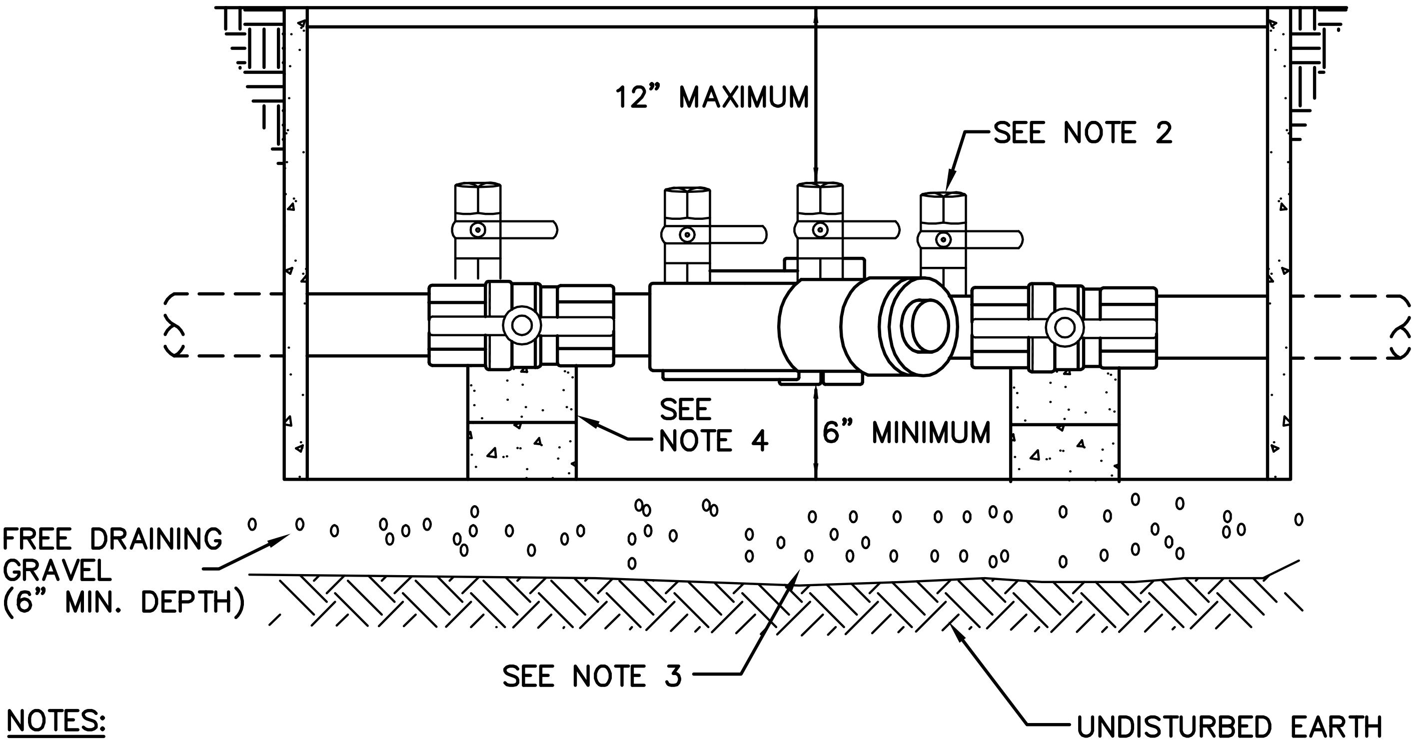
DWG. NO.
CUT–CONN

DATE: 12/2010	DRWN: J.S.M.	CHKD: W.W.P.	SCALE: NONE

ATTACHMENT A



PLAN VIEW



NOTES:

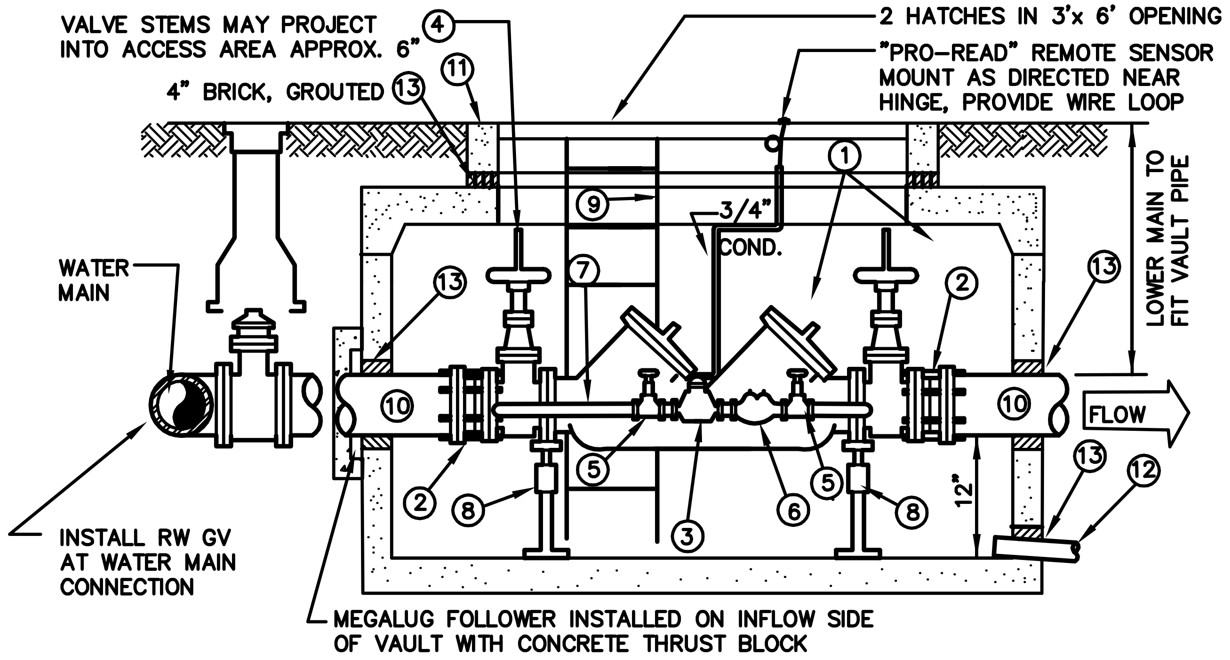
1. MINIMUM BOX SIZE 3/4"– 1" ASSEMBLIES, 10"x13"
   1 1/4"– 2" ASSEMBLIES, 14"x20"
2. ASSEMBLY MUST BE INSTALLED WITH TEST COCKS FACING UP OR TO ONE SIDE. INSTALL WATERTIGHT PLUGS IN ALL TEST COCKS.
3. SUFFICIENT DRAINAGE MUST BE PROVIDED TO PREVENT ASSEMBLY FROM BEING SUBMERGED.
4. PROVIDE SUPPPORT BLOCKS AS MAY BE REQUIRED.
5. PROVIDE A STRAINER WITH BLOW OUT TAPPING AHEAD OF DEVICE IF REQUIRED BY DISTRICT.
6. THOROUGHLY FLUSH THE LINE, PRIOR TO THE INSTALLATION OF THE DCVA.
7. PROTECT DEVICE FROM FREEZING BY INSTALLING IN STRUCTURE OR PER "HOT BOX" SHOWN IN REDUCED PRESSURE BACKFLOW DEVICE DETAIL.

KING COUNTY WATER DISTRICT No. 54

"INDIVIDUAL" DOUBLE CHECK ASSEMBLY

APPROVED: BY DISTRICT DATE			DWG. NO. DBL–CHCK
DATE: 12/2010	DRWN: J.S.M.	CHKD: W.W.P.	SCALE: NONE

ATTACHMENT A



NO.	DESCRIPTION
1	STATE APPROVED DOUBLE CHECK DETECTOR ASSEMBLY (DCDA) BACKFLOW PREVENTION ASSEMBLY WITH O.S.&Y. R.W. GATE VALVE
2	ROMAC STYLE 'FCA 501' FLANGED COUPLING ADAPTER
3	5/8" x 3/4" SENSUS CUBIC FEET READING METER COMPLETE WITH SPUD NUT
4	LOCATE CENTER OF VALVE 15" FROM CENTER OF VAULT TO ALLOW STEMS TO EXTEND INTO ACCESS OPENING WHEN APPLICABLE
5	3/4" SHUTOFF VALVE; BRASS GATE VALVE
6	STATE APPROVED 3/4" DOUBLE CHECK VALVE ASSEMBLY (DCVA)
7	BRASS OR TYPE K COPPER, DETECTOR CHECK PIPING (BY PASS LINE)
8	2 EA. GALVANIZED ADJUSTABLE STANCHIONS (LOCATE AT ENDS OF DOUBLE CHECK ASSEMBLY)
9	GALVANIZED STEEL LADDER, LOCATE AS DIRECTED BY DISTRICT, SECURE TO VAULT.
10	PIPE SPOOL, CL. 52 D.I., PLAIN END
11	"UTILITY VAULT" OR APPROVED EQUAL WITH 4" BRICK AND ADJUSTABLE COVER; ACCESS HATCHES: TWO #332P, EXCEPT 3 HATCHES FOR 10" DCDA 4" DCDC, USE 575LA + 57AT (4'-2" x 6'-6" x 4'-0" INSIDE 6" DCDC, 4484 LA + 57AT (4'-4" x 8'-4" x 6'-2" INSIDE 6" DCDC, 5106 LA + 57AT (5'-0" x 10'-6" x 4'-4" INSIDE 8" DCDC, 5106 LA + 57 AT (5'-0" x 10'-6" x 6'-2" OR 4'-4" INSIDE 10" DCDC, 5106 LA + 5106 AT (3HATCH) (5'-0" x 10'-6" x 6'-2" OR 4'-4")
12	6" PVC DRAIN, DISCHARGE TO DAYLIGHT OR TO CATCH BASIN. MINIMUM SLOPE 1% UNLESS OTHERWISE APPROVED. ADD SCREENS AT BOTH ENDS.
13	WATERTIGHT GROUT, INLET AND OUTLET PIPE, DRAIN PIPE AND BRICK ACCESS OPENING

NOTE:

AFTER PRESSURE TEST AND PURITY SAMPLES ARE RECIEVED, A CERTIFED BACKFLOW TECHNICIAN SHALL SUPPLY DISTRICT WITH A WRITTEN TEST REPORT ON EACH BACKFLOW ASSEMBLY.

KING COUNTY WATER DISTRICT No. 54

DOUBLE-CHECK DETECTOR BACKFLOW PREVENTION ASSEMBLY

KCWD 54

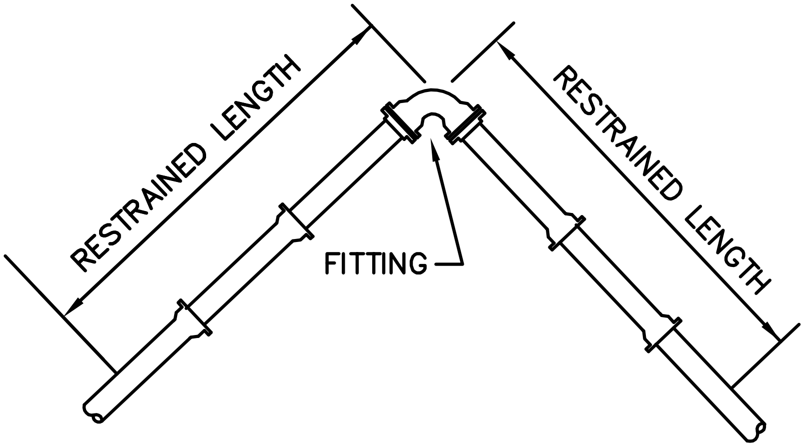
APPROVED:

BY DISTRICT DATE

DWG. NO.
DCD-BPA

DATE:	DRWN:	CHKD:	SCALE:
12/2010	J.S.M.	W.W.P.	NONE

ATTACHMENT A



PIPE SIZE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	TEE OR DEAD END CAP
	RESTRAINED LENGTH IN FEET				
4”	40	17	8	4	30
6”	55	23	11	6	39
8”	73	31	15	8	53
10”	88	37	18	9	67
12”	103	43	21	10	82
16”	133	55	27	13	110
18”	145	60	29	15	124

NOTES:

① RESTRAINED LENGTHS SHOWN ARE MINIMUM AND FOR LINEAL FEET REQUIRED ON EACH SIDE OF FITTING INDICATED.

② FOOTAGES ARE BASED ON 250 PSI PRESSURE AND 42 INCHES COVER. IF PRESSURE IS GREATER OR COVER IS LESS, THE RESTRAINED LENGTH SHALL BE INCREASED ACCORDINGLY

KING COUNTY WATER DISTRICT No. 54

THRUST RESTRAINT FOR
DUCTILE IRON PIPE

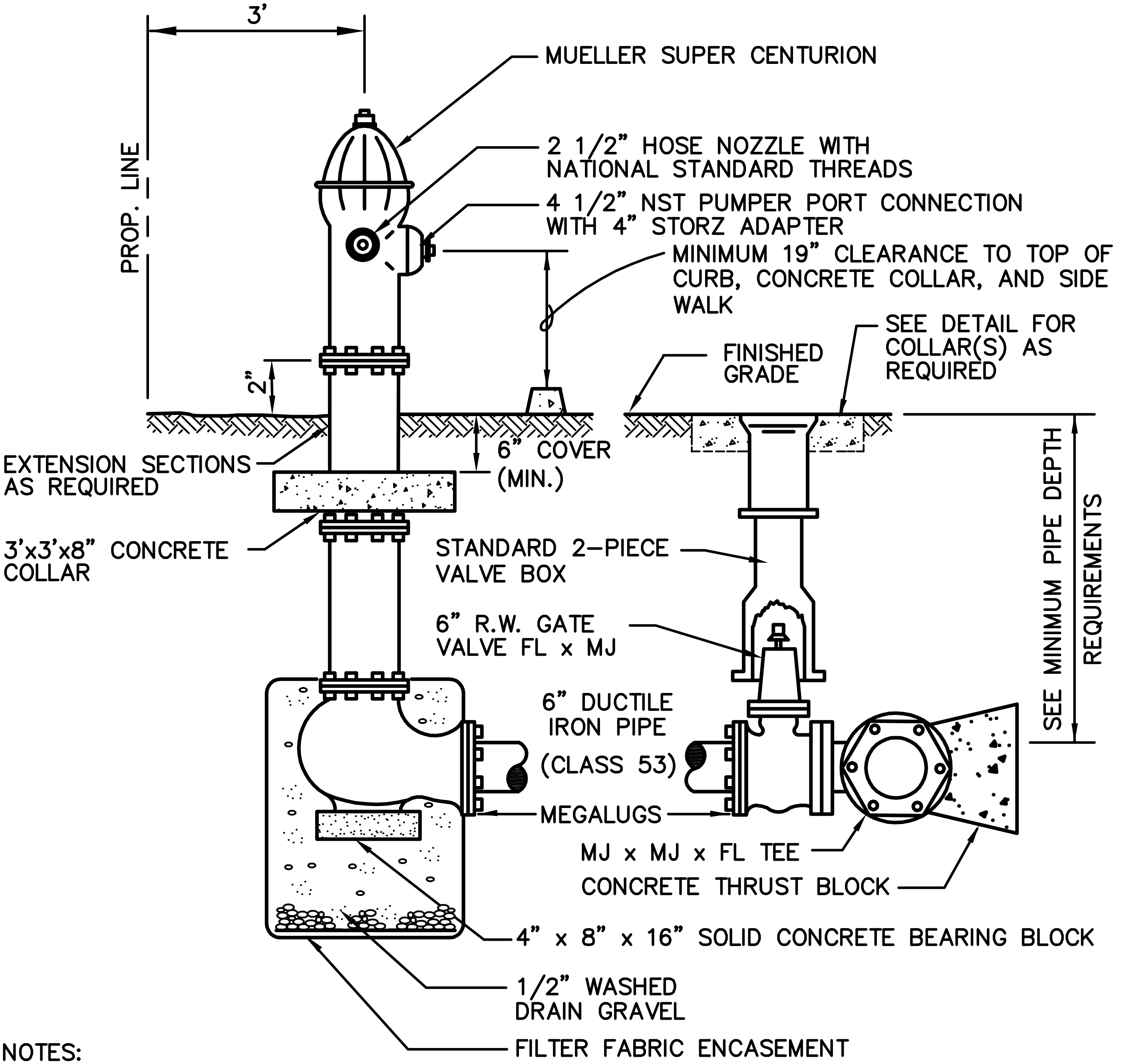
APPROVED:

BY DISTRICT DATE

DWG. NO.
DUCT–PIP

DATE: 12/2010
DRWN: J.S.M.
CHKD: W.W.P.
SCALE: NONE

ATTACHMENT A



NOTES:

1. FIRE HYDRANTS TO BE PAINTED AS FOLLOWS:
   A. RUSTOLEUM RED
2. INSTALL BLUE LANE REFLECTOR IN PAVEMENT.
3. STANDARD 4 1/2" NST PUMPER PORT CAP SUPPLIED WITH HYDRANT SHALL BE SALVAGED FOR DISTRICT USE.
4. HYDRANTS SHALL BE MUELLER SUPER CENTURION.

KING COUNTY WATER DISTRICT No. 54

FIRE HYDRANT INSTALLATION
(EXTRUDED CURB)

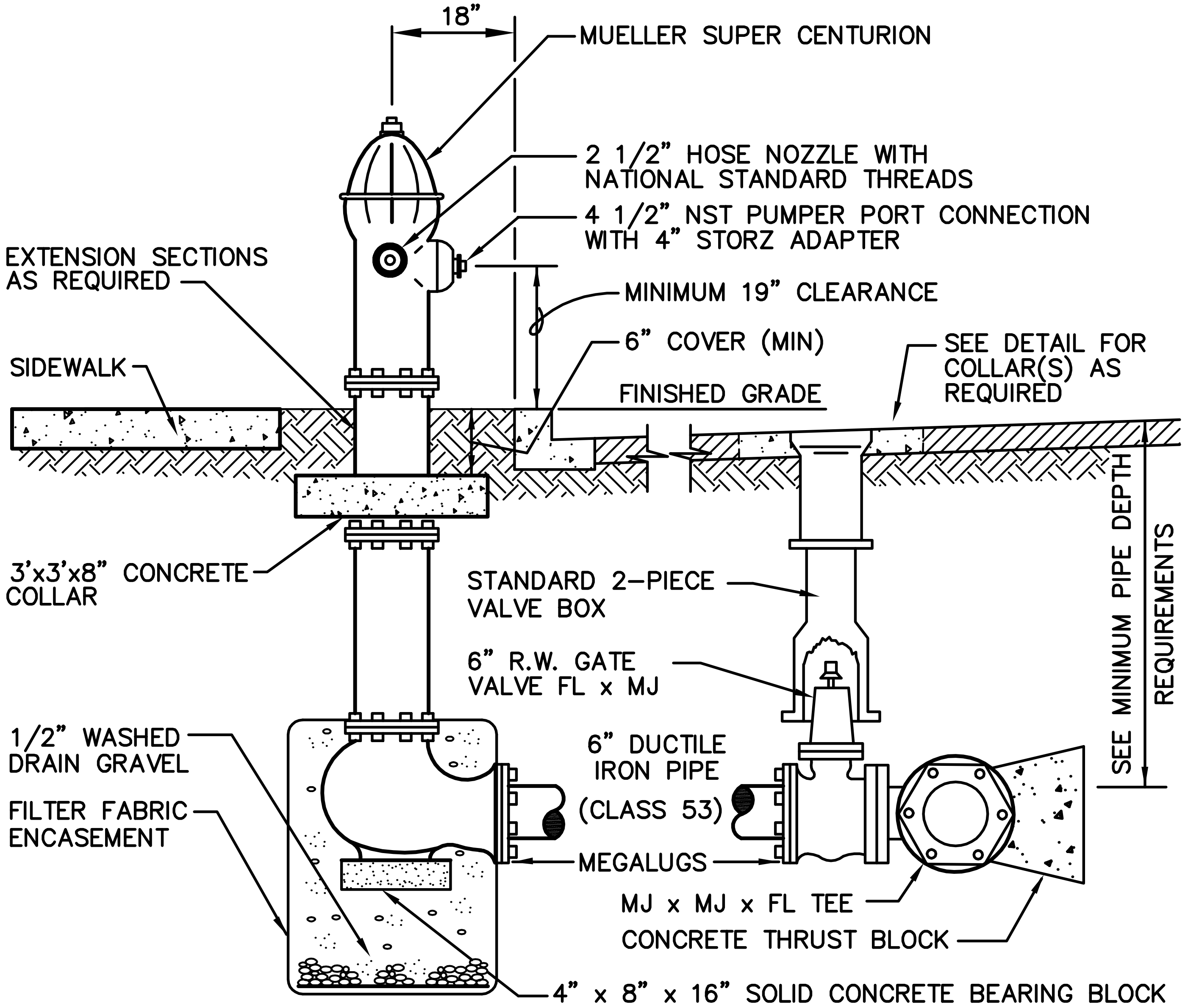
APPROVED:

BY DISTRICT DATE

DWG. NO.
FIRE-HYD

DATE: 12/2010	DRWN: J.S.M.	CHKD: W.W.P.	SCALE: NONE

ATTACHMENT A



NOTES:

1. FIRE HYDRANTS TO BE PAINTED AS FOLLOWS:
   A. RUSTOLEUM RED
2. INSTALL BLUE LANE REFLECTOR IN PAVEMENT.
3. STANDARD 4 1/2" NST PUMPER PORT CAP SUPPLIED WITH HYDRANT SHALL BE SALVAGED FOR DISTRICT USE.
4. HYDRANTS SHALL BE MUELLER SUPER CENTURION.

KING COUNTY WATER DISTRICT No. 54

FIRE HYDRANT INSTALLATION
(CURB, GUTTER, SIDEWALK)

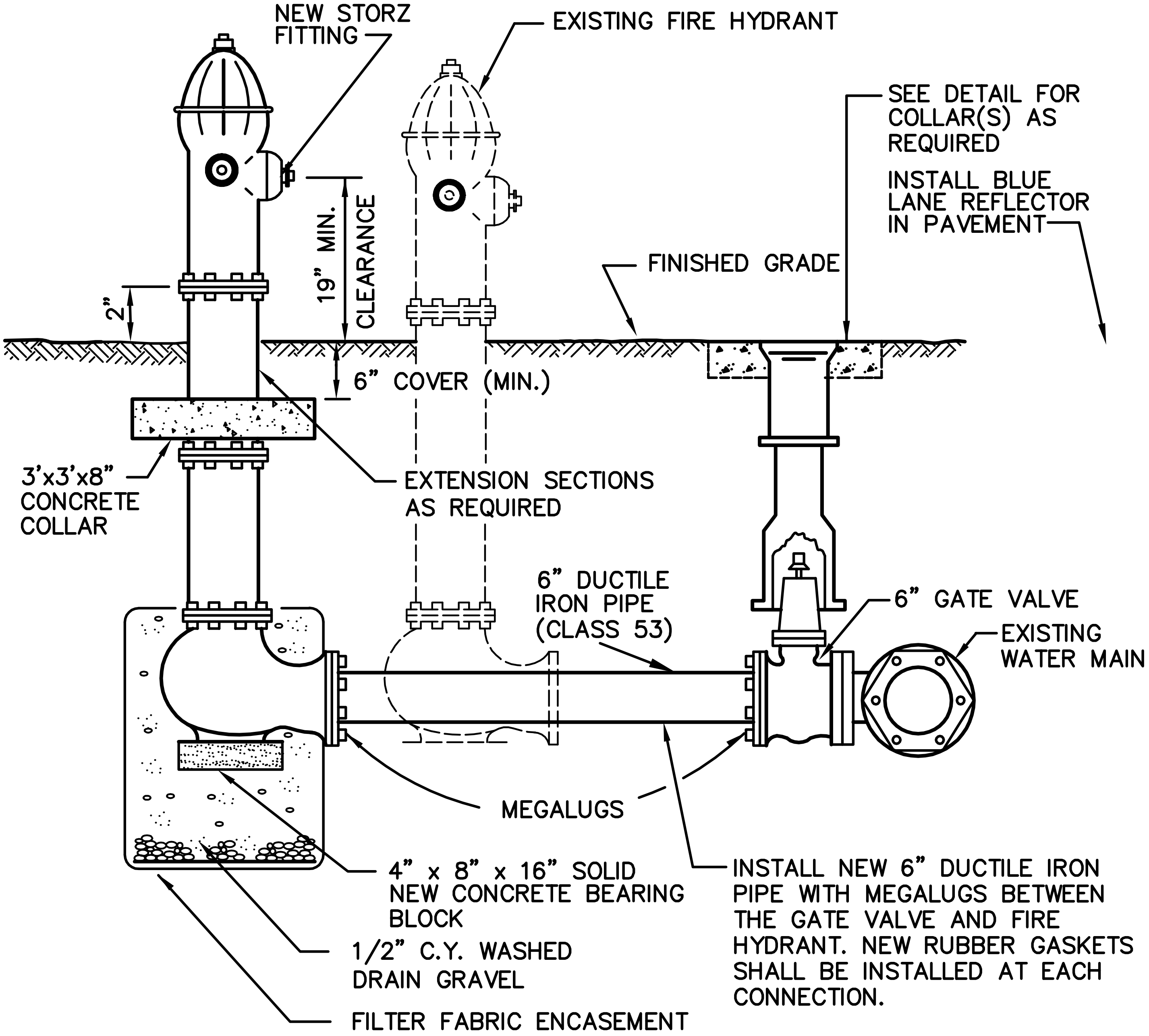
APPROVED:

BY DISTRICT DATE

DWG. NO.
FIRE-HYD2

DATE:	DRWN:	CHKD:	SCALE:
12/2010	J.S.M.	W.W.P.	NONE

ATTACHMENT A



NOTES:

1. ALL RELOCATED FIRE HYDRANTS SHALL HAVE 4 1/2" PUMPER PORTS WITH STORZ ADAPTOR.
2. PROVIDE MIN. 3' – 0" CLEARANCE AND LEVEL AREA AROUND RELOCATED HYDRANT.
3. REPAINT FIRE HYDRANTS: RUSTOLEUM RED

KING COUNTY WATER DISTRICT No. 54

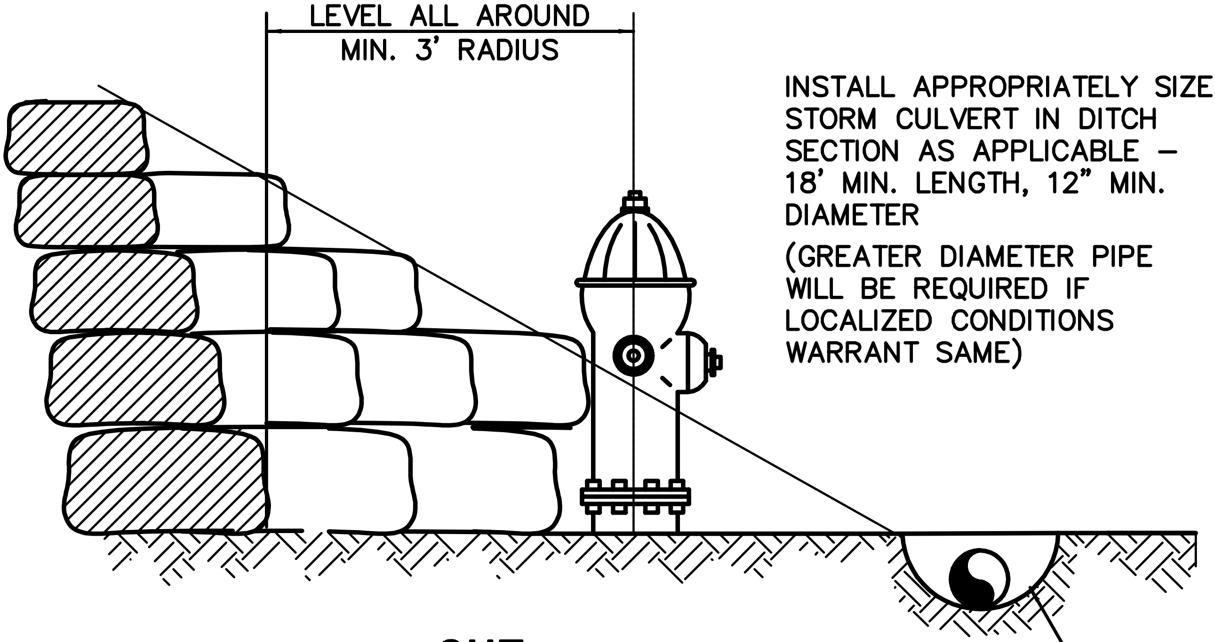
FIRE HYDRANT RELOCATION

APPROVED:

BY DISTRICT DATE

DWG. NO.
FIRE–HYD3

DATE:	DRWN:	CHKD:	SCALE:
12/2010	J.S.M.	W.W.P.	NONE



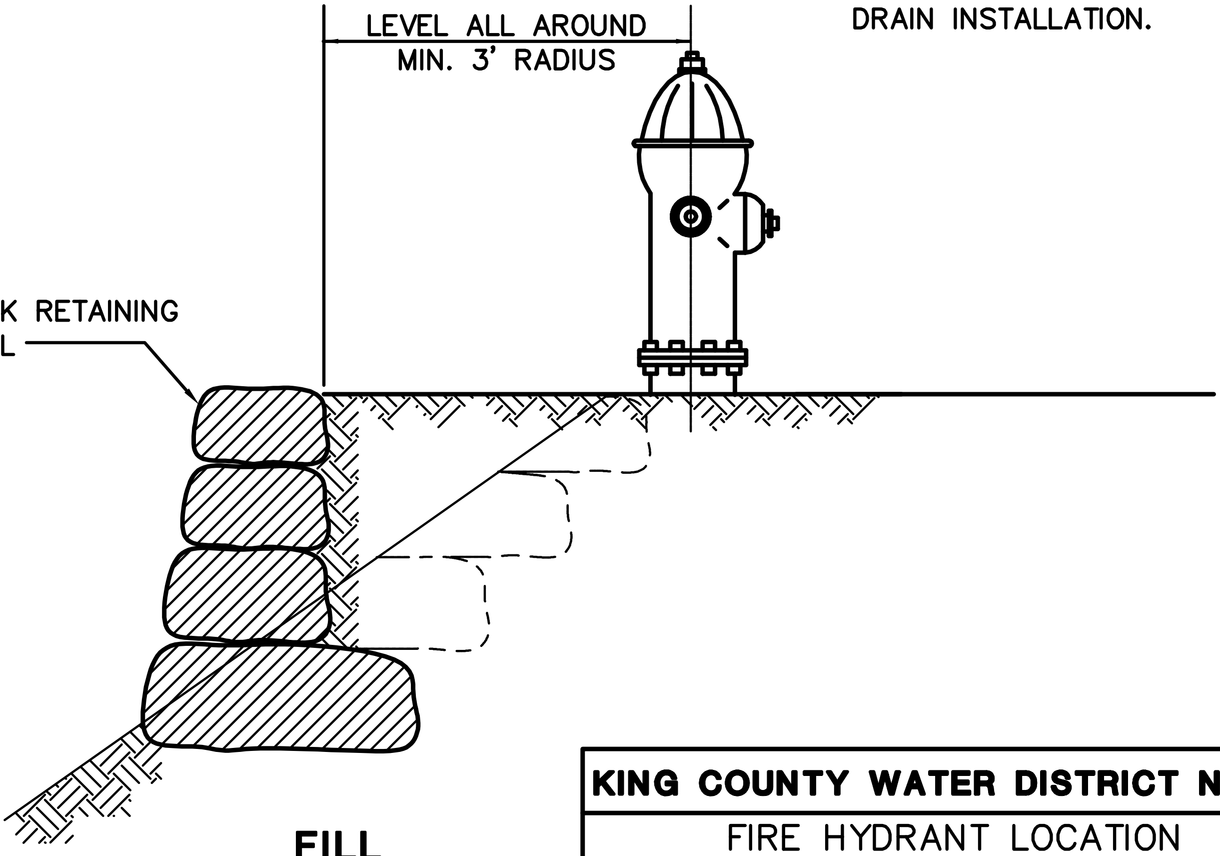
LEVEL ALL AROUND
MIN. 3' RADIUS

INSTALL APPROPRIATELY SIZED STORM CULVERT IN DITCH SECTION AS APPLICABLE – 18' MIN. LENGTH, 12" MIN. DIAMETER

(GREATER DIAMETER PIPE WILL BE REQUIRED IF LOCALIZED CONDITIONS WARRANT SAME)

REFER TO CITY STANDARDS FOR STORM DRAIN INSTALLATION.

CUT



LEVEL ALL AROUND
MIN. 3' RADIUS

ROCK RETAINING WALL

FILL

KING COUNTY WATER DISTRICT No. 54

FIRE HYDRANT LOCATION
IN CUT OR FILL

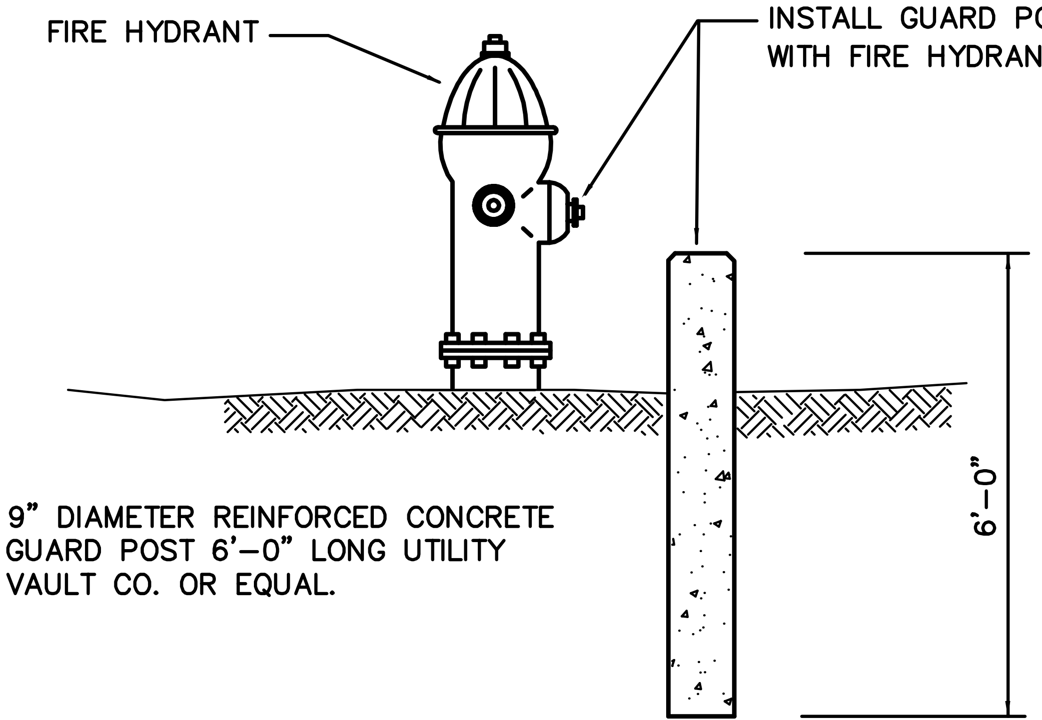
APPROVED:

BY DISTRICT DATE

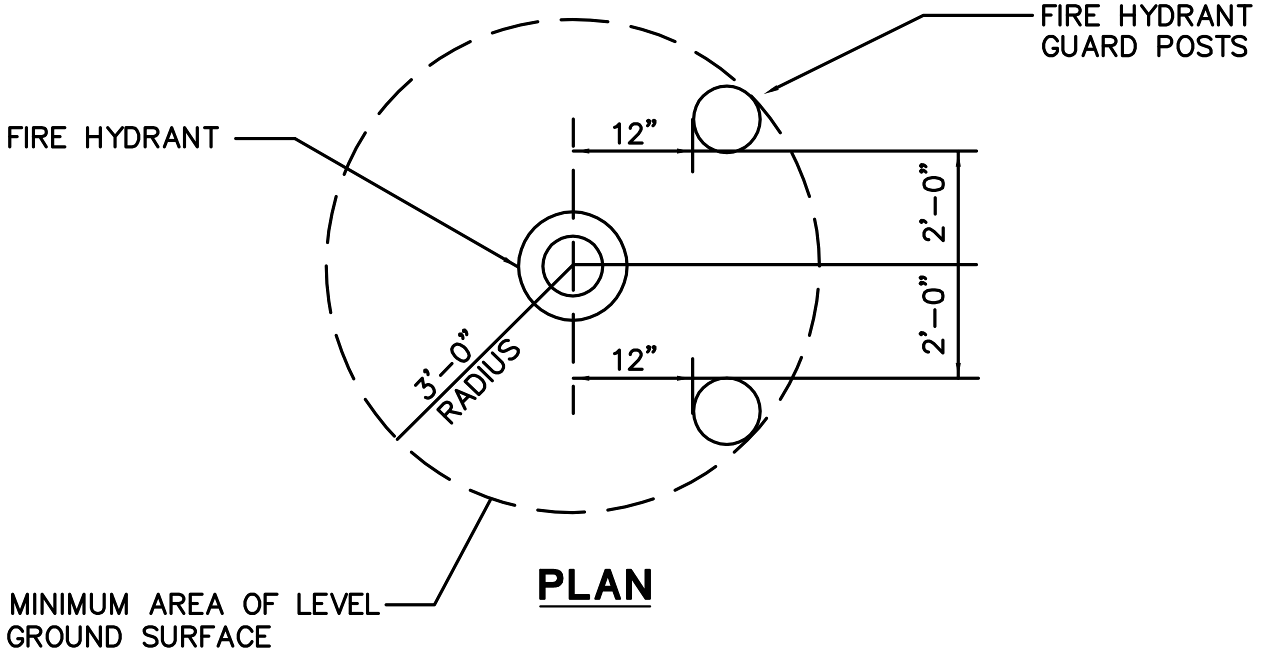
DWG. NO.
FIRE–HYD4

DATE:	DRWN:	CHKD:	SCALE:
12/2010	J.S.M.	W.W.P.	NONE

ATTACHMENT A



ELEVATION



PLAN

KING COUNTY WATER DISTRICT No. 54

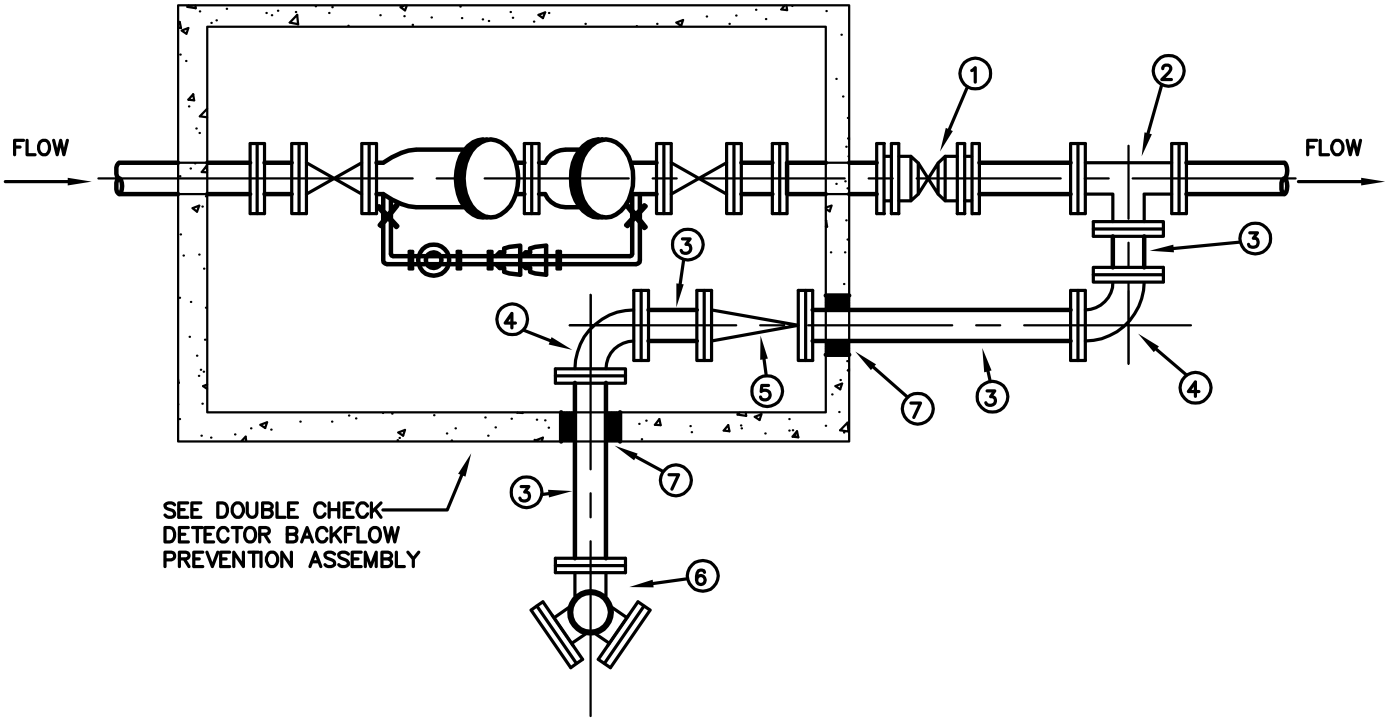
FIRE HYDRANT GUARD POST INSTALLATION

APPROVED:

BY DISTRICT DATE

DWG. NO.
FIRE–HYD5

DATE: 12/2010	DRWN: J.S.M.	CHKD: W.W.P.	SCALE: NONE



NO.	DESCRIPTION
1	POST INDICATOR VALVE, MJ WITH MEGALUGS
2	4" TEE, MJ WITH MEGALUGS
3	4" DUCTILE IRON PIPE, CLASS 52
4	4" x 90° BENDS, MJ WITH MEGALUGS
5	4" FLAPPER CHECK VALVE, MJ WITH MEGALUGS
6	FIRE DEPARTMENT CONNECTION, MJ WITH MEGALUGS. CONNECTION TO COMPLY WITH FIRE DEPARTMENT REQUIREMNETS.
7	WATERTIGHT GROUT

KING COUNTY WATER DISTRICT No. 54

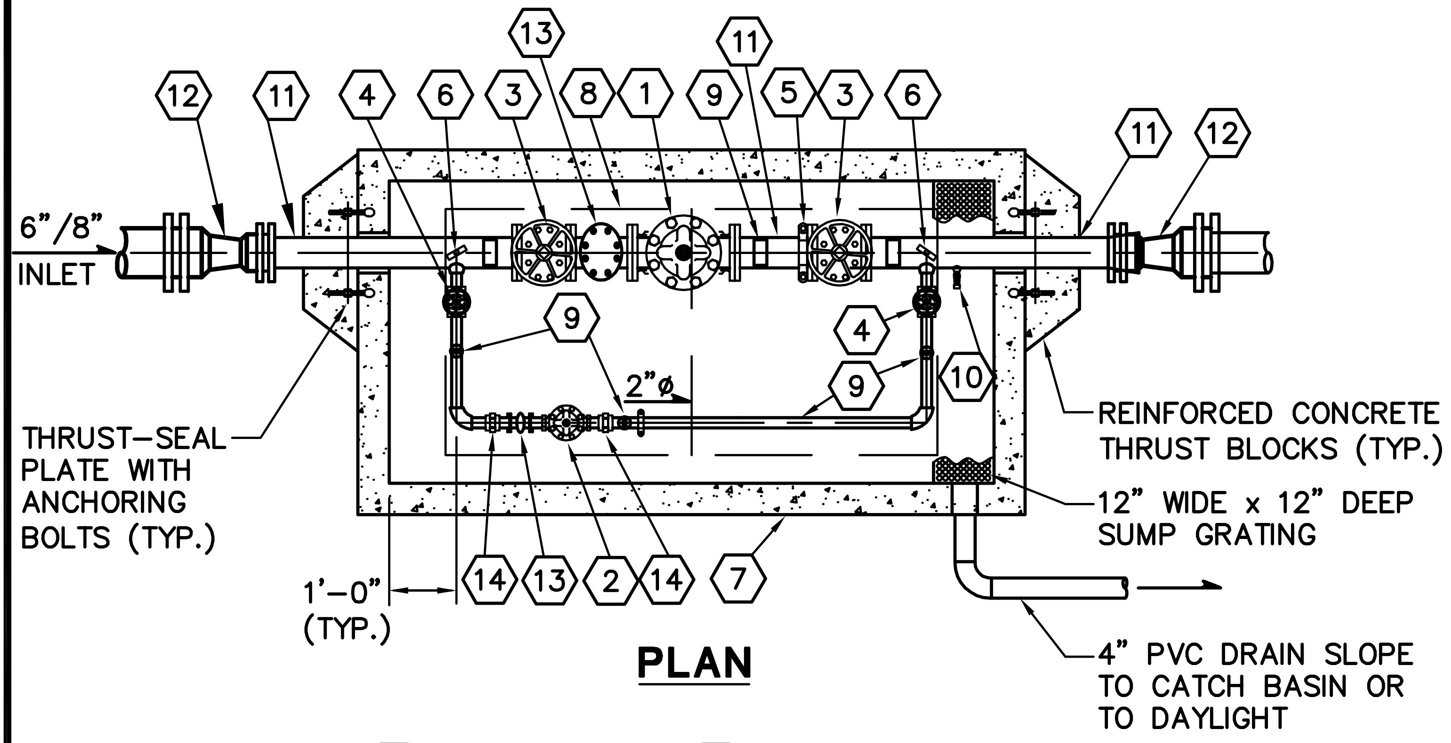
FIRE LINE CONNECTION

APPROVED:

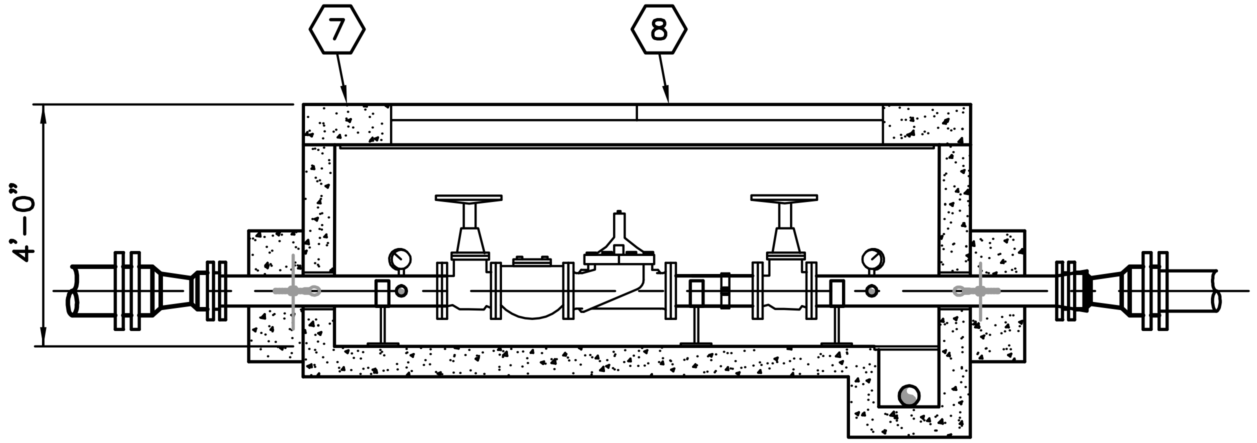
BY DISTRICT DATE

DWG. NO.
FIRELINE

DATE:	DRWN:	CHKD:	SCALE:
12/2010	J.S.M.	W.W.P.	NONE



PLAN



SECTION

NOTE:

ALTERNATE TO FIELD ASSEMBLED PRV AND VAULT
IS SYSTEM AS MANUFACTURED BY GC SYSTEMS.

SEE PAGE 2 FOR CALLOUTS AND NOTES

KING COUNTY WATER DISTRICT No. 54

PRESSURE REDUCING STATION
(1 of 2)

APPROVED:

BY DISTRICT DATE

DWG. NO.
PRSD

DATE:	DRWN:	CHKD:	SCALE:
12/2010	J.S.M.	W.W.P.	NONE

PRESSURE REDUCING STATION

(TO BE SIZED BY DISTRICT)

LEGEND - SEE PAGE 1 FOR PLAN AND SECTION

1 6” CLA-VAL 92G-01BCSY PRESSURE REDUCING VALVE WITH X101 POSITION INDICATOR DI BODY, S.S. TRIM, #150 FL.

2 2” CLA-VAL 90G-01BC PRESSURE REDUCING VALVE WITH X101 POSITION INDICATOR DI BODY, BRONZE TRIM – THREADED.

3 6” D.I. RW NRS GATE VALVE WITH HANDWHEEL, #150 FL.

4 2” MUELLER A2360-6W41 W55 RW NRS GATE VALVE WITH HANDWHEEL, THD.

5 UNIFLANGE

6 4” 0-300 PSI PRESSURE GAUGE WITH SNUBBER AND GAUGE COCK; TOP OF PIPE.

7 PRECAST CONCRETE VAULT 10’L x 5’W x 3’-7”H INSIDE, SOLID WALL WITH WHITE INTERIOR & BLACK EXTERIOR SEALANT

8 48” X 96” DOUBLE DOOR ALUMINUM HATCH, LW PRODUCTS OR EQUAL. H-20 RATED. DRAIN HATCH TO VAULT FLOOR.

9 ADJUSTABLE PIPE SUPPORTS

10 3/4” HOSE BIB ASSEMBLY

11 PIPE SPOOL (FLxPE) LENGTH AS REQUIRED.

12 REDUCER (AS REQUIRED), MJ WITH MEGA-LUGS

13 WATER METER STRAINER, INVENSYS OR EQUAL, FL

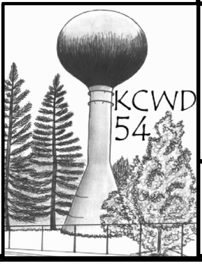
14 UNIONS

NOTES:

1. 6” x 2” PRV ASSEMBLY SHOWN. SIZES TO BE DETERMINED BY THE CITY BASED ON DOWNSTREAM DEMANDS.
2. ALL 3” AND LARGER PIPE INSIDE WETTED SURFACES TO BE SANDBLASTED, EPOXY LINED AND COATED TO AWWA C210 AND NSF-61 SPECIFICATION. EXTERIOR COATING SHALL BE BLUE ENAMEL.
3. ALL PIPE 2” AND SMALLER TO BE BRASS.

KING COUNTY WATER DISTRICT No. 54

PRESSURE REDUCING STATION
(2 of 2)



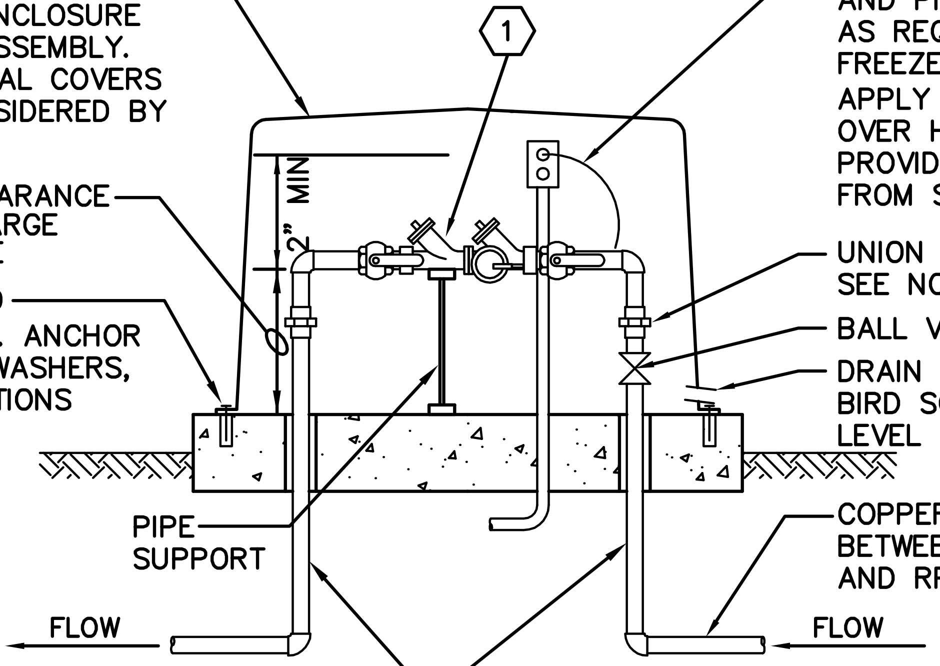
APPROVED:

BY DISTRICT DATE

DWG. NO.
PRSD

DATE:	DRWN:	CHKD:	SCALE:
12/2010	J.S.M.	W.W.P.	NONE

ATTACHMENT A



"HOT BOX" HB SERIES INSULATED ENCLOSURE SIZED FOR ASSEMBLY. ARCHITECTURAL COVERS WILL BE CONSIDERED BY DISTRICT.

12" MIN. CLEARANCE FROM DISCHARGE TO CONCRETE

BOLT TO PAD W/ 3/8" S.S. ANCHOR BOLTS AND WASHERS, MIN. 4 LOCATIONS

PIPE SUPPORT

PROVIDE HEAT TAPE AND PIPE INSULATION AS REQUIRED FOR FREEZE PROTECTION. APPLY 2" FIBERGLASS OVER HEAT TAPE. PROVIDE ELECTRICAL FROM SERVED FACILITY.

UNION (TYP. OF 2) SEE NOTE 5

BALL VALVE

DRAIN TO DAYLIGHT W/ BIRD SCREEN AT SLAB LEVEL

COPPER PIPE BETWEEN METER AND RPBA

COPPER PIPE FOR VERTICAL RISER. WHEN PASSING THROUGH CONCRETE, WRAP PIPE TO 2-INCHES EACH SIDE OF CONCRETE WITH DUCT TAPE PRIOR TO POURING CONCRETE BASE.

REDUCED PRESSURE BACKFLOW DEVICE

NOT TO SCALE

⟨1⟩ WASHINGTON STATE APPROVED REDUCED PRESSURE BACKFLOW ASSEMBLY (RPBA) WITH TEST COCK PROTECTION AND BRONZE BODY BALL VALVE AT EACH END.

NOTES:

1. CONCRETE TO BE 2500 PSI (MINIMUM) MIX WITH AIR ENTRAINMENT.
2. COMPLETE ALL WORK IN ACCORDANCE WITH STATE, DISTRICT AND MANUFACTURER STANDARDS.
3. SYSTEM SHALL NOT BE PUT INTO SERVICE UNTIL RPBA IS APPROVED BY THE DISTRICT AND TESTED/CERTIFIED BY A WASHINGTON STATE LICENSED TESTER.
4. RPBA IS CONSIDERED PART OF THE PRIVATE SYSTEM AND SHALL BE MAINTAINED BY THE PROPERTY OWNER WITH ANNUAL CERTIFICATION REQUIRED.
5. DIELECTRIC UNIONS SHALL BE USED TO SEPARATE DISSIMILAR MATERIALS.
6. NO BRANCH CONNECTIONS ALLOWED BETWEEN METER AND RPBA.

KING COUNTY WATER DISTRICT No. 54

REDUCED PRESSURE BACKFLOW
ASSEMBLY 3/4" TO 2"

KCWD
54

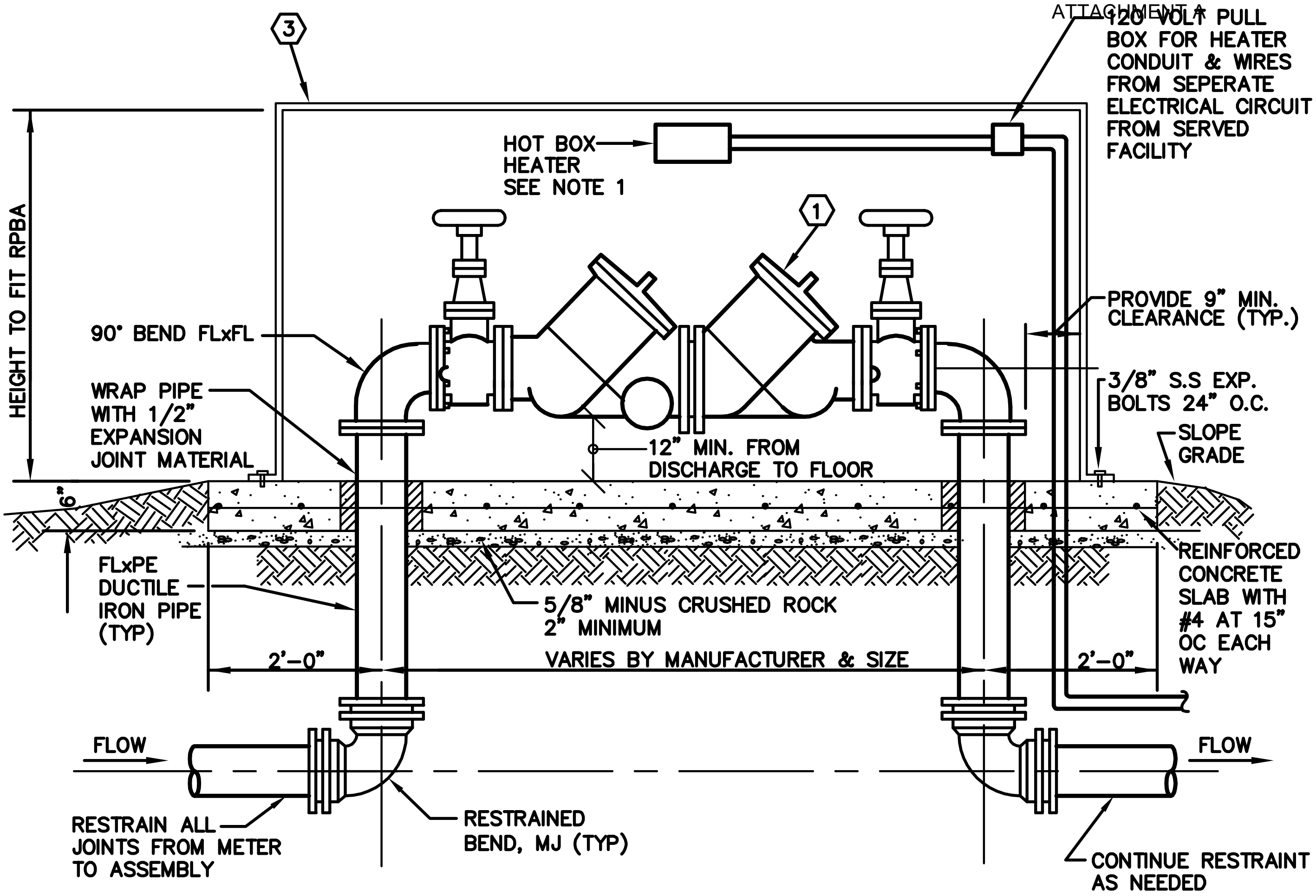
APPROVED:

BY DISTRICT DATE

DWG. NO.
RPBA

DATE: 12/2010	DRWN: J.S.M.	CHKD: W.W.P.	SCALE: NONE

ATTACHMENT A



① WASHINGTON STATE APPROVED REDUCED PRESSURE BACKFLOW ASSEMBLY (RPBA) WITH RESILIENT SEAT GATE VALVE EACH END

② NOT USED

③ ALUMINUM "HOT BOX" MODELS 4 THROUGH 10 FOR RESPECTIVE SIZE RPBA SHALL BE MODIFIED TO FIT ABOVE HEIGHT REQUIREMENTS. VALVE STEM SHALL NOT EXTEND OUTSIDE OF BOX.

NOTES:

1. "HOT BOX" TO BE LOCATED OUTDOORS AND ACCESSIBLE TO DISTRICT. ALTERNATE LOCATION REQUIRES DISTRICT APPROVAL.
2. HEATERS AND WIRING SHALL BE RATED AT 2,000 WATT FOR 8" AND UNDER: 3,000 WATT FOR 10".
3. CONCRETE TO BE 2500 PSI (MINIMUM) MIX WITH AIR ENTRAINMENT.
4. COMPLETE ALL WORK IN ACCORDANCE WITH STATE, DISTRICT AND MANUFACTURER STANDARDS.
5. SYSTEM SHALL NOT BE PUT INTO SERVICE UNTIL RPBA IS APPROVED BY THE DISTRICT AND TESTED/CERTIFIED BY A WASHINGTON STATE LICENSED TESTER.
6. RPBA IS CONSIDERED PART OF THE PRIVATE SYSTEM AND SHALL BE MAINTAINED BY THE PROPERTY OWNER WITH ANNUAL CERTIFICATION REQUIRED.
7. DRAIN TO DAYLIGHT WITH BIRD SCREEN LOCATED AT SLAB LEVEL (SIZED PER MANUFACTUERS RECOMMENDATION).
8. NO BRANCH CONNECTIONS ALLOWED BETWEEN METER AND RPBA.

KING COUNTY WATER DISTRICT No. 54

REDUCED PRESSURE BACKFLOW
ASSEMBLY 3" AND LARGER

KCWD
54

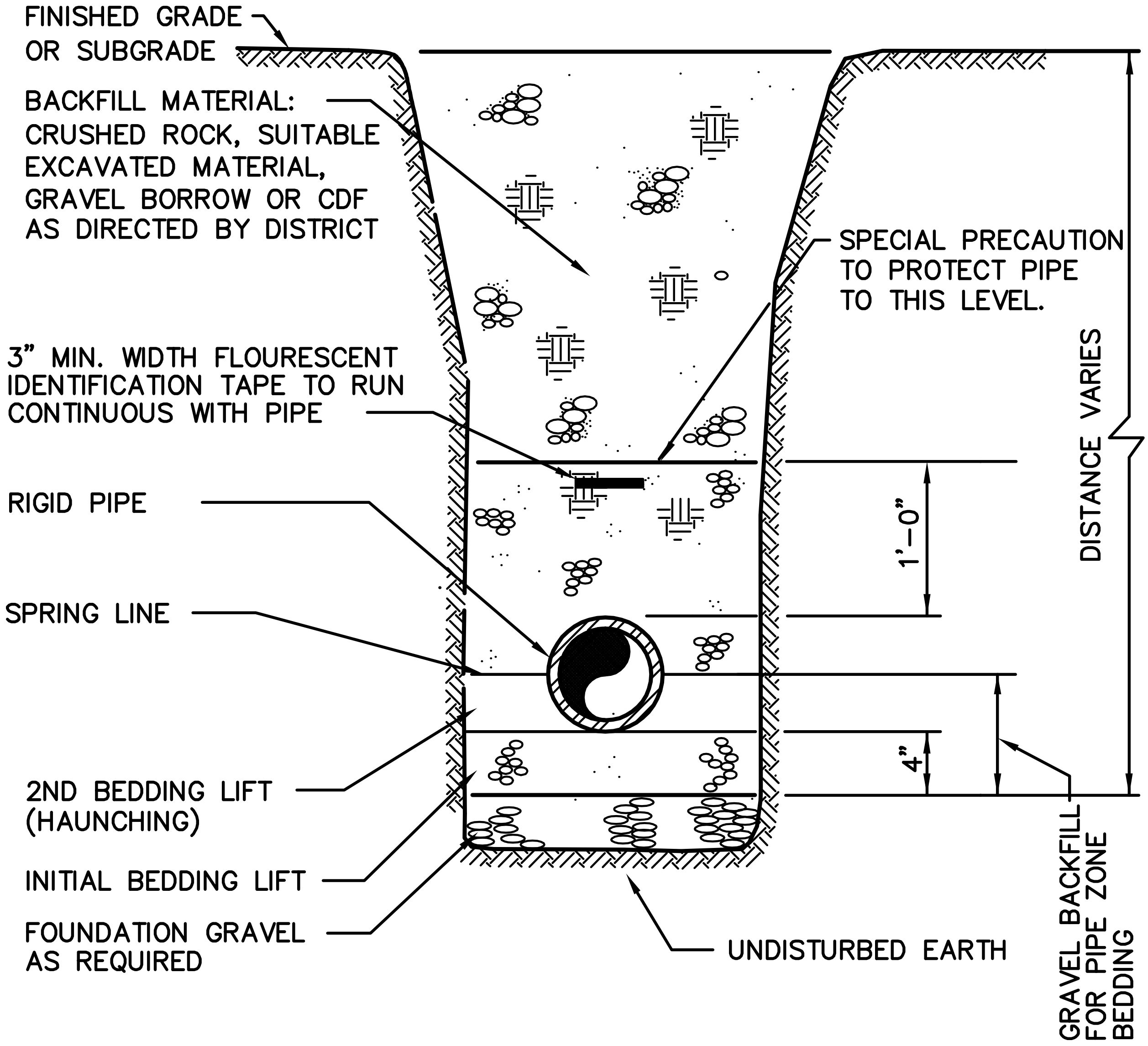
APPROVED:

BY DISTRICT DATE

DWG. NO.
RPBA-2

DATE:	DRWN:	CHKD:	SCALE:
12/2010	J.S.M.	W.W.P.	NONE

ATTACHMENT A



NOTE:

BACKFILL MATERIAL AND COMPACTION SHALL BE IN CONFORMANCE WITH DISTRICT STANDARDS AND/OR THE STATE PERMIT REQUIREMENTS (AS MAY BE APPLICABLE);

MINIMUM REQUIREMENTS:
ALL GRANULAR BACKFILL SHALL BE COMPACTED TO 95% MODIFIED PROCTOR, ASTM D1557

KING COUNTY WATER DISTRICT No. 54

TRENCH SECTION FOR RIGID PIPE

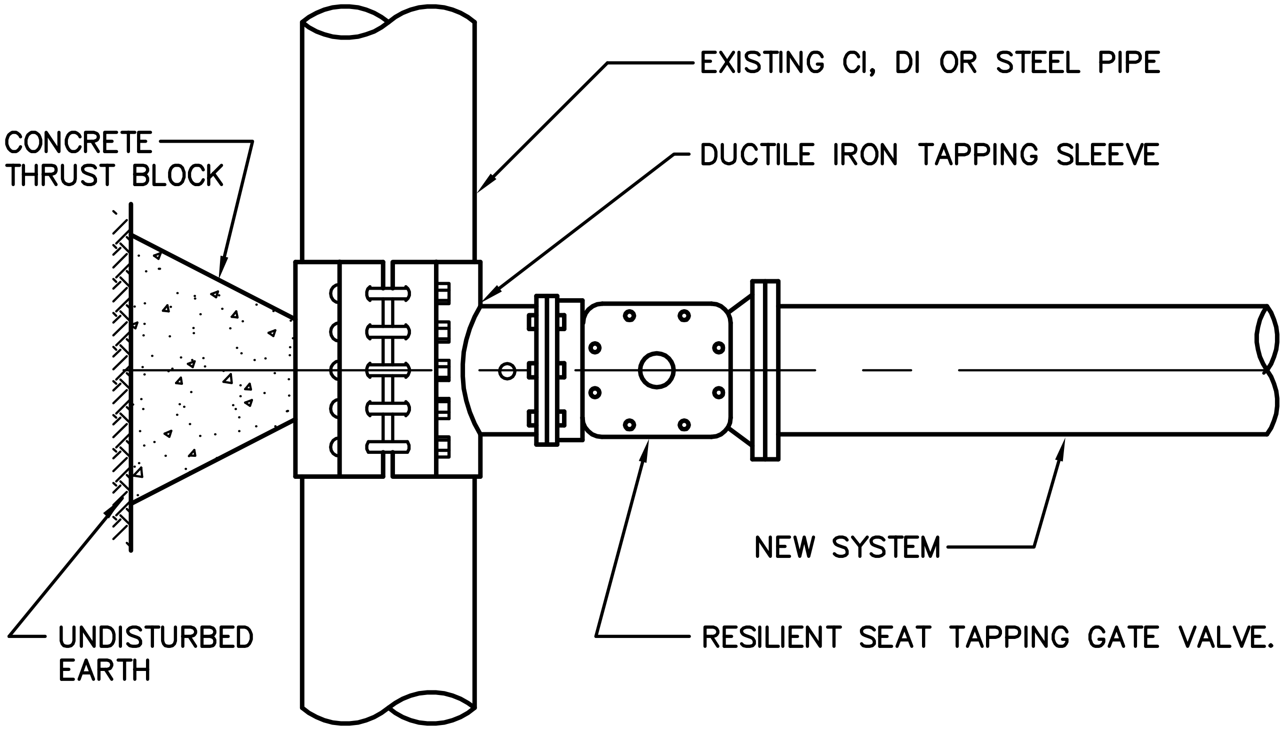
APPROVED:

BY DISTRICT DATE

DWG. NO.
SSTSRIGIDP

DATE: 12/2010	DRWN: J.S.M.	CHKD: W.W.P.	SCALE: NONE

ATTACHMENT A



KING COUNTY WATER DISTRICT No. 54

WET OR HOT TAP CONNECTION

APPROVED:

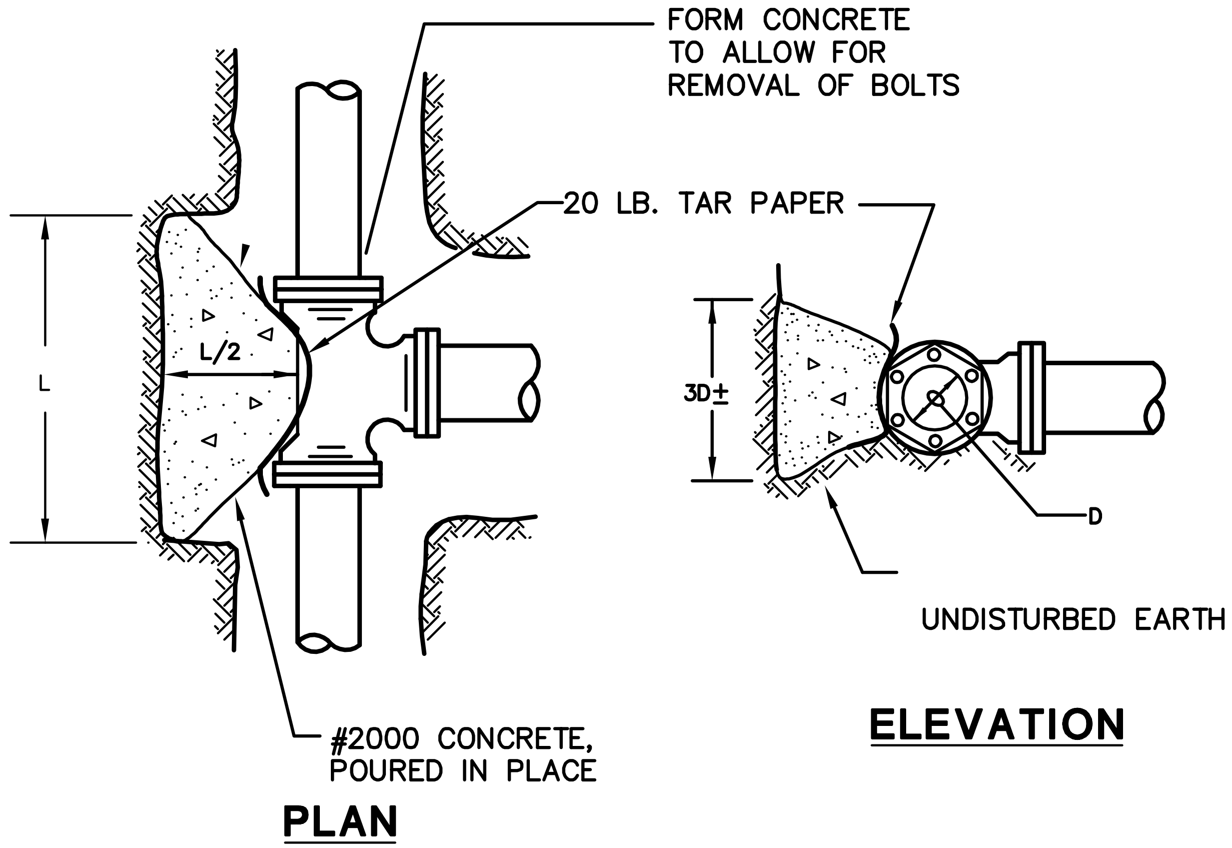
BY DISTRICT DATE

DWG. NO.
TAP-CONN

DATE: 12/2010	DRWN: J.S.M.	CHKD: W.W.P.	SCALE: NONE

ATTACHMENT A

MINIMUM BEARING AREA TABLE					
FITTING D	TEE	90°	45°	22 1/2°	11 1/4°
6"	4 SQ.FT.	6 SQ.FT.	3 SQ.FT.	2 SQ.FT.	2 SQ.FT.
8"	7 SQ.FT.	10 SQ.FT.	6 SQ.FT.	3 SQ.FT.	2 SQ.FT.
10"	10 SQ.FT.	15 SQ.FT.	9 SQ.FT.	5 SQ.FT.	3 SQ.FT.
12"	14 SQ.FT.	22 SQ.FT.	12 SQ.FT.	6 SQ.FT.	4 SQ.FT.
16"	25 SQ.FT.	38 SQ.FT.	21 SQ.FT.	11 SQ.FT.	7 SQ.FT.
18"	32 SQ.FT.	48 SQ.FT.	27 SQ.FT.	14 SQ.FT.	8 SQ.FT.



NOTE:

BEARING AREA TABLE BASED ON 250 PSI PRESSURE AND 2000 PSF SOIL BEARING. IF PRESSURE IS GREATER OR SOIL BEARING IS LESS, THE THRUST BLOCK SIZE SHALL BE INCREASED.

THIS TABLE REPRESENTS THE "MINIMUM" CONSTRUCTION STANDARDS. APPROPRIATELY SIZED THRUST BLOCKS BASED ON EXISTING AND LOCAL CONDITIONS ARE REQUIRED IF SOIL BEARING PRESSURE IS LESS THAN 2000 PSI OR PIPELINE PRESSURE EXCEEDS 250 PSI

KING COUNTY WATER DISTRICT No. 54

CONCRETE THRUST BLOCK

KCWD
54

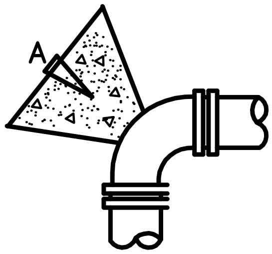
APPROVED:

BY DISTRICT DATE

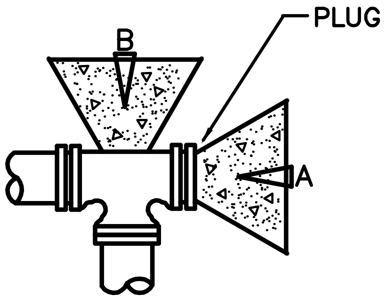
DWG. NO.
THR-BLO

DATE:	DRWN:	CHKD:	SCALE:
12/2010	J.S.M.	W.W.P.	NONE

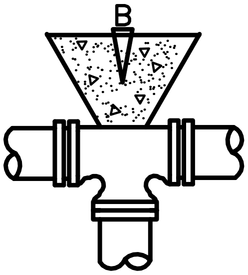
ATTACHMENT A



90° BEND



TEE



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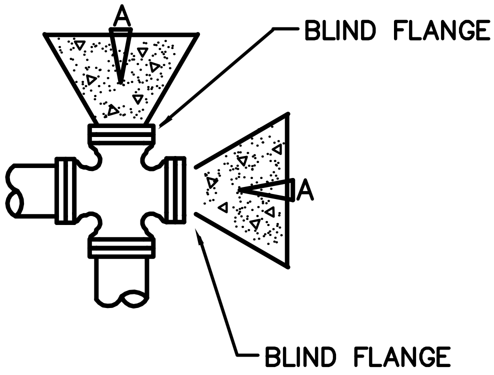
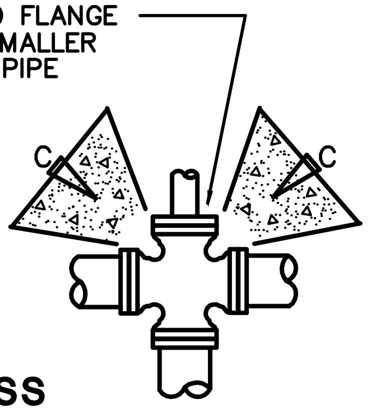
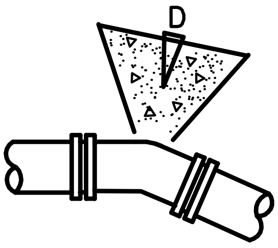


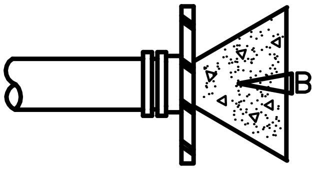
CAPPED CROSS



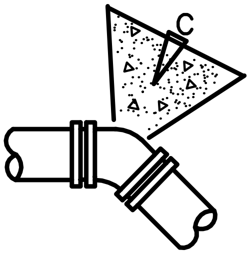
CROSS



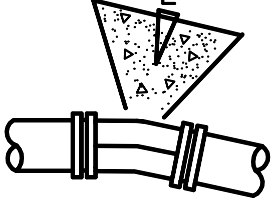
22 1/2° BEND



CAP



45° BEND



11 1/4° BEND

KING COUNTY WATER DISTRICT No. 54

THRUST BLOCK DETAIL (1 of 2)

APPROVED:

BY DISTRICT DATE

DWG. NO.
THRU-BL02

DATE: 12/2010	DRWN: J.S.M.	CHKD: W.W.P.	SCALE: NONE

ATTACHMENT A

THRUST BLOCK – TABLE
MIN. BEARING AREA AGAINST UNDISTURBED SOIL SQUARE FEET

PIPE SIZE	A(FT^2)	B(FT^2)	C(FT^2)	D(FT^2)	E(FT^2)	–
4"	3	1	1	1	1	–
6"	4	4	2	1	1	–
8"	7	6	4	2	1	–
10"	11	10	6	3	2	–
12'	16	14	9	5	3	–
14"	22	19	12	6	3	–
16"	29	25	16	8	4	–
18"	36	31	20	10	5	–
20"	45	39	24	13	6	–
22"	54	47	29	15	8	–
24"	64	56	35	18	9	–
28"	87	76	48	24	12	–
30"	101	87	55	28	14	–
36"	145	125	78	40	20	–
42"	197	171	107	55	27	–
48"	257	223	140	71	36	–

NOTES:

1. BEARING AREA OF CONCRETE THRUST–BLOCK BASED ON 200 PSI PRESSURE AND SAFE SOIL BEARING LOAD OF 2,000 POUNDS PER SQUARE FOOT.
2. AREAS MUST BE ADJUSTED FOR OTHER PIPE SIZES, PRESSURES AND SOIL CONDITIONS.
3. CONCRETE BLOCKING SHALL BE CAST IN PLACE AND HAVE A MINIMUM OF 1/4 SQUARE FOOT BEARING AGAINST THE FITTING. WRAP ALL FITTINGS IN 6 MIL PLASTIC PRIOR TO POURING BLOCK. NO CONCRETE SHALL BE PLACED NEAR BOLTS.
4. BLOCK SHALL BEAR AGAINST FITTINGS ONLY AND SHALL BE CLEAR OF JOINTS TO PERMIT TAKING UP OR DISMANTLING OF JOINT.
5. CONTRACTOR SHALL INSTALL BLOCKING ADEQUATE TO WITHSTAND FULL TEST PRESSURE AS WELL AS CONTINUOUSLY WITHSTAND OPERATING PRESSURE UNDER ALL CONDITIONS OF SERVICE.

KING COUNTY WATER DISTRICT No. 54

THRUST BLOCK DETAIL (2 of 2)

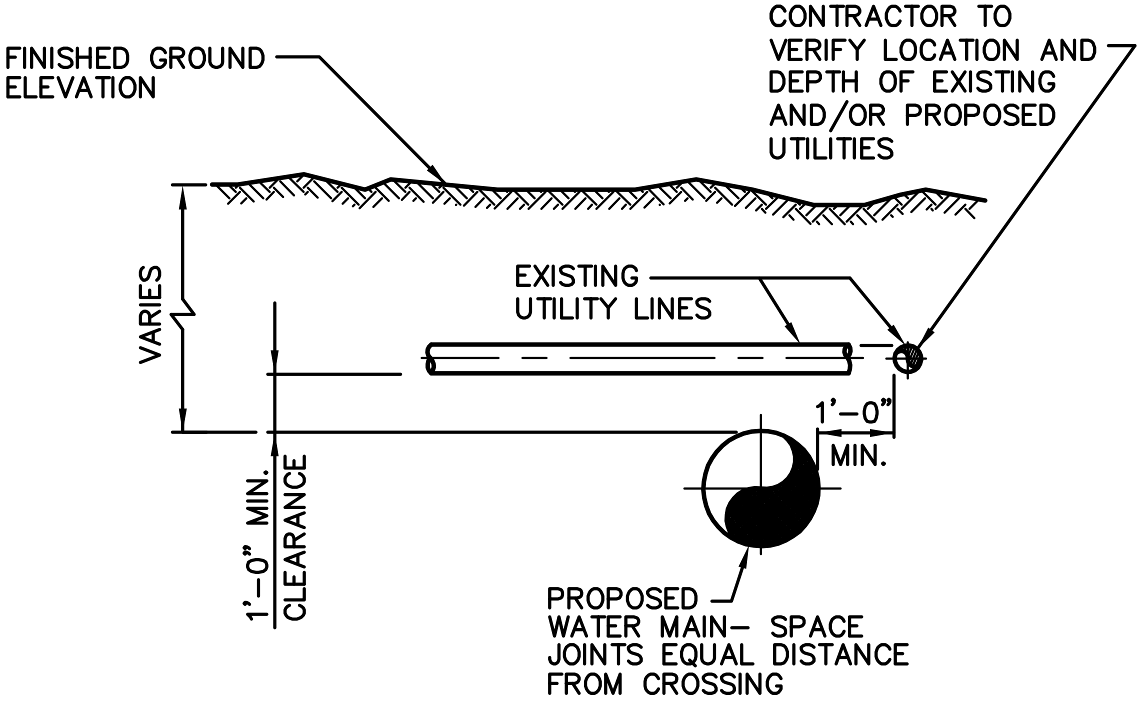
APPROVED:

BY DISTRICT DATE

DWG. NO.
THRU–BL02

DATE: 12/2010
DRWN: J.S.M.
CHKD: W.W.P.
SCALE: NONE

ATTACHMENT A



NOTE: CONCRETE ENCASEMENT (BEDDING) SHALL BE UTILIZED, IF APPROVED BY THE CITY, AT LOCALIZED UTILITY CROSSING IF MINIMUM PIPE SEPARATION (ELEVATION) CANNOT BE MAINTAINED / ACHIEVED.

KING COUNTY WATER DISTRICT No. 54

TYPICAL UTILITY CROSSING

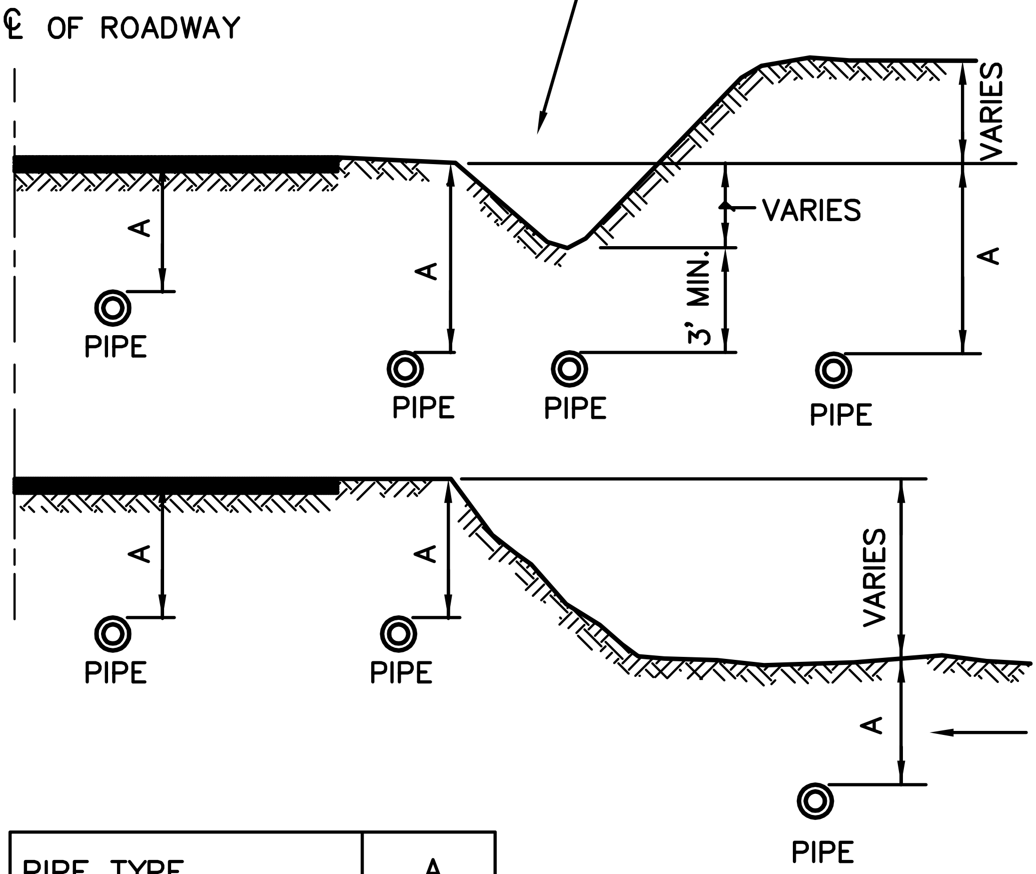
APPROVED:

BY DISTRICT DATE

DWG. NO.
TYP–UTIL

DATE: 12/2010	DRWN: J.S.M.	CHKD: W.W.P.	SCALE: NONE

ATTACHMENT A


FOR PIPE ALLOWED TO BE PLACED IN EXISTING DITCH SECTION, PIPE DEPTH WILL BE A MINIMUM OF 3' BELOW DITCH BOTTOM OR 3' BELOW ROAD WAY SHOULDER WHICHEVER IS GREATER

UNLESS SPECIFIED OTHERWISE BY CITY

PIPE TYPE	A
TRANSMISSION	42"
DISTRIBUITION	36"

* MINIMUM DEPTH

KING COUNTY WATER DISTRICT No. 54

WATER MAIN DEPTH REQUIREMENTS

KCWD 54

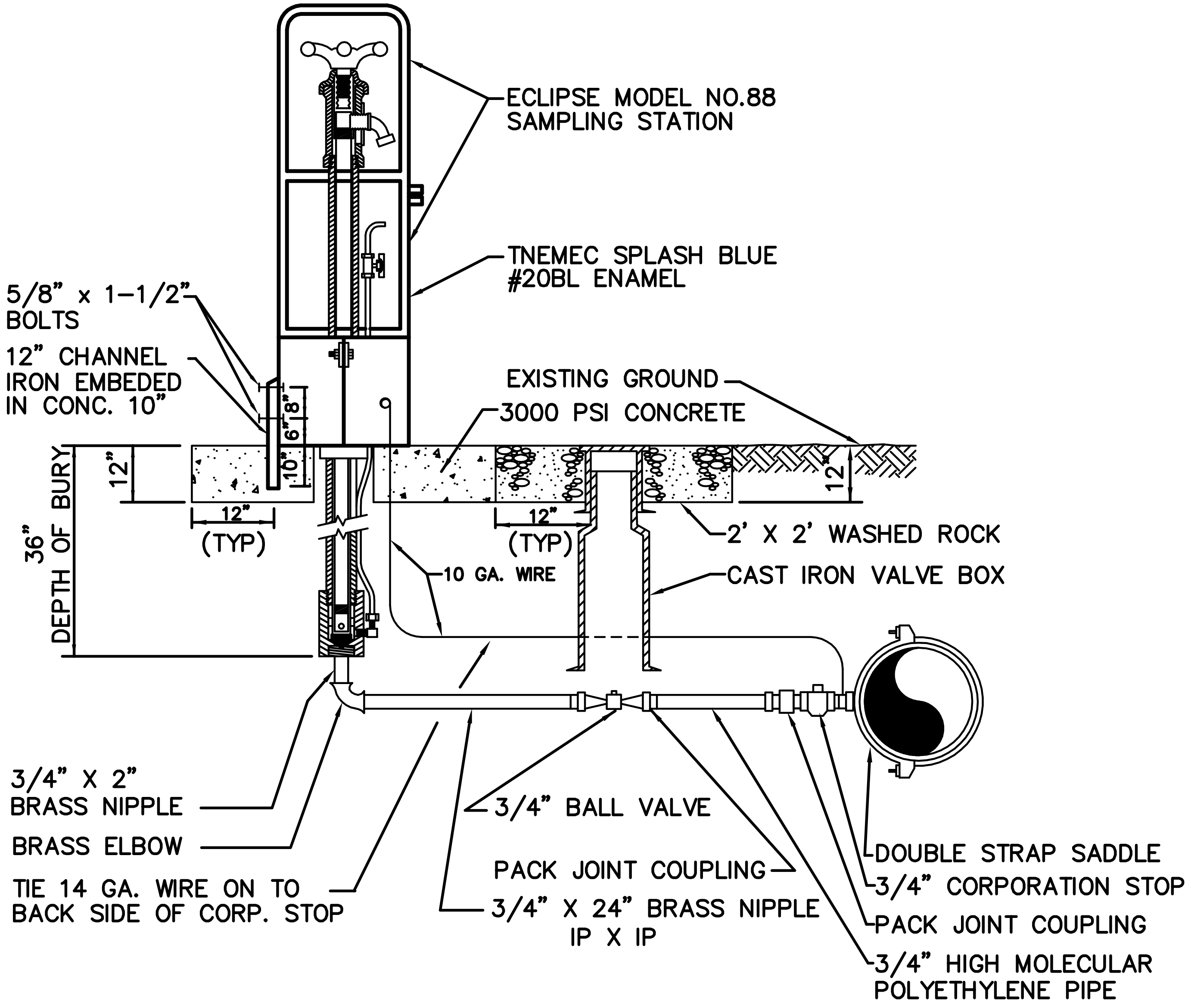
APPROVED:

BY DISTRICT DATE

DWG. NO.
WA–MAIN

DATE:	DRWN:	CHKD:	SCALE:
12/2010	J.S.M.	W.W.P.	NONE

ATTACHMENT A



KING COUNTY WATER DISTRICT No. 54

WATER SAMPLING STATION

KCWD
54

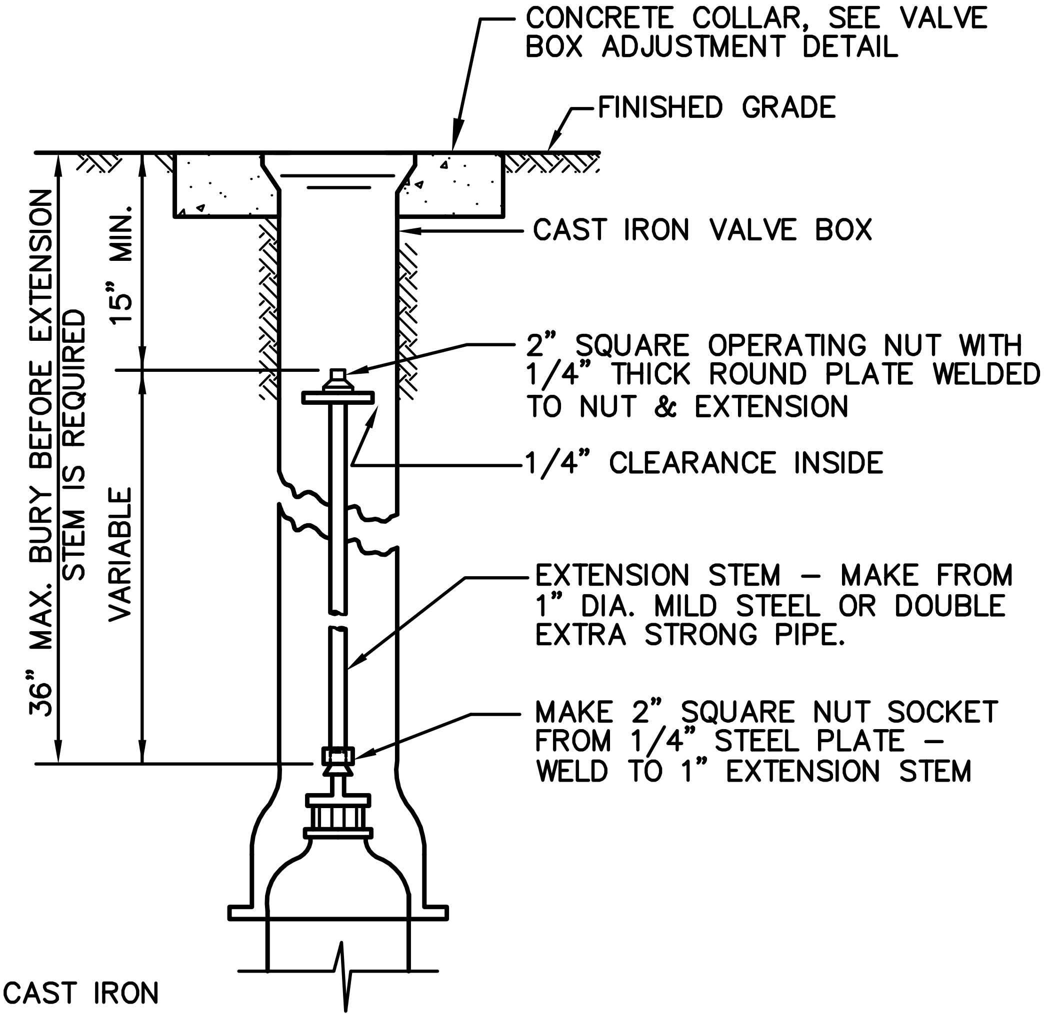
APPROVED:

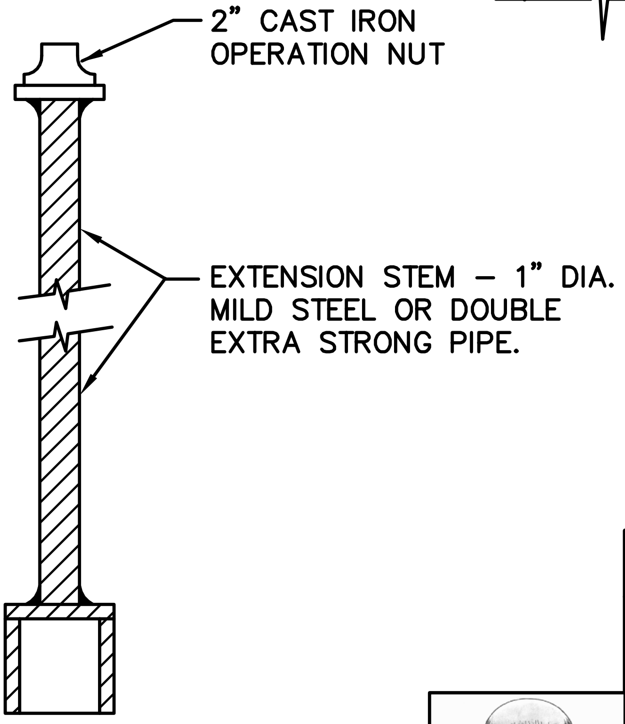
BY DISTRICT DATE

DWG. NO.
WAT-SAMP

DATE: 12/2010	DRWN: J.S.M.	CHKD: W.W.P.	SCALE: NONE

ATTACHMENT A





KING COUNTY WATER DISTRICT No. 54

WATER VALVE STEM EXTENSION

APPROVED:

BY DISTRICT DATE

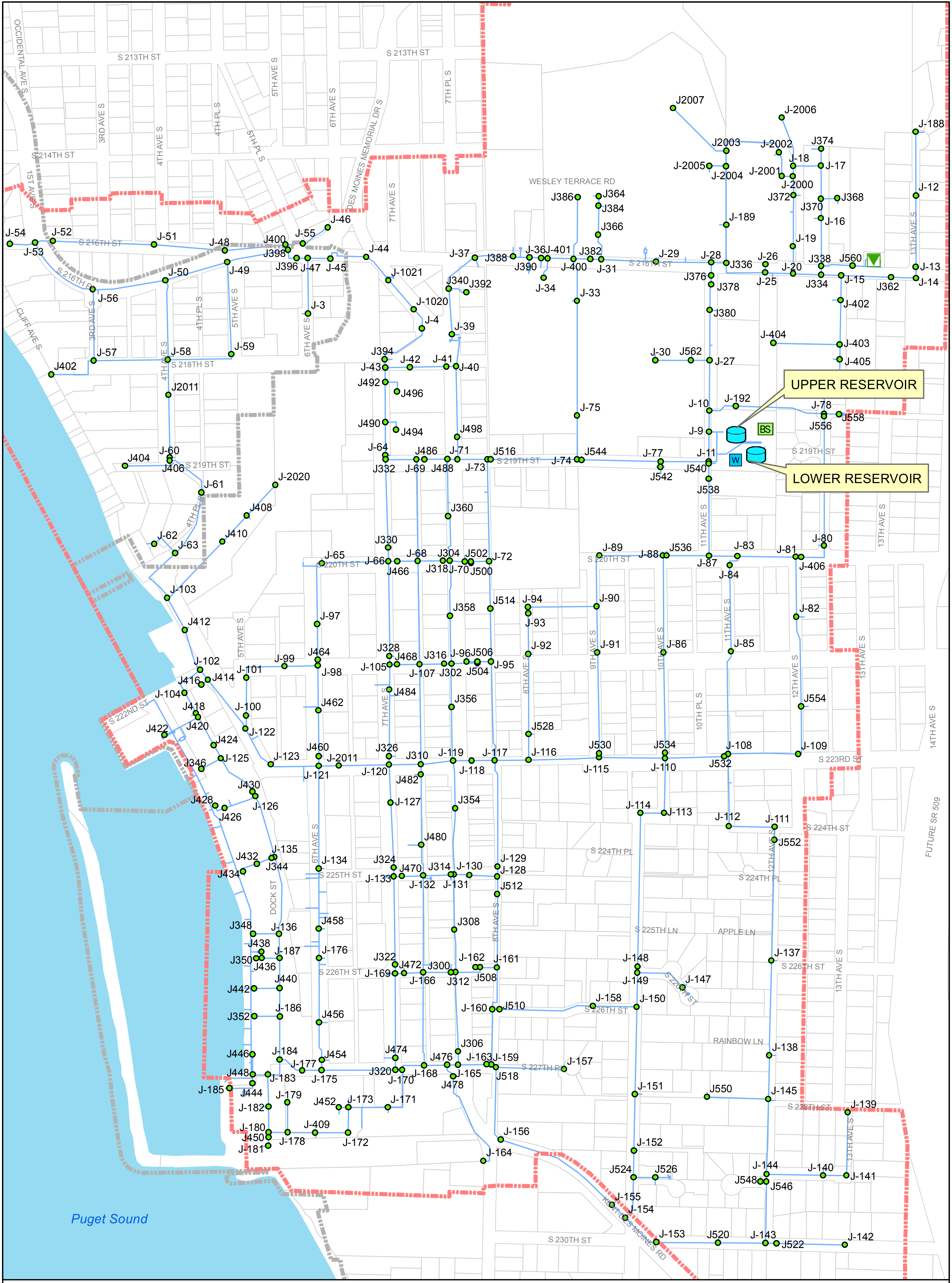
DWG. NO.
WAT–VALV

DATE:	DRWN:	CHKD:	SCALE:
12/2010	J.S.M.	W.W.P.	NONE

APPENDIX J

HYDRAULIC MODELING

ATTACHMENT A



LEGEND

- ● MODEL NODE
- WATER PIPES
- BS BOOSTER STATION
- RESERVOIR
- W WELL FIELD
- HIGHLINE WATER DISTRICT INTERTIE
- DISTRICT BOUNDARY
- DES MOINES CITY LIMITS
- PARCELS

N

0 250 500 1,000 Feet

KING COUNTY WATER DISTRICT #54

WATER SYSTEM PLAN
WATER MODEL NODE MAP

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\Kcwd54\18422 - WSP\GIS\MXDs\NODEMAP.mxd

2039 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-10	2.14	151.5	258.54	46.38
J-100	2.14	35	258.25	96.74
J-101	2.14	60.5	258.26	85.69
J-102	2.14	15.5	258.23	105.18
J-1020	2.14	101.5	258.27	67.93
J-1021	2.14	103.5	258.27	67.06
J-103	2.14	16.5	258.23	104.74
J-104	2.14	15.5	258.23	105.18
J-105	2.14	67.5	258.3	82.67
J-107	2.14	80.5	258.3	77.04
J-108	2.14	175	258.34	36.11
J-109	2.14	150	258.35	46.95
J-11	2.14	170.5	258.59	38.17
J-110	2.14	146.5	258.34	48.46
J-111	2.14	172	258.3	37.39
J-112	2.14	168	258.32	39.13
J-113	2.14	143.5	258.32	49.75
J-114	2.14	143	258.32	49.97
J-115	2.14	130.5	258.32	55.39
J-116	2.14	103.5	258.3	67.08
J-117	2.14	95.5	258.3	70.54
J-118	2.14	87.5	258.29	74
J-119	2.14	75.5	258.29	79.2
J-12	2.14	155	258.36	44.78
J-120	2.14	60	258.28	85.92
J-121	2.14	58	258.27	86.78
J-122	2.14	30.5	258.25	98.69
J-123	2.14	50	258.26	90.24
J-125	2.14	13.5	258.23	106.04
J-126	2.14	13.5	258.23	106.04
J-127	2.14	55	258.28	88.08
J-128	2.14	90.5	258.27	72.7
J-129	2.14	88.9	258.28	73.39
J-13	2.14	152	258.36	46.09
J-130	2.14	73	258.27	80.28
J-131	2.14	63.5	258.27	84.4
J-132	2.14	63.5	258.27	84.4
J-133	2.14	47.3	258.27	91.42
J-134	2.14	33.5	258.26	97.39
J-135	2.14	17.5	258.23	104.31
J-136	2.14	17.5	258.23	104.31
J-137	2.14	161.5	258.27	41.93
J-138	2.14	153.5	258.26	45.39
J-139	2.14	145	258.23	49.06
J-14	2.14	150.5	258.36	46.74
J-140	2.14	125	258.23	57.73
J-141	2.14	120	258.23	59.9
J-142	2.14	98.5	258.25	69.22
J-143	2.14	87.5	258.25	73.98
J-144	2.14	115	258.25	62.07
J-145	2.14	150.9	258.25	46.52
J-147	2.14	128.5	258.28	56.23
J-148	2.14	120.9	258.28	59.53
J-149	2.14	123.5	258.28	58.4

J-15	2.14	147.5	258.36	48.04
J-150	2.14	120.9	258.28	59.53
J-151	2.14	85	258.27	75.08
J-152	2.14	83.5	258.26	75.73
J-153	2.14	27.4	258.26	100.03
J-154	2.14	29.5	258.26	99.12
J-155	2.14	23.5	258.26	101.72
J-156	2.14	17.5	258.26	104.32
J-157	2.14	60.5	258.26	85.69
J-158	2.14	93.5	258.27	71.4
J-159	2.14	31	258.26	98.47
J-16	2.14	148.5	258.36	47.6
J-160	2.14	48	258.27	91.11
J-161	2.14	60.5	258.27	85.69
J-162	2.14	50.5	258.27	90.03
J-163	2.14	31	258.26	98.47
J-164	2.14	15.5	258.26	105.19
J-165	2.14	23.5	258.26	101.72
J-166	2.14	43.5	258.27	93.06
J-168	2.14	20.5	258.26	103.02
J-169	2.14	30	258.27	98.91
J-17	2.14	148.5	258.36	47.6
J-170	2.14	11.5	258.26	106.92
J-171	2.14	17.5	258.25	104.32
J-172	2.14	17.5	258.24	104.31
J-173	2.14	17.5	258.24	104.31
J-175	2.14	17.5	258.24	104.31
J-176	2.14	30.5	258.25	98.68
J-177	2.14	17.5	258.24	104.31
J-178	2.14	17.5	258.24	104.31
J-179	2.14	17.5	258.24	104.31
J-18	2.14	138.5	258.36	51.93
J-180	2.14	17.5	258.24	104.31
J-181	2.14	17.5	258.24	104.31
J-182	2.14	17.5	258.24	104.31
J-183	2.14	17.5	258.24	104.31
J-184	2.14	17.5	258.24	104.31
J-185	2.14	13.5	258.24	106.04
J-186	2.14	17.5	258.24	104.31
J-187	2.14	17.5	258.23	104.31
J-188	2.14	147.1	258.35	48.21
J-189	2.14	140	258.36	51.28
J-19	2.14	138.5	258.36	51.93
J-192	2.14	143.5	258.53	49.84
J-194	0	150	258.6	47.06
J-195	0	150	261.9	48.49
J-196	0	154	258.6	45.32
J-197	0	154	258.6	45.32
J-198	0	154	258.6	45.32
J-199	0	150	170.91	9.06
J-2	0	160.5	258.69	42.55
J-20	2.14	145.6	258.36	48.86
J-200	0	150	170.91	9.06
J-2000	2.14	140	258.36	51.28
J-2001	2.14	140	258.36	51.28

J-2002	2.14	140	258.36	51.28
J-2004	2.14	140	258.36	51.28
J-2005	2.14	140	258.36	51.28
J-2006	2.14	140	258.36	51.28
J-201	0	150	170.91	9.06
J-2011	2.14	58	258.27	86.78
J-202	0	152	261.94	47.64
J-2020	2.14	17	258.23	104.52
J-203	0	152	261.97	47.65
J-204	0	152	261.94	47.64
J-205	0	150	170.91	9.06
J-206	0	150	170.91	9.06
J-208	0	150	170.91	9.06
J-209	0	150	171.02	9.11
J-25	2.14	145	258.36	49.12
J-26	2.14	146.5	258.36	48.47
J-27	2.14	146.5	258.46	48.51
J-28	2.14	146.5	258.36	48.47
J-29	2.14	146.5	258.36	48.47
J-3	2.14	105	258.24	66.4
J-30	2.14	141.5	258.43	50.67
J-31	2.14	145.5	258.36	48.9
J-33	2.14	143.5	258.36	49.77
J-34	2.14	128.5	258.35	56.27
J-36	2.14	130.5	258.35	55.4
J-37	2.14	105	258.35	66.45
J-39	2.14	97	258.35	69.91
J-4	2.14	99.5	258.28	68.8
J-40	2.14	98	258.35	69.48
J-400	2.14	140.5	258.36	51.07
J-401	2.14	135.5	258.35	53.23
J-402	2.14	140	258.37	51.29
J-403	2.14	135	258.37	53.46
J-404	2.14	125	258.37	57.79
J-405	2.14	125	258.38	57.79
J-406	2.14	150	258.39	46.96
J-409	2.14	17.5	258.24	104.31
J-41	2.14	99.5	258.35	68.83
J-42	2.14	95.5	258.32	70.55
J-43	2.14	95.5	258.31	70.54
J-44	2.14	103	258.26	67.27
J-45	2.14	109.5	258.25	64.45
J-46	2.14	110.5	258.23	64.01
J-47	2.14	115.5	258.24	61.85
J-48	2.14	130.5	258.23	55.35
J-49	2.14	130.5	258.23	55.35
J-50	2.14	150.5	258.23	46.68
J-51	2.14	175	258.23	36.06
J-52	2.14	185	258.23	31.73
J-53	2.14	170.2	258.23	38.14
J-54	2.14	178.1	258.23	34.72
J-55	2.14	127.5	258.23	56.65
J-56	2.14	165.5	258.23	40.18
J-57	2.14	132.5	258.23	54.48
J-58	2.14	123.5	258.23	58.38

J-59	2.14	121.5	258.23	59.24
J-60	2.14	108	258.23	65.09
J-61	2.14	93.5	258.23	71.38
J-62	2.14	85	258.23	75.06
J-63	2.14	53.5	258.23	88.71
J-64	2.14	82.5	258.32	76.18
J-65	2.14	73.5	258.29	80.07
J-66	2.14	76.5	258.31	78.78
J-68	2.14	95.5	258.31	70.55
J-69	2.14	87.5	258.34	74.02
J-70	2.14	100.5	258.31	68.38
J-71	2.14	100.5	258.35	68.4
J-72	2.14	110.5	258.31	64.05
J-73	2.14	115.5	258.37	61.91
J-74	2.14	147.5	258.44	48.07
J-75	2.14	145.5	258.42	48.93
J-77	2.14	165	258.53	40.53
J-78	2.14	125.5	258.39	57.58
J-80	2.14	138.5	258.39	51.95
J-81	2.14	150.5	258.39	46.75
J-82	2.14	160	258.38	42.63
J-83	2.14	187	258.44	30.95
J-84	2.14	186.5	258.43	31.17
J-85	2.14	183.5	258.39	32.45
J-86	2.14	153.5	258.38	45.44
J-87	2.14	185.1	258.44	31.78
J-88	2.14	165	258.41	40.48
J-89	2.14	153	258.37	45.66
J-9	2.14	160.5	258.62	42.51
J-90	2.14	152.5	258.34	45.86
J-91	2.14	144.5	258.33	49.32
J-92	2.14	113.5	258.31	62.75
J-93	2.14	120.5	258.32	59.72
J-94	2.14	120.5	258.32	59.72
J-95	2.14	100.5	258.3	68.37
J-96	2.14	90.5	258.3	72.71
J-97	2.14	65.5	258.28	83.53
J-98	2.14	63.5	258.27	84.4
J-99	2.14	63.5	258.27	84.39
J2003	2.14	140	258.36	51.28
J2007	2.14	140	258.36	51.28
J2011	2.14	120	258.23	59.89
J300	2.14	43.5	258.27	93.06
J302	2.14	80.5	258.3	77.04
J304	2.14	95.5	258.31	70.55
J306	2.14	30	258.26	98.91
J308	2.14	65	258.27	83.74
J310	2.14	71	258.28	81.15
J312	2.14	43.5	258.27	93.06
J314	2.14	63.5	258.27	84.4
J316	2.14	80.5	258.3	77.04
J318	2.14	95.5	258.31	70.55
J320	2.14	11.5	258.26	106.92
J322	2.14	30	258.27	98.91
J324	2.14	47.3	258.28	91.42

J326	2.14	60	258.28	85.92
J328	2.14	67.5	258.3	82.67
J330	2.14	80	258.31	77.26
J332	2.14	82.5	258.32	76.18
J334	2.14	146	258.36	48.69
J336	2.14	145	258.36	49.12
J338	2.14	146	258.36	48.69
J340	2.14	97	258.35	69.91
J344	2.14	14	258.23	105.83
J346	2.14	0	258.23	111.89
J348	2.14	15	258.23	105.39
J350	2.14	15	258.23	105.39
J352	2.14	15	258.24	105.39
J354	2.14	78	258.28	78.12
J356	2.14	90.3	258.29	72.79
J358	2.14	99.2	258.3	68.94
J360	2.14	104	258.33	66.87
J362	2.14	149.5	258.36	47.17
J364	2.14	142.49	258.36	50.2
J366	2.14	143	258.36	49.98
J368	2.14	148.5	258.36	47.6
J370	2.14	148.5	258.36	47.6
J372	2.14	138.9	258.36	51.76
J374	2.14	148.5	258.36	47.6
J376	2.14	146.5	258.37	48.47
J378	2.14	146.5	258.38	48.48
J380	2.14	146.5	258.41	48.49
J382	2.14	142.49	258.36	50.2
J384	2.14	142.49	258.36	50.2
J386	2.14	140.5	258.36	51.07
J388	2.14	123.46	258.35	58.45
J390	2.14	126.41	258.35	57.17
J392	2.14	97	258.35	69.91
J394	2.14	99	258.3	69.03
J396	2.14	128.42	258.24	56.25
J398	2.14	130.05	258.23	55.54
J400	2.14	129.91	258.23	55.6
J402	2.14	60	258.23	85.89
J404	2.14	100	258.23	68.56
J406	2.14	107	258.23	65.53
J408	2.14	16.56	258.23	104.71
J410	2.14	16.52	258.23	104.73
J412	2.14	15.94	258.23	104.99
J414	2.14	27.98	258.24	99.77
J416	2.14	20	258.24	103.23
J418	2.14	14.11	258.23	105.78
J420	2.14	13.55	258.23	106.02
J422	2.14	8	258.23	108.43
J424	2.14	13.54	258.23	106.03
J426	2.14	8	258.23	108.43
J428	2.14	8	258.23	108.43
J430	2.14	13.5	258.23	106.04
J432	2.14	11	258.23	107.13
J434	2.14	8	258.23	108.43
J436	2.14	16.89	258.23	104.57

J438	2.14	16.89	258.23	104.57
J440	2.14	17.5	258.24	104.31
J442	2.14	15	258.24	105.39
J444	2.14	14.8	258.24	105.48
J446	2.14	14	258.24	105.83
J448	2.14	16.24	258.24	104.86
J450	2.14	17.5	258.24	104.31
J452	2.14	17.5	258.24	104.31
J454	2.14	29.16	258.24	99.26
J456	2.14	29.92	258.24	98.94
J458	2.14	32.56	258.25	97.79
J460	2.14	62.02	258.27	85.03
J462	2.14	62.75	258.27	84.72
J464	2.14	65.2	258.27	83.66
J466	2.14	90.23	258.31	72.83
J468	2.14	77.63	258.3	78.28
J470	2.14	49	258.27	90.68
J472	2.14	32	258.27	98.04
J474	2.14	23.79	258.26	101.59
J476	2.14	21.49	258.26	102.59
J478	2.14	16.31	258.26	104.84
J480	2.14	69.02	258.28	82
J482	2.14	69.27	258.28	81.9
J484	2.14	60	258.29	85.92
J486	2.14	98.03	258.34	69.46
J488	2.14	98.78	258.34	69.14
J490	2.14	90.62	258.31	72.66
J492	2.14	91.93	258.31	72.09
J494	2.14	90.62	258.31	72.66
J496	2.14	91.93	258.31	72.09
J498	2.14	98.61	258.35	69.22
J500	2.14	107.95	258.31	65.15
J502	2.14	107.95	258.31	65.15
J504	2.14	82.61	258.3	76.13
J506	2.14	96.29	258.3	70.2
J508	2.14	58.4	258.27	86.6
J510	2.14	50	258.27	90.24
J512	2.14	83	258.27	75.95
J514	2.14	105.21	258.31	66.34
J516	2.14	115	258.37	62.12
J518	2.14	35	258.26	96.74
J520	2.14	53.4	258.25	88.76
J522	2.14	96.99	258.25	69.87
J524	2.14	52.7	258.26	89.07
J526	2.14	52.7	258.26	89.07
J528	2.14	111.15	258.3	63.76
J530	2.14	130.5	258.32	55.39
J532	2.14	175	258.34	36.11
J534	2.14	153.15	258.34	45.58
J536	2.14	165	258.41	40.48
J538	2.14	182.39	258.56	33.01
J540	2.14	180.8	258.59	33.71
J542	2.14	168	258.53	39.23
J544	2.14	152	258.45	46.12
J546	2.14	115	258.25	62.07

J548	2.14	115	258.25	62.07
J550	2.14	131.5	258.25	54.92
J552	2.14	170	258.3	38.26
J554	2.14	163	258.36	41.32
J556	2.14	138.24	258.39	52.06
J558	2.14	125.5	258.39	57.58
J560	2.14	146	258.36	48.69
J562	2.14	143.19	258.45	49.94
J564	0	0	258.63	112.07
J566	0	156.33	258.6	44.31
J568	0	164.43	258.6	40.8
J570	2.14	120	258.37	59.96
J572	2.14	146	258.39	48.7
J574	2.14	156	258.42	44.38
J576	2.14	0	258.42	111.97

2038 Maximum Day Demand Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Flow at hydrant to Maintain Minimum System Pressure at 20 psi
J-10	3,501.74	8,993.58	J-10	20.00	197.66	8,993.64
J-100	3,501.74	6,489.88	J-52	8.09	203.67	3,654.25
J-101	3,501.74	4,657.60	J-52	17.26	224.83	3,826.90
J-102	3,501.74	9,201.01	J-52	-19.97	138.92	3,064.05
J-1020	3,501.74	4,306.30	J-52	-5.76	171.72	1,837.04
J-1021	3,501.74	4,208.20	J-52	-5.31	172.74	1,810.45
J-103	3,501.74	6,238.20	J-52	-19.20	140.68	2,172.25
J-104	3,501.74	9,138.66	J-52	-18.20	143.00	3,106.97
J-107	3,501.74	12,489.68	J-52	-9.17	163.83	4,629.81
J-108	1,001.74	3,770.97	J-85	19.92	229.48	3,750.25
J-109	1,001.74	3,812.28	J554	17.40	203.17	3,519.56
J-11	3,501.74	19,684.58	J-83	13.21	217.49	13,472.01
J-110	1,001.74	7,035.64	J-85	11.18	209.30	4,621.13
J-112	1,001.74	1,447.99	J-111	19.03	215.92	1,392.76
J-113	1,001.74	4,267.38	J-113	20.00	189.66	4,267.38
J-114	1,001.74	3,927.15	J-114	20.00	189.16	3,927.16
J-115	1,001.74	7,687.96	J-85	11.80	210.73	5,162.94
J-116	1,001.74	9,999.05	J-52	4.67	195.78	4,933.73
J-117	3,501.74	10,857.94	J-52	0.56	186.29	4,829.26
J-118	3,501.74	11,543.42	J-52	-3.86	176.09	4,690.19
J-119	3,501.74	13,063.68	J-52	-12.73	155.62	4,585.45
J-12	1,001.74	581.60	J-12	20.00	201.16	581.61
J-122	3,501.74	8,653.89	J-52	-4.92	173.64	3,558.81
J-123	3,501.74	8,159.90	J-52	1.02	187.35	3,781.42
J-125	3,501.74	9,126.59	J-52	-15.66	148.87	3,197.82
J-126	3,501.74	9,128.03	J-52	-14.04	152.60	3,263.20
J-127	3,501.74	9,074.86	J-52	3.92	194.04	4,446.13
J-128	3,501.74	5,919.59	J-52	16.10	222.15	4,586.00
J-13	1,001.74	2,261.29	J-12	18.70	198.15	2,186.03
J-130	3,501.74	11,050.77	J-52	-3.72	176.42	4,526.18
J-131	3,501.74	12,216.94	J-52	-9.39	163.33	4,523.08
J-132	3,501.74	11,762.28	J-52	-7.25	168.27	4,514.67
J-134	3,501.74	6,771.43	J-52	9.21	206.25	3,955.69
J-135	3,501.74	9,072.66	J-52	-11.75	157.89	3,344.94
J-136	3,501.74	9,227.17	J-52	-10.55	160.65	3,451.17
J-137	1,001.74	1,076.67	J-137	20.00	207.66	1,076.67
J-138	1,001.74	1,120.54	J-138	20.00	199.66	1,120.54

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Flow at hydrant to Maintain Minimum System Pressure at 20 psi
J-139	1,001.74	347.87	J-139	20.00	191.16	347.87
J-14	3,501.74	2,401.11	J-12	18.05	196.65	2,283.82
J-140	1,001.74	624.90	J-139	11.33	171.15	531.27
J-141	1,001.74	555.43	J-139	9.17	166.16	456.47
J-142	1,001.74	1,336.44	J-142	20.00	144.66	1,336.44
J-143	1,001.74	1,819.44	J-139	0.95	147.20	1,337.79
J-144	1,001.74	1,525.63	J-139	7.00	161.15	1,214.68
J-145	1,001.74	1,140.60	J-145	20.00	197.06	1,140.60
J-147	1,001.74	742.76	J-147	20.00	174.66	742.76
J-149	1,001.74	3,939.35	J-147	17.83	169.66	3,798.09
J-15	3,501.74	6,398.38	J-12	16.75	193.65	5,683.95
J-150	1,001.74	4,082.07	J-150	20.00	167.06	4,082.08
J-151	1,001.74	4,185.95	J-151	20.00	131.16	4,185.96
J-152	1,001.74	4,238.86	J-139	17.62	185.67	4,022.24
J-153	1,001.74	3,704.10	J-139	-4.79	133.96	2,508.01
J-154	1,001.74	5,437.97	J-139	-4.10	135.55	3,701.78
J-155	1,001.74	5,521.78	J-139	-2.99	138.10	3,807.32
J-156	3,501.74	6,152.52	J-52	16.05	222.04	4,757.22
J-157	1,001.74	2,374.54	J-157	20.00	106.66	2,374.54
J-158	1,001.74	3,640.72	J-158	20.00	139.66	3,640.72
J-159	3,501.74	9,094.89	J-52	5.32	197.27	4,614.42
J-16	1,001.74	2,895.04	J-16	20.00	194.66	2,895.04
J-160	3,501.74	6,361.83	J-52	14.97	219.55	4,660.94
J-161	3,501.74	7,479.49	J-52	10.41	209.03	4,562.73
J-164	3,501.74	2,414.45	J-164	20.00	61.66	2,414.45
J-165	3,501.74	11,974.97	J-52	-8.46	165.48	4,497.46
J-166	3,501.74	11,998.49	J-52	-8.84	164.60	4,479.98
J-168	3,501.74	10,875.20	J-52	-4.84	173.84	4,365.86
J-17	3,501.74	2,887.07	J374	20.00	194.66	2,887.07
J-170	3,501.74	11,208.76	J-52	-8.66	165.01	4,217.55
J-171	3,501.74	7,790.86	J-52	5.65	198.03	4,062.30
J-172	3,501.74	6,959.05	J-52	8.63	204.92	3,987.98
J-173	3,501.74	7,117.37	J-52	8.12	203.74	4,018.70
J-175	3,501.74	9,646.69	J-52	-7.03	168.79	3,781.17
J-176	3,501.74	6,636.66	J-52	9.69	207.37	3,933.11
J-177	3,501.74	9,687.13	J-52	-9.29	163.56	3,667.22
J-178	3,501.74	7,115.76	J-52	7.00	201.17	3,884.43

2038 Maximum Day Demand Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Flow at hydrant to Maintain Minimum System Pressure at 20 psi
J-179	3,501.74	5,638.49	J-52	13.77	216.77	3,884.43
J-18	3,501.74	4,030.96	J-2006	19.35	184.66	3,960.78
J-180	3,501.74	7,346.97	J-52	5.47	197.63	3,842.76
J-181	3,501.74	6,481.27	J-52	9.75	207.50	3,842.76
J-182	3,501.74	7,898.30	J-52	2.25	190.19	3,777.27
J-183	3,501.74	9,424.71	J-52	-7.76	167.08	3,662.36
J-184	3,501.74	9,732.28	J-52	-10.00	161.91	3,644.55
J-185	3,501.74	5,684.81	J-52	12.12	212.98	3,662.36
J-186	3,501.74	9,515.42	J-52	-9.98	161.96	3,574.09
J-187	3,501.74	9,297.42	J-52	-10.30	161.22	3,486.19
J-188	1,001.74	459.29	J-188	20.00	193.26	459.29
J-189	1,001.74	5,082.07	J-189	20.00	186.16	5,082.08
J-19	3,501.74	3,760.21	J-19	20.00	184.66	3,760.21
J-192	1,001.74	5,698.01	J-192	20.00	189.66	5,698.02
J-20	3,501.74	7,464.62	J-20	20.00	191.76	7,464.65
J-2000	3,501.74	4,122.67	J-2000	20.00	186.16	4,122.67
J-2001	3,501.74	4,036.30	J-2001	20.00	186.16	4,036.30
J-2002	1,001.74	3,920.62	J-2002	20.00	186.16	3,920.63
J-2004	3,501.74	4,093.87	J-2005	20.00	186.16	4,093.87
J-2005	1,001.74	3,439.06	J-2005	20.00	186.16	3,439.06
J-2006	3,501.74	2,692.34	J-2006	20.00	186.16	2,692.34
J-2011	3,501.74	10,836.40	J-52	-6.81	169.28	4,212.64
J-2020	3,501.74	3,321.70	J-52	12.00	212.70	2,172.25
J-25	1,001.74	6,130.54	J-26	19.35	191.16	6,013.03
J-27	3,501.74	6,613.15	J-27	20.00	192.66	6,613.16
J-28	3,501.74	7,924.21	J-28	20.00	192.66	7,924.24
J-29	1,001.74	7,478.65	J-29	20.00	192.66	7,478.68
J-3	1,001.74	2,869.09	J-52	3.10	192.16	1,474.65
J-30	1,001.74	3,672.32	J-30	20.00	187.66	3,672.32
J-31	3,501.74	7,363.99	J-52	19.66	230.37	7,115.38
J-33	1,001.74	3,516.94	J-33	20.00	189.66	3,516.94
J-34	1,001.74	4,377.76	J-34	20.00	174.66	4,377.76
J-37	3,501.74	10,560.60	J-52	11.20	210.85	6,025.33
J-39	3,501.74	12,367.28	J-52	2.36	190.44	5,352.02
J-4	3,501.74	4,605.39	J-52	-5.62	172.03	1,961.91
J-40	3,501.74	13,285.74	J-52	-3.24	177.51	5,204.39
J-400	3,501.74	7,741.43	J-52	18.72	228.20	6,861.00

2038 Maximum Day Demand Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Flow at hydrant to Maintain Minimum System Pressure at 20 psi
J-401	3,501.74	8,141.84	J-52	17.69	225.83	6,644.45
J-402	1,001.74	5,343.29	J-402	20.00	186.16	5,343.30
J-403	3,501.74	4,662.37	J-403	20.00	181.16	4,662.38
J-404	1,001.74	2,882.66	J-404	20.00	171.16	2,882.67
J-405	1,001.74	4,957.99	J-403	19.14	179.16	4,859.59
J-409	3,501.74	6,952.15	J-52	8.25	204.04	3,936.14
J-42	3,501.74	5,199.47	J-52	10.31	208.78	3,157.67
J-43	3,501.74	6,295.34	J-52	-5.98	171.20	2,631.20
J-44	3,501.74	3,973.29	J-52	-6.90	169.08	1,672.04
J-45	1,001.74	3,612.34	J-52	-6.89	169.09	1,527.90
J-47	3,501.74	3,415.26	J-52	-5.77	171.69	1,474.65
J-60	1,001.74	3,466.69	J-52	-2.68	178.82	1,574.46
J-61	3,501.74	3,866.28	J-52	-4.51	174.59	1,691.22
J-62	1,001.74	2,706.50	J-52	13.45	216.05	1,884.27
J-63	3,501.74	4,913.49	J-52	-12.41	156.37	1,884.27
J-65	3,501.74	7,171.75	J-52	10.93	210.23	4,465.20
J-66	3,501.74	13,025.11	J-52	-11.84	157.68	4,629.92
J-68	3,501.74	12,375.50	J-52	-7.96	166.64	4,672.69
J-69	3,501.74	13,339.25	J-52	-10.95	159.73	4,768.45
J-71	3,501.74	14,503.30	J-52	-11.96	157.39	5,057.04
J-72	3,501.74	6,285.99	J-52	16.00	221.92	4,860.94
J-73	3,501.74	13,099.08	J-52	-3.28	177.42	5,281.86
J-74	3,501.74	10,940.41	J-52	10.28	208.73	6,328.17
J-75	1,001.74	4,934.70	J574	19.11	200.11	4,816.49
J-77	3,501.74	10,925.21	J-52	16.44	222.95	8,822.60
J-78	3,501.74	4,762.57	J556	14.91	172.64	4,265.81
J-80	1,001.74	2,917.08	J-80	20.00	184.66	2,917.08
J-81	3,501.74	3,697.50	J-82	19.56	205.15	3,648.88
J-82	1,001.74	3,058.41	J-82	20.00	206.16	3,058.41
J-83	3,501.74	3,340.36	J-83	20.00	233.16	3,340.37
J-85	1,001.74	1,341.01	J-85	20.00	229.66	1,341.01
J-86	1,001.74	5,663.78	J-83	17.20	226.69	4,612.15
J-87	3,501.74	4,288.36	J-83	19.32	231.59	4,043.89
J-88	3,501.74	5,668.91	J-83	16.13	224.23	4,334.79
J-89	1,001.74	2,689.20	J-89	20.00	199.16	2,689.21
J-9	3,501.74	25,793.22	J-83	13.70	218.61	16,818.73
J-90	1,001.74	2,761.30	J-90	20.00	198.66	2,761.30

2038 Maximum Day Demand Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Flow at hydrant to Maintain Minimum System Pressure at 20 psi
J-91	1,001.74	2,569.69	J-91	20.00	190.66	2,569.69
J-92	1,001.74	2,998.96	J-92	20.00	159.66	2,998.96
J-94	1,001.74	2,807.70	J-94	20.00	166.66	2,807.71
J-95	3,501.74	6,726.87	J-52	13.83	216.92	4,695.99
J-97	3,501.74	6,973.02	J-52	10.97	210.31	4,336.05
J-98	3,501.74	7,486.25	J-52	8.33	204.22	4,237.80
J-99	3,501.74	4,875.74	J-52	17.51	225.42	4,071.29
J2003	3,501.74	3,986.24	J2007	20.00	186.16	3,986.24
J2007	1,001.74	3,543.55	J2007	20.00	186.16	3,543.55
J2011	3,501.74	3,164.19	J-52	-2.03	180.32	1,460.99
J300	3,501.74	12,399.08	J-52	-10.68	160.35	4,493.51
J302	3,501.74	13,127.91	J-52	-12.27	156.69	4,637.36
J304	3,501.74	12,966.22	J-52	-10.19	161.49	4,714.97
J306	1,001.74	11,785.05	J-52	-7.55	167.57	4,495.25
J308	3,501.74	11,361.82	J-52	-5.34	172.68	4,509.73
J310	3,501.74	12,152.76	J-52	-9.19	163.79	4,517.34
J322	3,501.74	10,935.93	J-52	-3.64	176.59	4,485.15
J324	3,501.74	10,752.86	J-52	-2.79	178.57	4,491.68
J326	3,501.74	10,971.00	J-52	-3.84	176.13	4,484.06
J328	3,501.74	11,018.43	J-52	-2.32	179.65	4,630.49
J330	3,501.74	10,363.90	J-52	-0.19	184.57	4,576.38
J332	3,501.74	10,313.82	J-52	-6.50	169.99	4,054.52
J334	3,501.74	10,851.31	J-12	17.45	195.27	10,513.52
J336	3,501.74	7,409.78	J336	20.00	191.16	7,409.80
J338	3,501.74	10,888.49	J-12	17.90	196.32	10,608.16
J340	3,501.74	11,543.80	J-52	7.11	201.42	5,622.80
J354	3,501.74	11,720.00	J-52	-6.72	169.49	4,537.92
J356	3,501.74	11,795.48	J-52	-6.03	171.07	4,616.23
J358	3,501.74	11,610.72	J-52	-4.51	174.59	4,668.54
J360	3,501.74	12,230.39	J-52	-5.12	173.18	4,832.18
J362	3,501.74	2,870.85	J-12	17.62	195.65	2,610.63
J364	1,001.74	1,506.02	J364	20.00	188.65	1,506.02
J368	1,001.74	2,432.65	J368	20.00	194.66	2,432.65
J372	1,001.74	3,929.01	J372	20.00	185.06	3,929.01
J374	1,001.74	2,789.82	J374	20.00	194.66	2,789.83
J376	1,001.74	6,727.38	J376	20.00	192.66	6,727.40
J380	1,001.74	5,778.73	J380	20.00	192.66	5,778.74

2038 Maximum Day Demand Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Flow at hydrant to Maintain Minimum System Pressure at 20 psi
J382	1,001.74	7,595.38	J-52	19.18	229.26	7,011.21
J386	1,001.74	2,549.10	J386	20.00	186.66	2,549.10
J408	1,001.74	3,710.94	J-52	8.74	205.18	2,172.25
J410	1,001.74	4,166.86	J-52	4.59	195.60	2,172.25
J412	3,501.74	7,041.24	J-52	-18.63	142.00	2,453.52
J418	3,501.74	9,147.26	J-52	-17.49	144.64	3,135.15
J424	3,501.74	9,132.59	J-52	-16.18	147.65	3,179.31
J454	3,501.74	8,666.82	J-52	-1.25	182.11	3,805.34
J456	3,501.74	7,352.65	J-52	5.73	198.22	3,870.75
J458	3,501.74	6,528.26	J-52	10.30	208.78	3,949.10
J460	3,501.74	9,344.04	J-52	-0.68	183.43	4,114.22
J462	3,501.74	7,610.59	J-52	7.31	201.86	4,166.72
J466	3,501.74	12,299.42	J-52	-8.04	166.44	4,641.81
J468	3,501.74	12,124.50	J-52	-7.46	167.77	4,625.24
J470	3,501.74	12,063.50	J-52	-8.82	164.65	4,509.59
J472	3,501.74	12,176.17	J-52	-9.79	162.40	4,476.75
J474	3,501.74	9,992.49	J-52	-2.02	180.33	4,255.65
J498	3,501.74	13,894.87	J-52	-8.93	164.39	5,059.16
J500	3,501.74	10,923.79	J-52	-0.78	183.19	4,725.15
J506	3,501.74	10,881.81	J-52	-1.53	181.46	4,646.70
J508	3,501.74	10,782.27	J-52	-2.73	178.69	4,501.00
J512	3,501.74	4,999.39	J-52	18.88	228.57	4,583.35
J514	3,501.74	4,211.72	J514	20.00	151.36	4,211.72
J520	1,001.74	2,333.17	J-139	-3.57	136.77	1,620.92
J522	1,001.74	1,664.08	J-139	7.64	162.63	1,337.79
J526	1,001.74	4,072.92	J-139	18.01	186.57	3,896.73
J528	1,001.74	8,633.89	J-52	9.22	206.28	4,951.44
J538	1,001.74	7,911.84	J-83	19.78	232.66	7,772.99
J550	1,001.74	464.08	J550	20.00	177.66	464.08
J552	1,001.74	1,142.89	J552	20.00	216.16	1,142.89
J554	1,001.74	2,983.53	J554	20.00	209.16	2,983.53
J560	1,001.74	10,860.88	J-12	18.86	198.53	10,705.39
J562	1,001.74	4,245.86	J562	20.00	189.35	4,245.87
J568	1,000.00	21,843.11	J-83	11.74	214.11	14,071.17
J570	1,001.74	6,086.32	J-52	19.17	229.25	5,714.56
J572	1,001.74	4,427.63	J572	20.00	192.16	4,427.63
J574	1,001.74	3,430.03	J574	20.00	202.16	3,430.03

2038 Maximum Day Demand Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Flow at hydrant to Maintain Minimum System Pressure at 20 psi
J576	1,001.74	9,860.17	J574	-28.31	90.66	4,908.63

ATTACHMENT A

2038 Maximum Day Demand Fire Flow Scenario with CIPs

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Flow at hydrant to Maintain Minimum System Pressure at 20 psi
J-10	3,501.74	9,100.76	J-10	20.00	197.66	9,100.81
J-100	3,501.74	6,289.78	J-85	19.83	229.26	6,213.45
J-101	3,501.74	4,590.18	J-101	20.00	106.66	4,590.18
J-102	3,501.74	7,981.50	J2011	-25.28	61.65	5,054.72
J-1020	3,501.74	3,092.98	J-47	13.93	147.66	2,849.15
J-1021	3,501.74	2,998.24	J-47	14.80	149.66	2,792.51
J-103	3,501.74	4,579.70	J2011	-24.85	62.65	2,917.82
J-104	3,501.74	8,001.81	J2011	-23.13	66.61	5,142.04
J-107	3,501.74	12,414.48	J-85	5.30	195.73	6,375.09
J-108	1,001.74	3,943.87	J-85	19.66	228.88	3,849.48
J-109	1,001.74	4,788.09	J-85	17.04	222.83	3,988.51
J-11	3,501.74	19,803.52	J-83	13.25	217.58	13,512.80
J-110	1,001.74	7,079.93	J-85	10.89	208.63	4,608.02
J-112	1,001.74	2,411.86	J-111	18.44	214.55	2,266.25
J-113	1,001.74	4,282.18	J-113	20.00	189.66	4,282.18
J-114	1,001.74	3,943.58	J-114	20.00	189.16	3,943.58
J-115	1,001.74	7,697.55	J-85	11.60	210.28	5,135.86
J-116	1,001.74	10,013.59	J-85	6.67	198.89	5,565.35
J-117	3,501.74	10,903.54	J-85	4.91	194.82	5,728.60
J-118	3,501.74	11,407.66	J-85	4.76	194.48	5,916.47
J-119	3,501.74	12,846.00	J-85	1.17	186.19	6,067.55
J-12	1,001.74	1,783.82	J-12	20.00	201.16	1,783.82
J-122	3,501.74	8,111.77	J2011	-3.13	112.78	6,114.39
J-123	3,501.74	7,792.11	J-85	16.18	220.84	6,205.42
J-125	3,501.74	8,128.70	J2011	-20.01	73.82	5,335.89
J-126	3,501.74	8,214.29	J2011	-17.65	79.26	5,482.93
J-127	3,501.74	8,941.72	J-85	13.09	213.71	6,090.30
J-128	3,501.74	7,674.32	J-85	15.23	218.64	5,890.45
J-13	1,001.74	2,305.34	J-12	18.70	198.16	2,228.81
J-130	3,501.74	10,981.03	J-85	6.44	198.37	5,948.35
J-131	3,501.74	12,071.89	J-85	2.86	190.10	5,955.97
J-132	3,501.74	10,987.95	J-85	6.66	198.87	5,980.41
J-134	3,501.74	6,648.87	J-85	18.89	227.09	6,174.50
J-135	3,501.74	8,254.88	J2011	-13.75	88.27	5,675.65
J-136	3,501.74	8,496.96	J2011	-11.45	93.57	5,940.00
J-137	1,001.74	1,244.07	J-137	20.00	207.66	1,244.07
J-138	1,001.74	1,225.37	J-138	20.00	199.66	1,225.37

2038 Maximum Day Demand Fire Flow Scenario with CIPs

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Flow at hydrant to Maintain Minimum System Pressure at 20 psi
J-139	1,001.74	1,094.06	J-139	20.00	191.16	1,094.06
J-14	3,501.74	2,451.76	J-12	18.05	196.66	2,332.23
J-140	1,001.74	1,408.64	J-139	11.33	171.16	1,198.11
J-141	1,001.74	1,419.53	J-139	9.17	166.16	1,167.15
J-142	1,001.74	1,372.96	J-142	20.00	144.66	1,372.96
J-143	1,001.74	1,900.55	J-139	2.14	149.94	1,418.67
J-144	1,001.74	1,611.97	J-139	7.00	161.16	1,283.79
J-145	1,001.74	1,228.85	J-145	20.00	197.06	1,228.85
J-147	1,001.74	2,888.45	J-147	20.00	174.66	2,888.45
J-149	1,001.74	3,987.15	J-147	17.83	169.66	3,844.32
J-15	3,501.74	6,412.16	J-12	16.75	193.66	5,695.91
J-150	1,001.74	4,146.17	J-150	20.00	167.06	4,146.17
J-151	1,001.74	4,275.16	J-151	20.00	131.16	4,275.17
J-152	1,001.74	4,351.31	J-139	19.79	190.68	4,330.67
J-153	1,001.74	3,795.13	J-139	-1.21	142.20	2,679.17
J-154	1,001.74	5,639.56	J-139	-1.01	142.66	3,984.44
J-155	1,001.74	5,737.70	J-139	0.01	145.03	4,106.38
J-156	3,501.74	6,655.52	J-139	7.96	163.38	5,322.98
J-157	1,001.74	4,460.33	J-157	20.00	106.66	4,460.34
J-158	1,001.74	3,722.66	J-158	20.00	139.66	3,722.67
J-159	3,501.74	9,964.35	J-85	7.84	201.59	5,692.22
J-16	1,001.74	9,977.96	J-16	20.00	194.66	9,977.98
J-160	3,501.74	8,815.54	J-85	11.34	209.67	5,695.14
J-161	3,501.74	9,125.78	J-85	11.10	209.13	5,808.71
J-164	3,501.74	4,346.08	J-164	20.00	61.66	4,346.08
J-165	3,501.74	12,097.05	J-85	1.85	187.78	5,855.88
J-166	3,501.74	11,966.17	J-85	2.84	190.04	5,911.67
J-168	3,501.74	10,793.51	J-85	6.85	199.31	5,923.23
J-17	3,501.74	8,476.28	J374	20.00	194.66	8,476.33
J-170	3,501.74	10,988.07	J-85	6.59	198.71	5,971.01
J-171	3,501.74	7,648.94	J-85	15.73	219.80	6,005.87
J-172	3,501.74	6,849.19	J-85	17.96	224.95	6,022.50
J-173	3,501.74	7,010.44	J-85	17.51	223.92	6,014.48
J-175	3,501.74	9,172.14	J-85	12.50	212.35	6,088.73
J-176	3,501.74	6,512.51	J-85	19.13	227.66	6,143.29
J-177	3,501.74	9,101.28	J-85	12.71	212.84	6,094.84
J-178	3,501.74	6,964.07	J-85	17.73	224.43	6,046.40

2038 Maximum Day Demand Fire Flow Scenario with CIPs

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Flow at hydrant to Maintain Minimum System Pressure at 20 psi
J-179	3,501.74	3,778.93	J-179	20.00	63.66	3,778.93
J-18	3,501.74	9,055.64	J374	19.17	192.74	8,805.10
J-180	3,501.74	7,162.97	J-85	17.24	223.28	6,055.56
J-181	3,501.74	6,353.00	J-85	19.30	228.03	6,055.56
J-182	3,501.74	7,617.87	J-85	16.04	220.52	6,069.55
J-183	3,501.74	8,875.39	J-85	13.27	214.11	6,092.69
J-184	3,501.74	9,116.43	J-85	12.68	212.77	6,096.03
J-185	3,501.74	4,027.67	J-185	20.00	59.66	4,027.67
J-186	3,501.74	8,862.99	J-85	13.35	214.30	6,103.22
J-187	3,501.74	8,591.56	J2011	-10.87	94.91	6,030.50
J-188	1,001.74	1,684.78	J-188	20.00	193.26	1,684.78
J-189	1,001.74	5,494.54	J-189	20.00	186.16	5,494.55
J-19	3,501.74	5,087.27	J-19	20.00	184.66	5,087.29
J-192	1,001.74	5,740.81	J-192	20.00	189.66	5,740.82
J-20	3,501.74	8,041.21	J-20	20.00	191.76	8,041.25
J-2000	3,501.74	8,018.08	J-2000	20.00	186.16	8,018.11
J-2001	3,501.74	6,616.67	J-2001	20.00	186.16	6,616.69
J-2002	1,001.74	5,383.28	J-2002	20.00	186.16	5,383.29
J-2004	3,501.74	4,624.93	J-2005	20.00	186.16	4,624.93
J-2005	1,001.74	3,738.48	J-2005	20.00	186.16	3,738.48
J-2006	3,501.74	3,384.75	J-2006	20.00	186.16	3,384.76
J-2011	3,501.74	10,504.52	J-85	9.60	205.65	6,201.12
J-2020	3,501.74	2,956.36	J2011	19.15	164.19	2,917.82
J-25	1,001.74	6,463.50	J-26	19.35	191.16	6,336.19
J-27	3,501.74	6,961.01	J-27	20.00	192.66	6,961.03
J-28	3,501.74	8,494.91	J-28	20.00	192.66	8,494.95
J-29	1,001.74	7,859.29	J-29	20.00	192.66	7,859.32
J-3	1,001.74	2,026.45	J-3	20.00	151.16	2,026.45
J-30	1,001.74	3,935.80	J-30	20.00	187.66	3,935.81
J-31	3,501.74	7,647.01	J-31	20.00	191.66	7,647.03
J-33	1,001.74	3,556.02	J-33	20.00	189.66	3,556.02
J-34	1,001.74	4,430.00	J-34	20.00	174.66	4,430.00
J-37	3,501.74	10,779.34	J-33	11.95	171.08	9,048.65
J-39	3,501.74	12,548.65	J-84	16.28	224.07	8,872.03
J-4	3,501.74	3,426.36	J-47	13.07	145.66	3,121.81
J-40	3,501.74	13,456.93	J-84	14.30	219.49	8,443.08
J-400	3,501.74	8,001.34	J-33	18.70	186.66	7,749.64

2038 Maximum Day Demand Fire Flow Scenario with CIPs

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Flow at hydrant to Maintain Minimum System Pressure at 20 psi
J-401	3,501.74	8,382.26	J-33	18.34	185.82	8,047.57
J-402	1,001.74	5,358.88	J-402	20.00	186.16	5,358.89
J-403	3,501.74	4,683.86	J-403	20.00	181.16	4,683.86
J-404	1,001.74	2,919.20	J-404	20.00	171.16	2,919.20
J-405	1,001.74	4,984.29	J-403	19.14	179.16	4,885.25
J-409	3,501.74	6,826.61	J-85	18.06	225.17	6,034.73
J-42	3,501.74	4,910.19	J-42	20.00	141.66	4,910.19
J-43	3,501.74	5,338.86	J-47	11.33	141.65	4,761.23
J-44	3,501.74	2,697.75	J-47	14.58	149.16	2,506.20
J-45	1,001.74	2,307.03	J-47	17.40	155.66	2,224.38
J-47	3,501.74	2,124.93	J-47	20.00	161.66	2,124.93
J-60	1,001.74	2,005.40	J2011	14.80	154.16	1,861.21
J-61	3,501.74	2,380.83	J2011	8.52	139.66	2,042.35
J-62	1,001.74	2,202.87	J-62	20.00	131.16	2,202.87
J-63	3,501.74	3,284.26	J2011	-8.81	99.66	2,369.61
J-65	3,501.74	7,158.16	J-85	18.67	226.59	6,561.94
J-66	3,501.74	13,069.81	J-85	6.08	197.53	6,718.33
J-68	3,501.74	12,413.98	J-85	7.88	201.69	6,721.90
J-69	3,501.74	13,404.79	J-84	11.41	212.83	7,239.62
J-71	3,501.74	14,639.11	J-84	10.09	209.79	7,525.79
J-72	3,501.74	6,302.46	J-72	20.00	156.66	6,302.47
J-73	3,501.74	13,206.50	J-84	13.30	217.20	7,748.83
J-74	3,501.74	11,382.17	J-83	18.00	228.54	8,981.95
J-75	1,001.74	9,582.26	J-83	19.57	232.17	9,030.47
J-77	3,501.74	11,068.82	J542	18.70	211.16	10,593.98
J-78	3,501.74	4,807.43	J556	14.94	172.72	4,309.02
J-80	1,001.74	3,197.96	J-80	20.00	184.66	3,197.97
J-81	3,501.74	4,920.37	J-83	17.33	226.99	4,020.45
J-82	1,001.74	3,597.54	J-82	20.00	206.16	3,597.54
J-83	3,501.74	3,461.33	J-83	20.00	233.16	3,461.34
J-85	1,001.74	1,343.99	J-85	20.00	229.66	1,343.99
J-86	1,001.74	5,663.29	J-83	17.12	226.51	4,590.70
J-87	3,501.74	4,360.06	J-83	19.39	231.75	4,135.21
J-88	3,501.74	5,668.58	J-83	16.22	224.42	4,352.09
J-89	1,001.74	2,674.34	J-89	20.00	199.16	2,674.34
J-9	3,501.74	25,903.80	J-83	13.75	218.74	16,841.31
J-90	1,001.74	2,719.21	J-90	20.00	198.66	2,719.21

2038 Maximum Day Demand Fire Flow Scenario with CIPs

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Flow at hydrant to Maintain Minimum System Pressure at 20 psi
J-91	1,001.74	2,554.40	J-91	20.00	190.66	2,554.40
J-92	1,001.74	2,789.38	J-92	20.00	159.66	2,789.38
J-94	1,001.74	2,699.64	J-94	20.00	166.66	2,699.64
J-95	3,501.74	6,724.63	J-85	19.20	227.80	6,369.13
J-97	3,501.74	6,931.99	J-85	18.94	227.22	6,462.12
J-98	3,501.74	7,389.95	J-85	17.66	224.27	6,393.33
J-99	3,501.74	4,832.96	J-99	20.00	109.66	4,832.96
J2003	3,501.74	4,589.04	J2007	20.00	186.16	4,589.04
J2007	1,001.74	2,532.31	J2007	20.00	186.16	2,532.31
J2011	3,501.74	1,699.08	J2011	20.00	166.16	1,699.08
J300	3,501.74	12,399.10	J-85	1.18	186.23	5,901.18
J302	3,501.74	13,040.98	J-85	3.28	191.07	6,366.79
J304	3,501.74	13,006.91	J-85	6.41	198.29	6,739.63
J306	1,001.74	11,880.98	J-85	2.69	189.70	5,861.83
J308	3,501.74	11,327.41	J-85	5.14	195.37	5,925.99
J310	3,501.74	11,952.59	J-85	4.68	194.30	6,121.63
J322	3,501.74	10,886.86	J-85	6.59	198.71	5,927.94
J324	3,501.74	10,381.67	J-85	8.72	203.61	6,010.13
J326	3,501.74	10,821.74	J-85	8.72	203.63	6,202.49
J328	3,501.74	10,985.70	J-85	9.86	206.25	6,451.27
J330	3,501.74	10,416.20	J-85	13.53	214.73	6,874.44
J332	3,501.74	10,049.71	J-84	16.76	225.18	7,203.99
J334	3,501.74	11,060.02	J-12	17.47	195.32	10,707.26
J336	3,501.74	8,024.61	J336	20.00	191.16	8,024.64
J338	3,501.74	11,169.00	J-12	17.80	196.08	10,859.85
J340	3,501.74	11,744.67	J-84	17.90	227.81	9,388.77
J354	3,501.74	11,545.47	J-85	5.19	195.48	6,021.26
J356	3,501.74	11,674.79	J-85	6.43	198.35	6,232.67
J358	3,501.74	11,593.95	J-85	8.95	204.14	6,559.70
J360	3,501.74	12,322.23	J-84	12.11	214.44	7,030.26
J362	3,501.74	2,871.22	J-12	17.62	195.66	2,623.43
J364	1,001.74	1,510.80	J364	20.00	188.65	1,510.80
J368	1,001.74	3,853.24	J368	20.00	194.66	3,853.25
J372	1,001.74	6,276.02	J372	20.00	185.06	6,276.04
J374	1,001.74	6,855.39	J374	20.00	194.66	6,855.41
J376	1,001.74	8,221.40	J376	20.00	192.66	8,221.44
J380	1,001.74	6,487.72	J380	20.00	192.66	6,487.74

2038 Maximum Day Demand Fire Flow Scenario with CIPs

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Flow at hydrant to Maintain Minimum System Pressure at 20 psi
J382	1,001.74	7,872.00	J-31	19.48	190.47	7,765.99
J386	1,001.74	2,564.90	J386	20.00	186.66	2,564.90
J408	1,001.74	3,227.11	J2011	12.90	149.77	2,917.82
J410	1,001.74	3,520.60	J2011	5.63	132.99	2,917.82
J412	3,501.74	5,535.99	J2011	-25.09	62.09	3,517.13
J418	3,501.74	8,055.00	J2011	-22.40	68.30	5,200.86
J424	3,501.74	8,108.12	J2011	-20.74	72.14	5,295.42
J454	3,501.74	8,301.15	J-85	14.64	217.30	6,096.14
J456	3,501.74	7,161.24	J-85	17.43	223.72	6,115.78
J458	3,501.74	6,413.25	J-85	19.40	228.27	6,154.21
J460	3,501.74	9,058.41	J-85	13.52	214.71	6,238.59
J462	3,501.74	7,475.49	J-85	17.25	223.32	6,326.83
J466	3,501.74	12,339.50	J-85	8.05	202.08	6,717.43
J468	3,501.74	12,057.86	J-85	6.43	198.34	6,383.46
J470	3,501.74	11,430.23	J-85	5.28	195.68	5,985.35
J472	3,501.74	12,135.45	J-85	2.27	188.74	5,915.49
J474	3,501.74	9,840.44	J-85	10.01	206.60	5,966.71
J498	3,501.74	14,010.55	J-84	11.82	213.77	7,740.15
J500	3,501.74	10,949.17	J-85	11.65	210.39	6,746.58
J506	3,501.74	10,819.32	J-85	9.73	205.97	6,359.54
J508	3,501.74	10,867.10	J-85	6.35	198.15	5,887.29
J512	3,501.74	7,449.88	J-85	15.82	220.00	5,872.69
J514	3,501.74	4,216.23	J514	20.00	151.36	4,216.24
J520	1,001.74	2,406.20	J-139	-0.86	143.02	1,725.18
J522	1,001.74	1,732.37	J-139	8.88	165.49	1,418.67
J526	1,001.74	4,159.74	J526	20.00	98.86	4,159.74
J528	1,001.74	4,045.25	J528	20.00	157.31	4,045.26
J538	1,001.74	7,953.74	J-83	19.93	233.01	7,910.71
J550	1,001.74	1,297.07	J-145	17.66	191.66	1,228.85
J552	1,001.74	1,736.02	J552	20.00	216.16	1,736.02
J554	1,001.74	3,472.16	J554	20.00	209.16	3,472.16
J560	1,001.74	11,121.24	J-12	18.88	198.57	10,960.30
J562	1,001.74	4,397.99	J562	20.00	189.35	4,397.99
J568	1,000.00	21,965.48	J-83	11.82	214.27	14,113.31
J570	1,001.74	6,450.55	J570	20.00	166.16	6,450.56
J572	1,001.74	5,118.17	J572	20.00	192.16	5,118.18
J574	1,001.74	3,995.58	J574	20.00	202.16	3,995.58

2038 Maximum Day Demand Fire Flow Scenario with CIPs

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Flow at hydrant to Maintain Minimum System Pressure at 20 psi
J576	1,001.74	16,649.80	J572	-26.37	85.14	8,912.41

APPENDIX K

WELLHEAD PROTECTION PLAN

ATTACHMENT A

Wellhead Protection Plan

August 2004

For:

King County Water District #54
922 South 219th Street
Des Moines, Washington 98198
206-878-7210

Prepared By:

Hedges Engineering & Consulting, Inc.
913 Kincaid Avenue
Sumner, Washington 98390
253-891-9365

and

Robinson & Noble, Inc.
Groundwater & Environmental Geologists
5320 Orchard Street West
Tacoma, Washington 98467
253-475-7711

David T. Hedges
15469
8/18/04
EXPIRES 12/27/ 05

Hydrogeologist
306
Joseph E. Becker

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EXECUTIVE SUMMARY

King County Water District 54 is totally reliant on ground water for the domestic and fire flow water that it provides to the cities of Des Moines and Normandy Park. This water is pumped from wells located in the Highline Aquifer. The water drawn from these wells is of such quality that it does not require any further treatment. The residents and consumers of King County Water District 54 have enjoyed this water for the past 65 years. They expect the District and other government agencies to ensure that the quality and supply that can be drawn from this source benefit many generations to come.

Wellhead Protection Planning is part of good stewardship of the water supply. Most of the Wellhead Protection Plan details are devoted to planning and preparedness within a 10 year exposure boundary because that is of our most immediate concern. However, pure water sources are valued for centuries and well operations are meant to last many decades. Therefore prudent land and water use practices need to extend well beyond the delineated boundaries shown in the studies for these plans. For communities to thrive, they must have access to potable water. A water source is part of a hydrogeologic system and is impacted by conditions within the local environment. Therefore, it is imperative that we, collectively, practice good stewardship of the resources.

Land use within the Wellhead Protection Planning Area for King County Water District 54 has undergone major changes within the last 50 years. Most of the issues with surface water, storm water and potential groundwater contamination have occurred within that same period of time. King County Water District 54's Wellhead Protection Plan details the measures that it is taking to protect and preserve groundwater resources and the wells that draw from those resources.

Water District 54 Source of Supply

The water source facilities of Water District 54 consists of four supply wells, a 660,000 gallon surface reservoir, a 250,000 gallon elevated reservoir, and a booster pump station. Three of the wells and the elevated reservoir are now in service. The fourth well, surface reservoir and booster pump station will be placed in service after completion of construction scheduled during 2004. Two of the wells now in service and the well to be placed in service are screened at depths of 320 to 340 feet in what is referred to as the "deep aquifer". The fourth well is screened at depths of 213 to 239 feet in what is referred to as the shallow aquifer. Production of the wells ranges from about 100 to about 500 gallons per minute. The water quality from both aquifers is generally considered good and no treatment is necessary. The water source has been used for over 65 years and the residents are keenly interested in preserving the taste and quality of the water. In addition to the well field, Water District 54 has an emergency intertie with Highline Water District.

Wellhead Protection Areas

A wellhead protection area (WHPA) represents an area of potential recharge from which a well derives its groundwater supply. It is based on the capture zones that describe the area of an aquifer that contribute water to a well in a given period of time. Capture zones for WHPAs are usually defined for travel periods of 6 months and one, five and ten years. Since the Water District 54 wells capture water from two aquifers, WHPAs are defined for both the deep and the shallow aquifers. Robinson & Noble, Inc., a consulting hydrogeologist firm, determined the WHPAs using analytical modeling for flow conditions near the wells and hydrogeologic mapping for more distant areas in the aquifer system.

The Water District 54 WHPA lies within the cities of Des Moines, Normandy Park, and SeaTac. Potential contaminant sites include those typical of residential and commercial properties and the fuel storage tanks at SeaTac Airport.

Identification and Ranking of Existing and Potential Contaminants

The locations of existing and potential contaminant sites were determined through a computerized database search and site verification with a windshield survey. Environmental Data Resources, Inc., a database research company, reviewed the EPA and Department of Ecology contaminant databases within a 2-mile radius of the center of the WHPA. All of the WHPAs are located within the 2-mile radius area. Personnel from the Water District and Hedges Engineering & Consulting, Inc. conducted the windshield survey. They used global positioning system (GPS) equipment to measure the latitude and longitude of each existing site with potential for contaminants.

After verifying the existence of each potential contaminant site, Robinson & Noble ranked the hazards according to three criteria. Proximity of the potential hazard to the water source was the first priority. Within this highest priority criteria, locations within the 6-month WHPA had the highest sub-priority and those outside WHPAs and down gradient of the water source had the lowest sub-priority. The next priority was the type of contaminant source with 12 sub-priorities based on the type of contaminated site. The third priority was the straight-line distance from the water source within each WHPA sub-priority. The potential contaminant sites are listed in order of their hazard ranking in Appendix C.

Notification of Wellhead Protection Areas

Owner/operators of potential contaminant sites were notified of the potential for their operations to contaminate the groundwater supplies of the Water District. The letter in Appendix C was distributed to each of these owner/operators. Local governments and appropriate state agencies listed in Appendix D were notified of the Water District 54 Wellhead Protection Plan. A sample copy of the letter to agencies/local governments is also included in Appendix D. Finally, emergency providers within the wellhead protection area were notified of the need to have appropriate spill/incidence response measures to prevent ground water contamination. A list of these emergency responders and a sample letter are listed in Appendix E.

Contingency Plans

Water District 54 maintains a Fire Protection and Emergency Intertie with the Highline Water District to provide water during emergency situations. In the event of contaminated water being found in one of the District wells, this Intertie can be immediately opened. Contingency plans have been further developed depending on the location of the contamination. If only one of the two aquifers, deep or shallow, becomes contaminated, the other aquifer may still be useable. This would most likely occur with contamination in the shallow aquifer and the deep aquifer remaining useable. If contamination occurs within either WHPA, a consulting groundwater hydrologist would be hired to develop recommendations for minimizing the effects and cleaning up the contamination.

Management Strategies and Implementation Tasks

Effective management strategies will be required to reduce the hazard of the known and potential contaminant sites within the WHP. Water District 54 owns only the small parcel of land where the wells are located, and implementation of this WHPP will require a long-term cooperative effort with local agencies, neighboring purveyors and state regulatory agencies. The

Management Strategies outline long-term management of potential contaminant sources such as sewers, septic tanks, storm water runoff, and petroleum storage tanks. They also include education and cooperative efforts to maximize the limited resources of the District. The Implementation Tasks list specific activities that will allow the Water District to meet their management goals within time and financial constraints. The District has developed this WHPP to identify the WHPA and known and potential contaminants within the area. It will, however, rely heavily on other government entities to establish and enforce standards and practices to minimize potential contamination.

Water District 54 recognizes the importance of a long-term commitment to the Management Strategies and Implementation Tasks in WHPP. The plan identifies the WHPA and will be used as a guideline for long-term monitoring of potential contamination within the area. It also provides for compliance with State and Federal regulations for the maintenance of groundwater quality for public water supplies.

INTRODUCTION

The Wellhead Protection Program

The 1986 amendments to the Federal Safe Drinking Water Act mandate the development of a state wellhead protection program. In July 1994, the State Department of Health addressed these mandatory requirements by modifying WAC 246-290 to include the necessary elements of the program. The overall goal of the state wellhead protection program is to prevent the contamination of ground waters used by Group A public water systems. In Washington State, the Wellhead Protection Plan (WHPP) must as a minimum include the following elements:

- A completed susceptibility assessment;
- A delineation of each groundwater source establishing time of travel zones for 6 month, and 1, 5 and 10-year boundaries based on recognized methods;
- An inventory of actual and potential ground water contaminant sources within the wellhead protection area along with notification documentation;
- Documentation that delineation and inventory findings are distributed to required entities;
- Development of a contingency plan to ensure that adequate supplies of water are available in the event of contamination; and
- Documentation of coordination with local emergency responders for appropriate spill/incident response measures.

Under the WAC, local public water systems have primary responsibility for developing and implementing local wellhead protection programs. The State Department of Health (DOH) oversees the wellhead protection program.

Water Supply for Water District No. 54

The Water District 54 wellhead protection area (WHPA) lies within the cities of Des Moines, Normandy Park and SeaTac. Boundaries are relative to time water takes to travel to the District's wells. The 10 year boundaries are as follows. The northern and southern boundaries for both the shallow and deep aquifers extend from the south edge of SeaTac Airport on the north to the community of Midway to the south. The eastern edges are along the west side of Interstate 5 for the shallow aquifer and along the east side of Interstate 5 for the deep aquifer. On the western edge, the shallow aquifer area is about ½ mile inside the Puget Sound shoreline, and the deep aquifer area extends slightly into Puget Sound.

Water District 54 wells have operated continuously for many decades and are expected to operate for many decades to come. To determine the shape of the 20 year or beyond boundary would require additional modeling beyond what has been required. However, the general shape can be described with present knowledge. The boundary would not reach further east of the 10 year boundary because this is already at a ground water divide. Likewise, the boundary to the west is near the aquifer boundary. The boundaries to the north and south would likely expand those directions. For example, 20 year boundaries could be at most several thousand feet beyond the 10 year boundaries.

Water District 54 depends entirely on ground water to supply its normal needs. The District has 768 connections and serves a population of slightly under 4000 residents – many of them in multi-family housing units. It has three wells drilled into the deep aquifer and one into the shallow aquifer. An elevated 250,000-gallon reservoir has been in service since 1968. A

660,000-gallon surface reservoir and booster pump station will be placed in service when construction is completed in 2004. In the event of an emergency, there is a Fire Protection and Emergency Intertie Agreement with Highline Water District. This Intertie opens automatically in the event that the water pressure in the District falls below a preset level

With the District's dependence on ground water, there is an obvious need for a Wellhead Protection Plan. The WHPA includes a large area of highly developed land with multiple, potential hazards. Examples of potential hazards include: leaking underground storage tanks, pipelines, fuel storage tanks, petroleum products, fertilizers and pesticides, seepage from septic systems, infiltration of runoff from many paved areas or waste and chemical storage facilities. The potential major hazards tend to be concentrated in the downtown Des Moines area, along Pacific Highway South, and along the southern portion of SeaTac Airport. The existing and potential contaminants identified occur at or near land surface while the District's wells draw from deep underground. Therefore, the District's sources are protected from contamination by geologic and hydrogeologic considerations, and the potential for contamination to affect the supply is small. Air-bourne contamination is also possible in the area, but its potential to affect the water supply is even more remote than land-surface contamination. Even though the likelihood of contamination of the water supply is small, with the District's location near so many potential sources of contamination, it is in the best interest of the District and water quality protection that both an inventory of existing and potential hazards and a list of tasks designed to reduce the risk from these hazards be made.

Susceptibility Assessment

The first step in the wellhead protection process was completion of Ground Water Contamination Susceptibility Assessment Forms for all of the District's wells. For Wells 4, 5, and 6 the Susceptibility Forms were completed in 1994. Well 7 was drilled in 2000, and the Susceptibility Form for this well was completed in the same year. Copies of the completed Ground Water Contamination Susceptibility Assessment Forms are included as Appendix A. The ground water protection areas estimated via these initial forms have now been replaced with a more thorough groundwater protection area delineation for the deep and shallow aquifers developed by Robinson & Noble, a recognized hydrogeologic consulting firm, as described below.

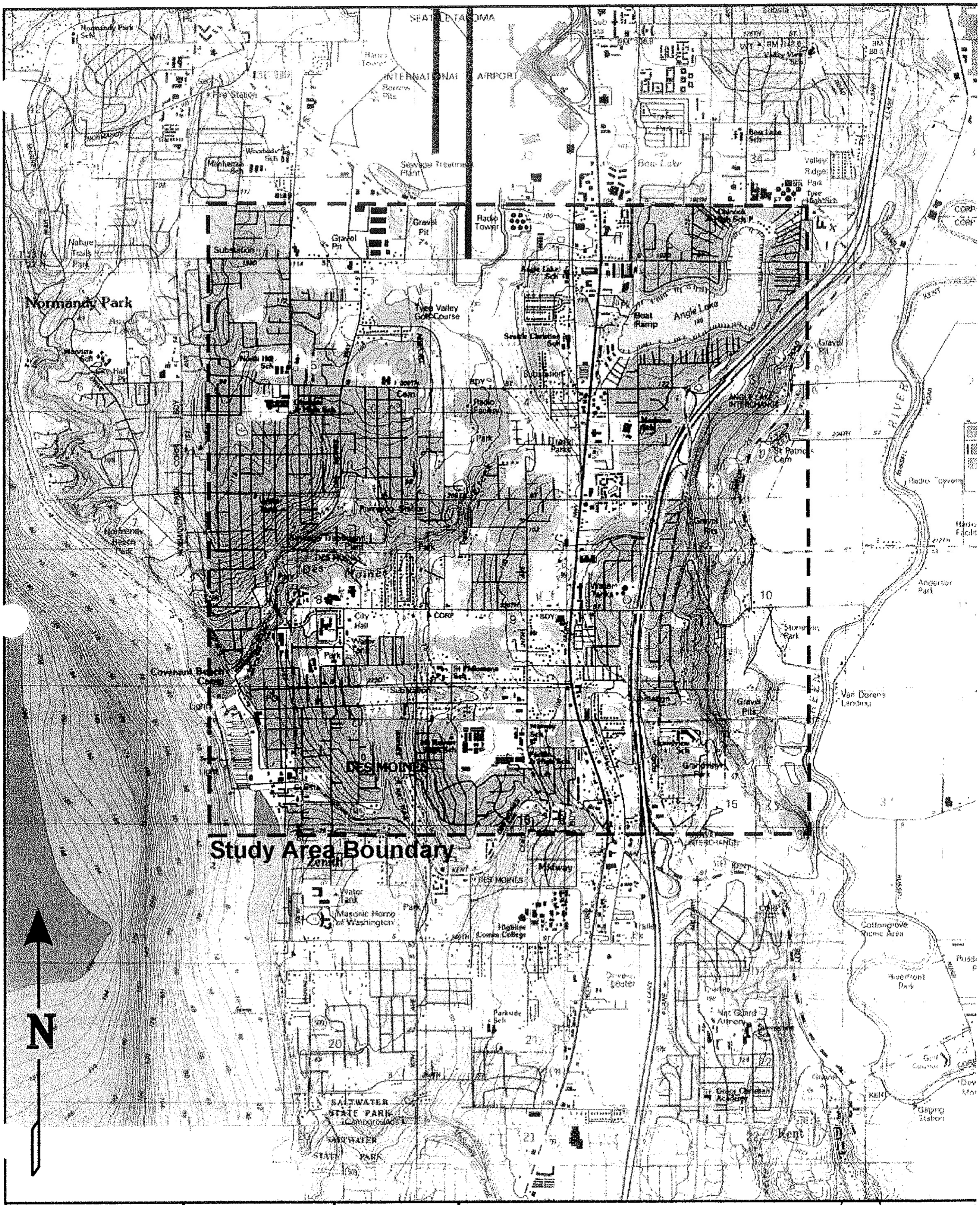
Hydrogeologic Assessment

Introduction

Purpose and Scope

Before a WHPP can be developed, a management zone around the protected well or wellfield must be delineated. This zone is called the wellhead protection area (WHPA). As required by State guidelines, WHPAs are primarily based on travel time-related capture zones. These capture zones describe the area of a well's aquifer system (and all overlying material) that can contribute water to the well in a given period of time. Capture zones are typically defined for time-of-travel periods of six months, and one, five, and ten years. Several steps are necessary to accurately delineate the area that contributes water to a well or wellfield. First, geologic and hydrogeologic data for the general region must be collected and analyzed. Secondly, a conceptual model of the hydrogeologic system that encompasses the well needs to be developed from the data analysis. Finally, the WHPA needs to be defined by using the data

ATTACHMENT A



(5A) Figure 1

REGIONAL MAP

King County Water District 54, Wellhead Protection Plan

ROBINSON & NOBLE, INC.	Note: Basemap taken from USGS Burien / Poverty Bay Quads	King County Scale 1" = 3000' March 2003 PM: Jeb

analysis and conceptual model to determine zones of contribution, travel times, and capture zones.

Several methods exist by which the capture zone of a well or wellfield can be defined. Generally, the methods are considered to be in one of four categories. From lesser to greater accuracy, these are: the calculated fixed radius method, analytical modeling, hydrogeologic mapping, and numerical modeling. The calculated fixed radius method is a non-technical approach that requires a minimum of hydrogeologic information. This method is overly simple and is not appropriate to the Water District's situation. The more technical methods of analytical modeling and hydrogeologic mapping vary in their accuracy, depending upon the nature of the hydrogeologic setting, the level of understanding of that setting, and the quantity and quality of available data for the study area. Numerical modeling is a rigorous process that is highly dependent on an abundance of data and a well-defined hydrogeologic setting. This method applies computer technology to "solve" a master flow equation for the domain of the model.

Due to the constraints of available data, the hydrogeologic conditions in the area, and the scope of the project, the numerical modeling method was not used for capture zone delineation for this WHPP. Instead, analytical modeling combined with hydrogeologic mapping was determined to be the most effective approach. The main drawback to using analytical modeling by itself is that this method assumes constant aquifer properties and, therefore, gives poor results at distance from wells where aquifer parameters typically change (from near-well conditions). For this reason each well is assigned its own near well aquifer properties, while the aquifer system is assigned averaged values determined by hydrogeologic mapping techniques, thereby providing good capture zone definitions at both near and far distances. The explicit tools and methods employed are described in detail later in this report.

Previous Studies

A regional groundwater study, Water-Resources Investigation Report 92-4098 (Woodward et al., 1995), describes the general water resources of the southwestern King County area. USGS Water Supply Bulletin No. 28 (Luzier, 1969) also specifically evaluated the groundwater resources of King County. This study collected and interpreted basic groundwater data and provided the first countywide look at the resources. Robinson & Noble conducted an aquifer definition study of the region in 1998 for the Highline Water District (Robinson & Noble, 1998). Additionally, Robinson & Noble has conducted several site-specific investigations of both the Water District's well field (Robinson & Noble, 1955, 1982, 2000) and other water-supply wells located in the immediate Des Moines area.

Hydrogeologic Data

The first step of the present study was to gather existing hydrogeologic information available in the area (in addition to the previous studies mentioned above). The data includes information for most wells of record in the study area for which a quarter-quarter section location, or finer, was available. Well records were collected from the Department of Ecology (Ecology) well database, Robinson & Noble project files, and published reports. These included construction reports for all of the District's wells. The well logs were cataloged and analyzed to guide the formation of our conceptual hydrogeologic model of the Des Moines area.

Study Area Physiography

Topography and Drainage

The study area covers an area of approximately 11 square miles near tidewater in the southeastern part of the Puget Sound Lowland, a topographic low between the Olympic Mountains and the Cascade Range. The area lies approximately midway between Seattle and Tacoma, immediately south of SeaTac Airport (Figure 1). The entire study area lies within King County, specifically the northern portions of Township 22 North/Range 4 East and the southernmost portion of Township 23 North/Range 4 East.

The physiographic and topographic characteristics of the area are similar to much of the surrounding Puget Sound Lowland area, consisting of remnants of a Pleistocene glacial drift plain. The Des Moines Plain upland, in the study area, lies between the Green River valley on the east and Puget Sound on the west. The bluff separating the upland plain from the Green River valley is fairly steep. The slope from the upland to Puget Sound is much more gradual throughout most of the study area. Occasional low rounded hills, or drumlins, can be found on the upland throughout the study area, and are a relic of the glacial processes. The upland has been bisected by two stream networks draining to Puget Sound. These are Des Moines Creek and Massey/Barnes Creek networks. Eastward drainage to the Green River is limited to a narrow band along the eastern portion of the upland. A fairly large lake without an apparent surface water drainage, Angle Lake, occurs in the northeastern portion of the study area.

Climate

King County has a characteristic Puget Sound Lowland climate, typified by warm, dry summers and prolonged, temperate, wet winters. The Olympic Mountains and the Cascade Range generally prevent severe winter storms from moving into the lowlands. The wet season generally lasts from October to April. Rainfall records from SeaTac Airport indicate the Des Moines area receives 38.08 inches of precipitation a year on average (Western Regional Climate Center website, 2003). This weather pattern coupled with the mild temperatures and a relatively long growing season is conducive to thick vegetation.

Winter storms generally approach the Puget Sound Lowland from the southwest. Typically, southwest King County receives relatively medium to high winter rainfall as a result of marine storms passing through the topographic gap between the Olympic Mountains and the Cascades, with the greater amounts occurring in the Cascade foothills. These winter storms bring approximately 80% of the annual precipitation during the 7-month period between October and April. The Pacific Ocean moderates temperatures within the Puget Sound Lowland and local marine waters. Temperatures rarely drop below freezing or exceed 90°F.

Geologic History and Stratigraphy

The surficial geology of the study area is formed entirely of unconsolidated Quaternary sediments. The unconsolidated sediments in the area are up to 1200 feet thick (Jones, 1999) and rest upon consolidated bedrock of Tertiary age. The unconsolidated sediments were deposited as a result of repeated cycles of glacial and interglacial episodes. It is generally accepted that four or more glaciations occurred in the Puget Sound Lowland during the Pleistocene Epoch. The most recent advance of the Puget glacial lobe into the southern end of Puget Sound occurred approximately 13,500 to 15,000 years ago and is called the Vashon Stade of the Fraser Glaciation. The Vashon deposits cover most of the study area. Due to lack of exposure, stratigraphic correlation of pre-Vashon deposits is problematic.

When the Vashon Glacier advanced into the Puget Sound region, it blocked north-flowing drainages and created a pro-glacial lake throughout much of the Puget Lowland areas. As the glacier advanced southward, meltwater flowing from the glacier deposited a coarse-grained sand and gravel outwash in front of the glacier. The resulting sands and gravels form the first permeable layer of Vashon deposits, and are commonly called Vashon advance outwash (Qva). As the glacier advanced further, it deposited a compacted clay, silt, sand and gravel mixture known as glacial till. The Vashon till (Qvt) is very common throughout the Puget Sound region, including the study area. Finally, as the glacier retreated, recessional outwash was deposited much in the same fashion as the advance materials. These Vashon recessional outwash (Qvr) deposits are typically thin in much of the Puget Lowland, but can be thicker locally.

Prior to the Vashon Glaciation, at least three other glaciations occurred in the area. Each of these likely had a history similar to the Vashon as described above. In between each of the glacial episodes, long periods of erosion and/or alluvial deposition occurred. Furthermore, at least portions of the area, if not all, also experienced one or more inundations of an ancestral Puget Sound, which added marine sediments to the area. This complex erosional and depositional history prior to the Vashon has lead to a highly variable Pleistocene stratigraphy and difficulty in differentiating between some glacial and non-glacial sediments. All of the Water District's wells are completed in the pre-Vashon sediments.

Conceptual Model

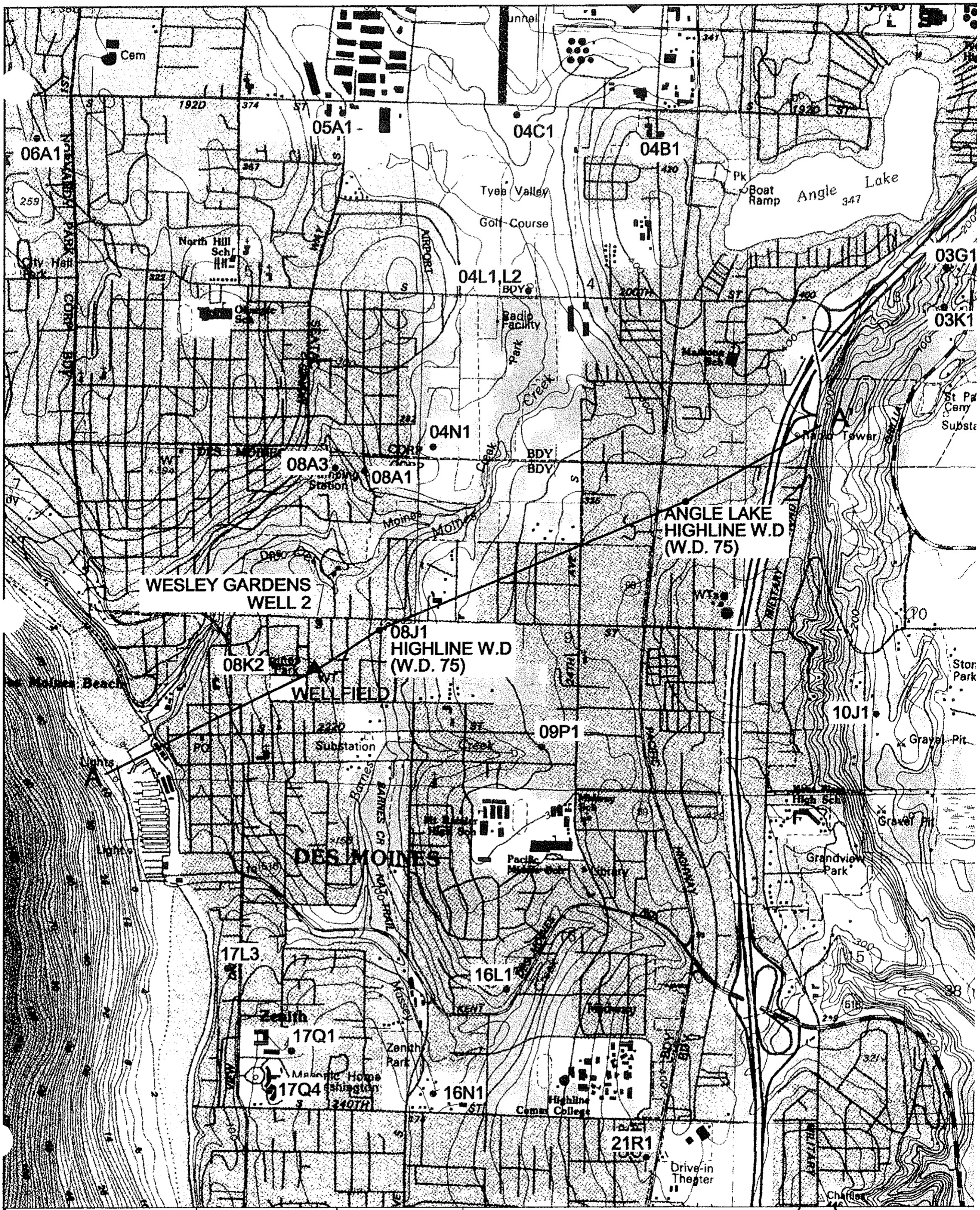
Well information, along with previous studies in the region, served as the basis for the development of a conceptual hydrogeologic model to describe the groundwater flow system in the Des Moines area. The locations of the wells providing information for this study are shown on Figure 2. The hydrostratigraphic units within the conceptual model are described in the following report section.

A conceptual model should be as simple as possible, yet contain every important hydrologic component necessary to recreate system behavior. Essentially, the conceptual model synthesizes information from geologic logs, cross sections, potentiometric maps, hydrographs, and other geologic and hydrologic information into a generalized representation of the geology as it affects the groundwater flow system. Once constructed, the conceptual model guides the scientific analysis of groundwater systems of an area. Conceptual models define three basic components of a groundwater system. These are the boundaries of the system, the hydrostratigraphic units in the system, and the general groundwater flow through the system.

Boundaries and General Flow System

Groundwater flow systems are confined by boundaries that control the flow. These boundaries are either physical or hydrologic in nature. Physical boundaries are formed by a physical presence (e.g., a bedrock mass) or absence (e.g., the erosional truncation of an aquifer). Hydrologic boundaries are formed by groundwater divides and other hydrologic features.

The groundwater flow system in the Des Moines area is largely constrained by three boundaries: Puget Sound on the west, the Green River valley on the east, and a groundwater divide between the other two. Puget Sound and the Green River valley are physical boundaries, and both represent discharge points for the groundwater system. As discharge points, water within the system flows toward these boundaries. The groundwater divide is a hydrological boundary. Water flows away from this boundary generally toward the other two. This groundwater divide is located on the eastern portion of the upland such that most of the area has westward flow toward Puget Sound.



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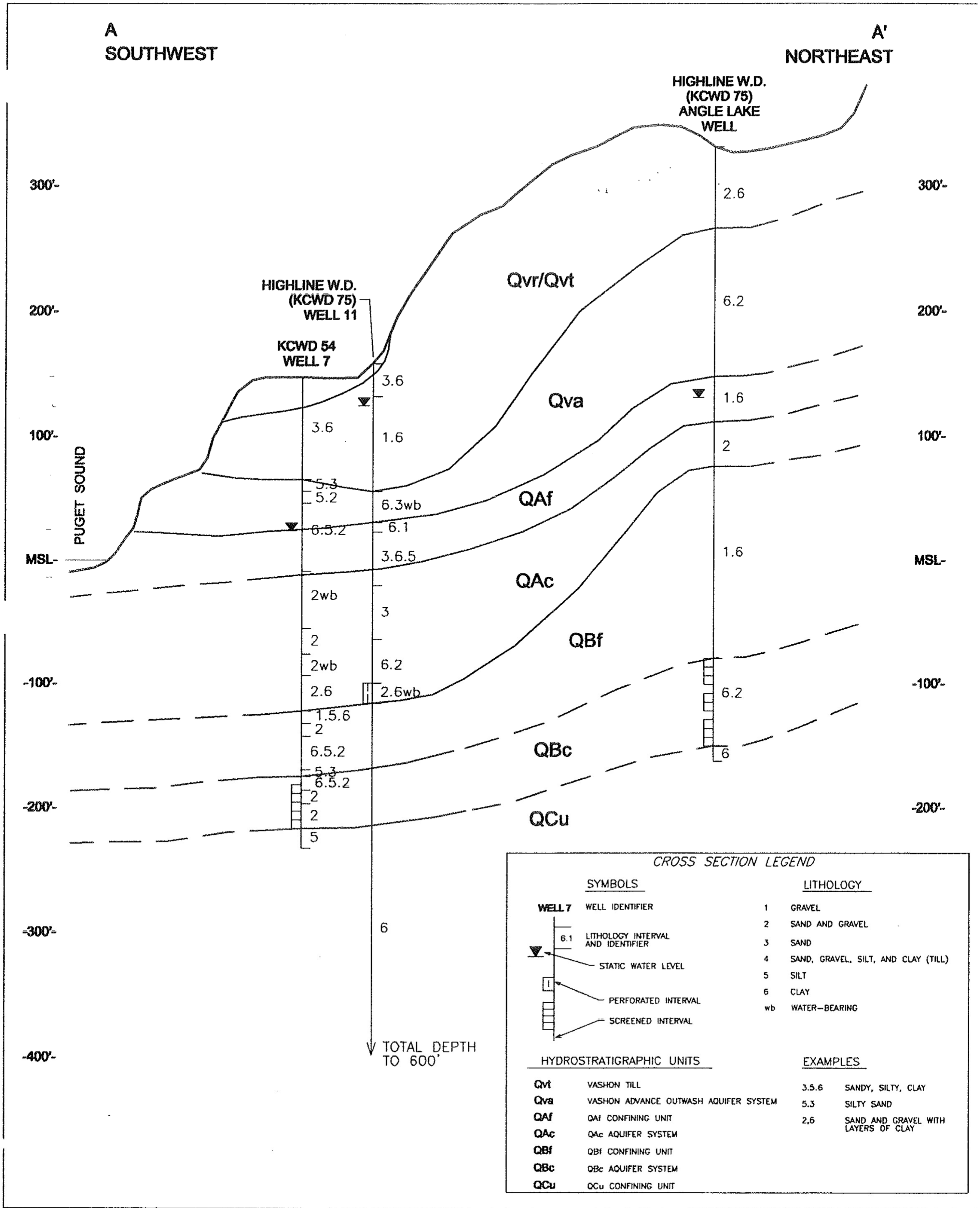
SCALE 1" = 2000'
KING COUNTY

FIGURE 2
WELL AND CROSS SECTION LOCATION MA
King County Water District 54, Wellhead Protection Pla

ATTACHMENT A



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KING COUNTY

(83)

FIGURE 3

HYDROGEOLOGIC CROSS SECTION A-A

King County Water District 54, Wellhead Protection Plan

Within the study area, the primary source of recharge for the groundwater system is direct recharge from precipitation, landscape irrigation, and septic systems. Leakage from Angle Lake also provides recharge to the northeastern portion of the area. Once in the groundwater system, the water flows generally west or east away from the groundwater divide discussed above. The discharge zones are Puget Sound to the west and the Green River valley to the east for the three uppermost aquifer systems defined below. The general flow pattern is the same for all three aquifer systems, though for the upper two, there is also some preferential flow toward, and discharge to, area streams.

Physical Definition of the Hydrogeologic System

Woodward et al. (1995) provided a summary of the hydrostratigraphic units in southwest King County; the units found in the Des Moines area are shown in Table 1. Following the USGS nomenclature, a hydrogeologic cross section was prepared from the deeper municipal wells in the area, presented as Figure 3. The cross section location is shown on Figure 2.

The primary ground water in the study area is contained within the unconsolidated sediments. The generally layered system consists of relatively permeable water-bearing units (aquifers) and low-permeability units, which generally retard water flow (aquitards). Textural variability within the sediments results in a complex assemblage of interfingered aquifers and aquitards occurring on scales ranging from regional to local. When examined at a regional scale, groups of related water-bearing sediments are best considered as aquifer systems, rather than individual aquifers. Lower permeability zones separating aquifer systems are known as confining layers or units. Generally, hydrostratigraphic units are either aquifer systems or confining layers.

Table 1. Summary of hydrostratigraphic units in the study area as given by USGS WRI 92-4098 (Woodward et al., 1995).

USGS Hydrostratigraphic Units	Generalized Description
Qvr	Vashon recessional outwash- coarse gravel with interstitial sand deposited by high energy glacial meltwater streams
Qvt	Vashon till - Poorly sorted deposits of clay, silt, sand, gravel and boulders. Regional confining unit.
Qva	Vashon advance outwash- generally sands or sand and gravel.
QAf	Fine-grained confining bed of clay and silt. Includes Kitsap Formation, Vashon and older till, confining bed
QAc	Coarse-grained sand and gravel unit. Regional, confined aquifer used extensively throughout King County, aquifer material
QBf	Fine grained interglacial sediment, confining bed
QBc	Outwash deposits of drift sediments, aquifer material
QCu	Undifferentiated deposits of Quaternary age. Contains both aquifers and confining beds.

Stratigraphy

The following descriptions of the units are based upon the 1998 Robinson & Noble report entitled *Groundwater Resource Study for the Highline Water District*.

Vashon Recessional Outwash (Qvr)

Vashon recessional outwash generally consists of relatively well-sorted, coarse-grained sand and gravel which mantles the till surface that underlies it throughout most of the study area.

These deposits were laid down as outwash from the receding glaciers. Where saturated, these deposits are considered aquifers and may yield adequate or even abundant domestic supplies. However, this unit is generally quite thin, discontinuous, and often unsaturated within the study area. Of the aquifer units discussed in this report, this unit is the most susceptible to contamination, making it of little use to the District as a potential water supply source. The unit does have significance, however, in that it increases the recharge potential of the groundwater systems where it is present in moderate to thick quantities.

Vashon Till (Qvt) Confining Layer

Vashon till, deposited directly by glacial ice, generally consists of sand, gravel, and cobbles within a matrix of gray to blue-gray silt and clay. This material was deposited at the base and margins of the Vashon glacier and subsequently greatly compacted by the weight of the overriding ice. This unit is present at or near land surface throughout most of the study area, although it is conspicuously missing in some of the major stream valleys due to erosion. The reported thickness of this till ranges from 0 to 180 feet in the greater Des Moines area, averaging about 50 to 70 feet. Although small domestic water supplies are occasionally obtained from localized sand and gravel deposits within the till, across most of the Des Moines upland this unit functions as a regional upper confining unit for the underlying Vashon advance outwash deposits.

Qva Aquifer System

The Qva aquifer system consists predominantly of Vashon advance outwash deposits comprised of materials shed from the advancing glacier. These sediments are generally reworked by glacial meltwater streams or sorted by deposition in pro-glacial lakes, resulting in a sequence of moderately well sorted sand and gravel deposits. The Qva unit, where saturated, is the uppermost significant aquifer identified in the study area, and along with the underlying QAc aquifer, likely supplies the majority of water to the relatively few individual domestic wells in this area.

The Qva unit underlying the Des Moines upland is comprised of sand and gravel deposits of variable permeability. This sequence of sediments is generally relatively fine-grained at its base and becomes coarser towards the top (due to the advancement of the glaciers). However, given the relatively fine-grained nature of the basal portion, the aquifer system may also incorporate some of the underlying non-glacial sediments. Production from this unit ranges from less than 50 gpm in finer-grained zones to 1,000 gpm in coarser zones, with an average production of approximately 280 gpm. In the greater Des Moines and Highline area, the unit ranges in thickness from 0 feet (where it has been eroded along major stream valleys) to 250 feet along the bluffs of the coast. Average thickness of the Qva is 100 to 150 feet. This unit slopes from east to west towards Puget Sound, most notably in the northern portion of the study area, and is generally encountered in wells at elevations between 450 and 200 feet above mean sea level (MSL). Due to the erosional removal of the Qva in some of the major stream valleys, this aquifer is likely the most discontinuous of the three aquifers present in the study area.

QAf Confining Layer

The QAf unit is a sequence of sandy clays and silts with wood and layers of fine sand and occasional gravel. It primarily is an interglacial deposit, but may also include lower permeability zones of the overlying and underlying glacial units. Although small lenses of water bearing sand and gravel do occur within the QAf, this unit as a whole functions as a regional confining unit.

QAc Aquifer System

The QAc aquifer system is comprised of predominantly coarse-grained deposits of sand and gravel presumed to be glacial in origin. This unit, which is the second primary aquifer below land surface, may be comprised of recessional and advance deposits as well as an intervening, discontinuous till. However, the unit as a whole is considered to be a single aquifer system with significant water production potential.

The QAc unit underlying the Des Moines upland is comprised of moderate to highly permeable coarse sand and gravel deposits, possibly becoming more matrix rich to the north. Production from this unit in the greater Des Moines and Highline area ranges from 200 gpm to 1,000 gpm, with an average production of approximately 460 gpm. The unit ranges in thickness from 50 to 250 feet with an average thickness of 50 to 100 feet. Similar in regional expression to the Qva aquifer, this unit also slopes from east to west, particularly towards the north. The QAc unit is generally encountered in wells at elevations of 100 feet above to 100 feet below MSL, although towards the northern portion of the study area this unit can be higher. Based upon the large number of wells that intersect this unit, the QAc aquifer is considered to be a regional aquifer underlying the majority of the study area. The Water District's Wells 3 and 5 produce from this aquifer system. For purposes of this report, this aquifer system is referred to as the "shallow aquifer."

QBf Confining Layer

The QBf unit is composed primarily of multicolored, hard silt and clay with layers of peat and occasional sequences of fine sand and cemented gravel that were deposited between glacial advances. This unit, which separates the QAc and QBc aquifers, functions as a confining layer.

QBc Aquifer System

The QBc unit, the third primary aquifer system below land surface, is predominantly coarse-grained sand and gravel deposits also considered to have a glacial origin. As with QAc, this system may consist of an entire glacial drift sequence (recessional outwash, till, and advance outwash) or only part of it. This is the system from which the District's Wells 4, 6 and 7 produce. For purposes of this report, this aquifer system is referred to as the "deep aquifer."

The QBc system underlying the Des Moines upland is comprised of highly-permeable coarse sand and gravel deposits. Production from this unit ranges in the greater Des Moines area from less than 50 to 3,200 gpm, with an average production, of approximately 1,600 gpm. The unit ranges in thickness from 50 to 250 feet with an average thickness of 50 to 100 feet. This aquifer slopes from east to west, in similar fashion to both the Qva and QAc aquifers. The QBc unit is generally encountered in wells completed at sea level to 200 feet below MSL. This unit is only tapped by five known wells within the study area, so little direct evidence of its lateral extent exists. However, the high quantities of production generally obtained from the wells that do tap this zone suggest that this aquifer has some regional support and it may be present beneath much of the study area.

QCu Undifferentiated Unit

Underlying the QBc aquifer is a thick sequence of fine-grained unconsolidated sediments with dubious water production potential. The only well found to penetrate this sequence (Masonic

Home well—17Q1) was drilled to a depth of 840 feet below MSL (total depth 1,001 feet). After penetrating a lower permeability zone of the QBc aquifer, the well encountered an extensive sequence of clay with minor amounts of sand and gravel. Water-bearing materials were encountered around 350 to 400 and 700 to 750 feet below MSL, but the well (screened in the lower zone) only yielded 420 gpm. Although future wells could penetrate this deep system and find more significant quantities of water, the QCu unit is generally considered to be an underlying confining unit for the purposes of this study.

WHPA Delineation

In order to define the WHPAs for the District's wells, two standard capture zone delineation methods were combined to identify the six-month and the one-, five-, and ten-year zones of capture. A computer-based analytical model was used to define the near-well response to pumping and to define the near-well portion of the capture zone. Hydrogeologic mapping was used to define capture zones at a distance from the wellfield. Due to the close proximity of the District's main wells, Wells 3 and 5 were modeled together in a single analytical model representing the QAc aquifer system and Wells 4, 6, and 7 were modeled together in a single model representing the QBc system.

The capture zone definitions are established through a process called particle tracking; that is, mapping the paths that water particles take to reach a well. Such paths can be mapped in either a forward or a reverse direction. By tracing paths backwards from the well and calculating the time it takes a particle to move along those paths, path lengths representing half-, one-, five- and ten-years of travel can be determined. A capture zone for a specific time is then defined as the area encompassing all particle paths for the same time period.

Both near-well and distant-well capture zone definitions were performed twice for the wells: once at one-half of the defined hydraulic conductivity (K) values, and once at double the conductivity. This double-modeling procedure brackets the geometry of the capture zones to account for the variability and uncertainty of aquifer parameters. For a given pumping stress, capture zones are shorter and wider for the low K values, and longer and narrower for the higher K values. The result of combining capture zones for the two analysis conditions defines the area most likely to actually cover the real world capture zone for each time period analyzed.

The composite capture zones were then subject to regional analysis using the conceptual model of the hydrogeologic conditions in order to define the appropriate WHPAs for the wells. This regional analysis also results in the definition of the overall zone of contribution. A zone of contribution, also know as a steady-state capture zone, is the total area which contributes water to a well, regardless of how much travel time is involved. Therefore, travel-time related capture zones are necessarily sub-areas of the zone of contribution.

Analytical Modeling Parameters

Several groundwater system characteristics are necessary to define the well-specific and regional cases of capture zone delineation. These parameters are used to satisfy the equations solved in the analytical model, to perform particle tracking to define travel distances for the specified half-, 1-, 5-, and 10-year times, and to define flow lines of capture. The parameters are:

1. Hydraulic conductivity, expressed in feet per day (ft/day)
2. Porosity, expressed as a percentage of total volume
3. Average annual well discharge, in cubic feet per day (ft^3/day)

4. Aquifer thickness, in feet
5. Potentiometric gradient, which is the vector representing the ratio of vertical change to horizontal change along a flow path.

Each parameter is discussed below in greater detail.

Hydraulic Conductivity

Hydraulic conductivity is the measure of the ability of a unit area of an aquifer to transmit water. It is expressed as a volume of water per unit time per unit area that would be transmitted if the gradient (pressure head) driving the water were equal to one (i.e., one foot of vertical drop for each foot of horizontal run). Using the common units of feet and days, hydraulic conductivity is expressed as cubic feet of water per day per square foot of aquifer area ($ft^3/day/ft^2$), which mathematically reduces to feet per day (ft/day). Although commonly expressed in units such as feet per day, it is not a velocity and does not represent the velocity of water moving through an aquifer. It is a description of a characteristic of the aquifer material not a statement of actual water movement within aquifers.

Hydraulic conductivity can be determined from transmissivity data generated by a pumping test. Transmissivity (T) is a statement of the volume of water passing through the entire aquifer thickness. It is usually expressed in gallons per day per foot of aquifer width (gpd/ft), and can be converted to units of cubic feet per day per foot of width by dividing by 7.48. The hydraulic conductivity is commonly calculated by dividing the transmissivity value by the saturated thickness of the aquifer at a well.

For most major production wells in the study area, hydraulic conductivity values were calculated from transmissivity values derived from pumping tests. For wells where transmissivity values were not available, but pumping test data was sufficient to calculate a specific capacity rating[1], a T value was estimated by applying a conversion factor to the specific capacity. Otherwise, estimates of the hydraulic conductivity were made by interpreting available geologic logs, applying an understanding of the local hydrogeologic conditions, and by the implications of conductivity distribution suggested by water surface patterns of the potentiometric maps.[2]

Porosity

The porosity of a geologic unit is the percentage of void space within the formation. The porosity relates to the storage characteristics of the sediments and influences the response of a given unit to the pumping of water. For the sediments of the Puget Lowland, the higher the porosity value, the greater the amount of water a unit is able to store, and the longer it takes for a particle of water or contaminant to travel through the material.

Average Annual Well Discharge

The production rate for the wells is expressed as an average annual flow rate and is derived from an analysis of the District's groundwater rights. The pumping rates used in the analytical models were 1090 gallons per minute (gpm) for the deep aquifer, and 223 gpm for the QAc aquifer. Within the model, the flow rates were expressed in units of cubic feet per day.

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[1] A determination of the gallons per minute verses feet of drawdown (gpm/ft) giving a comparative value to estimate well productivity.

[2] A flat area (low gradient) on water surface maps (potentiometric maps) generally represent zones of high K; steep areas result from zones of low K.

Other Parameters

Aquifer thicknesses used by the modeling were taken from available geologic logs, the cross sections, and hydrogeologic interpretations provided in previous studies. Potentiometric gradients used were based upon work from previous studies.

Capture Zone Modeling

Analytical modeling requires specific values for hydraulic conductivity, porosity, aquifer thickness, gradient, and pumping rate. All these must be held constant over the domain of the model for a given model run. Since these factors are not truly constant over the actual area represented by the model, representative values were used based upon known data and principles of hydrogeology. Two models were used, one for the QAc aquifer system and one for the QBc system. The parameters used in the models are given on Table 2. The software used for the analytical modeling was Winflow version 2.36.

Table 2: Analytical Model Parameters

Aquifer System	Hydraulic Conductivity (gpd/ft^2)	Porosity	Aquifer Thickness (ft)	Gradient	Pumping Rate (ft^3/d)
Qac	100	0.2	22	0.014	42,930
QBc	80	0.2	25	0.0073	209,839

Because the assumption of uniform aquifer properties is less valid with distance from the modeled well, analytical modeling, by itself, was only used to define the half-year capture zones. For the larger capture zones, the analytical modeling results were used in conjunction with hydrogeologic mapping and analysis techniques. Modeled drawdowns from the two analytical models were superimposed on potentiometric maps of the two aquifer systems to define potentiometric surface under pumping conditions for the aquifers. The pre-pumping potentiometric surface for the QAc aquifer (Figure 4) used in the analysis was based upon the QAc surfaces presented in regional studies (Woodward et al., 1995; Robinson & Noble, 1998). The pre-pumping QBc surface was assumed to be planar, sloping west to southwestward as dictated by known static water levels in the few wells completed in the aquifer system, and modified to reflect a groundwater divide on the eastern portion of the upland.

In order to address the uncertainty in the definition of the hydraulic conductivity and account for any regional variability in its value, the first run of capture zone definitions was made using half the mapped K value and a the second run was made at double the K value. From these runs, 1/2-year particle traces were generated to define the 1/2-year capture zones for the two extremes of modeled K conditions for both aquifer systems. These capture zones and particle traces were then superimposed on the potentiometric maps discussed above, and the further delineation of the capture zones was made by applying hydrogeologic mapping and analysis techniques.

After the 1/2-year particle traces were overlain on the potentiometric map, flow lines established by the particle tracks from the analytical models were traced up-gradient from the well until a basin boundary for the aquifer zone was reached. In both the QAc and QBc cases, the basin boundary reached was the groundwater divide on the eastern portion of the upland. The outermost of the lines defines the maximum zone of contribution for the wells.

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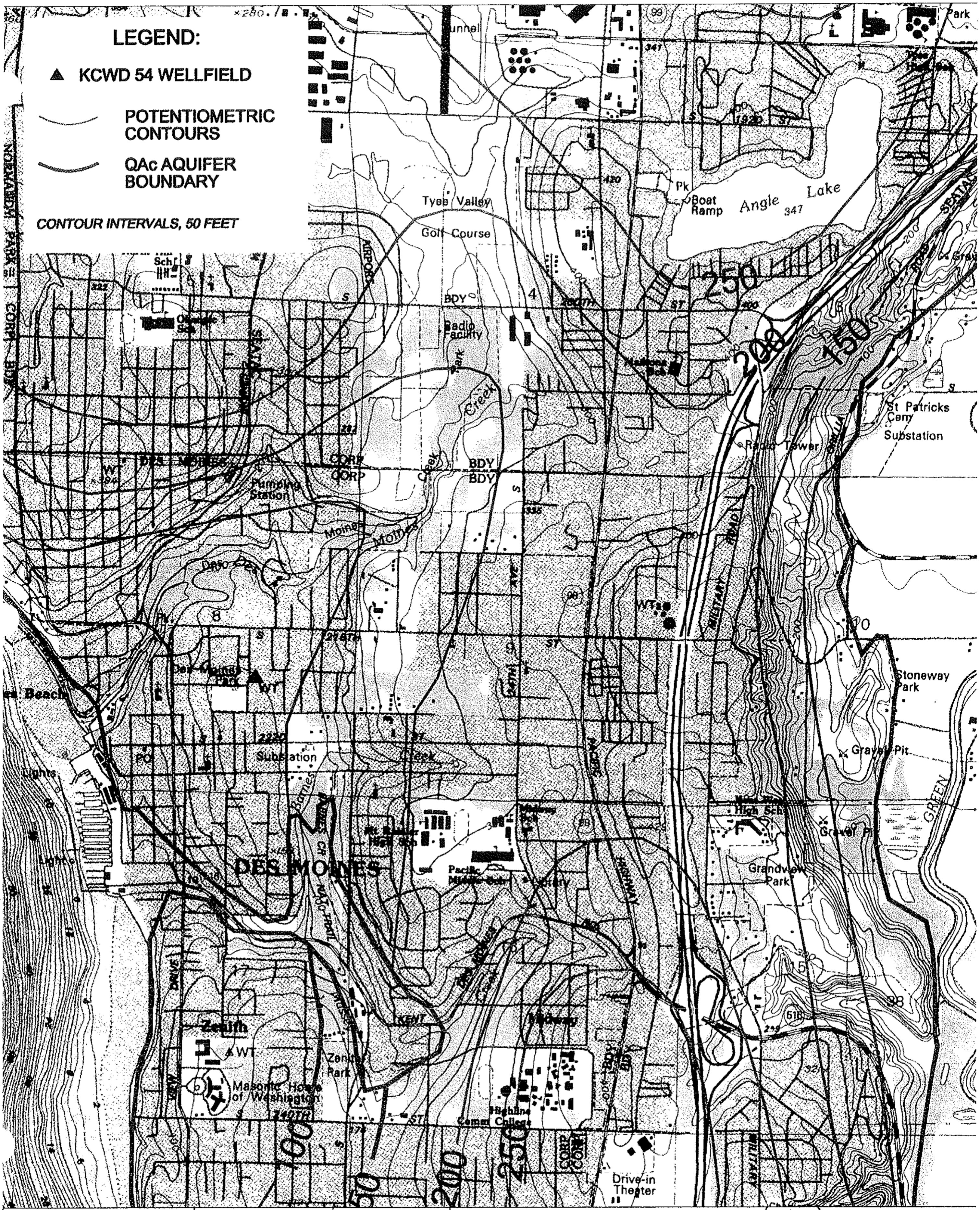

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FIGURE 4

POTENTIOMETRIC SURFACE OF THE QAc AQUIFER

King County Water District 54, Wellhead Protection Plan

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Once the zone of contribution was defined, the 6-month and one-, five-, and ten-year capture zones were established by calculating the travel time along the mapped particle tracks using the following formula:

$$\text{Travel Time} = \frac{\eta\, d^2}{K\, \Delta h}$$

where:
η = porosity
d = distance in feet
K = hydraulic conductivity in feet/day
Δh = head difference in feet over the specified distance

Thus, the process of travel-time calculation combined the results of mapping the hydraulic conductivity and porosity values and the potentiometric surface definition. Once a specific travel time was calculated along a set of particle tracks for a well, the endpoints along the line for that travel time were connected to define the preliminary capture zone for that time period. As with the analytical modeling, this process was accomplished using one-half and double the hydraulic conductivity value in order to account for uncertainty in aquifer parameters. The results of the two conductivity cases were combined to reflect the longest and widest indicated capture zones.

Recommended WHPA Zones

The Washington State Department of Health requires the definition of wellhead protection zones based on travel time rates of ground water. They define five zones for which wellhead protection strategies should be considered:

The *sanitary control area*: typically the 100-foot radius of control around a wellhead (as defined in WAC 246-290-135)

Zone 1: the six-month horizontal time of travel boundary

Zone 2: the one-year horizontal time of travel boundary

Zone 3: the five-year horizontal time of travel boundary

Zone 4: the ten-year horizontal time of travel boundary

and the *Buffer Zone*, which extends up gradient of Zone 4 and may include the entire zone of contribution

The first four of these zones are required components of WHP plans and define areas requiring differing levels of response to a contamination event based on the expected time of travel to the given well or wellfield. The Buffer Zone is optional, but is considered useful in compensating for errors when delineating capture zones, and is considered an important planning tool for providing information on monitoring the presence of potential contaminant sources outside Zone 4 that have the potential for contaminating the WHPA (Health, 1995).

In the case of the District, the recommended zones are based on the composite half-, one-, five, and ten-year capture zones as delineated by the modeling process described above. Figures 5 and 6 present the defined WHPA zones for the District's wells in the QAc and QBc aquifer

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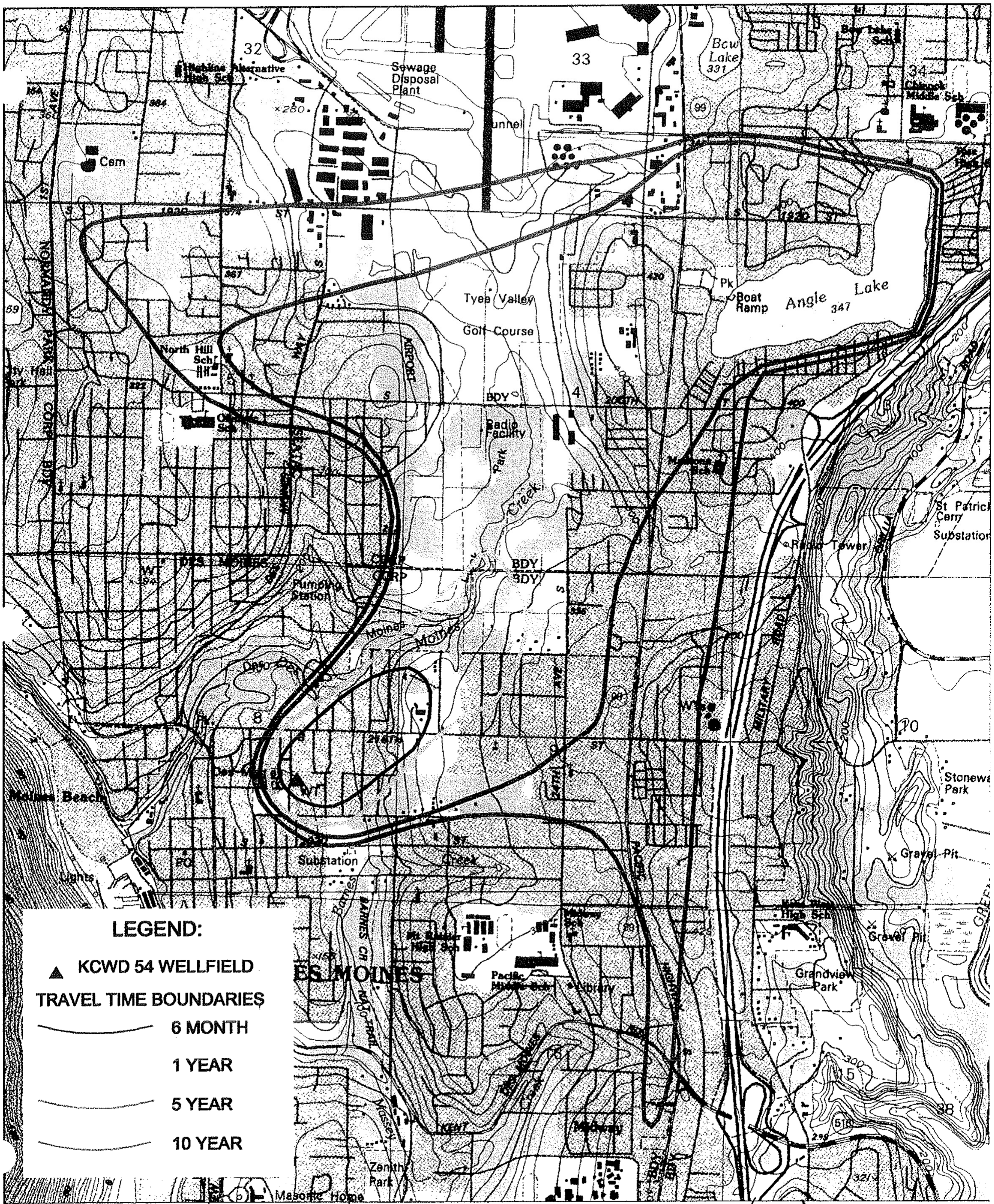

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FIGURE 5

RECOMMENDED WELLHEAD PROTECTION AREA FOR THE SHALLOW (QAc) AQUIFER SYSTEM

King County Water District 54 Wellhead Protection Plan

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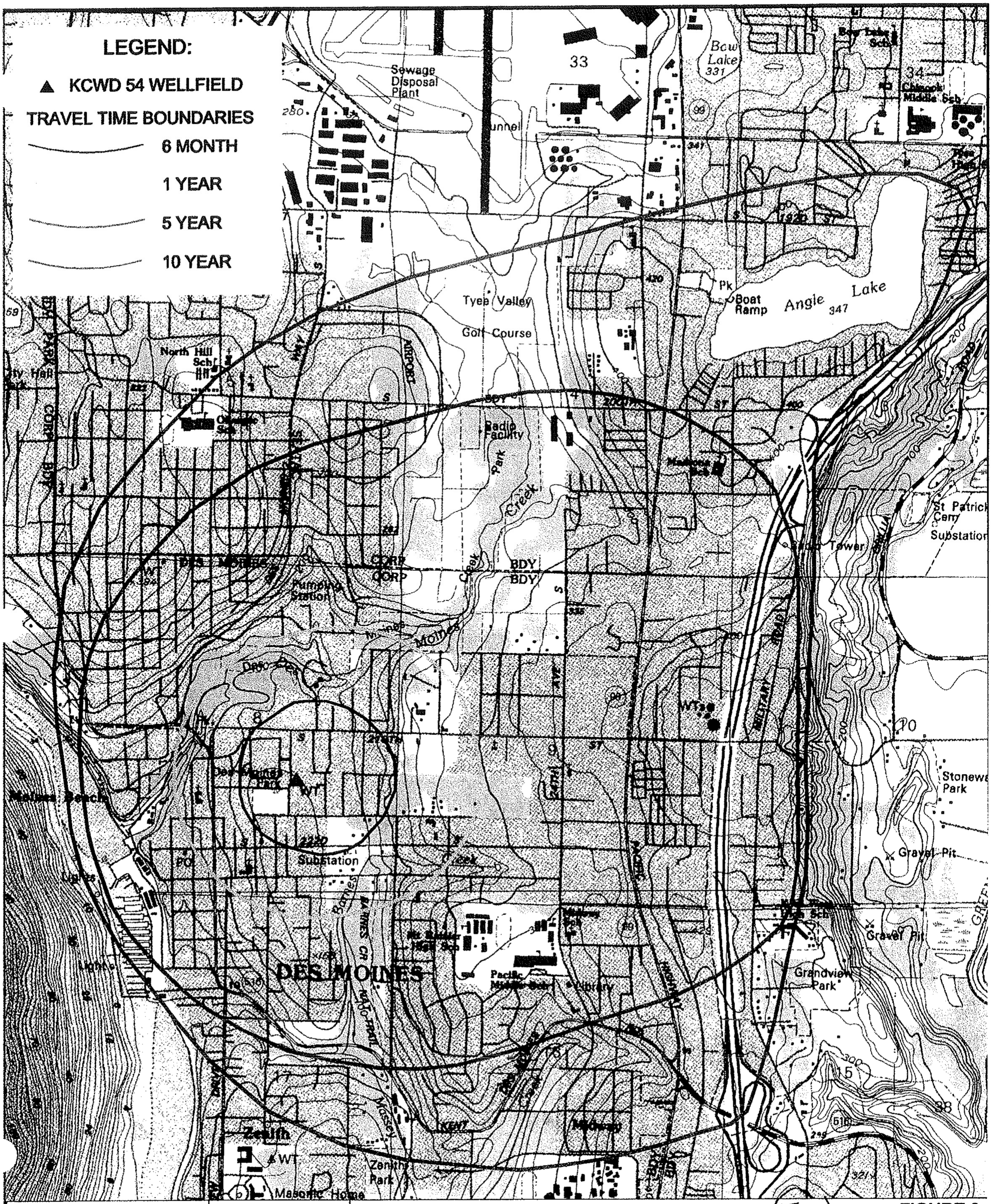

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FIGURE 6

RECOMMENDED WELLHEAD PROTECTION AREA FOR THE DEEP (QBc) AQUIFER SYSTEM

King County Water District 54 Wellhead Protection Plan

systems respectively. The recommended zones are not a direct representation of the composite capture zones; instead, they are slight modifications of the capture zones. The modification represents interpretation based on an understanding of how the assigned modeling conditions may differ from actual hydrogeologic conditions, which typically have a much higher degree of lateral and vertical variability than can be represented in the modeling process. In this case, two major modifications were made from the modeled capture zones. In both cases, the entire Angle Lake area was added to the capture zones even though the modeled capture zones only included half the lake. This was thought necessary because, although the lake is bisected by the groundwater divide, a hazardous spill anywhere in the lake would affect ground water on both sides of the divide. The second major modification was to add additional area to the eastern edge of the QBc five- and ten-year capture zones. This accounts for uncertainty in the position of the groundwater divide for this aquifer system.

Buffer Zones are commonly based upon the entire zone of contribution. However, in this case, the ten-year capture zones essentially already contain the entire zones of contribution. Therefore, no buffer zone is defined for the Water District.

Discussion of WHPA Results

The Department of Health has defined the Wellhead Protection process to assume that for deeper, confined aquifer systems, the assigned WHPAs reflect a time of travel for contaminants introduced directly into the aquifer. Consequently, no vertical time of travel is incorporated into the WHPA definition. Further, in all cases, the WHPAs are based upon the travel time for particles of water. Contaminants may move slower, the same speed, or faster than particles of water (Health, 1995).

The WHPA zones defined for the Water District's well field represent the primary area appropriate for consideration of the plan components to be implemented within a given time period (one half-, one, five, or ten-years). Their definition is based on the maximum likely capture zone predictable from the available data as modified to reflect an understanding of the regional hydrogeologic conditions.

Contaminant Source Inventory

The process for inventorying potential contaminant sources within and around the WHPAs was based upon the December 1993 Washington Department of Health guidance document entitled "Inventory of Potential Contaminant Sources in Washington's Wellhead Protection Areas." This section summarizes the basic steps for conducting an inventory, including:

- Review and identification of potential and known contaminant sources
- Data management
- Prioritizing risks to the WHPA

Known Soil and Groundwater Contaminant Sites

The database research company, Environmental Data Resources, Inc. (EDR), was used to identify sites of known or suspected soil and groundwater contamination. EDR reviewed databases from EPA and the Department of Ecology for a 2-mile radius area centered on the WHPAs that coincided with the extent of the project area. The executive summary and the overview map of the EDR report are included as Appendix B of this report. The entire report is available for viewing at the Water District office. Included in the EDR report is a complete list of the databases reviewed. The findings of known sites of contamination based on the regulatory database review are summarized in a later section. NOTE: The accuracy of an EDR report is totally dependent on the accuracy of the database used, which is highly variable. A field survey was conducted to supplement the EDR.

Field Survey

In order to confirm the locations of sites identified in the EDR report and to identify other potentially unregulated or unlisted sites, a windshield survey of the study area was conducted. This survey involved a drive-by reconnaissance of the area to map known and potential sites of the types listed on Table 5. Most sites identified were located with GPS coordinates. Differences between field data and EDR-reported data were noted.

Potential Hazards

158 potential contamination sites are listed in Appendix C. Most of them can be divided into the following categories:.

- Petroleum Products: This is the largest category on the list and includes oils, grease and fuels stored above the ground surface. These generally occur at service stations, automotive repair shops and several facilities around SeaTac Airport.

- Wastewater Treatment Plants: The Midway Sewer District operates a sewage treatment plant within the 6-month time of travel WHPA.

- Landfills: The now closed SeaTac Disposal Industrial Waste Facility is located within the WHPA.

- Fuel Storage Tanks: These generally are located at service stations and at facilities within the SeaTac airport area. Even when well designed and adequately monitored, buried fuel tanks always remain a potential source of contamination.

- Fuel Pipeline and Storage Tank Farm: A branch of the Olympic Pipeline extends from the Kent Valley to SeaTac Airport ending at the tank farm on the southeast portion of the airport, just south of 188th—this is the only portion of the pipeline that extends into the WHPA. In addition the airport has fuel lines within its boundaries.

- Unsewered Areas: Several residential areas within the wellhead protection areas depend on septic sewer system. Drainage from septic system leach fields will contain more nitrogen in the form of nitrates than the native ground waters. The un-sewered areas are small in comparison to the groundwater protection areas so septic system drainage is diluted before it enters the District wells.

- Heating Oil Storage: This occurs at a small number of residences within the wellhead protection areas. These storage tanks are located both above and below ground.

- Solvents: These are generally used at automotive repair shops and may be used at several locations at SeaTac Airport.

- Fertilizers and Pesticides: Fertilizers and pesticides applied to lawns and gardens are a potential contaminant source throughout the wellhead protection area. Several suppliers of fertilizer and pesticide are also a potential contaminant source.

- Dry Cleaners: The cleaning solutions used in the dry cleaning process can potentially contaminate ground water.

- Spills from Trucking Accidents: Trucking accidents are most likely to occur along Interstate Highway 5, Pacific Highway and other highway corridors.

- Saltwater Intrusion: Prevention of this contamination will require maintaining the potentiomentric surface of the aquifers so that some groundwater continues to flow toward Puget Sound. Maintaining this condition is heavily dependent on the Department of Ecology's judicious approval and enforcement of groundwater rights.

- Miscellaneous: This listing includes PCB's halogenated organic compounds, TCE, and PCE. The risk potential of these various potential contaminants will primarily depend on their distance from the District wells. This will be discussed later in a discussion of the highly ranked and known sources of contamination.

- Other potential sources of contamination such as the introduction of contaminated fill, deicing spray, new water wells, mining, sand and gravel operations, borrow pits, and new sewer pipelines may occur in the future. The District's Management Strategies are designed to monitor these activities on a long-term continuing basis. However, the District is reliant upon lead agency to excersice permitting and oversight that will not in any way jeopardize the viability of the aquifer, it's recharge or the wells and the Districts rights to draw from the aquifer.

Aquifer Protection

Protection of the aquifer and the hydrogeology that supply's it.

- Dewatering:
- Stream Assessment:
- Reduction of Potential Infiltration:
- Surface water management:

Establishing Risk Priority for Contaminant Sources within the WHPA

Methodology for Establishing Risk Priority

The methodology for prioritizing contaminant risks in the Water District 54 WHPAs was based on the EPA Guidance document entitled *Managing Ground Water Contamination Sources in Wellhead Protection Areas: a Priority Setting Approach* (1991). The ranking effort was also based on the level of confidence in data and information that are currently available for known and potential contamination sites as previously discussed.

Each site or land use was ranked according to three factors called decision levels. The decision levels used were, in decreasing order of importance: Travel time of the potential hazard to the WHPA, type of contamination at the site, and straight-line distance to the closest wellhead, (Table 3).

Table 3: Overall Risk Prioritization Scheme

Decision Level	Available Data and Information
I	Travel time of potential hazard to within WHPA
II	Type of contamination
III	Straight-line distance from the contaminated site to the wellhead

Each known and potential contamination site was first sub-prioritized using decision level one. Sites whose Level I sub-priority were equal, were then further sub-prioritized using decision level two. If sites were still equal in priority, they were further sub-prioritized under decision level three. No sites were still equal in priority after the third decision level.

Decision Level I - Proximity to Source: For the first decision level, the sub-prioritization of potential hazards sites and land uses was based on their location in the WHPAs: the shorter the travel time, the higher the priority. Sub-Priority Levels 4 and 5 were based on potentiometric surface maps developed for this study. Known and potential contaminated sites were sub-prioritized as summarized on Table 4.

Table 4: Level I Sub-Prioritization: Proximity to Source

Sub-Priority Level	Proximity to Source
1	6 month time-of-travel from the source (Zone 1)
2	1-year time-of-travel from the source (Zone 2)
3	5-year time-of-travel from the source (Zone 3)
4	10-year time-of-travel from the source (Zone 4)
5	Outside the defined WHPAs, upgradient or potentially upgradient from source
6	Outside the defined WHPAs, downgradient from source

Table 5: Potential Contaminant Sources Listed by Type

Category I: Sources Designed to Discharge Substances

- Subsurface Percolation (e.g. septic tanks and cesspools)
- Injection Wells
  - Hazardous waste
  - Non-hazardous waste (e.g. brine disposal and drainage)
  - Non-waste (e.g. enhanced recovery, artificial recharge solution mining, and *in situ* mining)
- Land Application
  - Wastewater (e.g. spray irrigation)
  - Wastewater by-products (e.g. sludge)
  - Hazardous waster
  - Non-hazardous waste

Category II: Sources Designed to Store, Treat, and/or Dispose of Substances; Discharge through Unplanned Release

- Landfills
  - Industrial hazardous waste
  - Industrial non-hazardous waste
  - Municipal sanitary
- Open Dumps, Including Illegal Dumping (Waste)
- Residential (or Local) Disposal (Waste)
- Surface Impoundments
  - Hazardous waste
  - Non-hazardous waste
- Waste Tailings
- Waste Piles
  - Hazardous waste
  - Non-hazardous waste
- Materials Stockpiles (Non-waste)
- Graveyards
- Animal Burial
- Above ground Storage Tanks
  - Hazardous waste
  - Non-hazardous waste
  - Non-waste
- Underground Storage Tanks
  - Hazardous waste
  - Non-hazardous waste
  - Non-waste
- Containers
  - Hazardous waste
  - Non-hazardous waste
  - Non-waste
- Open Burning Sites
- Detonation Sites
- Radioactive Disposal Sites

Category III: Sources Designed to Retain Substances during Transport or Transmission

- Pipelines
  - Hazardous waste
  - Non-hazardous waste
  - Non-waste
- Materials Transport and Transfer Operations
  - Hazardous waste
  - Non-hazardous waste
  - Non-waste

Category IV: Sources Discharging Substances as a Consequence of Other Planned Activities

- Irrigation Practices (e.g. return flow)
- Pesticide Applications
- Fertilizer Applications
- Animal Feeding Operations
- De-Icing Salt Applications
- Urban Runoff
- Percolation of Atmospheric Pollutants
- Mining and Mine Drainage
  - Surface mine-related
  - Underground mine-related

Category V: Sources Providing Conduit or Inducing Discharge through Altered Flow Patterns

- Production Wells
  - Oil (and gas) wells
  - Geothermal and heat recovery wells
  - Water supply wells
- Other Wells (non-waste)
  - Monitoring wells
  - Exploration wells
- Construction Excavation

Category VI: Naturally Occurring Sources for which Discharge is Created and/or Exacerbated by Human Activity

- Ground Water - Surface Water Interactions
- Natural Leaching
- Saltwater Intrusion/Brackish Water
  - Upconing (or intrusion of other poor-quality natural water)

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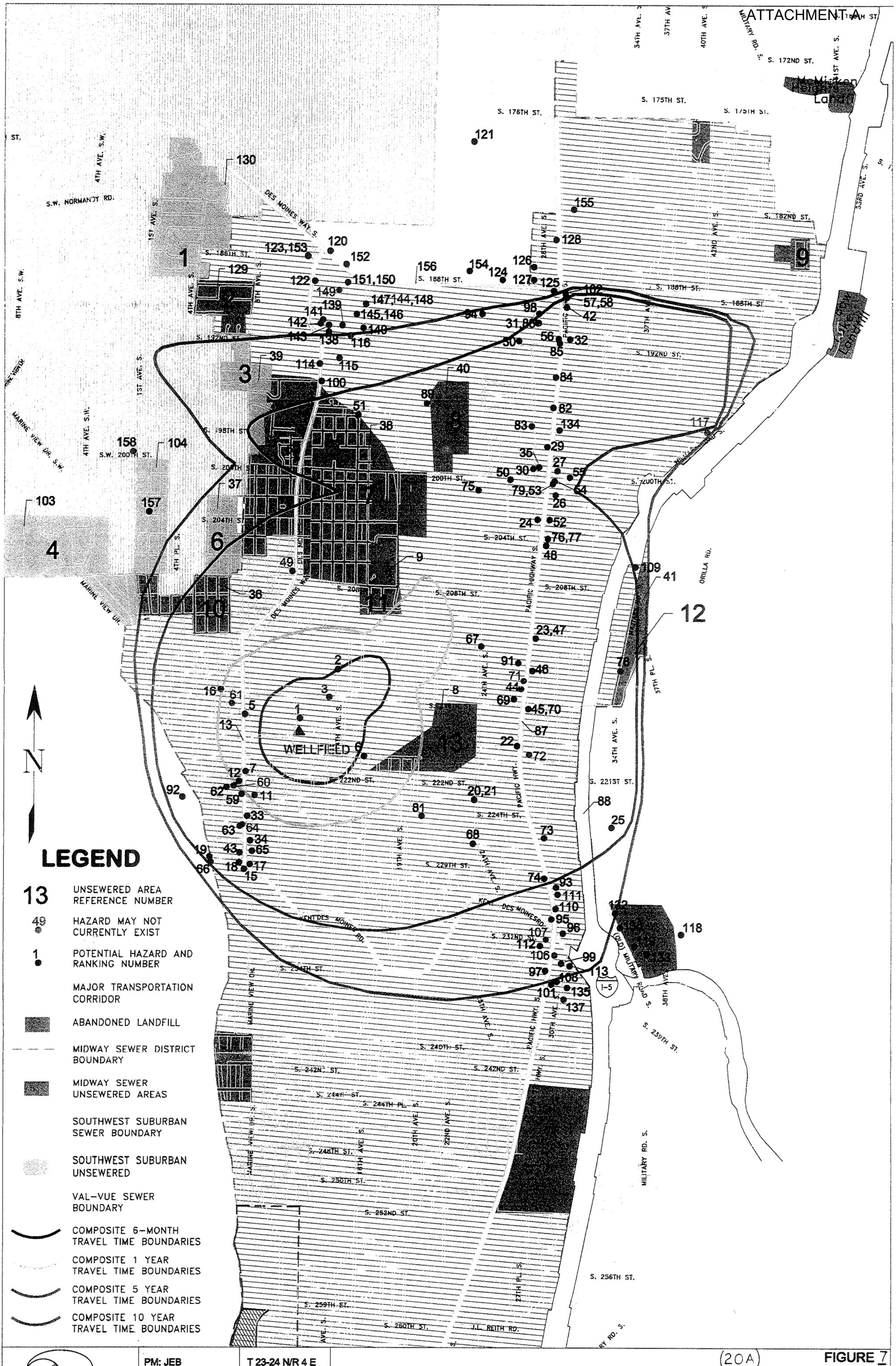

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FIGURE 7

POTENTIAL HAZARD LOCATION AND RANKING MAP

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Decision Level II – Type of Contamination: For the second decision level, the sites and land uses were sub-prioritized as either having known contamination or potential contamination. Known contamination sites were defined as sites located within the WHPAs that have been identified in the databases as earlier discussed. Potential contaminat sites are sites or land areas of the WHPA that are known to be used in ways that could potentially pose a risk to the water quality. This category includes both point and non-point sources. Further sub-prioritization for this decision level concerned the type of contaminated site as summarized on Table 6.

Table 6: Level II Sub-Prioritization: Type of Contamination

Sub-Priority Score	Known or Suspected	Type of Contaminated Site	Assumptions
1	Known	Confirmed and Suspected Contaminated Sites (CSCSL) and Comprehensive Environmental Response, Compensation, and Liability Information (CERCLIS)	As a worst case scenario, contamination is assumed to be comprised of the most toxic chemical identified for the site, based on information contained in the Ecology and EPA databases.
2	Known	Leaking Underground Storage Tanks (LUST)	All contamination sites assumed to contain petroleum products.
3	Known	Washington Independent Cleanup Report (WA ICR)	Since not confirmed as totally cleaned, assumes cleanup not 100% effective.
4	Potential	Septic Systems	Nitrates and bacterial contamination are assumed to be health risks, along with potential chemical hazards, but it is not known what the likelihood is for sites to contaminate the wells.
5	Potential	Storm Water	This category includes the potential release of lead, petroleum products, and/or solvents.
6	Potential	Sewer Mains	Nitrates and bacterial contamination are assumed to be health risks along with potential chemical hazards.
7	Potential	Underground Storage Tanks (UST)	It is assumed that petroleum products are stored in underground storage tanks on site, but contamination is not imminent.
8	Potential	Resource Conservation and Recovery Act Sites (RCRA)	It is assumed that hazardous chemicals may be stored on site, but contamination has not necessarily occurred. FINDS sites are included with this category.
9	Potential	Accidental Spills	This category includes highways and railroad tracks that pass through the WHPA. The risk is based on the possibility of hazardous material spill (e.g., gasoline).
10	Potential	Pesticide Application	Pesticide use appears to be concentrated along transportation corridors and power lines.
11	Potential	Fertilized Sites	This category is predominantly represented by fertilized lawns and hobby farms.
12	Potential	Seawater Intrusion	The potential for saltwater incursion into wellhead capture zones exists in coastal areas.

Decision Level III - Straight-line Distance from Wells: For contaminated sites or potential sources with similar characteristics for prioritization decision Levels I and II, the straight-line distance from the sites to the closest wellhead was used to sub-prioritize further. Those sites closest to a water source were given a higher priority.

Results of the Risk Ranking for Potential and Known Contaminant Sources in the WHPAs

The following discussion summarizes the findings of the risk ranking for sites and land uses identified within the study area. The complete risk rankings are given in Appendix C. The windshield survey identified 30 additional potential hazard sites within the WHPP study area other than the sites identified by EDR (some outside the EDR search area). In all, 158 EDR report and windshield survey hazard sites and potentially hazardous land use types were identified in the search area, and a total of 117 potentially hazard sites and land use types are located within the WHPA boundaries (Figure 7).

The hazard sites were ranked using the risk priority scheme outlined above. Of these, the risk ranking found 14 high priority sites and land uses located within the delineated one-year WHPA. The highest ranked risk is a leaking underground storage tank at the Des Moines Public Works yard next to the wellheads; this is one of 29 known contaminations that have occurred within the WHPA. The second highest-ranking site is also a leaking underground storage tank. The third highest ranked site is a sewage treatment plant less than 1100 feet from the wellheads. The residential land use in the immediately vicinity of the well field presents the fourth highest risk. Additional leaking underground storage tanks are on the list in the five through seven spots. Several highly ranked areas (ranking eighth and ninth) are unsewered residential districts that use septic systems.

Sites 118 through 156 do not fall within the 10 year WHPA. However, they are up gradient from the well field and therefore contaminations at those sites could represent hazards beyond a ten year time frame. Included in this range is site 121 which is the general site for SeaTac International Airport. That site contains multiple locations for existing and potential hazards. Confirmed and suspected contaminated sites within the Airport are being tracked by the Department of Ecology. Consult DOE Toxic Clean-up Program for further information. Note the airport's fuel tank farm is addressed separately as site 94.

Site 157 and 158 are included solely for completeness. They are known hazards in the study area. However, there is no potential for contamination from those sites reaching the wells.

Some of the sites within the 118 to 158 range are large in magnitude and hence deserve being part of this plan. Others present such slight risk that they easily could be discarded from further assessment.

Owner/Operators of the potential contamination sites were notified of the potential hazard of their operations to groundwater quality within the Water District 54 Wellhead Protection area. A sample copy of the letter is included in Appendix C along with the list of the potential contamination sites. The letter informs the Owner/Operators of the existence of the Water District Wellhead Protection Plan. It then informs them of the potential hazard from their operations and requests that they request assistance if needed to prevent groundwater. Finally, it reminds them that the District's customers depend on high quality ground water and requests that they be especially aware of the potential to contaminate ground water.

A sample of the letter to Agencies/Local Governments and the mailing list are included in Appendix D. This letter is more detailed than the Owner/Operator letter and provides information about the District and the nature of its water system. It informs them that the District wells have a "low susceptibility" of contamination, but that a potential for contamination always exists. Maps of the 6-month, and 1-, 5-, and 10-year wellhead protection areas for both the shallow and deep aquifers are attached. The Agencies/Local government's mailing list was supplied for each of the recipients.

Highly Ranked Hazards

The highly ranked hazards are known hazards at close distances to the Water District wells. Of the four highest ranked hazards located in Zone 1, two are known contaminant sites and two are potential contaminant sites.

The Number 1 hazard ranking is due to a leaking underground waste oil storage tank leak within the 6-month wellhead protection area. It is on property adjacent to the wells which is owned and operated by the City of Des Moines. The underground storage tank has been removed, and The City of Des Moines has had a cleanup program underway for several years. The City of Des Moines has indicated the spill has been contained and is being remediated. The most recent progress report by the environmental consultant is attached as Appendix F.

The 2nd highest hazard ranking is for a leaking underground heating fuel tank at a distance of 1730 feet from the well sites. Water District personnel investigated this hazard site side and discovered that the leak was in an oil line rather than in the storage tank. The leak has been promptly repaired, but the underground heating oil tank remains at the site.

The 3rd highest ranking is for the sewage treatment plant operated by the Midway Sewer District and located 1050 feet from the site of the wells. This agency has been notified of the WHPA and their location within the 6-month WHPA.

The 4th highest ranking is fertilizer and pesticide application on neighboring properties whose boundaries are approximately 100 feet from the well sites.

Follow-up for the remaining high-ranked and known contaminant sites will be a long-term activity of the Water District. They can monitor the progress of cleanup at known sites by accessing the Department of Ecology Internet site. They can also monitor activities at any of the highly ranked potential contaminant sites. Cooperatively, they can work with local agencies, local groundwater purveyors and state agencies to monitor the activities of the large fuel storage tanks at the SeaTac Airport.

Emergency Scenarios

Contamination from a surface source could contaminate either aquifer, the shallow aquifer, the shallow aquifer and deep aquifers, or potentially only the deep aquifer. The most likely scenarios would be contamination of the shallow aquifer from one of the potential contaminant sites or from a surface spill. Contamination of the deep aquifer only through recharge from surface water is possible but not as likely to occur. Contamination of this aquifer only would most likely occur through introduction of contaminants at a well. Since a contaminated well could be completed in both aquifers, both the shallow and deep aquifers could potentially be contaminated this way.

The loss of pumping capacity due to groundwater contamination would depend on the whether the shallow aquifer, deep aquifer or both aquifers are not useable. The pumping rates of the District's wells are listed in Table 7.

Table 7. Contributing aquifer and pumping rates for the Water District's wells

Well No.	Aquifer	Pumping Rate, (Q_i) gal/min
4	Deep	125
5	Shallow	500
6	Deep	310
7	Deep	340
	Total	1275

The District's instantaneous water right, $Q_{i,}$ is 1150 gpm, and only three of the four wells can be pumped simultaneously. If the shallow aquifer becomes contaminated, the loss of pumping capacity is 500 gal/min or 39% of the District's instantaneous pumping rate. Contamination of the deep aquifer would result in the loss of 775 gal/min or 61% of the District's instantaneous pumping rate.

CONTINGENCY PLANS

Existing or Potential Interties

Water District No. 54 entered into a Fire Protection and Emergency Intertie Agreement with the Highline Water District on July 5, 2000. Use of water from the Intertie is limited to fire fighting, emergency use and special maintenance purposes. The Intertie is operational on a year-around basis. Flow is one-way only from Highline to Water District No. 54, and the Intertie only benefits this District. Water District No. 54 is responsible for inspections and maintenance of the Intertie, and pays Highline Water District a semi-annual fee for the Intertie connection privileges and the supplemental standby storage. The Intertie is located at 9th Avenue South and 216th Street. The two water systems are connected through an 8-inch water main, and a pressure-sensing valve in the pipeline will automatically open if the Water District 54 system pressure head drops below a preset and agreed upon pressure at the valves.

Future Potential Sources of Drinking Water

The main future source of drinking water for the District is drilling additional wells outside the present district property. This would require property acquisition or easements to locate wells on property not owned by the District. The District either has now or has applied for sufficient water rights to meet the water needs at build-out within the District. If any of the District wells were abandoned, these water rights could likely be transferred to the new wells.

Expansion Options to Meet Current Water Rights Availability

The service area of the Water District is nearing build out, and with current housing conditions, it can be supplied with the current water rights. Combined water rights for the District are Q_i=1150 gal/min and Q_a = 1256 acre-ft/yr (409,269,000 gal/yr). In the project report for a recently completed surface reservoir, the Equivalent Residential Use (ERU), based on recent billing records and a safety factor of 1.25, was 243 gal/day/ERU. With the number of ERU's at build-out estimated at 2998, Average Daily Demand (ADD) was calculated to be 504 gal/min and Maximum Daily Demand (MDD) was calculated to be 1008 gal/min. The booster pump station together with storage and well pumps now under construction is designed to provide this MDD along with a fire flow of 3500 gal/min for 3 hours. Future increases in customer population would most likely occur from conversion of single-family to multi-family residences.

Notification of Emergency Assistance Providers

Emergency Providers within wellhead protection area were notified of the existence and importance of the District's Wellhead Protection Plan. A sample of the letter to Emergency Providers and the mailing list of Emergency Providers are included in Appendix E. The letter asks the Emergency Providers to be aware of the District's WHPAs and modify their incident/spill response procedures if needed. Maps of the deep and shallow aquifer WHPAs were included to inform them of the extent of the protection areas. If the Emergency Providers had any questions, they were asked to call the Water District or Hedges Engineering & Consulting, Inc.

The District maintains a list of emergency phone numbers and these are also included in Appendix E. This is a comprehensive notification list and includes federal/state agencies as well as county/local agencies. It also includes phone numbers for hospitals/life services and the public media. The agencies to call would be determined by the type of spill or emergency. In the case of a hazardous spill, for example, notification of the spill would go to local law enforcement agencies, the media, and state agencies such as the Departments of Ecology, Fish and Wildlife, and Health.

Emergency Chlorination System

The District and its customers have chosen not to chlorinate the District water supply on an ongoing basis. They enjoy the pure water as it is delivered. The District has installed an emergency chlorination system that is capable of chlorinating all of the water pumped from the aquifers if necessary. This system is located at the well site and can be manually activated by District personnel by simply turning the unit on and providing a source of chlorine solution, such as chlorine bleach to the unit.

MANAGEMENT STRATEGIES AND IMPLEMENTATION TASKS

Completion of the wellhead protection planning provides no safeguards unless effective management strategies are implemented to prevent potential contamination of ground water sources. Water District No. 54 owns only the small parcel of land where its wells and water supply facilities are located. Without direct control of the WHPA, implementation of the WHPP will require a cooperative effort between the District and local agencies, neighboring purveyors, and state regulatory agencies. A key component in managing the area will be the notification of the existence and extent of the WHPA to the proper agencies in King County, neighboring communities and local residents.

Management Strategies

Long Term Management and Cooperation: The WHP Program is designed to be a continuing management activity to meet the District's future planning needs and to adapt to changes in the physical conditions of the aquifer system. As such, the management strategies outlined within this study provide a general direction but will need to be periodically refined to fit specific conditions. Additional changes may be needed to address future activities and regulations or in current regulations that may affect the WHPA.

Land Management Activities: The District should encourage owners or agencies responsible for large land parcels and developments to use and monitor best management practices (BMP) for control, reduction, and restriction of potential contaminants within the WHPA.

Land Use Strategies: The District has no authority to directly control land use for those areas of the WHPA that are outside of its property. Therefore, the District should develop a cooperative relationship with those local and state agencies that administer land use programs. At the present time, the best strategy for the District is to seek special designations for the WHPA from pertinent agencies. The District should evaluate and seek the different designations that may be most beneficial.

Well Drilling Inspections Inside the WHPA: The city should encourage frequent well construction inspection within the WHPA.

Septic Tanks: The District should request King County to require that as-builts of new septic systems, drafted by a septic design professional, be recorded with property deeds. Additionally, the District should support the implementation of laws and regulations requiring proper design, construction and inspection of septic systems.

Sewers: The District, in coordination with the managers of local sewer systems, should develop emergency plans to be implemented in the advent of sewage leaks or spills especially those from force mains. The District should maintain a continuing dialog with Midway Sewer District about the potential impact of their sewage treatment plant at 1200 South 216th Street on the District's water supply wells. The District should encourage all industrial and commercial facilities within the WHPA to connect to sanitary sewers if such services are reasonably available.

Storm Water Management: The District, in coordination with the responsible agencies, should evaluate the adequacy of storm water facilities, including proper routing, retention and detention. A balance is needed that allows optimum recharge of storm water to groundwater systems while adequately protecting the water quality of the aquifers.

Emergency Response for Transportation Corridors: The District should notify the appropriate emergency response organizations of the location of the WHPA and establish formal communications protocols with the first-response emergency units.

Petroleum Pipelines: The District should document the location and use of petroleum pipelines and establish emergency response plans for pipeline failure. These efforts should be coordinated with the pipeline companies and the federal, state, and county agencies responsible for emergency, petroleum-product spill response.

Abandoned Well Inventory: The District could locate and inventory decommissioned, abandoned, and unused wells. Owners of these wells should be notified of the potential liability of such wells and be educated on the benefits of well decommissioning.

Underground Storage Tanks: The District should inventory and locate underground storage tanks besides those presently identified by the current hazard inventory This inventory should include new tanks placed after the hazard inventory was finished, residential home heating oil USTs, and other tanks that were not previously identified.

Education Strategies: Education of the public and industrial/commercial occupants of the WHPA concerning groundwater protection is a critical portion of the WHPP. Through proper education, the degree and potential for future contamination can be greatly reduce.

If it has not already begun, the District should begin groundwater educational programs to educate the WHPA residents, particularly on groundwater quality issues. The WHPA should be targeted for distribution of literature regarding septic tank maintenance; fuel oil storage tank maintenance and abandonment; residential use of herbicides and pesticides; and hazardous material use, storage and disposal. In addition to District programs, the District should participate in and support small-quantity waste disposal programs, and actively work with state and local government in developing and creating public education programs concerning ground water.

Implementation Tasks

In order to protect the WHPA it is recommended that the District adopt the WHP Implementation Tasks below. These have been grouped in their recommended order of priority. The District may implement all or a portion of these tasks depending upon available funding, time and other constraints.

Below you will find a list addressing the priority level of tasks to be addressed by the District. They will either be categorized "Immediate" or "Near Term" depending on the urgency.

Items to be addressed "**Immediate**"

- The District should actively monitor the cleanup status of the contamination at the City of Des Moines Maintenance site ranked No. 1 on the list of potential contaminant sites. This will involve continuing dialog with the City of Des Moines and evaluating progress reports from their environmental consultant.

- Establish and maintain formal communications with first responders to contaminant spills.
- Work cooperatively with Highline Water District to monitor potential contaminants and report any clean up spills within common groundwater protection areas.
- Maintain continuing dialog with Midway Sewer District to monitor the operation of their sewage treatment plant at 1200 South 216th Street and ground water wells. Appraise them of the potential impact of their treatment plant on the District's water supply wells.
- The District should notify the Health and Planning/Land Use Departments of King County of the existence of the WHPA. The District should request that the King County Health Department assist small water systems with wellhead protection by initiating a small system WHP Coordination Program. They should ask the King County Planning Department to consider the WHPA in their designations of critical areas regulations, susceptibility mapping, and development permitting.
- Communicate the location of the WHPA, explain basic WHPA concepts, and address specific WHP concerns to industrial/commercial site owners and local gravel mine owners.
- Increase public awareness of homeowners who are connected to the District's water system through notification letters to customers within the WHPA. This notification letter should be given to homeowners either at the time of service hookup or as part of the property escrow. In addition, information about the District's WHPAs and the need for cooperative effort to maintain the ground-water quality should be included in the District's annual Consumer Confidence Report.
- Participate in a regional groundwater data development and management program. This will help assure that an adequate regional database is developed.
- Receive and review all SEPA threshold documents for projects within the WHPA. Provide comments on all documents.
- The District should develop data on the number and size of exempt underground tanks within the 1-year WHPA.
- Monitor cleanup of existing major contamination sites, such as those on Port of Seattle property.
- Monitor land use planning and its implication on potential water quality and hydrology. Request inclusion in local governments, planning process.

Items to be addressed "Near Term"

- Encourage the requirement that engineering as-builts of new septic systems be recorded with property deeds. These as-builts should be drawn and submitted by registered professional designers licensed by the State of Washington. Support the implementation of state laws and regulations regarding septic system inspection and maintenance programs. Participate in public education programs to notify the public concerning the impact of septic systems on the WHPA. Promote public education programs concerning proper septic tank maintenance and hazardous waste disposal.

- Document the location and use of petroleum pipelines and develop appropriate emergency procedures.
- Promote and coordinate public education programs concerning underground tank hazards, leak detection methods, and proper removal and closure procedures. These programs should target owners of exempt underground storage tanks.
- Encourage the development and use of best management practices throughout the WHPA. This effort should focus on large land units including large residential developments, schools, golf courses, parks, mining operations, and forest parcels.
- Revise assessment and include new and existing criteria: Contaminant volume and potential likelihood.
- Inventory for septic systems within WHPA.

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ATTACHMENT A

Appendix A

Initial Groundwater Contamination Susceptibility Assessment Forms

VWMN awmn 2

ATTACHMENT A

RECEIVED
JUN 08 1994
Dept. of Health
Division of Drinking Water

Ground Water Contamination Susceptibility Assessment Survey Form

Version 2.1

IMPORTANT! Please complete one form for each ground water source (well, wellfield, spring) used in your water system. Photocopy as necessary.

PART I: System Information

Well owner/manager : Rolfe Pedersen

Water system name : King County Water District No. 54

County: King

Water system number: 399504 Source number: S01

Well depth: 328 (ft.) (*From WFI form*)

Source name: Well No. 4

WA well identification tag number: A A B - 1 8 1

___ well not tagged

Number of connections: 695 Population served: 2076

Township: 22 NORTH Range: 4 EAST

Section: 8 1/4 1/4 Section: NW SE

Latitude/longitude (if available): 47° 24' 22" / 122° 19' 05"

How was lat./long. determined?

___ global positioning device ___ survey ✓ topographic map

___ other: ___

* Please refer to Assistance Packet for details and explanations of all questions in Parts II through V.

PART II: Well Construction and Source Information

1) Date well originally constructed: 6 / 28 / 67 month/day/year

last reconstruction: ___ / ___ / ___ month/day/year

___ information unavailable

PART III: Hydrogeologic Information

1) Depth to top of open interval: [check one]

___ < 20 ft ___ 20–50 ft ___ 50–100 ft ___ 100–200 ft [✓ >200 ft]

___ information unavailable ('<' *means less than;* '>' *means greater than*)

2) Depth to ground water (static water level):

___ < 20 ft ___ 20–50 ft [✓ 50–100 ft] ___ > 100 ft

___ flowing well/spring (artesian)

How was water level determined?

[✓ well log] __ other: ____________________

__ depth to ground water unknown

3) If source is a flowing well or spring, what is the confining pressure:

_______ psi (pounds per square inch)
or
_______ feet above wellhead

4) If source is a flowing well or spring, is there a surface impoundment, reservoir, or catchment associated with this source: YES / NO

5) Wellhead elevation (height above mean sea level): 140 (ft)

How was elevation determined? [✓ topographic map] ___ Drilling/Well Log ___ altimeter

__ other: ____________________

__ information unavailable

6) Confining layers: (This can be completed only for those sources with a drilling log, well log or geologic report describing subsurface conditions. Please refer to assistance package for example.)

[✓ evidence of a confining layer in well log]

__ no evidence of a confining layer in well log

If there is evidence of a confining layer, is the depth to ground water more than 20 feet above the top of the open interval? [✓ YES] ___ NO

___ information unavailable

PART IV: Mapping Your Ground Water Resource

1) Annual volume of water pumped: 46,000,000 (gallons)

How was this determined?

___ meter

___ estimated: ___ pumping rate (______________)

___ pump capacity (______________)

✓ other: AVERAGED 1993 WATER Pumped over 3 pumping Wells.

2) "Calculated Fixed Radius" estimate of ground water movement: (see Instruction Packet)

6 month ground water travel time : 440 (ft)

1 year ground water travel time : 620 (ft)

5 year ground water travel time: 1390 (ft)

10 year ground water travel time: 1970 (ft)

Information available on length of screened/open interval?

✓ YES ___ NO

Length of screened/open interval: 23 (ft)

3). Is there a river, lake, pond, stream, or other obvious surface water body within the 6 month time of travel boundary? YES / [✓ NO] (mark and identify on map).

4) Is there a stormwater and/or wastewater facility, treatment lagoon, or holding pond located within the 6 month time of travel boundary? YES / [✓ NO] (mark and identify on map).

Comments: ______________________________

2) Source specific water quality records:

Please indicate the occurrence of any test results since 1986 that meet the following conditions: (Unless listed on assessment, MCLs are listed in assistance package.)

A. Nitrate: (Nitrate MCL = 10 mg/l)

	YES	NO
Results greater than MCL	___	✓

	YES	NO
< 2 mg/liter nitrate	✓	___
2–5 mg/liter nitrate	___	✓
> 5 mg/liter nitrate	___	✓

___ Nitrate sampling records unavailable

B. VOCs: (VOC detection level 0.5 ug/l or 0.0005 mg/l.)

	YES	NO
Results greater than MCL or SAL	___	✓
VOCs detected at least once	___	✓
VOCs never detected	✓	___

___ VOC sampling records unavailable

C. EDB/DBCP:(EDB MCL = 0.05 ug/l or 0.00005 mg/l. DBCP MCL = 0.2 ug/l or 0.0002 mg/l.)

	YES	NO
EDB/DBCP detected below MCL at least once	___	___
EDB/DBCP detected above MCL at least once	___	___
EDB/DBCP never detected	___	___

___ EDB/DBCP tests required but not yet completed

✓ EDB/DBCP tests not required

D. Other SOCs (Pesticides):

	YES	NO
Other SOCs detected (pesticides and other synthetic organic chemicals).	___	___

__ Other SOC tests performed but none detected (list test methods in comments

✓ Other SOC tests not performed

If any SOCs in addition to EDB/DBCP were detected, please identify and date. If other SOC tests were performed, but no SOCs detected, list test methods here: ________________

3) Is the source located in an aquifer with a high horizontal flow rate? (These can include sources located on flood plains of large rivers, artesian wells with high water pressure, and/or shallow flowing wells and springs.)

YES [✓ NO]

4) Are there other high capacity wells (agricultural, municipal and/or industrial) located within the CFRs?

a) Presence of ground water extraction wells removing more than approximately 500 gal/min within...

	YES	NO	unknown
< 6 month travel time		✓	
6 month–1 year travel time		✓	
1–5 year travel time		✓	
5–10 year travel time		✓	

b) Presence of ground water recharge wells (dry wells) or heavy irrigation within...

	YES	NO	unknown
< 1 year travel time		✓	
1–5 year travel time		✓	
5–10 year travel time		✓	

Please identify or describe additional hydrologic or geographic conditions that you believe may affect the shape of the zone of contribution for this source. Where possible, reference them to locations on the map produced in Part IV.

ATTACHMENT A

WATER WELL REPORT

STATE OF WASHINGTON

le Original and First Copy with
Division of Water Resources
nd Copy — Owner's Copy
l Copy — Driller's Copy

Application No. 8089

Permit No. 7559

1) NER:
King County Water District No. 54
ess P. O. Box 367
Des Moines, Washington 98016

2 LOCATION OF WELL:
Owner's number, if any — #4
¼ ¼ Section T. R. W.M.
ng and distance from section or subdivision corner
attached drawing for legal description

TYPE OF WORK (check):
Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
abandonment, describe material and procedure in Item 11.

PROPOSED USE (check):
stic ☐ Industrial ☐ Municipal ☒
igation ☐ Test Well ☐ Other ☐

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

CASING INSTALLED: Threaded ☐ Welded ☐
10" Diam. from 0 ft. to 305 ft. Gage
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

) PERFORATIONS: Perforated? ☐ Yes ☒ No
of perforator used
of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

SCREENS: Well screen installed ☒ Yes ☐ No
nufacturer's Name Johnson Well Screen Co.
Stainless steel Model No.
12" Slot size 50 Set from 305 ft. to 328 ft.
Slot size Set from ft. to ft.

CONSTRUCTION:
ell gravel packed? ☐ Yes ☒ No Size of gravel:
vel placed from ft. to ft.
surface seal provided? ☐ Yes ☐ No To what depth? ft.
al used in seal—
y strata contain unusable water? ☐ Yes ☒ No
of water? Depth of strata
d of sealing strata off

) WATER LEVELS:
61 ft. below land surface Date 6-13-67
n pressure lbs. per square inch Date
ter is controlled by (Cap, valve, etc.)

(11) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom?
Yield: 800 gal./min. with 110 ft. drawdown after 5 hrs.
" 600 " 89 " 4 "
" 550 " 55 " 3 "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level
2:46	109.7	2:50	103.3
2:47	107.5	2:55	100.3
2:48	105.6	3:00	98.7
2:49	104.3	3:10	96.6

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☒ No

(12) WELL LOG: Diameter of well inches.
Depth drilled 334 ft. Depth of completed well 328 ft.

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Top soil	0	2
Yellow clay, sand & gravel	2	5
Yellow clay	5	16
Blue clay	16	64
Blue clay, streaks sand & gravel	64	85
Fine & course sand & gravel	85	109
Cemented sand & gravel	109	120
Clay & gravel	120	130
Fine & course sand - water	130	133
Fine silty sand & clay	133	138
Fine & course sand & gravel -		7
hard streaks of clay	138	145
Fine & course sand, clay & gravel	146	149
Cemented sand & gravel	149	152
Fine & course sand, clay & gravel	152	161
Fine & course sand, gravel & hard		
clay streaks	161	186
Cont. on attached sheet		

Work started April 20 1967. Completed June 28, 1967

(13) PUMP:
Manufacturer's Name JACUZZI
Type: 10 MS7 H.P. 60

Well Driller's Statement:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Richardson Well Drilling Company
(Person, firm, or corporation) (Type or print)

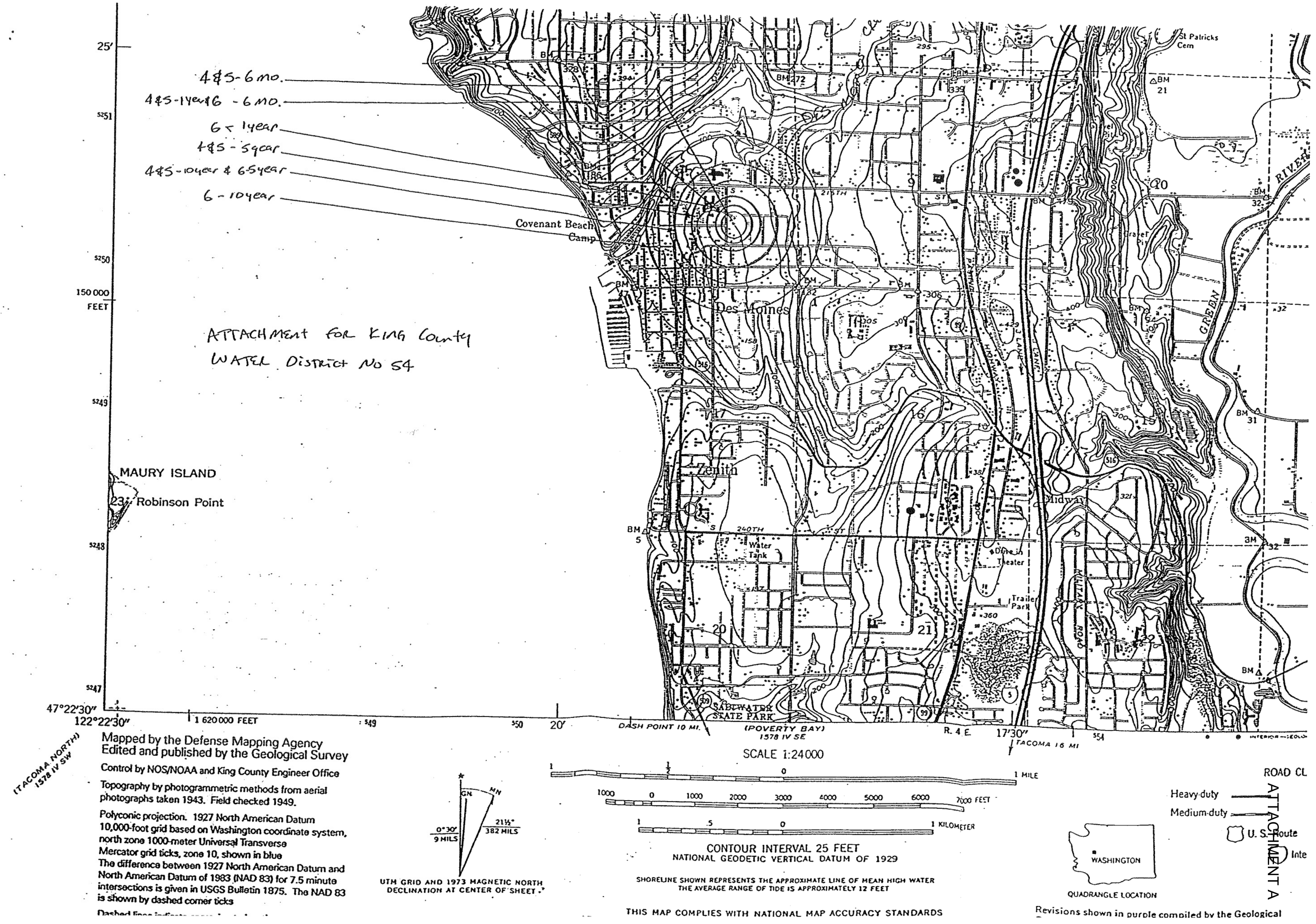
Address 219 So. 115th St., Tacoma, Washington

[Signed]
(Well Driller)

License No. 223-32-5194 Date August 2, 1967

(USE ADDITIONAL SHEETS IF NECESSARY)

ATTACHMENT A



ATTACHMENT FOR KING COUNTY
WATER DISTRICT NO 54

Mapped by the Defense Mapping Agency
Edited and published by the Geological Survey

Control by NOS/NOAA and King County Engineer Office

Topography by photogrammetric methods from aerial photographs taken 1943. Field checked 1949.

Polyconic projection. 1927 North American Datum
10,000-foot grid based on Washington coordinate system, north zone 1000-meter Universal Transverse Mercator grid ticks, zone 10, shown in blue
The difference between 1927 North American Datum and North American Datum of 1983 (NAD 83) for 7.5 minute intersections is given in USGS Bulletin 1875. The NAD 83 is shown by dashed corner ticks

UTM GRID AND 1973 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 25 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER
THE AVERAGE RANGE OF TIDE IS APPROXIMATELY 12 FEET

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

Revisions shown in purple compiled by the Geological awmn

ATTACHMENT A 5

RECEIVED
JUN 08 1994
Dept. ... Health
Division of Drinking Water

Ground Water Contamination Susceptibility Assessment Survey Form

Version 2.1

IMPORTANT! Please complete one form for each ground water source (well, wellfield, spring) used in your water system. Photocopy as necessary.

PART I: System Information

Well owner/manager : RolFe PEDERSEN

Water system name : KING COUNTY WATER DIST #54 *

RECIEVED
JAN 29 2003
WATER DISTRICT #54

County: KING

Water system number: 399504 Source number: S02

Well depth: 244 (ft.) (*From WFI form*)

Source name: WEll #5

WA well identification tag number: A A B 1 8 2

____ well not tagged

Number of connections: 685 Population served: 2076

Township: 22 NORTH Range: 4 EAST

Section: 8 1/4 1/4 Section: NW, SE

Latitude/longitude (if available): 47°-24'-22" / 122°-19'05"

How was lat./long. determined?

____ global positioning device ____ survey X topographic map
____ other: ____

* Please refer to Assistance Packet for details and explanations of all questions in Parts II through V.

PART II: Well Construction and Source Information

1) Date well originally constructed: 5 / 1582 month/day/year

last reconstruction: ____ / ____ / ____ month/day/year

____ information unavailable

2) Well driller: MUELLER DRILLING
4020 SO. 170TH
SEATTLE WASH.

___ well driller unknown

3) Type of well:

X Drilled: ___ rotary ___ bored X cable (percussion) ___ Dug

___ Other: ___ spring(s) ___ lateral collector (Ranney)

___ driven ___ jetted ___ other: ___

Additional comments: ___

4) Well report available? X YES (attach copy to form) ___ NO

If no well log is available, please attach any other records documenting well construction; e.g. boring logs, "as built" sheets, engineering reports, well reconstruction logs.

5) Average pumping rate: 500 (gallons/min)

Source of information: DRILLING REPORT

If not documented, how was pumping rate determined? ___

___ Pumping rate unknown

6) Is this source treated? NO

If so, what type of treatment:

___ disinfection ___ filtration ___ carbon filter ___ air stripper ___ other

Purpose of treatment (describe materials to be removed or controlled by treatment): ___

7) If source is chlorinated, is a chlorine residual maintained: YES / NO

Residual level: ___ (*At the point closest to the source.*)

PART III: Hydrogeologic Information

1) Depth to top of open interval: [check one]

___ < 20 ft ___ 20-50 ft ___ 50-100 ft ___ 100-200 ft [✓ >200 ft]

___ information unavailable ('< ' *means less than;* '> ' *means greater than)*

2) Depth to ground water (static water level):

___ < 20 ft [✓ 20-50 ft] ___ 50-100 ft ___ > 100 ft

___ flowing well/spring (artesian)

How was water level determined?

[✓ well log] __ other: ______________________________

__ depth to ground water unknown

3) If source is a flowing well or spring, what is the confining pressure:

_______ psi (pounds per square inch)
or
_______ feet above wellhead

4) If source is a flowing well or spring, is there a surface impoundment, reservoir, or catchment associated with this source: YES / NO

5) Wellhead elevation (height above mean sea level): 140 (ft)

How was elevation determined? ___ topographic map [✓ Drilling/Well Log] ___ altimeter

__ other: ______________________________

__ information unavailable

6) Confining layers: (This can be completed only for those sources with a drilling log, well log or geologic report describing subsurface conditions. Please refer to assistance package for example.)

[✓ evidence of a confining layer in well log]

__ no evidence of a confining layer in well log

If there is evidence of a confining layer, is the depth to ground water more than 20 feet above the top of the open interval? [✓ YES] ___ NO

___ information unavailable

7) Sanitary setback:

___ < 100 ft* X 100-120 ft ___ 120-200 ft ___ > 200 ft
* if less than 100 ft describe the site conditions:

____
____
____

8) Wellhead construction:

X wellhead enclosed in a wellhouse

__ controlled access (describe): ______________________________
____

X other uses for wellhouse (describe): ELECTRICAL EQUPMENT FOR PUMP MOTORS

__ no wellhead control

9) Surface seal:

___ 18 ft

___ < 18 ft (no Department of Ecology approval) (*'<' means less than*)

___ < 18 ft (Approved by Ecology, include documentation) (*'<' means less than*)

X > 18 ft (*'>' means greater than*)

___ depth of seal unknown

___ no surface seal

10) Annual rainfall (inches per year):

___ < 10 in/yr ___ 10-25 in/yr X > 25 in/yr

PART IV: Mapping Your Ground Water Resource

1) Annual volume of water pumped: 46,230,000 (gallons)

How was this determined?

___ meter

___ estimated: ___ pumping rate (____________________)

___ pump capacity (____________________)

X other: AVERAGE OF WATER PUMPED 1993

2) "Calculated Fixed Radius" estimate of ground water movement:
(see Instruction Packet)

6 month ground water travel time : 440 (ft)

1 year ground water travel time : 620 (ft)

5 year ground water travel time: 1390 (ft)

10 year ground water travel time: 1970 (ft)

Information available on length of screened/open interval?

X YES ___ NO

Length of screened/open interval: 17' (ft)

3). Is there a river, lake, pond, stream, or other obvious surface water body within the 6 month time of travel boundary? YES [✓ NO] (mark and identify on map).

4) Is there a stormwater and/or wastewater facility, treatment lagoon, or holding pond located within the 6 month time of travel boundary? YES [✓ NO] (mark and identify on map).

Comments: ______________________________

PART V: Assessment of Water Quality

1) Regional sources of risk to ground water:

Please indicate if any of the following are present within a circular area around your water source having a radius up to and including the five year ground water travel time:

	6 month	1 year	5 year	unknown
likely pesticide application				X
stormwater injection wells				
other injection wells				
abandoned ground water well		5		
landfills, dumps, disposal areas				
known hazardous materials clean-up site	X			
water system(s) with known quality problems				
population density > 1 house/acre	X			
residences commonly have septic tanks				X
Wastewater treatment lagoons				
sites used for land application of waste				

Mark and identify on map any of the risks listed above which are located within the 6 month time of travel boundary? *(Please include a map of the wellhead and time of travel areas with this form. Please locate and mark any of the following.)*

If other recorded or potential sources of ground water contamination exist within the ten year time of travel circular zone around your water supply, please describe:

THE KNOWN HAZARDOUS MATARIAL
CLEAN UP SITE IS THE SITE OF A
REMOVED UNDERGROUND PETROLEAM
STORAGE TANK

2) Source specific water quality records:

Please indicate the occurrence of any test results since 1986 that meet the following conditions: (Unless listed on assessment, MCLs are listed in assistance package.)

A. Nitrate: (Nitrate MCL = 10 mg/l)	YES	NO
Results greater than MCL		X

	YES	NO
< 2 mg/liter nitrate	X	
2-5 mg/liter nitrate		X
> 5 mg/liter nitrate		X

___ Nitrate sampling records unavailable

B. VOCs: (VOC detection level 0.5 ug/l or 0.0005 mg/l.)	YES	NO
Results greater than MCL or SAL		X
VOCs detected at least once		X
VOCs never detected	✓	X

___ VOC sampling records unavailable

C. EDB/DBCP: (EDB MCL = 0.05 ug/l or 0.00005 mg/l. DBCP MCL = 0.2 ug/l or 0.0002 mg/l.)	YES	NO
EDB/DBCP detected below MCL at least once		
EDB/DBCP detected above MCL at least once		
EDB/DBCP never detected		

___ EDB/DBCP tests required but not yet completed

✓X EDB/DBCP tests not required

D. Other SOCs (Pesticides):	YES	NO
Other SOCs detected (pesticides and other synthetic organic chemicals).		

___ Other SOC tests performed but none detected (list test methods in comments

✓X Other SOC tests not performed

If any SOCs in addition to EDB/DBCP were detected, please identify and date. If other SOC tests were performed, but no SOCs detected, list test methods here: ____________________

E. Bacterial contamination:

	YES	NO
Any bacterial detection(s) in the past 3 years in samples taken from the source (not distribution sampling records).	___	X
Has source (in past 3 years) had a bacteriological contamination problem found in distribution samples that was attributed to the source.	___	X

___ Source sampling records for bacteria unavailable

Part VI: Geographic or Hydrologic Factors Contributing to a Non-Circular Zone of Contribution

The following questions will help identify those ground water systems which may not be accurately represented by the calculated fixed radius (CFR) method described in Part IV. For these sources, the CFR areas should be used as a preliminary delineation of the critical time of travel zones for that source. As a system develops its Wellhead Protection Plan for theses sources, a more detailed delineation method should be considered.

1) Is there evidence of obvious hydrologic boundaries within the 10 year time of travel zone of the CFR? (Does the largest circle extend over a stream, river, lake, up a steep hillside, and/or over a mountain or ridge?)

_X_ YES ______ NO

Describe with references to map produced in Part IV:

DES MOINES CREEK WITHIN
10YEAR TRAVEl ZONE

2) Aquifer Material:

A) Does the drilling log, well log or other geologic/engineering reports identify that the well is located in an area where the underground conditions are identified as fractured rock and/or basalt terrain?

______ YES _X_ NO

B) Does the drilling log, well log or other geologic/engineering reports indicate that the well is located in an area where the underground conditions are primarily identified as coarse sand and gravel?

______ YES _X_ NO

3) Is the source located in an aquifer with a high horizontal flow rate? (These can include sources located on flood plains of large rivers, artesian wells with high water pressure, and/or shallow flowing wells and springs.)

______ YES X NO

4) Are there other high capacity wells (agricultural, municipal and/or industrial) located within the CFRs?

a) Presence of ground water extraction wells removing more than approximately 500 gal/min within...

	YES	NO	unknown
< 6 month travel time	___	X	___
6 month–1 year travel time	___	X	___
1–5 year travel time	___	X	___
5–10 year travel time	___	X	___

b) Presence of ground water recharge wells (dry wells) or heavy irrigation within...

	YES	NO	unknown
< 1 year travel time	___	X	___
1–5 year travel time	___	X	___
5–10 year travel time	___	X	___

Please identify or describe additional hydrologic or geographic conditions that you believe may affect the shape of the zone of contribution for this source. Where possible, reference them to locations on the map produced in Part IV.

Suggestions and Comments

Did you attend one of the susceptibility workshops? YES / [✓ NO]

Did you find it useful? YES / [✓ NO]

Did you seek outside asistance to complete the assessment? [✓ YES] / NO

This form and instruction packet are still in the process of development. Your comments, suggestions and questions will help us upgrade and improve this assessment form. If you found particular sections confusing or problematic please let us know. How could this susceptibility assessment be improved or made clearer? Did the instruction package help you find the information needed to complete the assessment? How much time did it take you to complete the form? Were you able to complete the assessment without additional/outside expertise? Do you feel the assessment was valuable as a learning experience? Any other comments or constructive criticisms you have would be appreciated.

le Original and First Copy with
epartment of Ecology
econd Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. G1-25001
ATTACHMENT A

Permit No. G1-23881P

1) OWNER: Name KING COUNTY WATER DISTRICT #54 Address 922 South 219th STREET, Des Moines 981

(2) OCATION OF WELL: County KING — NE ¼ SE ¼ Sec. ____ T. 22 N., R. 4E W.M.

Bea and distance from section or subdivision corner

3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☒ Irrigation ☐ Test Well ☐ Other ☐

) TYPE OF WORK: Owner's number of well (if more than one) 5

New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

5) DIMENSIONS: Diameter of well 12 inches.
Drilled 245 ft. Depth of completed well 244 ft.

) CONSTRUCTION DETAILS:

Casing installed: 12 " Diam. from +3 ft. to 211.5 ft.
Thread ☐ " Diam. from ____ ft. to ____ ft.
Welded ☒ " Diam. from ____ ft. to ____ ft.

Perforations: Yes ☐ No ☒
Type of perforator used ____
SIZE of perforations ____ in. by ____ in.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.

Screens: Yes ☒ No ☐
Manufacturer's Name COOK
Type 304 STAINLESS Model No. ____
Diam. 10" Slot size .100 from 212.6 ft. to 218 ft.
Diam. 10" Slot size .100 from 223 ft. to 234.15 ft.

Gravel packed: Yes ☐ No ☐ Size of gravel: ____
Gravel placed from ____ ft. to ____ ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ____ Depth of strata ____
Method of sealing strata off ____

) PUMP: Manufacturer's Name NA
Type: ____ H.P. ____

(8) WATER LEVELS: Land-surface elevation above mean sea level 175 ft.
ic level [illegible] ft. below top of well Date 5-6-82
esian pressure ____ lbs. per square inch Date ____
Artesian water is controlled by ____ (Cap, valve, etc.)

) WELL TESTS: Drawdown is amount water level is lowered below static level
s a pump test made? Yes ☒ No ☐ If yes, by whom? Neil Hahn
ld: 500 gal./min. with 55 ft. drawdown after 5½ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
10 Min	74'				
3'	67'				
9	61'				

Date of test 5-7-82
ailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Artesian flow ____ g.p.m. Date ____
nperature of water 51.4° Was a chemical analysis made? Yes ☒ No ☐

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
TOP SOIL	0	8
BLUE CLAY	8	70
GRAY SILTY SAND	70	90
SILTY BLACK AND GREEN SAND	90	
AND GRAVEL		117
GRAY SILTY SAND AND GRAVEL	117	128
BLACK AND GREEN SAND	128	
AND GRAVEL		135
GRAY SILTY SAND AND GRAVEL	135	156
BLACK AND GREEN SAND	156	
AND GRAVEL (WATER BEARING)		202
GRAY SAND WITH SOME GRAVEL	202	208
BLACK AND GREEN SAND AND	208	
GRAVEL (WATER BEARING)		236
DENSE BLUE-GREEN CLAY AND	236	
SAND AND GRAVEL WITH PEAT		
TOTAL DEPTH		245

Work started 4/6, 19 82 Completed 5/15, 19 82

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Mueller Drilling
(Person, firm, or corporation) (Type or print)

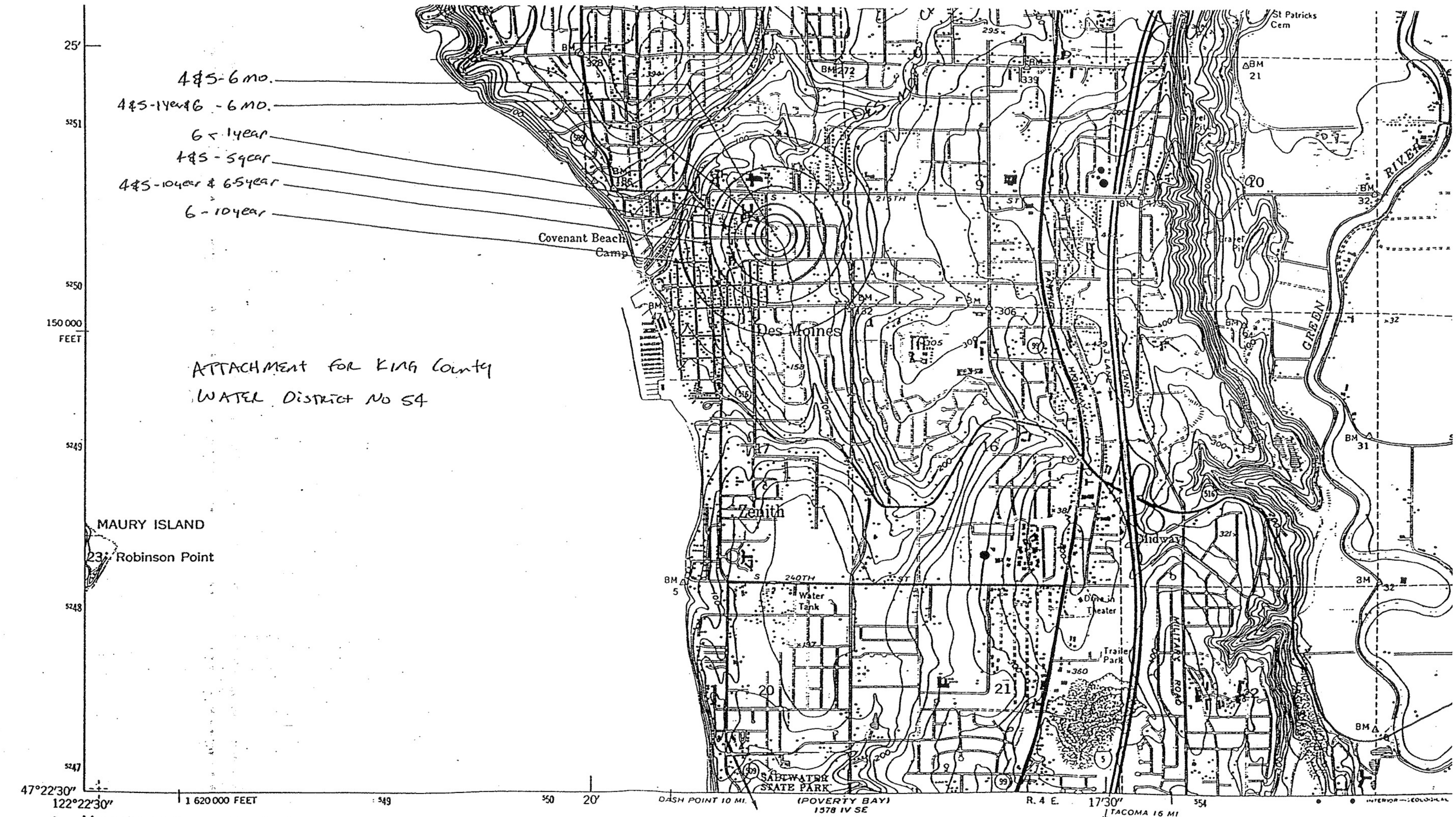
Address 4020 S 170 SEATTLE

[Signed] H. T. Mueller
(Well Driller)

License No. 0930 Date 6-2, 19 82

(USE ADDITIONAL SHEETS IF NECESSARY)

ATTACHMENT A



ATTACHMENT FOR KING County
WATER DISTRICT NO 54

Mapped by the Defense Mapping Agency
Edited and published by the Geological Survey

Control by NOS/NOAA and King County Engineer Office

Topography by photogrammetric methods from aerial photographs taken 1943. Field checked 1949.

Polyconic projection. 1927 North American Datum
10,000-foot grid based on Washington coordinate system, north zone 1000-meter Universal Transverse Mercator grid ticks, zone 10, shown in blue
The difference between 1927 North American Datum and North American Datum of 1983 (NAD 83) for 7.5 minute intersections is given in USGS Bulletin 1875. The NAD 83 is shown by dashed corner ticks

Dashed lines indicate approximate locations

UTM GRID AND 1973 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24000

CONTOUR INTERVAL 25 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER
THE AVERAGE RANGE OF TIDE IS APPROXIMATELY 12 FEET

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

QUADRANGLE LOCATION

Revisions shown in purple compiled by the Geological Survey from aerial photographs taken 1968 and 1973. This information not field checked

ROAD CLASS

Heavy-duty
Medium-duty
U. S. Route
Intersta

awmn

ATTACHMENT A

7

Ground Water Contamination
Susceptibility Assessment Survey Form
Version 2.1

RECEIVED
JUN 08 1994
Dept. of Health
Division of Drinking Water

IMPORTANT! Please complete one form for each ground water source (well, wellfield, spring) used in your water system. Photocopy as necessary.

PART I: System Information

Well owner/manager : ROLFE PEDERSEN

Water system name : KING County Water District No. 54

County: KING

Water system number: 399504 Source number: S04

Well depth: 358 (ft.) (*From WFI form*)

Source name: WELL No. 6

WA well identification tag number: A A B - 1 8 3

_______ well not tagged

Number of connections: 685 Population served: 2076

Township: 22 NORTH Range: 4 EAST

Section: 8 1/4 1/4 Section: NW SE

Latitude/longitude (if available): 47° 24' 22" / 122° 19' 05"

How was lat./long. determined?

_______ global positioning device _________ survey ✓ topographic map

____other: ______________________________________

* Please refer to Assistance Packet for details and explanations of all questions in Parts II through V.

PART II: Well Construction and Source Information

1) Date well originally constructed: 10 / 27 / 89 month/day/year

last reconstruction: ___ / ___ /___ month/day/year

_______ information unavailable

2) Well driller: HOLT DRILLING INC

~~4080 S 170th~~ 10621 TODD ROAD E

Puyallup, WA 98372

___ well driller unknown

3) Type of well:

___ Drilled: ___ rotary ___ bored ✓ cable (percussion) ___ Dug

___ Other: ___ spring(s) ___ lateral collector (Ranney)

___ driven ___ jetted ___ other: ___________

Additional comments: ___________________________

4) Well report available? ✓ YES (attach copy to form) ___ NO

If no well log is available, please attach any other records documenting well construction; e.g. boring logs, "as built" sheets, engineering reports, well reconstruction logs.

5) Average pumping rate: 350 (gallons/min)

Source of information: DRILLING REPORT

If not documented, how was pumping rate determined? ___________________________

___ Pumping rate unknown

6) Is this source treated? NO

If so, what type of treatment:

___ disinfection ___ filtration ___ carbon filter ___ air stripper ___ other

Purpose of treatment (describe materials to be removed or controlled by treatment):

____

7) If source is chlorinated, is a chlorine residual maintained: ___ YES ___ NO

Residual level: ___________ (*At the point closest to the source.*)

PART III: Hydrogeologic Information

Depth to top of open interval: [check one]

___ < 20 ft ___ 20–50 ft ___ 50–100 ft ___ 100–200 ft ✓ > 200 ft

___ information unavailable ('<' *means less than;* '>' *means greater than*)

2) Depth to ground water (static water level):

___ < 20 ft ___ 20–50 ft ___ 50–100 ft ✓ > 100 ft

___ flowing well/spring (artesian)

How was water level determined?

✓ well log ___ other: ______________________

___ depth to ground water unknown

3) If source is a flowing well or spring, what is the confining pressure:

_______ psi (pounds per square inch)
or
_______ feet above wellhead

4) If source is a flowing well or spring, is there a surface impoundment, reservoir, or catchment associated with this source: ___ YES ___ NO

5) Wellhead elevation (height above mean sea level): 155 (ft)

How was elevation determined? ✓ topographic map ___ Drilling/Well Log ___ altimeter

___ other: ______________________

___ information unavailable

6) Confining layers: (This can be completed only for those sources with a drilling log, well log or geologic report describing subsurface conditions. Please refer to assistance package for example.)

✓ evidence of a confining layer in well log

___ no evidence of a confining layer in well log

If there is evidence of a confining layer, is the depth to ground water more than 20 feet above the ~~top~~ bottom of the ~~open interval?~~ lowest confining layer ✓ YES ___ NO

___ information unavailable

7) Sanitary setback:

___ < 100 ft* ✓ 100–120 ft ___ 120–200 ft ___ > 200 ft
* if less than 100 ft describe the site conditions:

8) Wellhead construction:

___ wellhead enclosed in a wellhouse

✓ controlled access (describe): Vault over Well HEAD

✓ other uses for wellhouse (describe): ELECTRICAL conduit & piping

___ no wellhead control

9) Surface seal:

___ 18 ft

___ < 18 ft (no Department of Ecology approval) *('<' means less than)*

___ < 18 ft (Approved by Ecology, include documentation) *('<' means less than)*

✓ > 18 ft *('>' means greater than)*

___ depth of seal unknown

___ no surface seal

10) Annual rainfall (inches per year):

___ < 10 in/yr ___ 10–25 in/yr ✓ > 25 in/yr

PART IV: Mapping Your Ground Water Resource

Annual volume of water pumped: 46,000,000 (gallons)

How was this determined?

___ meter

___ estimated: ___ pumping rate (________________)

___ pump capacity (________________)

✓ other: AVERAGED 1993 WATER Pumped over 3 pumping wells

2) "Calculated Fixed Radius" estimate of ground water movement:
(see Instruction Packet)

6 month ground water travel time : 310 (ft)

1 year ground water travel time : 440 (ft)

5 year ground water travel time: 980 (ft)

10 year ground water travel time: 1390 (ft)

Information available on length of screened/open interval?

✓ YES ___ NO

Length of screened/open interval: 45 (ft)

3) Is there a river, lake, pond, stream, or other obvious surface water body within the 6 month time of travel boundary? ___ YES ✓ NO (mark and identify on map).

4) Is there a stormwater and/or wastewater facility, treatment lagoon, or holding pond located within the 6 month time of travel boundary? ___ YES ✓ NO (mark and identify on map).

Comments: ________________

PART V: Assessment of Water Quality

1) Regional sources of risk to ground water:

Please indicate if any of the following are present within a circular area around your water source having a radius up to and including the five year ground water travel time:

	6 month	1 year	5 year	unknown
likely pesticide application				✓
stormwater injection wells				
other injection wells				
abandoned ground water well			✓	
landfills, dumps, disposal areas				
known hazardous materials clean-up site	✓			
water system(s) with known quality problems				
population density > 1 house/acre	✓			
residences commonly have septic tanks				✓
Wastewater treatment lagoons				
sites used for land application of waste				

Mark and identify on map any of the risks listed above which are located within the 6 month time of travel boundary? *(Please include a map of the wellhead and time of travel areas with this form. Please locate and mark any of the following.)*

If other recorded or potential sources of ground water contamination exist within the ten year time of travel circular zone around your water supply, please describe:

THE KNOWN HAZARDOUS MATERIALS CLEAN UP SITE IS THE SITE OF

A REMOVED LEAKING UNDERGROUND PETROLEUM STORAGE TANK

2) Source specific water quality records:

Please indicate the occurrence of any test results since 1986 that meet the following conditions: (Unless listed on assessment, MCLs are listed in assistance package.)

A. Nitrate: (Nitrate MCL = 10 mg/l)	YES	NO
Results greater than MCL		✓
< 2 mg/liter nitrate	✓	
2-5 mg/liter nitrate		✓
> 5 mg/liter nitrate		✓

___ Nitrate sampling records unavailable

B. VOCs: (VOC detection level 0.5 ug/l or 0.0005 mg/l.)	YES	NO
Results greater than MCL or SAL		✓
VOCs detected at least once		✓
VOCs never detected	✓	

___ VOC sampling records unavailable

C. EDB/DBCP:	YES	NO
(EDB MCL = 0.05 ug/l or 0.00005 mg/l. DBCP MCL = 0.2 ug/l or 0.0002 mg/l.)		
EDB/DBCP detected below MCL at least once		
EDB/DBCP detected above MCL at least once		
EDB/DBCP never detected		

___ EDB/DBCP tests required but not yet completed

✓ EDB/DBCP tests not required

D. Other SOCs (Pesticides):	YES	NO
Other SOCs detected (pesticides and other synthetic organic chemicals)		

___ Other SOC tests performed but none detected (list test methods in comments

✓ Other SOC tests not performed

If any SOCs in addition to EDB/DBCP were detected, please identify and date. If other SOC tests were performed, but no SOCs detected, list test methods here: ______________________________

____

____

____

E. Bacterial contamination:

	YES	NO
Any bacterial detection(s) in the past 3 years in samples taken from the source (not distribution sampling records).	___	✓
Has source (in past 3 years) had a bacteriological contamination problem found in distribution samples that was attributed to the source.	___	✓

___ Source sampling records for bacteria unavailable

Part VI: Geographic or Hydrologic Factors Contributing to a Non-Circular Zone of Contribution

The following questions will help identify those ground water systems which may not be accurately represented by the calculated fixed radius (CFR) method described in Part IV. For these sources, the CFR areas should be used as a preliminary delineation of the critical time of travel zones for that source. As a system develops its Wellhead Protection Plan for theses sources, a more detailed delineation method should be considered.

1) Is there evidence of obvious hydrologic boundaries within the 10 year time of travel zone of the CFR? (Does the largest circle extend over a stream, river, lake, up a steep hillside, and/or over a mountain or ridge?)

✓ YES ___ NO

Describe with references to map produced in Part IV:

DES MOINES CREEK

2) Aquifer Material:

A) Does the drilling log, well log or other geologic/engineering reports identify that the well is located in an area where the underground conditions are identified as fractured rock and/or basalt terrain?

___ YES ✓ NO

B) Does the drilling log, well log or other geologic/engineering reports indicate that the well is located in an area where the underground conditions are primarily identified as coarse sand and gravel?

___ YES ✓ NO

3) Is the source located in an aquifer with a high horizontal flow rate? (These can include sources located on flood plains of large rivers, artesian wells with high water pressure, and/or shallow flowing wells and prings.)

___ YES ✓ NO

4) Are there other high capacity wells (agricultural, municipal and/or industrial) located within the CFRs?

a) Presence of ground water extraction wells removing more than approximately 500 gal/min within...

	YES	NO	unknown
< 6 month travel time		✓	
6 month–1 year travel time		✓	
1–5 year travel time		✓	
5–10 year travel time		✓	

b) Presence of ground water recharge wells (dry wells) or heavy irrigation within...

	YES	NO	unknown
< 1 year travel time		✓	
1–5 year travel time		✓	
5–10 year travel time		✓	

Please identify or describe additional hydrologic or geographic conditions that you believe may affect the shape of the zone of contribution for this source. Where possible, reference them to locations on the map produced in Part IV.

Suggestions and Comments

Did you attend one of the susceptibility workshops? ___ YES [✓ NO]

Did you find it useful? ___ YES [✓ NO]

Did you seek outside assistance to complete the assessment? [✓ YES] ___ NO

- -

This form and instruction packet are still in the process of development. Your comments, suggestions and questions will help us upgrade and improve this assessment form. If you found particular sections confusing or problematic please let us know. How could this susceptibility assessment be improved or made clearer? Did the instruction package help you find the information needed to complete the assessment? How much time did it take you to complete the form? Were you able to complete the assessment without additional/outside expertise? Do you feel the assessment was valuable as a learning experience? Any other comments or constructive criticisms you have would be appreciated.

riginal and First Copy with
rtment of Ecology
d Copy—Owner's Copy
Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 6738

ATTACHMENT A

Water Right Permit No. ______

OWNER: Name KCWD 54 Address Des Moines

LOCATION OF WELL: County King NW ¼ SE ¼ Sec 8 T 22 N., R 4E W.M.

STREET ADDRESS OF WELL (or nearest address) So 219th ST & 11th Ave. So,

PROPOSED USE: ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☒ Other ☐

TYPE OF WORK: Owner's number of well (if more than one) 6

bandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☒ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

DIMENSIONS: Diameter of well 16 inches.
rilled 375 feet. Depth of completed well 356 ft.

CONSTRUCTION DETAILS:

asing installed: 16 " Diam. from 0 ft. to 336 ft.
elded ☒ ______ " Diam. from ______ ft. to ______ ft.
ner installed ☐
Threaded ☐ ______ " Diam. from ______ ft. to ______ ft.

erforations: Yes ☐ No ☒
ype of perforator used ______
SIZE of perforations ______ in. by ______ in.
______ perforations from ______ ft. to ______ ft.
______ perforations from ______ ft. to ______ ft.
______ perforations from ______ ft. to ______ ft.

Screens: Yes ☒ No ☐
anufacturer's Name Johnson
Stainless Steel Model No. Tele:
Diam. 14 Slot size .080 from 336 ft. to 346 ft.
Diam. 14 Slot size .040 from 386 ft. to 351 ft.

ravel packed: Yes ☐ No ☒ Size of gravel ______
Gravel placed from ______ ft. to ______ ft.

urface seal: Yes ☒ No ☐ To what depth? ~~XXX~~ 40 ft.
aterial used in seal Cement/Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ______ Depth of strata ______
ethod of sealing strata off ______

PUMP: Manufacturer's Name ______
ype: ______ H.P. ______

WATER LEVELS: Land-surface elevation above mean sea level 155 ft.
Static level 132.35 ft. below top of well Date 10/19/89
rtesian pressure ______ lbs. per square inch Date ______
Artesian water is controlled by ______ (Cap, valve, etc.))

WELL TESTS: Drawdown is amount water level is lowered below static level
as a pump test made? Yes ☒ No ☐ If yes, by whom? Carr/Assoc.
ield: 350 gal./min. with 137.20 drawdown after 24. hrs.
" " " "
" " " "

ecovery data (time taken as zero when pump turned off) (water level measured om well top to water level)

me	Water Level	Time	Water Level	Time	Water Level
1	175.70	30	146.57	300	141.18
	152.47	100	144.14	626	140.10
	149.69	180	143.17	1420	137.08

Date of test 10/19 - 10/20/89

ailer test ______ gal./min. with ______ ft. drawdown after ______ hrs.
rtest ______ gal./min. with stem set at ______ ft. for ______ hrs.
Artesian flow ______ g.p.m. Date ______

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Top Soil	0	2
Brown Clay Sandy, Rocky	2	14
Clay, Gray	14	23
Clay, Gray, Silty	23	50
Silt, Gray	50	76
Silt, Gray, Sandy	76	83
Sand, Fine to coarse	83	89
Sand, Gravel, some big rocks	89	102
Sand, Gravel, looser	102	105
Sand, Gravel, Siltbound	105	115
Silt, Tight, occasional grvl	115	123
Silt, Sandy, some grvls & cbls	123	146
Sand & Grvl, silty green wtr.	146	161
Sand, Gravel, green binder	161	164
Sand, Gravel, silty, looser	164	176
Sand, Gravel, tight grn. bind.	176	193
Sand, Gravel, layered	193	206
Sand, Gravel, looser	206	214
Sand, Gray, few gravels	214	245
Sand, Gravel	245	252
Sand, Gravel, hard claybound	252	271
Sand, Gravel, Clay	271	284
Sand, Gravel, Water	284	288
Clay, some grvl, multi-color	288	297
Clay, multi-colored	297	315
Gravel, Water	315	316
Silt, gravel, gray-green	316	320
Grvl., Sand, green claybound	320	336
Gravel, Sand, Water	336	352.5
Sand, Gray, Silty	352.5	373
Silt, Gray, Sandy	373	375

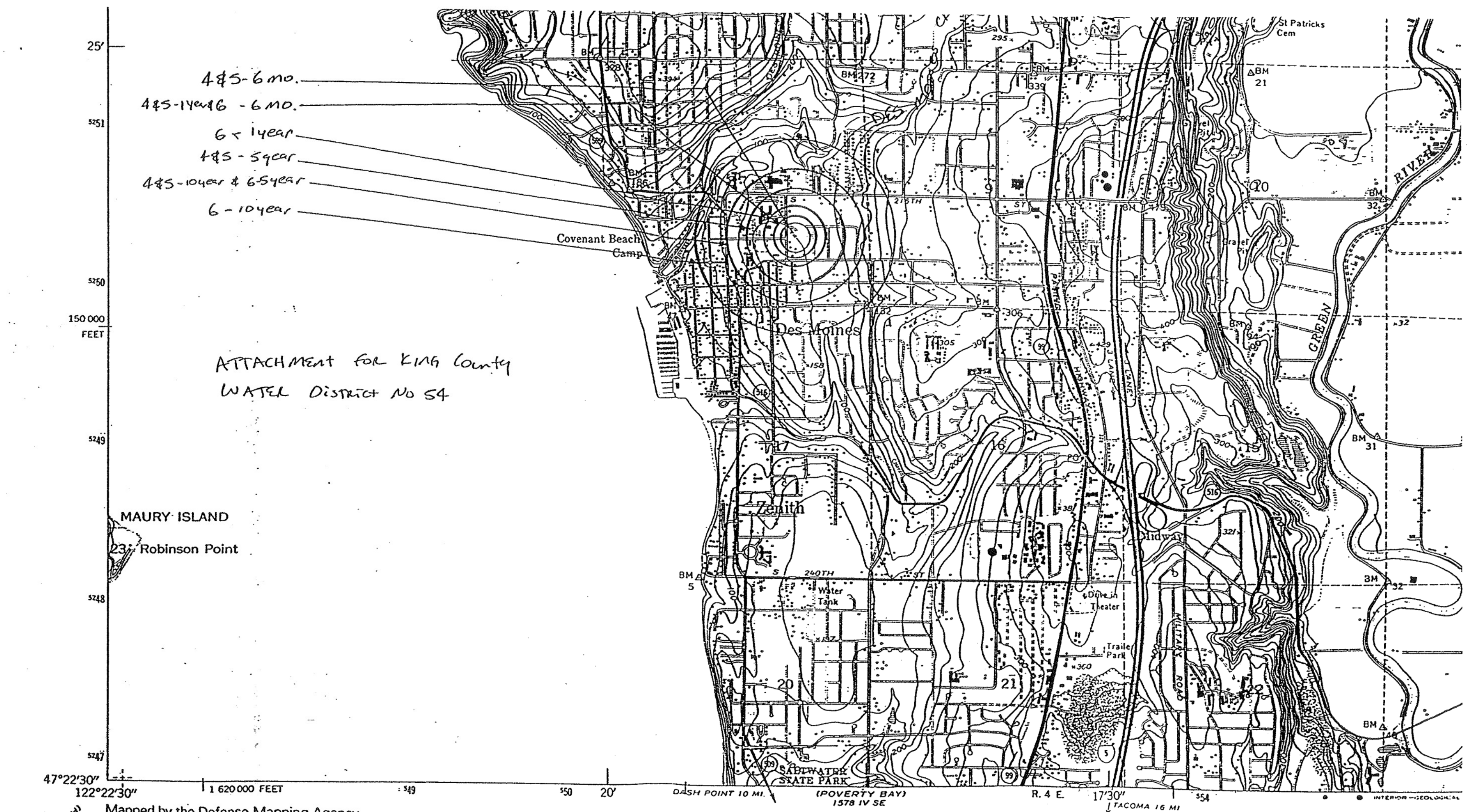
Work started 8-16 , 19 . Completed 10-27 , 1989

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Holt Drilling, Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 10621 Todd Road E. Puyallup WA 98371
(Signed) ______ (WELL DRILLER) License No. 1099
Contractor's Registration No. HO-LTDIZ * 13606 Date 11-9 , 1989

ATTACHMENT A



ATTACHMENT FOR KING County
WATER DISTRICT NO 54

(TACOMA NORTH) 1578 IV SW

Mapped by the Defense Mapping Agency
Edited and published by the Geological Survey

Control by NOS/NOAA and King County Engineer Office

Topography by photogrammetric methods from aerial photographs taken 1943. Field checked 1949.

Polyconic projection. 1927 North American Datum
10,000-foot grid based on Washington coordinate system, north zone 1000-meter Universal Transverse Mercator grid ticks, zone 10, shown in blue
The difference between 1927 North American Datum and North American Datum of 1983 (NAD 83) for 7.5 minute intersections is given in USGS Bulletin 1875. The NAD 83 is shown by dashed corner ticks

Dashed lines indicate approximate locations

UTM GRID AND 1973 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

0°30' 9 MILS

21½° 382 MILS

SCALE 1:24000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 25 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER
THE AVERAGE RANGE OF TIDE IS APPROXIMATELY 12 FEET

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

WASHINGTON

QUADRANGLE LOCATION

Revisions shown in purple compiled by the Geological Survey from aerial photographs taken 1968 and 1973. This information not field checked

ROAD CLASS

Heavy-duty

Medium-duty

U. S. Route

ATTACHMENT A

Well #7
(Deep Aquifer)

12/22/00

Survey Form Version 2.2

Ground Water Contamination
Susceptibility Assessment Survey Form
Version 2.2

IMPORTANT! Please complete one form for each ground water source (well, wellfield, spring) used in your water system. Photocopy as necessary.

PART I: System Information

Well owner/manager: Robert Awford

Water system name: Water District #54

County: King

Water system number: 399504

Source number: SO5

Well depth: 380 (ft.) (From WFI form)

Source name: Well # 7

WA well identification tag number: AFC-525

well not tagged

Number of connections: 765

Population served: 2500

Township: 22 North

Range: 4 East

Section: 8

1/4 1/4 Section: NW , SE

Latitude/longitude (if available): 47 -24'-22" / 122° 19' 2"

How was lat./long. determined?

☑ global positioning device

survey

other:

As Edited
by Robinson
& Noble
Jan. 2003

* Please refer to Assistance Packet for details and explanations of all questions in Parts II through V.

PART II: Well Construction and Source Information

1) Date well originally constructed: 03 /23 / 2000
last reconstruction: none

2) Well driller: Holt Drilling Inc.
PO Box 1890
Milton, WA. 98354 253-874-7448

3) Type of well:

Drilled: rotary bored ☑cable (percussion) Dug

Other: spring(s) lateral collector (Ranney)

driven jetted other:

Additional comments:

4) Well report available? ☑ YES (attach copy to form) NO

If no well log is available, please attach any other records documenting well construction; e.g. boring logs, "as built" sheets, engineering reports, well reconstruction logs.

5) Average pumping rate: currently 0 /rated at 370(gallons/min)

Source of information: Environmental & Ground Water Geologists drilling report

If not documented, how was pumping rate determined?

No pump currently installed

6) Is this source treated? No

If so, what type of treatment:

disinfection filtration carbon filter air stripper other

12/22/00

Purpose of treatment (describe materials to be removed or controlled by treatment):

7) If source is chlorinated, is a chlorine residual maintained: YES NO

Residual level: (At the point closest to the source.)

PART III: Hydrogeologic Information

1) Depth to top of open interval: (check one)

< 20 ft 20-50 ft 50-100 ft 100-200 ft ☑ >200 ft (327)

information unavailable ('<' means less than; '>' means greater than)

2) Depth to ground water (static water level):

< 20 ft 20-50 ft 50-100 ft ☑ >100 ft (125)

flowing well/spring (artesian)

How was water level determined?

well log other: ☑depth sounder

depth to ground water unknown

3) If source is a flowing well or spring, what is the confining pressure:

psi (pounds per square inch)
or
feet above wellhead

4) If source is a flowing well or spring, is there a surface impoundment, reservoir, or catchment associated with this source: YES NO

5) Wellhead elevation (height above mean sea level): 148 (ft)

How was elevation determined? ☑ topographic map Drilling/Well Log altimeter

other:

6) Confining layers: (This can be completed only for those sources with a drilling log, well log or geologic report describing subsurface conditions. Please refer to assistance package for example.)

☑ evidence of a confining layer in well log

no evidence of a confining layer in well log

If there is evidence of a confining layer, is the depth to ground water more than 20 feet above the bottom of the lowest confining layer? ☑ YES NO

7) Sanitary setback:

< 100 ft* ☑ 100–120 ft 120–200 ft > 200 ft
* if less than 100 ft describe the site conditions:

8) Wellhead construction:

☑wellhead enclosed in a wellhouse

controlled access (describe): secured locked gated facility, well house or vault under design phase

other uses for wellhouse (describe): well house or vault will include related instrumentation

no wellhead control

9) Surface seal: 52 ft constructed of bentonite

< 18 ft (no Department of Ecology approval)	('<' means less than)
< 18 ft (Approved by Ecology, include documentation)	('<' means less than)
☑ > 18 ft	('>' means greater than)
depth of seal unknown	
no surface seal	

10) Annual rainfall (inches per year):

< 10 in/yr 10–25 in/yr ☑ > 25 in/yr (45 – 50 in/yr)

ATTACHMENT A

12/22/00

PART IV: Mapping Your Ground Water Resource

1) Annual volume of water pumped: No pump installed rated ~~at 370GPM~~ ~~AcFt/yr~~

291, 290, 947 gal 'gallons' on other sheets

How was this determined? initial pump test

meter

estimated: pumping rate (370 ~~GPM~~) ?

pump capacity ( )

other: Water Rights Qa

2) "Calculated Fixed Radius" estimate of ground water movement:
(see Instruction Packet)

6 month ground water travel time : ~~440~~ ∼ 1000* (ft)

1 year ground water travel time : ~~620~~ ∼ 2200* (ft)

5 year ground water travel time: ~~1390~~ ∼ 6700* (ft)

10 year ground water travel time: ~~1970~~ ∼ 8700* (ft)

→ Not calculated as a fixed radius –

*See wellhead protect Area for the Deep Aquifer System

Information available on length of screened/open interval?

☑ YES NO

Length of screened/open interval: ~~30~~ (ft) 37'

3) Is there a river, lake, pond, stream, or other obvious surface water body within the 6 month time of travel boundary? ☑ YES NO (mark and identify on map).

4) Is there a stormwater and/or wastewater facility, treatment lagoon, or holding pond located within the 6 month time of travel boundary? ☑ YES NO (mark and identify on map).

Comments: See Attachment #

PART V: Assessment of Water Quality

1) Regional sources of risk to ground water:

Please indicate if any of the following are present within a circular area around your water source having a radius up to and including the five year ground water travel time:

	6 month	1 year	5 year	unknown
likely pesticide application				☑
stormwater injection wells				
other injection wells				
abandoned ground water well				
landfills, dumps, disposal areas				
known hazardous materials clean-up site	☑			
water system(s) with known quality problems				
population density > 1 house/acre				
residences commonly have septic tanks				☑
Wastewater treatment lagoons				
sites used for land application of waste				

Mark and identify on map any of the risks listed above which are located within the 6 month time of travel boundary? (Please include a map of the wellhead and time of travel areas with this form. Please locate and mark any of the following.)

If other recorded or potential sources of ground water contamination exist within the ten year time of travel circular zone around your water supply, please describe: The neighboring property (City of Des Moines Public Works Dept.) once housed a petroleum storage tank.

12/22/00

2) Source specific water quality records:

Please indicate the occurrence of any test results since 1986 that meet the following conditions: (Unless listed on assessment, MCLs are listed in assistance package.)

A. Nitrate: (Nitrate MCL = 10 mg/l) YES

Results greater than MCL ____
< 2 mg/liter nitrate X
2-5 mg/liter nitrate ____
> 5 mg/liter nitrate ____
Nitrate sampling records unavailable____

B. VOCs: (VOC detection level 0.5 ug/l or 0.0005 mg/l.) YES

Results greater than MCL or SAL ____
VOCs detected at least once____
VOCs never detected X
VOC sampling records unavailable ____

C. EDB/DBCP: YES

(EDB MCL = 0.05 ug/l or 0.00005 mg/l. DBCP MCL = 0.2 ug/l or 0.0002 mg/l.)

EDB/DBCP detected below MCL at least once ____
EDB/DBCP detected above MCL at least once ____
EDB/DBCP never detected X
EDB/DBCP tests required but not yet completed ____
EDB/DBCP tests not required ____

D. Other SOCs (Pesticides): YES

Other SOCs detected
(pesticides and other synthetic organic chemicals) ____
Other SOC tests performed but none detected
(list test methods in comments) ____
Other SOC tests not performed X

If any SOCs in addition to EDB/DBCP were detected, please identify and date. If other SOC tests were performed, but no SOCs detected, list test methods here:

E. Bacterial contamination: **No**

Any bacterial detection(s) in the past 3 years in samples taken from the source (not distribution sampling records). **No**

Has source (in past 3 years) had a bacteriological contamination problem found in distribution samples that was attributed to the source. **No**

Source sampling records for bacteria unavailable. **No**

Part VI: Geographic or Hydrologic Factors Contributing to a Non-Circular Zone of Contribution

The following questions will help identify those ground water systems which may not be accurately represented by the calculated fixed radius (CFR) method described in Part IV. For these sources, the CFR areas should be used as a preliminary delineation of the critical time of travel zones for that source. As a system develops its Wellhead Protection Plan for theses sources, a more detailed delineation method should be considered.

1) Is there evidence of obvious hydrologic boundaries within the 10 year time of travel zone of the CFR? (Does the largest circle extend over a stream, river, lake, up a steep hillside, and/or over a mountain or ridge?)

☑ YES NO

Describe with references to map produced in Part IV:

- Des Moines Creek
- Puget Sound

2) Aquifer Material:

A) Does the drilling log, well log or other geologic/engineering reports identify that the well is located in an area where the underground conditions are identified as fractured rock and/or basalt terrain?

YES ☑ NO

B) Does the drilling log, well log or other geologic/engineering reports indicate that the well is located in an area where the underground conditions are primarily identified as coarse sand and gravel?

YES ☑ NO

3) Is the source located in an aquifer with a high horizontal flow rate? (These can include sources located on flood plains of large rivers, artesian wells with high water pressure, and/or shallow flowing wells and springs.)

YES ☑ NO

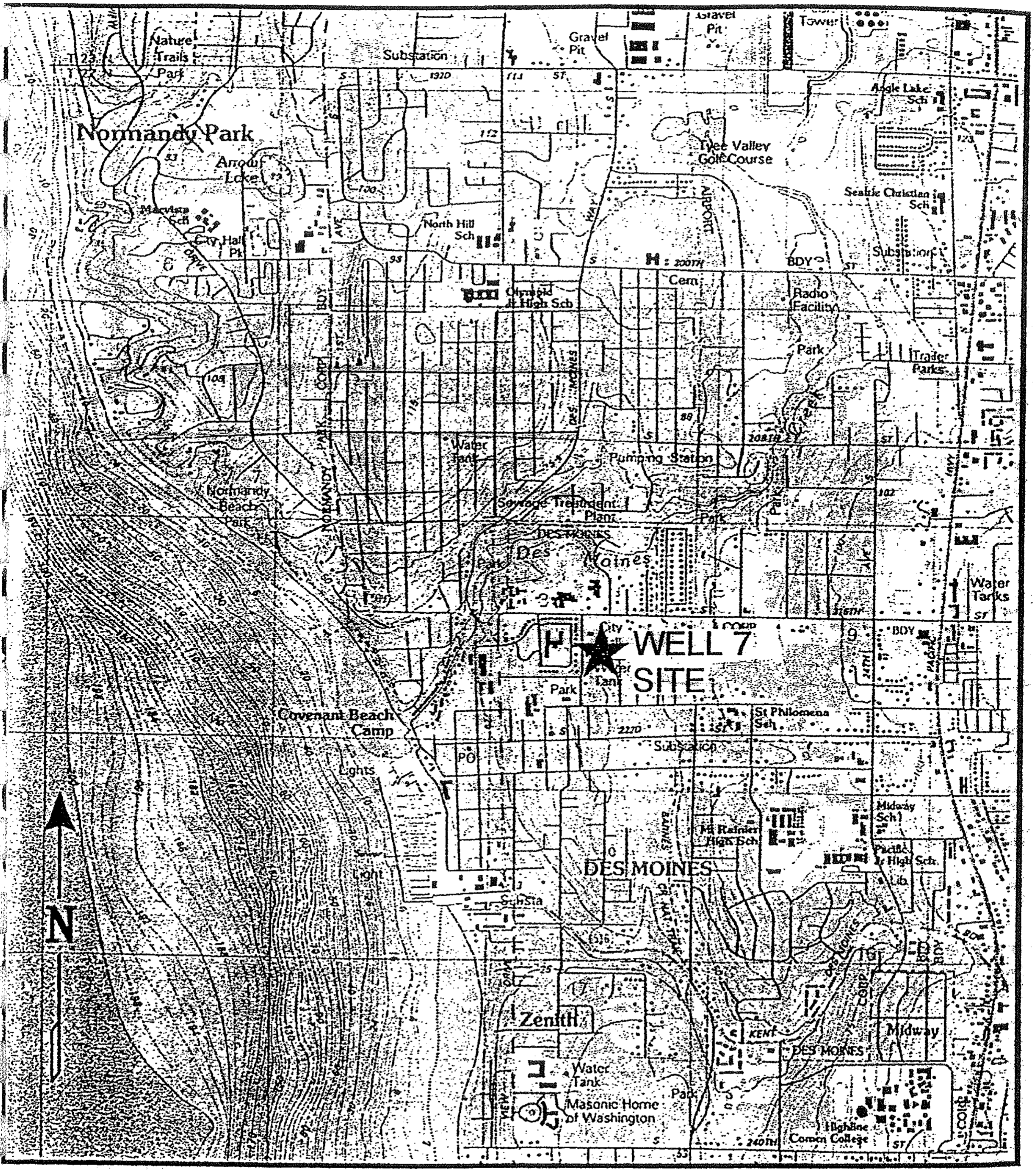
4) Are there other high capacity wells (agricultural, municipal and/or industrial) located within the CFRs?

a) Presence of ground water extraction wells removing more than approximately 500 gal/min within...

	YES	NO	unknown	
< 6 month travel time	X	___	____	
6 month–1 year travel time		X	____	____
1–5 year travel time	X	___	____	
5–10 year travel time	X	___	____	

ATTACHMENT A

FIGURE 1



BASE MAP TAKEN FROM USGS BURIEN QUAD (METRIC)

SCALE = 1: 25,000

T 22 N/R 4 E - 8K

PIERCE COUNTY

ROBINSON & NOBLE, INC.

SITE LOCATION MAP

King County Water District 54

Original and First Copy with
artment of Ecology

ond Copy- Owner's Copy
d Copy- Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. W124639 ATTACHMENT A
Unique Well ID # AFC 525
Water Right Permit No. 6076-A

OWNER: Name King County Water District 54 Address 922 South 219th, Des Moines, WA 98198

LOCATION OF WELL: County King - NW ¼ SE ¼ Sec 8 T. 22 N., R. 04E W.M.

STREET ADDRESS OF WELL (or nearest address) East of 10th Avenue ¼ mile south of 216th St. (59' south of Well 4, 69' east of well 6)

PROPOSED USE: ☐ Domestic ☐ Irrigation ☐ Dewater Industrial ☐ Test Well ☐ Municipal ☒ Other ☐

TYPE OF WORK: Owners number of well (if more than one) Well 7
☐ Abandoned New well ☒ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Cable ☒ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

DIMENSIONS: Diameter of well 12 inches.
Drilled 379 feet. Depth of completed well 374 ft.

CONSTRUCTION DETAILS:
Casing Installed: 12 " Diam. from +2.4 ft. to 334 ft.
Welded ☒ ____" Diam. from ____ ft. to ____ ft.
Liner installed ☐ ____" Diam. from ____ ft. to ____ ft.
Threaded ☐

Perforations: Yes ☐ No ☒
Type of perforator used ____
Size of perforations ____ in. by ____ in.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type Stainless Model No. ____
Diam. 8T " Slot size 0.050 from 364 ft. to 327 ft.
Diam. ____ " Slot size ____ from ____ ft. to ____ ft.
Diam. ____ " Slot size ____ from ____ ft. to ____ ft.

Gravel packed: Yes ☒ No ☐ Size of gravel 8 X 12
Gravel placed from 379 ft. to 287 ft.

Surface Seal: Yes ☒ No ☐ To what depth? 52 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ____ Depth of strata ____
Method of sealing strata off ____

PUMP: Manufacturer's Name ____
Type: ____ H.P. ____

WATER LEVELS: Land-surface elevation above mean sea level 148 165 ft.
Static level 122.2 ft. below top of well Date 3/15/2000
Artesian pressure ____ lbs. per square inch Date ____
Artesian water is controlled by ____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? R&N / Holt
Yield: 346 gal./min. with 110.6 ft. drawdown after 6 hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off)(water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
13.5	147.0	25.0	145.30	60.0	143.25
15.0	146.75	30.0	144.80	90.0	142.5
20.0	145.90	42.0	144.0	120.0	141.8

Date of Test 3/23/2000
Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Airtest ____ gal./min. with stem at ____ ft. for ____ hrs.
Artesian flow ____ g.p.m. Date ____
Temperature of water 50°F Was a chemical analysis made? Yes ☒ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Brown and gray compact silty clay with occasional sand	0	84
Gray silty fine sand	84	92
Gray and black coarse sand and gravel with gray silt	92	100
Gray-green silty sand and gravel with occl. cobbles and occl. clay layers	100	156
Gray, white, green and black water-bearing gravel and sand	156	204
Green, gray, white and black sand with occasional gravel (Volcanic ash layer @ 214')	204	225
Gray, white, green and black water-bearing gravel and sand	225	236
Tightly layered gray silt, clay, and sand	236	240
Gray clay with some sand and gravel	240	270
Gray gravelly silt and clay	270	278
Brown medium to coarse water-bearing sand with gravel to 2-inch, sandier from 286'-288'	278	288
Gray-green sand, gravel, and silt, gravel increases with depth, color grades to gray	288	318
Compact, interbedded green silt and sand	318	322
Greenish-gray clayey siltbound sand and gravel, tan sand seam @ 324'-326'	322	334
Water-bearing gray fine to coarse sand and gravel, less gravel with depth	334	345
Water-bearing gray fine to medium sand, becomes coarse below 352', color darker gray below 359'	345	365
Dark gray, fine to medium, somewhat better-sorted sand	365	366
Gray silt with a slight lavender cast	366	379

Prepared by: Robinson & Noble, Inc.
5320 Orchard St. W., Tacoma, WA 98467

Work started February 7, 20 00. Completed March 27, 20 00.

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME H. H Drilling Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address PO Box 1840
(Signed) ____ (WELL DRILLER) License No. 1099
Contractor's Registration No. HOLTDI 136OG Date 4-5-00, 19____

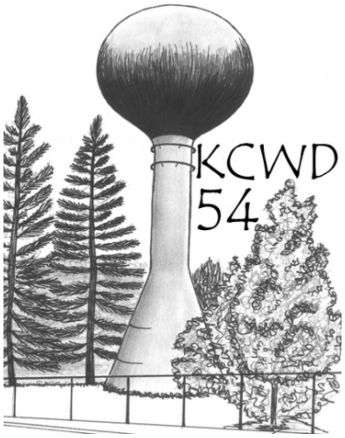
APPENDIX L

EMERGENCY RESPONSE PLAN

ATTACHMENT A

KING COUNTY
WATER DISTRICT 54

KING COUNTY **WASHINGTON**



EMERGENCY RESPONSE PLAN

ERIC CLARKE
DISTRICT MANAGER

APRIL 2016

Gray & Osborne, Inc.
CONSULTING ENGINEERS

ATTACHMENT A

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INTRODUCTION

This Emergency Response Plan is written to assist King County Water District 54 (WD 54) in the event of an emergency. It was developed using guidance from state, federal, and AWWA documents, and from discussion with WD 54 staff regarding realistic and reasonable desired response. The intent is to provide a brief reference document that can be used to help WD 54 personnel work through an emergency while supplying information to the public in a clear and concise manner, and cooperating with other agencies. WD 54 will strive to avoid emergencies through the use of Best Management Practices, but ultimately an emergency will occur.

The federal government has identified five steps in emergency planning and response:

1. Prevention – Those capabilities necessary to avoid, prevent, or stop a threatened or actual act of terrorism.
2. Protection – Those activities that decrease the likelihood that an emergency will occur.
    - WD 54 Action – Implementation and periodic update of the Best Management Practices Manual.
3. Mitigation – Coordination of emergency response to reduce loss of life and property damage by lessening the impact of a disaster.
    - WD 54 Action – Implementation and periodic update of this Manual
4. Response – Describes specific actions to save lives, prevent illness, and protect property and the environment.
    - WD 54 Action – Implementation and periodic update of this Manual.
5. Recovery – How best to restore, redevelop and revitalize the health, social, economic, natural, and environmental fabric of the community.

Item 1 is a law enforcement item, and not within WD 54's purview except for reporting suspicious activities to the appropriate law enforcement authority. Item 5 is focused on the long-term restoration of the community as the result of a large-scale event. Item 5 will require input from the City of Des Moines and perhaps other local agencies, and will require adaptive management depending upon the nature of the emergency and the immediate short-term response.

The Emergency Response Plan is targeted to ensure that:

- If drinking water is contaminated, public notice is provided quickly and completely, and that corrective actions are undertaken immediately to restore water quality.
- If a seismic event occurs, the system's integrity can be assessed quickly prioritizing critical components followed by a thorough system evaluation.
- If there is a major water main break, it may be located and repaired as quickly and efficiently as practicable while preserving water quality integrity.

PAST EMERGENCIES

During the water quality violation and subsequent boil water notice in September 2013, four major deficiencies in WD 54's response were apparent:

1. The Incident Commander role was not clearly defined.
2. Appropriate and consistent messaging to the press and public was lacking.
3. Field activities were not completed efficiently and in a timely manner.
4. A clear and concise presentation of the location of WD 54 is needed to reduce public phone calls from outside of WD 54 boundaries.

STAFF ORGANIZATION

INCIDENT COMMANDER

Description

The WD 54 Manager, currently Eric Clarke, will be the Incident Commander. He will be responsible for all communication to the press and public and for all field tasks. With input from the Washington State Department of Health (WDOH) and WD 54 staff, he will develop the message to be delivered to the public.

Actions

The Incident Commander will be responsible for:

- Formulate all information disseminated to the press and public, with input from staff and other local agencies.

- Identifying if direct communication to customers via door hangars is necessary. Calling adjacent jurisdictions to request assistance to implement this task.

- Coordinate all field response activities, based upon his knowledge of the system, and input from field staff.

- Promptly identify needs and request backup support from other jurisdictions. Be specific about requests. Rather than requesting “personnel” and “supplies,” specify what types of each are needed and in what quantities. The manager should use personal contacts to his advantage.

The Incident Commander must rely on key staff. He should not participate in field activities. The Field Manager will undoubtedly need help in the field. The Incident Commander must resist the urge to physically assist. Personnel requested through the Mutual Aid agreements should be used to assist in the field.

OFFICE MANAGER

Description

The WD 54 Office Manager, currently Patti Clayton, will be responsible for managing assistants in the office and ordering supplies as needed. The Office Manager needs to assure consistent messaging to the public.

Actions

The Office Manager will be responsible for:

- Updating the website periodically throughout the emergency.

- Accessing and implementing the “Code Red” messaging system.

- Assisting with telephone calls and other forms of communication.

- Ordering supplies such as bottled water.

- Assisting the Incident Commander to synthesize information from the field as it comes in.

FIELD MANAGER

Description

The Field Manager, currently Damion Wolkenhauer, will be responsible for implementing field operations as directed by the Incident Commander. The Field Manager will need to be communicating frequently with the Incident Commander to apprise him of conditions in the field, particularly if they are changing. The Field Manager should err on the side of "over-communicating" to the Incident Commander. He is the "eyes" of the District during the emergency.

Actions

The Field Manager will be responsible for:

- Assessing the situation and taking immediate actions, such as closing valves, isolating portions of the system, and if a water quality emergency, identifying potential locations of contamination.
- Reporting back to the Incident Commander regarding the situation and what action has been taken, if any.
- If water quality sampling is required, he shall complete that sampling unless WD 54's water quality sampling contractor, Water Management Lab, is available to obtain samples. Samples should be collected in a timely manner to avoid costly delays in bringing the system to full working order.

The Field Manager should work with other agency staff provided to WD 54, as directed by the Incident Commander, to mitigate and resolve the emergency.

The Field Manager should be reasonably "tight lipped" regarding dissemination of information to the public. If asked a question, answer courteously but with a brief response and refer the questioner to the call in number at the WD 54 office. The intent is to limit multiple lines of communication and thus keep the message from WD 54 consistent and accurate.

A summary of the WD 54 contacts, including staff and contractors, is presented in the Appendix. Table 1 presents a brief summary of the WD 54 key facilities and personnel.

TABLE 1

Brief System Description

System Name and Address	King County Water District 54 922 South 219th Street Des Moines, Washington 98198	206-878-7210
System Identification Number	39950	
Website	www.KCWD54.org	
Service Area	WD 54 serves the downtown area of Des Moines, including the Wesley Homes and Wesley Terrace Retirement Community (see generalized location map below) and a small area in the southwest corner of Normandy Park. http://kcwd54.org/DocumentCenter/View/61	
Brief System Description	The WD 54 system consists of three active production wells, a booster station, two reservoirs and the water main distribution system. Flow-paced chlorine facilities are located at each wellhead. The distribution system has one pressure zone. Pressure ranges from approximately 30 psi to 105 psi. Under normal conditions, each of the wells pumps to the low-level 660,000-gallon reservoir. The booster station then pumps the water to the upper reservoir, from which it flows to the system. If a high-flow event lowers the water level in the upper reservoir below 23 feet, the large pumps in the booster station will turn on sequentially and discharge directly to the system with excess flow, if any, going to the increase the water level in the upper reservoir.	
Population Served/Connections	5,000/760 (as of 2015)	

TABLE 2

Key Contacts

District Manager	Eric Clarke	206-396-2246 (C)
Incident Commander	Eric Clarke	206-396-2246 (C)
Office Manager	Patti Clayton	206-915-9055 (C)
Field Manager	Dammiean Wolkenhauer	206-396-6413 (C)
District Engineer	Warren Perkins, P.E., Gray & Osborne, Inc.	206-284-0860 (W) 206-930-5548 (C)

POTENTIAL EMERGENCIES

There are many potential emergency scenarios. However, three potential emergencies that may cover most types of scenarios include:

1. Water Quality Violation – Public Boil Water Notice
2. Earthquake – Loss of storage and fire flow
3. Water Main Break – Loss of system pressure in the entire system or locally

WATER QUALITY VIOLATION

In the event of a water quality violation, notify WDOH if applicable (Figure 1). An acute water quality violation may result depending upon results of subsequent sampling rounds (Figure 1). If an acute water quality violation occurs, this Emergency Plan should be implemented. Figure 1 may need to be updated periodically to be consistent with the most recent WDOH protocol.

If WDOH confirms that a water quality violation has occurred, others on the emergency list must be contacted. A Contact List is presented in the Appendix.

The following actions should be taken:

1. Work with the WDOH and King County to develop language for a press release. Send the appropriate language to the news agencies, **including the "Generalized Water District 54 Location Map"** below. Include the WD 54 website address for the news agencies to communicate to the public.
2. Contact Code Red and provide impacted area and language for their recording to be sent to WD 54 customers.
3. Contact Highline Water District and the City of Des Moines. Request emergency aid to notify WD 54 customers using door hangers.
4. Post the notification of the boil water on the WD 54 website. The website should be updated daily, preferably twice daily, to keep customers abreast of the situation.
5. Contact bottled water distributors to provide bottled water to WD 54 for the period that the boil water notice is in place.

6. If WD 54 is not chlorinating its water supply, with WDOH input add chlorine to the reservoir and begin flow-paced chlorination immediately. (A chlorine dosing worksheet is provided after Figure 1.)

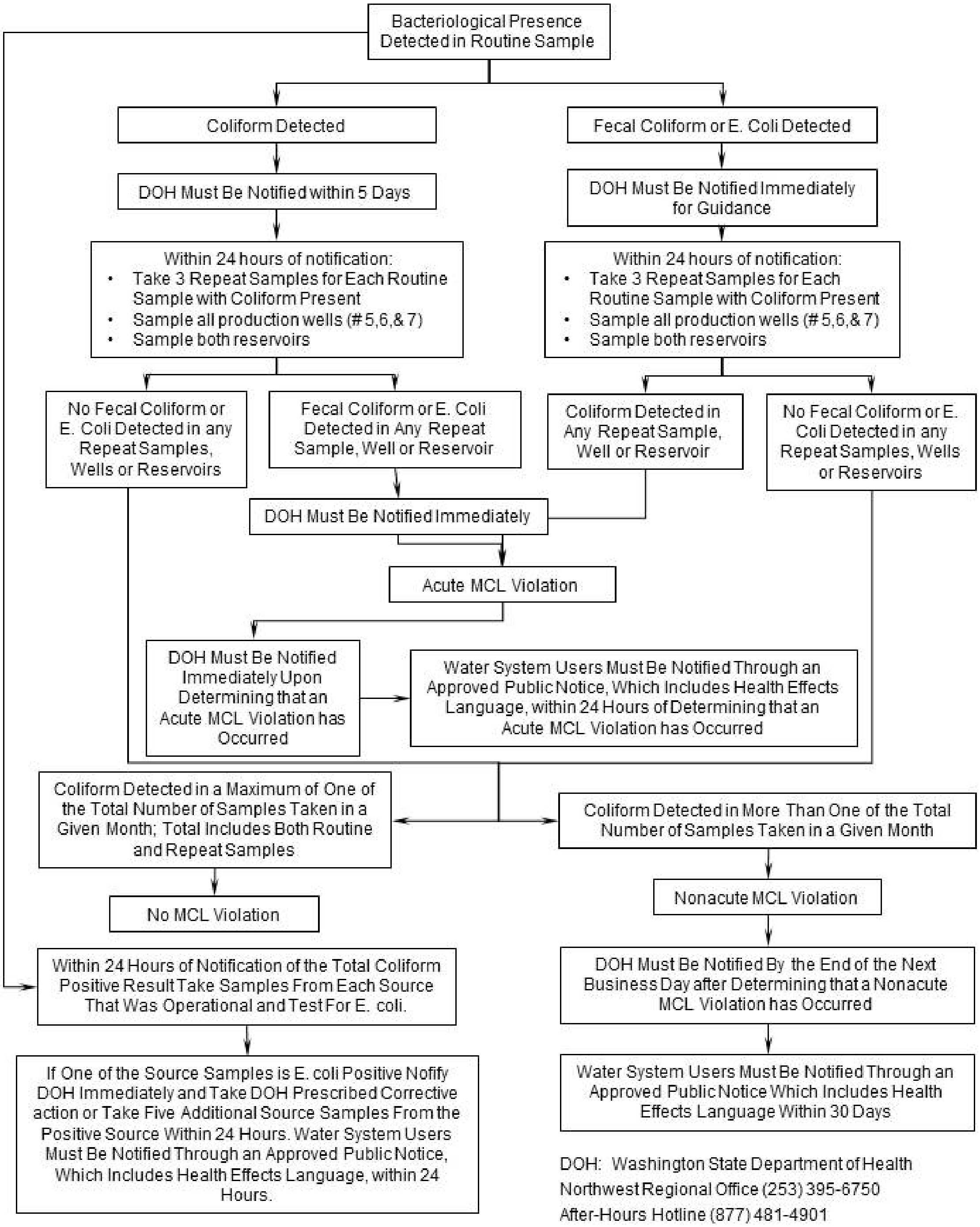
7. Sample the raw water from the wells upstream of the chlorine injection.

8. Begin Unidirectional Flushing (UDF) using the UDF Plan. Start upstream of the violation and work downstream. The intent is to draw the chlorinated water into the area of concern quickly. Implementation of the UDF may cause the large booster pumps to turn on. This is not a cause for alarm, but the water level in the lower reservoir should be monitored. Request field staff assistance from Highline.

9. Upon completion of the UDF for the area of concern, sample the water system. Take samples to the laboratory.

10. In order to return the system to normal operation as soon as possible, if sufficient time remains in the day to get a second round of samples to the laboratory, do so.

If a boil water notice is issued, two rounds of satisfactory samples are required in order to remove the boil water notice. A minimum of 2 hours between samples is needed between sample collection times for the samples to be considered as separate sample rounds.



DOH: Washington State Department of Health
Northwest Regional Office (253) 395-6750
After-Hours Hotline (877) 481-4901

FIGURE 1

Coliform Detection and Notification Flow Chart

TABLE 3

Chlorine Dosing Worksheet – Source Water and Reservoir

The tables below provide summary calculations for dosing the source water at the wellheads and for dosing the reservoir. The conversion factors do NOT account for chlorine demand in the water or in the system. Historically, WD 54 has injected chlorine at the wellheads at about 3.5 mg/L to yield a 0.5 mg/L chlorine residual in the southwest portion of the system, thus a chlorine demand of 3 mg/L. Therefore, the chlorine residual concentration shown, 4.5 mg/L, should yield a residual in the southwest portion of the system of approximately 1.5 mg/L. When the boil water notice has been lifted, the dose may be reduced. WD 54 will need to discuss required chlorine residual with WDOH. The dose rate and chlorine demand are similar regardless of which source well is used.

Source Water Chlorine Injection Dose Rate

	Well Flow Rate (gpm)	Desired Chlorine Residual Concentration in Water (mg/L)	Conversion Factor (X% Cl) (1)	Chlorine Solution (gal/hr)
Example	500 x	4.5 x	0.00042 (12.5%) =	0.95

(1) Conversion Factor:
- Use 0.0042 for 12.5 percent chlorine,
- Use 0.00092 for 6.25 percent chlorine, and
- Use 0.0015 for 5 percent Chlorine.

Reservoir Dosing

	Gallons in Reservoir	Desired Chlorine Residual (mg/L)	Conversion Factor (2)	% Chlorine (3)	Chlorine Solution (gal)	Granular Chlorine (lb)
Example	660,000 x	4.5 x	0.000083 ÷	12.5	19.7	
Example	660,000 x	4.5 x	0.00083 ÷	65		38

(2) Conversion Factor:
- Use 0.000083 for liquid chlorine (4 zeros 83), and
- Use 0.00083 for granular chlorine (3 zeros 83).

(3) Enter 5 percent chlorine as a 5 not 0.05. Enter 65 percent chlorine as 65, not 0.65.

KING COUNTY WATER DISTRICT 54 GENERAL LOCATION

- SOUTH OF SOUTH 213TH STREET
- NORTH OF SOUTH 230TH STREET
- WEST OF 13TH AVENUE SOUTH

206-878-7210

www.KCWD54.org

FIGURE 2

Generalized Water District 54 Location Map

EARTHQUAKE

Earthquake may cause:

- Well Damage:

  - Failure of well,
  - Pumping of turbid water, and
  - Reduced capacity.

- Reservoir Failure

- Water Main Break

- Fires

- Power Outage

In the event of an earthquake the following actions should be taken:

Damage Assessment

1. Visually check the elevated reservoir from safe distance to see if any structural damage is noticed (use binoculars if available). Signs of failure include, leaks, wrinkled steel, stretched tie-down bolts, etc.

   a. If reservoir shows obvious signs of failure skip to Item 6 below.

2. Check the low-level reservoir for signs of failure, leaks, cracks, etc. If time permits and there is no apparent immediate crisis, climb to the top of the low-level reservoir and from the top of the ladder visually examine the roof for signs of failure. **DO NOT** walk on the roof.

3. Check the water levels in the reservoirs. Low water level may indicate a major leak or fire in the water system, or a leak in the piping to/from the reservoirs.

4. Call Des Moines Police and South County Regional Fire for any reports of fire in the service area as that may be a cause of water level decline.

5. Check the booster station to determine if the pumps are operating normally.

6. If the elevated reservoir shows signs of damage, place the system into "booster pump" mode and close valves to and from the upper reservoir. Notify Highline of potential intertie use.

    a. The Highline intertie works automatically on a pressure drop in the WD 54 system.
    b. The high-flow pumps are taken offline when the system is in "booster pump" mode.

7. Check source water for turbidity:

    a. Turn on each well and visually observe the discharge for turbidity and flow rate during the flow-to-waste cycle. If the discharge water appears to be clear and the flow rate typical, leave the well in AUTO mode so that it may be called to service if needed.
    b. If the pumping rate appears to be reduced, the well may need to be taken offline to prevent damage to the pump.
    c. If the water from the well is noticeably turbid, allow it to pump to waste and watch for a decline in the turbidity to near normal levels. If the water does not clear up in a reasonable time, 10 to 15 minutes, turn off the well and leave it off. Move on to the next well.

8. Available field staff should complete a reconnaissance of the water system to see if any leaks or fires are visible. If leaks are visible, staff should report in and then isolate that portion of the system. Immediately "bag" any hydrants that are taken out of service. The WD 54 distribution system is laid out in a grid; isolating the water main on one block will reduce fire flow availability but will not eliminate the delivery of high volumes of water to other parts of the system.

9. Check the Highline Intertie to see if it is supplying water to the WD 54 system.

10. Initiate wellhead chlorination and maintain chlorine residual in the system until the system returns to normal physical operation. Dose the lower reservoir if the roof is safe to walk on. If there is any question regarding the integrity of the roof, do not walk on it. Though an earthquake may not necessarily compromise water quality, an abundance of caution is warranted until the system is reviewed and its integrity confirmed.

Document System Condition

In the event of a significant earthquake, the District may need to rely on its own staff to operate the system; adjacent purveyors may not be able to render assistance. After a damage assessment and potential isolation of portions of the system, the staff should meet. Record any damage to the system. Note the following:

1. Wells – for each well:

    a. Production rate,
    b. Visual water quality, and
    c. Chlorine injection on/off, dose rate.

2. Reservoirs – for each reservoir:

    a. Structural observations,
    b. Leaks,
    c. Water level, and
    d. Is the elevated reservoir still online?

3. Booster Pumps and Booster Pump Station:

    a. Visual condition of the pumps,
    b. Leaks in the booster station piping,
    c. Normal pump operation? If not normal what is the issue?
    d. Production rate from booster pumps normal?
    e. Is the booster pump station in "booster pump" mode and elevated reservoir is offline?

4. Distribution System – see District Base Map (Figure 3):

    a. Leaks noted in water mains,
    b. Hydrants condition okay?
    c. Actions taken to isolate portions of the system, and
    d. Check the Highline Intertie for damage and if flowing water.

Write down the locations and types of damaged infrastructure. What portions of the system may be operated without compromising Public Health? Is a boil water notice needed?

If the water in the system is turbid, immediately start chlorination and strongly consider issuing a boil water notice. Sampling may not be possible due to other demands on staff, or laboratories may be damaged and not able to handle demand for water quality analyses. Immediately start chlorination as a preventive measure.

Prioritize the repairs to bring the system back up to normal operation.

The repairs should be prioritized to return the system to normal operation while maintaining system integrity and water quality. If areas of the distribution system have sustained substantial damage, restoration of service in a short period of time may not be possible. Consider providing temporary service with appropriate notice to customers.

If the elevated reservoir is compromised, leave it offline. Consider draining it. There may be aftershocks and if the reservoir is damaged, it may be unable to withstand future shaking. If the elevated reservoir is offline, operate the system in “booster pump” mode. Notify Highline of potential intertie use.

WATER MAIN BREAK

A water main break may cause:

- Loss of System Pressure
- Water Quality Violations
- Loss of Fire Flow
- Localized Flooding from Main Break

A water main break will generally be a localized problem. The extent of the impact on the system will in part depend upon when and where the break occurs. If WD 54 staff is notified by customers or other personnel of a water leak, it should be easy to quickly locate the leak and isolate that part of the system. If the leak occurs in a remote area of the system or after hours, it may go unnoticed until low-level conditions in the reservoir trip alarms.

If the alarms notify WD 54 staff of a low reservoir level, they should complete a windshield survey of the District to locate the water main break.

Once the leak is located and that area of the system isolated, WD 54 should undertake repairs in accordance with the BMP Manual and bring that portion of the system back online as soon as possible. For a significant water main break, repairs will likely include a section of pipe replacement and chlorination of the water system in the impacted area. Satisfactory water quality tests should be obtained prior to allowing the repaired area to be brought back online.

FIGURE 3

Water System Base Map

ATTACHMENT A

APPENDIX

EMERGENCY CONTACT LIST

ATTACHMENT A

EMERGENCY RESPONSE CONTACT INFORMATION

Agency	Name	Title	Phone Number Work/After Hours	Email
KCWD 54	Eric Clarke	Manager	206-878-7210	eric.clarke@kcwd54.org
KCWD 54	Patti Clayton	Office Manager	206-878-7210	patti.clayton@kcwd54.org
WDOH	Bob James	Regional Engineer	253-395-6764	bob.james@doh.wa.gov
WDOH	Derek Pell	Technical Expert	253-395-6763 877-481-4901	derek.pell@doh.wa.gov
WDOH	Carol Stuckey Ingrid Salmon	Water Quality	253-395-6775	carol.stuckey@doh.wa.gov ingrid.salomn@doh.wa.gov
King County Public Health	Becky Elias	Food & Facilities Manager	206-263-9566 206-296-4606	becky.elias@kingocunty.gov
King County Public Health	Darrell Rodgers	Community & Environmental Health	206-263-1412 206-296-4606	darrell.rodgers@kingcounty.gov
City of Des Moines	Tony Piasecki	City Manager	206-870-6541	tpiasecki@desmoineswa.gov
City of Normandy Park	Mark Hoppen	City Manager	206-248-8246	markh@ci.normandy-park.wa.us
Code Red	Ray Gross		866-939-0911 800-336-3410 (24-hr)	https://next.coderedweb.com/portal/Account/Logon Login, Password, Pin Code, and Launch Codes are at the WD 54 office
Des Moines Elementary	Rick Wisen	Principal	206-631-3700	rick.wisen@highlineschools.org
Wesley Homes			206-824-5000	
Water Management Lab			253-531-3121	
Mutual Aid Assistance				
Highline Water District	Jeremy DelMar	Engineering Manager (24-hour on call)	(206) 592-8904 (206) 827-0375	jdelmar@highlinewater.org
City of Des Moines	Dan Brewer	Public Works Director	(206) 870-6581	dbrewer@desmoineswa.gov

OTHER CONTACT NUMBERS

Business/Agency	Phone Number	Personnel Name	Task/Position
Answering Service Care	253-859-1931		S 7070
City of Des Moines	206-878-4595 206-870-6550	Tony Piasecki	
City of Des Moines Building Inspector	206-870-7576		
	206-870-6569	Larry Pickard	
	206-870-6566	Dave Maresh	
City of Des Moines Public Works	206-870-6522		
	206-870-6539	Scott Romano	
	206-870-6524	Loren Reinhold	
City of Des Moines Police	206-878-3301		
Custom Security Systems	800-238-9126		
Don Small & Sons Oil Dist. Co.	253-833-0430		Generator fuel
EC Power Syst. (generator/switchgear)	800-452-1511	Don King	
Evolution Controls	425-359-5322	Al Friedli	SCADA
Fogtite	206-935-8000	Greg – Meters	
GC Systems	800-525-9425		Control valves
Gray & Osborne – Engineers	206-284-0860 (O) 206-930-5548 (C)	Warren Perkins	District Engineer
HD Fowler	253-863-8600		Water parts supplies
HD Supply Waterworks	206-722-4800		Water parts supplies
Hertz (Tukwila)	206-241-9255	Scott	
Highline Water District			
Icon	253-839-2101		Sand & Gravel
KatoLight	877-370-8407	Charlie	Generator
King County Office of Emergency Management	206-296-3830 206-296-3838 Fax		
Lakehaven Utility District	253-941-1516		
Midway Sewer District	206-824-4960	Gina/Karen	
Midway Sewer Treatment Plant	206-824-2760	Jace	
PumpTech	425-644-8501	Mike Dunn	Pumps
Safety & Supply	206-762-8500		
South King Fire & Rescue	253-946-7241 (O) 206-510-7526 (C)	T. Raymond	
United Rentals Renton	800-540-7628 425-656-5940		
Univar	253-872-5000		Chlorine
Utilities Underground Locate Services	800-424-5555		WD 54 ID 27604

Business/Agency	Phone Number	Personnel Name	Task/Position
Water & Sewer Risk Management Pool	425-452-9750 425-452-9740 Fax		
Water District 125	206-242-9547	Mark	
Water Management Laboratories	253-531-3121	Mike Knight	
Western Power & Equipment	253-735-2702	Backhoe	

LOCAL MEDIA OUTLETS

Television		
KING 5	newstips@king5.com	206-448-3850
KOMO 4	tips@komo4news.com	888-477-5666
KIRO 7	newstips@kirotv.com	206-728-8308
Radio		
KIRO 97.3 FM	newsdesk@973kiro.com	206-726-7000
KOMO 97.7 FM	tips@komonews.com	206-404-4000
KUOW 94.9 FM		206-543-2710
KPLU 88.5 FM		206-677-5758
Print		
Seattle Times Twitter	newstips@seattletimes.com twitter.com/seattletimes	206-464-2204

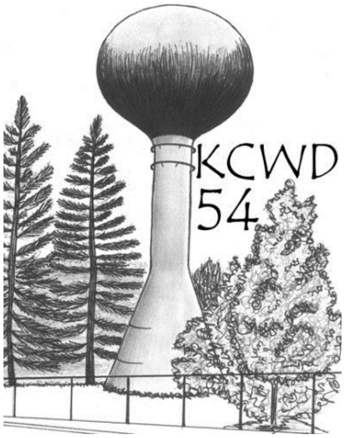
APPENDIX M

BEST MANAGEMENT PRACTICES

ATTACHMENT A

KING COUNTY
WATER DISTRICT 54

KING COUNTY WASHINGTON



OPERATION AND MAINTENANCE
BEST MANAGEMENT PRACTICES MANUAL

ERIC CLARKE
DISTRICT MANAGER

JANUARY 2019

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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INTRODUCTION

King County Water District 54 (District) serves approximately 4,800 customers through 750 connections, generally within the downtown Des Moines area. The Washington State Department of Health (WDOH) System ID is 39950. The District provides chlorine-free water to its customers.

In recognition of the importance of providing clean chlorine free water, the District has reviewed its Best Management Practices (BMPs) to help ensure it provides high quality water to its customers. This manual documents those BMPs. BMPs are part of both routine operations, for example water quality sampling, and non-routine events, such as standard procedures for new water main installation or major leak repair. BMPs are also administrative, for example updating the cross-connection control database on a regular basis. The District will continue to periodically evaluate and implement BMPs and actions necessary to maintain the quality of the source water throughout the system.

ORGANIZATION AND STAFFING

The District is governed by a three-member Board of Commissioners. The Board appoints a manager who is responsible for day-to-day operations and management of the District. The District has three employees: Eric Clarke – District Manager, Patti Clayton – Office Manager, and Dammiean Wolkenhauer – Field Maintenance. Based upon the population served, the District must have, at a minimum, an employee with a WDM 2 certification. Mr. Clarke has a WDM 3, exceeding the minimum requirements. Personnel with supporting certifications, one grade lower than the required Level 2 (i.e., Level 1), must be available as backup for the mandatory certified position.

In order to promote and maintain expertise for the various grades of operator certification, Washington State requires that all certified operators complete at least three Continuing Education Units (CEU) within each 3-year period. Programs sponsored by the Washington Environmental Training and Resource Center (WETRC), the American Waterworks Association (AWWA) Pacific Northwest Subsection, and Evergreen Rural Water of Washington (ERWoW) are the most popular sources of CEUs for certified operators in Washington State. District employees attend programs as needed to acquire the proper number of CEUs for recertification.

The District has a mutual aid agreement with the Highline Water District to provide assistance to the District if needed.

OPERATIONS

The District's supply wells, reservoirs, and booster pump station are all located on one site at 21810 11th Avenue South in Des Moines. The wells, reservoirs, and booster station operate together to provide supply and storage. Backup generator power is at the site and supplied via an automatic transfer switch.

SOURCE

The District alternates the use of its three supply wells, Wells 5, 6, and 7, with each of them used more or less equally (Table 1). Well 4 is also equipped as a production well, but is seldom used due to its low rate of production. Wells 1, 2, and 3 are no longer in service. Well 3, approximately 245 feet deep, is used as a monitoring well.

TABLE 1

Well Flow Rates and Depths

Well	Flow Rate (gpm)	Depth of Well (feet)
Well 4	60	334
Well 5	280	245
Well 6	310	375
Well 7	320	379

Under normal conditions, water is pumped from the wells to the lower reservoir. The on-site booster station pumps from the lower reservoir to the elevated reservoir, which maintains system pressure. Water from Wells 5 and 6 may be pumped directly to the elevated reservoir if needed, though this is not the normal mode of operation.

STORAGE

The low-level reservoir is a 23-foot tall, 70-foot diameter, 660,000-gallon concrete reservoir. The elevated reservoir is an elevated steel spheroid. The elevated reservoir is 109 feet tall with a 250,000-gallon capacity. Overflow from both reservoirs is to the on-site stormwater system, though at different locations. Water enters the lower reservoir through a single fill pipe near the top of the reservoir and exits through a single pipe in the bottom. The standpipe (elevated) reservoir is also filled through a single pipe entering near the top and exits through a single pipe in the bottom.

The elevated reservoir sets the hydraulic grade line of the system, elevation 232 feet.

BOOSTER STATION

The District’s booster pump station (BPS) is supplied water from the lower reservoir via a 16-inch pipe. Under normal conditions, the BPS discharges to the elevated reservoir. The BPS is equipped with three low-flow pumps, three high-flow pumps, and a telemetry control system. The three low-flow pumps have capacities as follows: two pumps at 250 gpm and one pump at 440 gpm. They pump into a common header pipe which feeds through an 8-inch water main to the elevated reservoir. The low-flow pumps are set to operate in sequence based on the water level in the elevated reservoir.

The three high-flow pumps have capacities of 1,750 gpm each. The BPS uses up to two high-flow pumps to convey water directly to the distribution system through a 12-inch outlet line. The third 1,750 gpm pump is redundant. The lead and lag high-flow pumps are set to operate in sequence based on the level of the elevated reservoir. Under normal operating conditions, the high-flow pumps are called to service only when the three low-flow pumps cannot meet the system demands and the water level in the upper reservoir drops more than 5 feet.

DISTRIBUTION

The District maintains approximately 60,000 feet of water mains ranging in size from 12-inch to 4-inch diameter. The older mains are generally asbestos-concrete and the newer mains are generally ductile iron. The entire system is within the same pressure zone. Under normal operating conditions, system pressure ranges from approximately 30 psi in the northwest portion of the District, to approximately 100 psi along the waterfront.

WATER QUALITY

Concentrations of manganese in the District’s source water range from about 0.050 to 0.60 mg/L. Manganese is a secondary contaminant with the secondary standard at 0.05 mg/L. High levels on manganese can lead to brown water discharging at customers’ taps. Brown water complaints have occurred periodically and with increased frequency since chlorination began. Other constituents are below regulatory levels.

The District has tested positive periodically for total coliform over the years. The cause of the positive tests is unknown. They may perhaps be related to chemical and biological changes within the distribution system. The only positive E. coli test was in September 2013.

In general, source water quality will be maintained and bacterial impacts avoided if separation can be maintained between the source water and surface water, animals, animal byproducts, and manmade chemicals. BMPs have been adopted to help ensure this separation.

BEST MANAGEMENT PRACTICES

The District has adopted the following guiding principles to preserve the water quality of the water in its system and to minimize the possibility of future water quality contamination events:

- **Pressure –** At all times and in all possible locations, keep the system pressurized.

- **Atmosphere –** When the localized water system pressure is at atmospheric pressure, a pathway for contamination to enter the system is created. Special precautions must be taken whenever any portion of the system is at atmospheric pressure. Examples of locations where the system is typically at atmospheric pressure include: wellheads, reservoirs, water main shutdowns for repair, or replacing or installing new water mains.

- **Sampling –** Samples for routine and repeat water quality samples must be taken from approved sampling stations following approved sanitary techniques.

- **Security –** Access to the system should be secure at all times.

PASS – Keep the system **P**ressurized. If pressure is not an option, invoke BMPs that are targeted to preventing contamination when the system is at **A**tmospheric pressure. Always use **S**anitary sampling techniques. **S**ecurity is paramount. No unauthorized personnel should be accessing any District facilities at any time, unless accompanied by District personnel.

In addition to BMPs that are targeted to field operations, there are administrative BMPs that provide redundancy to field operations to further ensure the delivery of high-quality water. These include annually, or more frequently: review and update the District cross-connection control database, administrative cooperation with the City of Des Moines, review of security BMPs, and estimation of distribution system leakage (DSL).

FIELD BMPS

The discussion below outlines BMPs utilized by staff for work on the water system.

Pressurized System

Keeping the system pressurized is critical to ensuring water quality. Whenever and wherever the water system pressure is reduced to atmospheric pressure or below that of adjacent or customer facilities, pathways for contamination are created. Contamination may enter the system at these locations either through direct contamination into a water main or by potential cross connections.

Leak Repair – Pressurized

Leaks are repaired as soon as possible and under positive pressure if possible. Each leak is unique and presents its own challenges. A balance must be maintained between keeping a “dry” trench for leak repair and maintaining positive pressure in the water mains. Small leaks are repaired using repair bands while maintaining positive pressure.

If the flow from the leak is too high to prevent working in a dry environment, the District will partially shut down valves surrounding the leak to reduce flow to the area and reduce pressure. If necessary, the water main trench is over-excavated to allow for removal of water from the trench before it reaches the area of the leak.

Blowoffs or hydrants in the reduced pressure area may be opened as needed to further reduce the pressure. Unless the repair is an emergency, those connected to the system in the impacted area will be notified, prior to pressure reduction for leak repair, and told not to use the water until they are notified that the repair is complete. Flow to the repair area is then reduced until the pressure is minimal **but still positive.** At that time, a repair under pressure is attempted. When the repair is completed, the water main is brought back to full pressure and the repair is visually inspected to ensure that it was successful prior to backfilling the water main trench.

Water Main Flushing

Water main flushing is a key component in maintaining water quality. Through flushing, sediment and chemical precipitates are removed from the system. Manganese sediment, scale, and biofilm have built up in the water mains over many years. Biofilm that has developed over time and adheres to the inside of the water mains may slough off as it reaches equilibrium or be induced to slough off due to changes in water chemistry, such as the addition of chlorine. If biofilm is released from the water mains during the time of sampling, sample results may be positive for total coliform.

Timely and appropriate flushing may reduce brown water complaints by removing sediment and reducing scale and biofilm. Water main flushing should be completed in a manner that promotes a velocity of water in the water mains of at least 6.0 fps. Pressure should not drop below 20 psi anywhere in the system as a result of flushing.

The ability to flush water mains may be limited by production capacity, water rights, and staffing. During periods of low water use, more frequent flushing of water mains may be needed to promote circulation and reduce water stagnation within the system.

Water mains should be flushed unidirectionally. Unidirectional flushing forces water in one direction to the point of exit from the water system, typically a hydrant. Unidirectional flushing accomplishes two major objectives. First, forcing the water in one direction through a water main increases the water velocity relative to leaving all valves open. Water velocity of 6.0 fps can scour the inside of the water main removing loose film and sediment that may have built up on the inside of the water mains. Second, selected valves need to be closed so that water is forced in one direction only. Therefore, unidirectional flushing requires valve location and valve operation, and by doing so the valves are exercised and checked.

Minimum flushing rates to achieve a water velocity of 6.0 fps using unidirectional flushing techniques are given below (Table 2).

TABLE 2

Flow Rate Needed for a Water Velocity of 6.0 fps in Pipe

Pipe Diameter (inches)	Flow Rate (gpm)
4	240
6	520
8	960
12	2,160

The locations and frequency of flushing are, in part, customer complaint based and may be seasonal in nature. The District keeps records of customer complaints and water quality samples taken in the distribution system. The District will continue to track the locations and timing of known water complaints and any coliform-positive samples and tailor its flushing program accordingly. Paramount is maintaining water quality; however, the need for flushing must be balanced against the wise use of the District's limited resources.

System at Atmospheric Pressure

When maintaining a pressurized system is not possible, the District follows a strict protocol to help ensure system integrity to equal or exceed AWWA C651-05.

Water Main Repair/Replacement

If a cut-in repair or pipe replacement is required, maintaining a positive pressure is not possible. In this event, the trench excavation is maintained so that no groundwater or surface water runoff enters the water main. If necessary, the trench is over-excavated to allow for water to be directed away from the repair area and removed from the trench.

Immediately prior to installation for the repair, all new fittings and pipe spools are swabbed with a 5 percent chlorine solution (minimum) prior to installation. In addition to the chlorine swabbing, the District adds dry calcium hypochlorite granules (65 percent chlorine) to the inside of the pipe in the repair area. The minimum amount of calcium hypochlorite added should be sufficient to achieve a 50 mg/L concentration within the impacted area. The amount of calcium hypochlorite added per 100 feet of pipe is given below (Table 3). The length of pipe assumed for the repair is the distance of pipe isolated for the repair, i.e., between valves, not just the repair length.

TABLE 3

Calcium Hypochlorite (65 Percent Chlorine) Addition per 100 Feet of Pipe

Pipe Diameter (inches)	Quantity	
	(grams)	(ounces)
4	0.67	0.02
6	1.52	0.05
8	2.70	0.09
10	4.22	0.15
12	6.07	0.21

After the repair is made, the District pressurizes the system and performs a visual check for leaks. The water main should be filled from the lower end to the upper end of the repair section, so that the dry chlorine is not washed down the water main and away from the repair area. The “super” chlorinated water remains in contact with the repair area for a minimum of 60 minutes prior to the water main being flushed and brought back online. Customers are notified after the water main is flushed that repairs are complete.

Water quality samples for bacteriological analysis are collected from the repair area immediately after the water main is flushed. If a sampling station is located within the repair area, samples will be collected from it. If there is no sample station, samples will be collected from taps or hose bibs at adjacent buildings using sanitary techniques. Samples are collected using the attached sampling protocol in the Appendix.

<u>New or Replaced Water Main Installation</u>

The District follows installation procedures for water mains whether part of a new main or a water main replacement to help ensure sanitary installation. The installation procedure shall equal or exceed WSDOT (Section 7-09) and AWWA (C600-10 and C651-05) standards. New mains are capped at the factory prior to arrival at the site to minimize contamination during storage, transport, and installation. The water mains remain capped until they are ready to be connected to the already installed adjacent length of pipe.

During water main installation, calcium hypochlorite granules are added to each section of new water main in the proportions indicated in Table 3 above. The resulting chlorine concentration within the water main shall not be less than 50 mg/L (see WSDOT Standard Specifications Section 7-09.3(24)D). New water mains are filled using an approved backflow prevention assembly. The water main is filled from the lower elevation end so that as the water main is filled, the chlorine is contacted and dissolved and the chlorine is spread relatively uniformly through the length of the new water main. Pressure tests and bacteriological tests are completed and must be passed before any new water main is physically connected to the system.

The chlorinated water is allowed to remain in contact with the new system for a minimum of 24 hours. After 24 hours, water may be **added** to the water main for the purposes of pressure testing. The water in the main used for pressure testing must remain in the water main until the pressure testing is complete. If necessary, liquid chlorine shall be injected into the water main with fill water to maintain a concentration in the water main above 50 mg/L.

Pressure testing includes testing against valves and hydrants (WSDOT 7-09.2(23)). Each valve shall be tested by closing each in turn and reducing the pressure beyond the valve. The pressure on the back side of the valve should not be eliminated. Care must be taken that during this process that positive pressure remains throughout the system being tested at all times. All hydrant foot valves shall be open during pressure testing so that the pressure test is against the hydrant valve.

If the new section of water main does not pass pressure testing, pressure testing shall be repeated until leaks are found, repaired, and the water main passes the pressure test. After successful completion of repeat pressure tests, the water main is chlorinated using chlorine bleach solution. The water main shall be flushed with a water chlorine bleach solution (1 gallon of 5 percent bleach to 1,000 gallons of water). The volume of new water pumped into and through the water main is three times the pipe volume.

After successful pressure testing, the water main is thoroughly flushed to remove all super-chlorinated water from the new water main. A minimum of five pipe volumes is flushed out of the water main or until the chlorine concentration in the water main is no greater than the residual in adjacent pipes, whichever is greater. Samples are collected for bacteriological analysis after flushing and again 24 hours after the first set of samples.

No new water main is connected to the system until the second satisfactory bacteriological analysis is obtained.

All closure fittings shall be sprayed clean and then swabbed with a 5 percent chlorine solution immediately prior to installation per AWWA Standard C651. Additional samples for bacteriological analysis shall be collected from the immediate vicinity of the new or replaced water main and analyzed after the final connections are made. If necessary, additional flushing is conducted and additional samples collected until satisfactory results are obtained.

Reservoir Screens, Vents, and Overflows

Reservoirs are particularly susceptible to bacteriological contamination, as they are at atmospheric pressure at all times. Insects, birds, rodents, or other animals may penetrate the integrity of unprotected reservoirs resulting in bacteriological contamination. The District has adopted the following BMPs to protect the reservoirs from intrusion:

- All roof vents on all reservoirs are checked semiannually to be sure that screens are in place and are not damaged or worn. Screens are cleaned or replaced, if necessary.

- The lower reservoir contains approximately 2 days of storage based upon average day demand and less than 1 day of storage based upon maximum day demand. Turnover in the reservoir is fairly rapid. District staff has not observed a correlation between air and water temperatures that lead to water stratification in the reservoirs. The District measures water temperature at discrete intervals in the reservoir weekly for the months of July and August. If the data indicates a thermal stratification of the water in the reservoir, the District may institute overflowing the reservoirs on an occasional basis.

- The elevated reservoir overflow pipe is within a catch basin on the site. The bottom of the overflow pipe is completed with a duckbill valve to prevent movement of animals up through the overflow pipe into the reservoir. The overflow pipe from the lower reservoir ends aboveground and has an air gap. The overflow pipe is completed with a screen to prevent animals from entering the overflow pipe.

- The District contracts with divers, to both inspect and remove accumulated sediment from reservoirs, on a 3-year cycle. The most recent inspection was on November 8, 2014. The reservoirs are inspected using video cameras so that the divers can record their findings. Based upon the inspection the need for reservoir repair, such as painting, is evaluated.

Wellhead Screens, Vents, Discharges, and Drains

The District has four wells equipped for production. Three production wells are used on a rotating basis. Each of these wells is a potential location for contamination to enter the groundwater. Well 4 (seldom used) and Well 5 are completed aboveground. Wells 6 and 7 are completed in vaults, but above the vault floor. Both vaults have gravity drains to the on-site stormwater system. Similarly to the reservoirs, the wellheads are at atmospheric pressure and thus are a high-risk entry point for contamination to enter the system.

The vaults are checked for standing water on a weekly basis. If standing water is observed, the vault is pumped out and the drainage system cleaned out/repaired. The drainage system from each vault is tested semiannually by flushing water though the pipe and observing it entering the on-site stormwater system.

All reservoir vents, are checked on a semiannual basis to prevent contamination from dust, pollen, insects, and other animal infestation.

No chemicals of any sort are stored at the wellheads. Chlorine is located in a separate building adjacent to the wellheads and pumped under pressure into the well discharge upon well startup. Chemicals located at the wellheads are removed immediately.

Prior to any insertion into a well, any tools, equipment, or materials are disinfected.

WATER QUALITY MONITORING

Subsequent to the coliform-positive samples in September 2013, the District installed Kupferle Eclipse Model 88 dedicated sample stations for all routine and repeat coliform testing. Sample stations provide sanitary locations to minimize the possibility of false coliform positive samples.

The District recognizes that the discontinuation of disinfection, chlorine injection at the source, removes a barrier to water borne pathogens in the water system. However, the District believes that with a robust monitoring program, and good management of the water system, it will be able to mitigate the loss of the disinfection barrier. The District's baseline monitoring program will collect data that will influence decisions and actions to manage the system at a high level, and to minimize the likelihood of intrusion of contaminants into the system. The Baseline Monitoring Program presented in this manual is the minimum proposed long term monitoring that will be conducted should disinfection be discontinued.

Manganese is in the source water at approximately 0.050 mg/L, the secondary maximum contaminant limit. Manganese is known to create aesthetic water quality concerns, i.e., brown water. The level of aesthetic impact is generally related to the concentration of the manganese and whether or not the manganese is oxidized. Chlorine injection for disinfection, oxidizes the manganese in the water system and if the manganese concentration is sufficiently high, brown water may result.

An interim Transitional Monitoring Plan has also been developed. Should the District elect to discontinue disinfection, the Transitional Monitoring Plan will be continued for a minimum of an 18-month period.

Baseline Monitoring

The Baseline Sampling Program is as follows:

Weekly Sampling

For each month the sampling cycle is as given below:

- 1st Week – Sample all active production wells (i.e., Wells 5, 6 & 7) for heterotrophic bacteria and coliform bacteria. Each well will be flushed to waste for 5 minutes before sampling. Be sure to set the SCADA system prior to sampling for the extended flush to waste period.

- 2nd Week of the Month – Collect required samples for coliform bacteria analysis, one sample from each of the six routine sample locations.

  Collect samples for heterotrophic bacteria from three repeat test station sites. The three sample locations will be northeast (2), middle west (3) and southeast portions (6) of the system and will alternate between the two repeat locations for each of Stations 2, 3, and 6.

- 3rd Week of the Month – Collect samples for heterotrophic bacteria. Samples will be collected from the repeat sample stations for the northwest (1), middle east (4) and southwest (5) and will alternate between the two repeat locations for each of Stations 1, 4, and 5.

- 4th Week of the Month – Collect investigatory samples for coliform bacteria analysis, one sample from each of the six sample locations.

Other Sampling

Manganese

Semi-annually in the first week of January and July collect samples from each of the active wells for both total and dissolved manganese.

Semi-annually in the fourth week of January and July collect samples for both total and dissolved manganese from the sample stations used to collect samples for coliform bacteria.

Sample the top, middle and bottom of the lower reservoir in April and October for both total and dissolved manganese.

Transitional Monitoring Plan

In addition to the long term Baseline Monitoring the District will increase monitoring for a period of 18 months. The Transitional Monitoring will begin one month before turning off the chlorine and will continue for 14 months after completely ceasing chlorine disinfection. The chlorine injection will be ramped down over three months to prevent a shock to the system.

Weekly Sampling

For each month the sampling cycle is as given below:

- 1st Week – Sample all active production wells (i.e. Wells 5, 6 and 7) for heterotrophic bacteria and coliform bacteria. Each well will be flushed to waste for 15 minutes before sampling. Be sure to set the SCADA system prior to sampling for the extended flush to waste period.

- 2nd Week of the Month – Collect required samples for coliform bacteria analysis, one sample from each of the six routine sample locations.

  Collect samples for heterotrophic bacteria (HPC) one sample from each of six repeat sample locations. The sample locations will be from the repeat locations north or east of the routine sample station.

- 3rd Week of the Month – Collect samples for heterotrophic bacteria one sample from each of the six repeat sample locations. The sample locations will be from the repeat locations south or west of the routine sample station.

  Sample each of the wells for heterotrophic bacteria and for coliform bacteria.

- 4th Week of the Month – Collect samples for coliform bacteria analysis, one sample from each of the six sample locations.

Other Sampling

Manganese

Quarterly in the first week of January, April, July and October collect samples from each of the active wells for both total and dissolved manganese.

The second week of each month collect samples for both total and dissolved manganese from each of the repeat sample stations used to collect samples for heterotrophic bacteria. Note: This sampling is combined with the samples collected for HPC analysis.

Quarterly on the first week of the quarter, sample the top, middle and bottom of the lower reservoir for manganese.

Temperature

Weekly in July and August collect temperature readings from the lower reservoir, top middle and bottom.

ACTION PLAN

The results of the monitoring will influence the actions taken by staff to aggressively manage the water system. The Action Plan outlines recommended actions for potential results of the monitoring program. Adaptive management will be needed for results not anticipated here.

Heterotrophic Plate Count – The District will manage the system to maintain heterotrophic plate count results to less than 20 anywhere in the system.

- Wells – If the results of sampling show HPC greater than 20, collect samples for heterotrophic bacteria at the booster station and from each repeat sample location (i.e., 1B, 2B, etc.) to assess if the heterotrophic bacteria has spread into the system.

  If HPC results are above 20 for two consecutive sampling periods for any one well, consider treating the well with shock chlorination.

- Distribution System – If HPC results are greater than 20 at any location within the distribution system flush that area of the system within 24 hours. Collect samples at the completion of flushing for HPC and coliform analysis. If the HPC results are still above 20, or coliform is present, then unidirectional flush that portion of the system within 24 hours. The UDF sections that need to be flushed should be determined at the time based upon the location of the presence of coliform (refer to the UDF flushing program). The intent is to flush the impacted area, and surrounding areas, thoroughly. Upon completion of flushing take samples for heterotrophic bacteria and coliform.

- Manganese – The concentration of manganese, both total and dissolved, may be used as potential indicator of when flushing may be needed. As manganese is oxidized the concentration of dissolved manganese decreases as a percentage of the total manganese. During the transition period the District may observe a change in manganese from a small percentage of the manganese being dissolved to a large percentage of the manganese being dissolved, as the oxidizing agent, chlorine, is removed from the system.

As data is developed trends may become evident that relate water age to the ratio of dissolved/total manganese, and potentially to any brown water complaints. This information may potentially be used to target areas with longer water age for preemptive flushing.

- Reservoir Manganese – The distribution of manganese in the reservoir, top, middle, bottom may be used as a guide for scheduling reservoir cleaning. Manganese concentrations at the bottom of the lower reservoir were an order of magnitude greater in July 2014 at the bottom of the reservoir than in the middle or top of the reservoir. Six months after Reservoir cleaning the concentrations were similar throughout.

- Reservoir Temperature – Water temperature measurements in the reservoir may indicate thermal stratification. This is unlikely given the rapid turnover of water during peak periods. However, if it is noticed staff may wish to spill some water from the reservoir assure “fresh” water throughout the water column.

FACILITY SECURITY

Recognizing the potential treat of vandalism, sabotage, or terrorism, the District has installed a security system at its yard site. The security system is an invisible fence around the perimeter of the yard and a video surveillance system. The invisible fence system is on all the time. If at any time the invisible fence is triggered, a text message is sent to each District staff member. District staff may access the video system from their cellphone. If District staff notice anything that does not seem appropriate, District personnel respond accordingly. If necessary, staff will call the Des Moines Police, located on the adjacent lot to the south.

The well buildings and vaults, the Upper Reservoir Building, the Booster Pump Station Building, and the lower reservoir hatch are equipped with intrusion alarms. The alarms are on a timer. They begin operation at 6:00 p.m. and deactivate at 6:00 a.m.

Access to the lower reservoir is via an external ladder, protected by a 10-foot high stainless steel shield which is locked at all times. Access to the upper reservoir is via the inside of the reservoir control room which is locked at all times. Access to the well pump house, vaults, and chlorination facilities is locked at all times.

The District and the City of Des Moines work cooperatively to restrict access to District facilities. City employees recognize that the District facilities are Critical Infrastructure that must be protected, and that it is a federal offense to tamper with public water facilities under U.S. Code Title 42 Section 300i-1.

If Des Moines personnel observe any use of or access to District facilities, except by District personnel, the protocol is to notify the District immediately and instruct those connected to or accessing to cease what they are doing. Use of District facilities for any purpose is prohibited, all unauthorized personnel should cease and desist immediately. Fire Department personnel are the exception from this policy for emergencies.

ADMINISTRATIVE BMPS

Cross-Connection Control

Cross-connection control assemblies are required by law (WAC 246-290-490) and District Resolution 2015-1. The intent of cross-connection control (backflow) assemblies is to prevent back siphoning of the customers' water into the public distribution system in locations where an elevated risk of contamination exists. Typical locations include doctor and dental offices, locations that store or treat graywater or wastewater, food processing facilities, carwashes, internal fire suppression systems, buildings greater than 30-feet tall, etc.

The District requires premise isolation for all new commercial, multifamily, and irrigation services. The District works with the City to identify any business permits, other permits, or activities within existing buildings that require cross-connection control. As they are identified, a backflow assembly is installed and added to the database.

Currently, there are 215 cross-connection control assemblies that the District tracks. Each assembly is tested annually and the test report is sent to the District. The parcel location of each cross-connection control assembly is shown on the District's base map. The base map has been reviewed by District staff to help ensure that there are no facilities that should have a backflow assembly but do not. The District reviews the need for changing any of the assemblies or the need for additional assemblies annually. The backflow database is updated annually and revisions to the base map are made if needed.

Many of the older services in the District do not have premise isolation backflow prevention. The backflow preventers are specific to individual uses and appliances within buildings. For example, an apartment building may have backflow prevention on its fire system and irrigation system, but not its domestic service system. The District will evaluate the need for premise isolation at individual facilities. Per District Resolution 2015-1, customers requiring premise isolation backflow preventers are required to install them. The District will continue to track independent individual appliance backflow preventers on private property as well as the premise isolation cross-connection control facilities.

Hydrants

A strict “no use” policy for all fire hydrants except by water or fire personnel is enforced. Only fire trucks should be connected to District hydrants unless District personnel are present.

Construction crews, hydroseeders, and street sweepers are allowed to fill trucks for bulk water sales only at the fill point in the District Yard. Neighborhood watch personnel are also aware of this policy, and consequently report violations to the District and the City of Des Moines.

Sample Station

The District has sampling stations in its distribution system that it uses for bacteriological sample collection. Only District personnel or personnel contracted to obtain samples are allowed to access the sampling stations. If the sampling stations are accessed by any other persons, District staff and City of Des Moines personnel are instructed to notify District personnel and to instruct those using the sampling station that they are in violation of District policy.

Distribution System Leakage Review

Annually, the District estimates its water DSL by comparing the volume sold to the volume of water pumped. The estimated DSL does not directly impact water quality; however, it provides a good background for water use and overall system efficiency. The District will contract with a leak detection company to acoustically test its water system if leaks are suspected or if the DSL exceeds 10 percent. In addition to contracted leak detection services, if District personnel find or City crews or customers call in regarding any unusual puddles or wet areas, an appropriate investigation and if necessary, leak repairs will be undertaken.

ATTACHMENT A

APPENDIX N

CROSS-CONNECTION CONTROL

KING COUNTY WATER DISTRICT NO. 54 - CROSS CONNECTION CONTROL DEVICE LIST FOR 2018

ATTACHMENT A

ID Numb	Notice sent	Date returned	Pass/ Fail	Name	Mail to Name & Address	Device Address	Device Location	Make	Model	Size	Serial number	Type	Prem. Iso.
123	1/19/18	3/17/18	P	6th Ave Des Moines LLC	8213 155th Ave SE	22529 6th Ave So	Next to meter	Wilkins	950 XL	3/4"	699830	DCVA	
124	1/19/18	3/17/18	P		Newcastle, WA 98059	22529 6th Ave So	Mechanical room	Febco	876V	3"	9801231356	DCVA	
125	1/19/18	3/17/18	P			22529 6th Ave So	Mechanical room on 3" DC	Watts	007M3QT	3/4"	144194	DCVA	
1	1/19/18	2/7/18	P	7-Eleven Inc, Site 27283	Ecova-MS 1937	820 So Kent Des Moines Road	Above mop sink	Watts	009QT	1/2"	129497	RPBA	
2	1/19/18	2/7/18	P		PO Box 2440	820 So Kent Des Moines Road	Above mop sink	Watts	009M3QT	3/4"	12296	RPBA	
					Spokane, WA 99210-2440								
3	1/19/18	6/16/18	P	7th Avenue Dental Arts	Same as Device Address	22221 7th Ave So	SE shrub bed by meter	Wilkins	950XLT	1"	713882	DCVA	
XX	1/19/18	3/17/18	P			22221 7th Ave So	Vault near meter	Watts	LF009M2QT	1.5"	046628	RPBA	X
4	1/19/18	2/6/18	P	A+ Dental	Same as Device address	22030 7th Ave So #100	Under back sink	Watts	909M2	1"	25457	RPBA	X
XX	EC says	6/1/17	P	Adriana Sen. Housing	Same as Device address	22525 7th Ave So	South end mechanical room	Apollo	DCLF4A	4"	58255	DCVA	
XX	OK for	12/22/17	P				Mechanical Room	Watts	957	4"	QJ2000	RPBA	X
XX	2018	12/22/17	P				Mechanical Room	Watts	LF009M2QT	2"	070956	RPBA	X
XX		12/22/17	P				Top of stairs trash chute	Watts	LF009QT	1/2"	154615	RPBA	
5				Ages in Stages	Same as Device Address	22038 9th Ave So	Next to meter	Watts	007M1QT	1"	A08983	DCVA	
6	1/19/18	6/26/18	P	All Star Sports Bar	Resolute Inv Group LLC	22303 Marine View Dr So	Basement, NW corner of bldg	Wilkins	950XL	3/4"	2750734	DCVA	
7	1/19/18	6/26/18	P		20641 3rd Ave So		Basement, NW corner of bldg	Wilkins	350ADA	3"	V14333	DCVA	
					Des Moines, WA 98198								
8	1/19/18	6/13/18	P	Anchor Apts	Nguyen / Tran	821 So 219th St	NE corner of property	Febco	805Y	1"	W5157	DCVA	
					5039 32nd Ave So								
					Seattle, WA 98118								
11	1/19/18	2/14/18	P	Arbors, The	Powell Homes/The Arbors	21407 12th Ave So	SW corner of bldg	Wilkins	950XLT	1"	1206905	DCVA	
12	1/19/18	2/14/18	P		PO Box 98309	21415 12th Ave So	W side of bldg	Wilkins	950XLT	1"	1223058	DCVA	
13	1/19/18	2/14/18	P		Des Moines, WA 98198	21423 12th Ave So	W side of bldg	Wilkins	950XL	1"	1844035	DCVA	
14	1/19/18	2/14/18	P			21503 12th Ave So	NW corner next to meter	Wilkins	950XLT	1"	1206927	DCVA	
15	1/19/18	2/14/18	P			21515 12th Ave So	NW corner next to meter	Wilkins	950XLT	1"	1206910	DCVA	
16	1/19/18	9/13/18	P	Athens Pizza	Same as Device Address	22340 Marine View Dr So #A	Under dishwasher	Wilkins	975XL2TCU	1/2"	W398105	RPBA	
17	1/19/18	9/13/18	F/P		Suite A	22340 Marine View Dr So #A	Under soft drink machine	Watts	009QT	1/2"	97835	RPBA	
10	1/19/18	2/3/18	P	Atwood, Glenna & Julie	Same as device Address	922 So 222nd St	Right side yard	Wilkins	350	1"	A138845	DCVA	
18	1/19/18	5/14/18	F/P	Bank of America	Bank of America	707 So 227th St	South side of bldg	Wilkins	950XLT	1"	2852894	DCVA	
					PO Box 1027								
					Mandan, ND 58554								
19	1/19/18	8/13/18	P	Bay View Condos	Around the Clock Inc	800 So 219th St	No of meters, at sidewalk behind bench	Febco	805Y	3/4"	AL4155	DCVA	
					716 W Meeker St, #101								
					Kent, WA 98032								
20	1/19/18	4/18/18	P	Beachstone Condos	CM & M Company	620 So 227th St	NW corner garage riser room	Febco	805YB	3/4"	013706	DCDA	
21	1/19/18	4/18/18	P		1911 SW Campus Dr #454	620 So 227th St	E. of Law office entrance	Febco	805Y	1"	A159804	DCVA	
22	1/19/18	4/18/18	P		Federal Way, WA 98023	620 So 227th St	NW corner of garage	Febco	856	4"	0003171031	DCDA	
XX	1/19/18	7/13/18	P	Beasley, Kimberly	Same as Device Address	22025 9th Ave So	NE corner in yard near meter	Febco	850	1"	HC32519	DCVA	
23	1/19/18	6/18/18	P	Bell, Steve	Same as Device Address	21827 4th Ave So	In garage	Conbraco	40203T2	1/2"	105722	RPBA	X
24	1/19/18	6/18/18	P				In garage	Ames	2000B	1 1/2"	A00789	DCVA	
XX	1/19/18	6/18/18	P				right side of house under rocks near steps	Febco	850	1"	HB61623	DCVA	
9	1/19/18	1/5/18	P	Better Properties - Metro	Better Properties - Metro	22239 Marine View Dr So	Closet behind bar in Lighthouse Lounge	Watts	009QT	1/2"	427424	RPBA	
205	1/19/18	1/5/18	P		3232 15th Ave W #102		In hotbox by window	Watts	LF009M2	1 1/4"	07178	RPBA	X
				(Lighthouse Lounge)	Seattle, WA 98119								

KING COUNTY WATER DISTRICT NO. 54 - CROSS CONNECTION CONTROL DEVICE LIST FOR 2018

ATTACHMENT A

ID Numb	Notice sent	Date returned	Pass/ Fail	Name	Mail to Name & Address	Device Address	Device Location	Make	Model	Size	Serial number	Type	Prem. Iso.
25	1/19/18	3/25/18	P	Blackinton, Janice	Same as Device Address	909 So 226th Place	Box behind meter, NE corner	Winkins	350	1"	A586369	DCVA	
26	1/19/18	3/10/18	P	Bradshaw, Phil	Same as Device Address	304 So 219th St	Front yard by meter	Wilkins	350	1"	2985821	DCVA	
27	1/19/18	5/23/18	P	Brown Bear Carwash	Carwash Enterprises PO Box 70527 Seattle, WA 98127	22706 Marine View Dr So	NE corner of carwash inside on wall	Watts	009M2QT	1 1/2"	A41074	RPBA	X
28	1/19/18	8/6/18	P	Buysse, Mark	Same as Device Address	21825 4th Ave So	15' right of meter behind fence	Febco	850	1"	HB55265	DCVA	
29	1/19/18	2/3/18	P	Clark, Steven	Same as Device Address	1017 So 226th St	Behind chain link fence, 3' west of meter	Febco	850	1"	20158	DCVA	
30	1/19/18	8/27/18	P	Cliff Condominiums	Bell Anderson	22226 Cliff Ave	Fire sprinkler room in garage	Watts	007M1QT	2"	112385	DCVA	X
31	1/19/18	8/27/18	P		PO Box 5640	22226 Cliff Ave	Front ctr of bldg by meter, W side	Febco	850	1"	H49373	DCVA	
32	1/19/18	8/27/18	P		Kent, WA 98064	22226 Cliff Ave	Fire sprinkler room in garage	Ames	2000B	3/4"	25424	DCDA	
33	1/19/18	8/27/18	P			22226 Cliff Ave	Fire sprinkler room in garage	Ames	3000SS	4"	1180250302	DCDA	
34	1/19/18	3/25/18	P	Cole, King	Same as Device Address	22539 10th Ave So	Next to meter	Watts	007M1QT	1"	58234	DCVA	
36	1/19/18	5/16/18	P	Des Moines Dental Ctr	The Reeves Bldg LLC	21904 Marine View Dr So	Back room of Chiropractic Clinic	Febco	856 DCDA	4"	9806181244	DCDA	
37	1/19/18	5/16/18	P		21904 Marine View Dr So	21904 Marine View Dr So	Upper mechanical room	Wilkins	975XL	1 1/4"	554209	RPBA	X
38	1/19/18	5/16/18	P		Des Moines, WA 98198	21904 Marine View Dr So	Back room of Chiropractic Clinic	Febco	805YB	3/4"	A007716	DCVA	
39	1/19/18	5/16/18	P			21904 Marine View Dr So	Next to dumpster in planter	Wilkins	950XLT	1"	874007	DCVA	
40	1/19/18	5/16/18	P			21904 Marine View Dr So	Lower mech rm, janitor closet	Watts	009	1/2"	113384	RPBA	X
45	1/19/18	6/25/18	P	DM Professional Center	MRP Enterprises Inc	22506 Marine View Dr So	Mechanical room	Wilkins	350ADA	4"	U11241	DCDA	
46	1/19/18	6/25/18	P	Key box #6345	c/o Sarah Phillips		Mechanical room, east side of bldg	Wilkins	950XL	3/4"	2539972	DCVA	
47	1/19/18	6/29/18	P		2349 Harbor Ave SW #304		In lawn So of dumpster	Febco	850	1"	HA93980	DCVA	
XX	1/19/18	6/25/18	P		Seattle, WA 98126		Fire Sprinkler riser room	Watts	LF009M2QT	1"	080175	RPBA	X
XX	1/19/18	7/7/18	P	Des Moines Yacht Club	PO Box 13004 Des Moines, WA 98198	22737 Marine View Dr So	NE corner of property by MVD	Watts	LF007M2QT	1 1/2"	01953	DCVA	
XX	1/19/18	2/17/18	P	Dollar Tree #6112	PO Box 1261 Mandan, ND 58554	21851 Marine View Dr So	In basement mid wall, mop area	Wilkins	975XL	1"	4094277	RPBA	
51	1/19/18	3/5/18	P	DOM Construction	Same as Device Address	22608 Marine View Dr So		Wilkins	350ADA	4"	V17573	DCDA	
52	1/19/18	3/5/18	P					Wilkins	950XL	3/4"	2926326	DCDA	
XX	1/19/18	3/5/18	F/P					Wilkins	950XLT	1"	2753673	DCVA	
53	1/19/18	3/25/18	P	Eernisse, James	Same as Device Address	833 So 223rd St	5' So of meter on 223rd, Mid lot	Wilkins	950XL	1"	W014121	DCVA	
54	1/19/18	5/21/18	P	Egan, Michael	Same as Device Address	317 So 216th St	NE corner of house	Febco	805Y	3/4"	449347	DCVA	
55	1/19/18	3/14/18	P	El Mirador	Brooks Fenton	22022 7th Ave So	Front of bldg	Febco	805Y	1"	W1263	DCVA	
XX	1/19/18	9/6/18	P		22022 6th Ave So #108		At meter in vault	Watts	757	3"	OF0380	DCVA	x
					Des Moines, WA 98198								
48	1/19/18	5/24/18	P	Flores, Quentin	Same as device address	22224 10th Place So	Fire sprinkler riser closet	Watts	007M2QT	1 1/2"	66024	DCVA	
49	1/19/18	5/24/18	P				South side of house by AC unit	Watts	007M1QT	1"	479151	DCVA	
50	1/19/18	5/24/18	P				West side of house	Febco	850	1"	HD33112	DCVA	
56	1/19/18	6/23/18	P	Frakes, Jothan	Same as Device Address	313 So 219th St	Front yard by meter, NW corner	Conbraco	08686	1"	A010502	DCVA	
41	1/19/18	2/8/18	P	Franciscan Medical Clinic	Franciscan Prop Mgmt	22004 Marine View Dr So	Next to meter in island by lamp post-irr	Wilkins	350	1 1/2"	B027922	DCVA	
42	1/19/18	2/8/18	P		MS 10-06	22004 Marine View Dr So	Fire sprinkler room in garage-fire line	Hersey	DDC II	3"	9212500	DCVA	
43	1/19/18	2/8/18	P		PO Box 2197	22004 Marine View Dr So	Fire sprinkler room in garage-fire line	Hersey	FDC	3/4"	160577	DCVA	
44	1/19/18	2/8/18	P		Tacoma, WA 98401	22004 Marine View Dr So	Fire sprinkler room in garage-domestic	Watts	009M1QT	2"	58026	RPBA	X
71	1/19/18	6/11/18	P	Gerding/McGuire	Same as Device Address	1022 So 226th St	SW corner of house in box	Wilkins	950XL	1"	258399	DCVA	
83	1/19/18	9/29/18	P	Gorgona LLC	c/o D. Poletti Assoc.	22341 Marine View Dr So	Middle level, Ice machine rm	Watts	009QT	1/2"	A13866	RPBA	
84	1/19/18	8/8/18	P	(was Pearle Holdings)	1200 Westlake Ave No #1001		Riser Room	Wilkins	350ADA	4"	V15641	DCVA	

KING COUNTY WATER DISTRICT NO. 54 - CROSS CONNECTION CONTROL DEVICE LIST FOR 2018

ATTACHMENT A

ID Numb	Notice sent	Date returned	Pass/ Fail	Name	Mail to Name & Address	Device Address	Device Location	Make	Model	Size	Serial number	Type	Prem. Iso.
85	1/19/18	9/20/18	P	3445 California Ave SW #A	Seattle, WA 98109		Riser Room	Wilkins	950XL	3/4"	2796436	DCVA	
206	1/19/18	9/26/18	P	Seattle, WA 98116			By meter near PIV in hot box	Wilkins	975XL	1"	4076225	RPBA	x
XX	1/19/18	9/20/18	P				Hair salon closet w fire valves	Watts	LF009M2QT	1 1/4"	11686	RPBA	x
XX	1/19/18	2/20/18	P	Hale & Associates		22014 7th Ave So	in bathroom janitors closet 1st floor	Watts	LF009M2QT	1"	102005	RPBA	x
XX	1/19/18	2/20/18	P			22007 Marine View Dr So	back of bldg in grey lock box	Watts	LF009M2QT	1 1/2"	11534	RPBA	x
58	1/19/18	2/14/18	P	Heng Zhou DDS	Same as Device Address	22007 Marine View Dr So #101	Mechanical room	Wilkins	975XL	1/2"	W022389	RPBA	
59	1/19/18	6/4/18	P	Hossman, Carl	196 Boundary Lane NW	22024 Marine View Dr So	Rear of property	Febco	805Y	1"	AL7674	DCVA	
					Seattle, WA 98177								
XX				Houston, David	Same as Devise Address	22220 10th Ave So	Next to meter						
60	1/19/18	2/6/18	P	Jack in the Box	NW Food Mgmt Group	22633 Marine View Dr So	W side of bldg in box next to meter	Watts	007M1QT	1"	310071	DCVA	
61	1/19/18	2/6/18	F/P		2493 Roll Dr. #210-2016		In back room on wall by syrup	Wilkins	975XL	3/4"	W148683	RPBA	
					San Diego, CA 92154								
62	1/19/18	5/28/18	P	Key Bank	Same as Device Address	22033 Marine View Dr So	E side of building by hose bib	Wilkins	950XLT	1"	1635017	DCVA	
63	1/19/18	5/28/18	P			22040 7th Ave So (ATM bldg)	So side of bldg in lawn box	Wilkins	950XLT	1"	2040220	DCVA	
64		7/18/18	P	King Co Water District #54	Same as Devise Address	21810 11th Ave So	Portable	Watts	1007M1	2"	108138	DCVA	
65		7/18/18	P				Portable	Watts	LF009M2QT	2"	090757	RPBA	
207		7/21/18	P			Intertie w Highline WD	In vault	Wilkins	350	3/4"	2689885	DCVA	
66		7/18/18	P				Portable	Wilkins	975XL	2"	3070937	RPBA	
XX							Portable	Watts	LF007M1QT	2"	025591	DCVA	
35	1/19/18	6/27/18	P	Lepak, Martin	Same as Devise Address	1060 So. Rainbow Lane	E side of house in box underground	Wilkins	950XLT	1"	2061515	DCVA	
XX	1/19/18	3/2/18	P	Little Pearls Kids Dentistry	Same as Device Address	22506 Marine View Dr So #101	In stair elevation rm, center of office	Watts	LF009QT	1/2"	125463	RPBA	
						Des Moines, WA 98198							
67	1/19/18	3/7/18	P	Marina Condo's	WPM South	22612 6th Ave So	In bed by riser stairway	Wilkins	950XLT	1"	1484378	DCVA	
				(old Sea Aira Apts)	13106 SE 240th St #200								
					Kent, WA 98031								
208	1/19/18	6/28/18	P	Marina Estates	c/o Crown Management	22219 6th Ave So	In east carport	Watts	LF007M2QT	1.5"	005801	DCVA	
209	1/19/18	6/28/18	P		13505 Ambaum Blvd SW #103	528 So 223rd St	in basement storage area east	Watts	LF007M1QT	2"	194279	DCVA	X
XX	1/19/18	6/28/18	P		Burien, WA 98146	22219 6th Ave So	in storage rm basement in area east	Watts	LF007M1QT	2"	011211	DCVA	X
XX	1/19/18	3/28/18	P	Marina Professional Center	Same as Device Address	Attn: Manager	Common area electrical rm on wass	Wilkins	350XL	2"	B103303	DCVA	X
						22030 7th Ave So							
XX		4/6/18	P	Marine View Vet	Same as Device Address	22616 Marine View Dr So	Behind building in hot box in alley	Watrs	LF009M2	1"	128436	RPBA	X
68	1/19/18	6/30/18	P	Mariner Manor	The Copeland Group	601 So 227th St	No of pool area	Febco	PVBA 765	1 1/2"	H019993	PVBA	X
					221 1st Ave W #105								
				Also mail to Matt Concie	Seattle, WA 98119								
				at property address #100									
69	1/19/18	3/11/18	P	Martinson, Martin	Same as Device Address	1016 So 225th Lane	Buried in box south side of front yard	Febco	805Y	1"	AL0271	DCVA	
70	1/19/18	6/19/18	P	Mayer, Kristina	PO Box 98995	1052 So 230th St	Left of driveway in plant area	Watts	007M1QT	1/2"	09066	DCVA	
					Des Moines, WA 98198								
72	1/19/18	6/23/18	P	Midway Sewer District	Midway Sewer District	Beach Park Lift Station	Hot Box	Febco	860	3/4"	A00319	RPBA	X
73	1/19/18	6/23/18	P		PO Box 3487	1200 So 216th St	Vault next to main gate	Wilkins	375AST	6"	7032C	RPBA	X
75	1/19/18	6/23/18	P		Kent, WA 98089	7th Avenue Lift Station	Inside door on E wall	Watts	LF009M2QT	1"	042330	RPBA	X
76	1/19/18	2/23/18	P	Moore & Jaehning	Same as Device Address	22722 10th Ave So	In garage next to boiler	Watts	009QT	1/2"	280328	RPBA	X
				(Bennett)									
77	1/19/18	4/13/18	P	Northwest Tower Crane	Same as Device Address	710 So 226th St	Next to irrigation meter	Wilkins	950XLT	1"	473528	DCVA	

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XX	1/19/18	4/13/18	P				In hot box SE corner of bldg	Wilkins	350	1"	A533921	DCVA	X
79	1/19/18	1/4/18	P	Park Place Condos	Park Place Condos	22218 5th Ave So	Fire sprinkler room	Watts	007M2QT	3/4"	18685	DCVA	
80	1/19/18	1/4/18	P		Susan Corey	22218 5th Ave So	Fire sprinkler room	Ames	3000 S	4"	3DJ0735	DCDA	
81	1/19/18	1/30/18	P		22218 5th Ave So #101	22218 5th Ave So	Next to irr. Meter SW corner property	Febco	805Y	3/4"	AG1365	DCVA	
XX	1/19/18	1/4/18	P		Des Moines, WA 98198	22218 5th Ave So	Riser room on wall	Watts	LF009M2QT	2"	065242	RPBA	x
82	1/19/18	3/11/18	P	Paul, Peggy (Hanson)	Same as Device Address	22502 10th Ave So	By meter near NW P/C	Febco	850	1"	H52294	DCVA	
86	1/19/18	6/22/18	P	Peterson, Gary	Same as Device Address	509 So 222nd St	West of meter in plastic box	Watts	007M3QT	3/4"	251482	DCVA	
87	1/19/18	3/28/18	P	Pier View Condos	WPM South	22226 6th Ave So	Fire sprinkler room	Ames	3000 SS	4"	107385	DCVA	
88	1/19/18	3/27/18	P		13106 SE 240th St #200	22226 6th Ave So	NE of meter, So side of bldg	Watts	775QT	1"	10161	DCVA	
89	1/19/18	3/27/18	P		Kent, WA 98031	22226 6th Ave So	Fire sprinkler room	Ames	2000 B	3/4"	21537	DCDA	
90	1/19/18	4/28/18	P	Proszek, Morris	Same as Device Address	21647 3rd Ave So	By Meter	Watts	007M1QT	1"	45838	DCVA	
91	1/19/18	3/21/18	P	Puddlejumpers Daycare	Same as Device Address	21616 7th Place So	Fire sprinkler room	Ames	3000 S	2 1/2"	3HM1919	DCVA	
92	1/19/18	3/21/18	P			21616 7th Place So	Fire sprinkler room	Ames	2000B	3/4"	0001614	DCVA	
93	1/19/18	7/16/18	F/P	Red Robin	Red Robin	22705 Marine View Dr So	Fire sprinkler room	Ames	3000 SS	2 1/2"	3HL0511	DCVA	
94	1/19/18	7/16/18	F/P		c/o Ecova	22705 Marine View Dr So	Fire sprinkler room	Watts	007M2QT	3/4"	85966	DCVA	
95	1/19/18	4/5/18	P		PO Box 2440	22705 Marine View Dr So	Inside bldg, next to pop syrups	Wilkins	975XL	3/4"	3402006	RPBA	
96	1/19/18	4/5/18	P		Spokane, WA 99210	22705 Marine View Dr So	Next to irrigation meter, east drvwy	Febco	805Y	2"	BA6735	DCVA	
XX	1/19/18	7/2/18	P			22705 Marine View Dr So	Mechanical room	Wilkins	950XL	2"	370664	RPBA	
97	1/19/18	6/16/18	P	Roedell/Mitchell	Roedell/Mitchell	22712 10th Ave So	Right of driveway, by meter	Wilkins	950XL	1"	?	DCVA	
					PO Box 13647								
					Des Moines, WA 98198								
57	1/19/18	5/4/18	P	Samuel, Kitty	Same as Device Address	21629 3rd Ave So	In bed to south of front door	Febco	LF850	1"	A05274	DCVA	
98	1/19/18	3/11/18	P	Schriock, Michael	Same as Device Address	819 So 226th Pl	Next to meter	Wilkins	950XL	3/4"	808691	DCVA	
99	1/19/18	3/11/18	P				Above heater in workshop off garage	Watts	009QT	1/2"	30834	RPBA	
100	1/19/18	9/29/18	P	Scott, George C. Studios	Same as Device Address	22220 7th Ave So	SW corner before mezzanine	Febco	856	8"	F0301060751	DCVA	
101	1/19/18	8/29/18	P				SW corner before mezzanine	Febco	805YB	3/4"	A023931	DCVA	
102	1/19/18	9/26/18	P	Scully, John	Same as Device Address	21443 13th Ave So	So side of driveway, 10' east of garage	Febco	850	1"	HB80460	DCVA	
103	1/19/18	2/14/18	P	Shellmont Association	Shellmont Association	22514 6th Ave So	Vault in front of bldg	Watts	709	4"	106276	DCVA	
104	1/19/18	2/14/18	P		PO Box 98309	22514 6th Ave So	Vault in front of bldg	Watts	709	3/4"	160572	DCVA	
105	1/19/18	2/14/18	P		Des Moines, WA 98198	22514 6th Ave So	Next to meter	Febco	805Y	1"	73651	DCVA	
78	1/19/18	5/25/18	P	Sims, Marshall	Same as Device Address	21609 6th Ave So	Backyard no side of house	Wilkins	950	1"	1659604	DCVA	
106	1/19/18	4/14/18	P	Solberg, Lance	Same as Device Address	22214 9th Ave So	In yard behind hedge	Wilkins	950XLT	1"	2445454	DCVA	
107	1/19/18	4/30/18	P	Soldano, Gayla	Same as Device Address	22038 11th Ave So	Next to meter	Wilkins	950XLT	3/4"	548963	DCVA	
108	1/19/18	2/9/18	P	South Shore Condos	Same as Device Address	22315 6th Ave So	Next to meter vault	Wilkins	950XLT	1"	1554812	DCVA	
109	1/19/18	8/24/18	P	Spyglass Condos	WPM South	21937 7th Ave So	SE corner of bldg 21925	Wilkins	950XL	1"	095646	DCVA	
					13106 SE 240th St #200								
					Kent, WA 98031								
110	1/19/18	9/21/18	P	Syskon Group LLC	Same as Device Address	309 So 219th St	No side of house	Wilkins	950XLT	1"	1377086	DCVA	
111	1/19/18	2/28/18	P	Taco Time	3300 Maple Valley Hwy	809 Kent Des Moines Road	Closet across from mens room	Watts	009QT	1/2"	277470	RPBA	
112	1/19/18	2/28/18	P		Renton, WA 98058	809 Kent Des Moines Road	Flower bed 5' south of water meter	Wilkins	950XLT	1"	3922070	DCVA	
113	1/19/18	6/22/18	P	Tamburelli	Same as Device Address	316 So 216th	Behind meter	Wilkins	350	3/4"	W001293	DCVA	

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114	1/19/18	3/21/18	p	Terrace View	Louie Hong	22505 6th Ave So	Next to meter	Febco	850	1"	A38831	DCVA	
115	1/19/18	3/21/18	P		22505 6th Ave So	22505 6th Ave So	Basement on east wall	Conbraco	40108A2	2"	HM535	DCVA	
116	1/19/18	3/21/18	P		Des Moines, WA 98198	22505 6th Ave So	Basement on east wall	Febco	850	1 1/2"	H28298	DCVA	
117	1/19/18	7/5/18	P	Tomlin-Shorey B.	Same as Device Address	22342 10th Ave So	Next to meter	Wilkins	950DC	3/4"	1863	DCVA	
211	1/19/18	2/9/18	P	Tran, Tony	Tony Tran	22201 Marine View Dr So	Premise Isolation: in back room of	Watts	LF009M2QT	1"	045954	RPBA	X
					Marina Properties LTD		Polonez Automotive						
					2447 Nicollet Ave								
					Minneapolis, MN 55404								
118	1/19/18	6/23/18	F/P	Turner, Andrew	Same as Device Address	311 So 219th St	East side of house	Wilkins	950XLT	1"	721202	DCVA	
119	1/19/18	6/8/18	P	Tuscany at DM Creek	Gurnenak Restaurant Group	21830 Marine View Dr So	Kitchen area, right of dishwasher	Watts	009QT	1/2"	90978	RPBA	
120	1/19/18	6/8/18	P		21830 Marine View Dr So	21830 Marine View Dr So	Cab under sink, right of pop machine	Watts	009QT	1/2"	265722	RPBA	
					Des Moines, WA 98198								
121	1/19/18	6/9/18	P	Via Marina	Same As Device Address	22636 Marine View Dr So	Kitchen closet by water heater	Watts	009QT	1/2"	324583	RPBA	
122	1/19/18	6/9/18	P				Kitchen closet by water heater	Wilkins	950XLT	3/4'	2455289	DCVA	
126	1/19/18	5/29/18	P	Waterford at Des Moines	Waterford at Des Moines	22515 6th Ave So	Pkg garage, in fire sprinkler room	Wilkins	950XL	3/4"	1176119	DCVA	
127	1/19/18	5/29/18	P		22515 6th Ave So #1		Pkg garage, in fire sprinkler room	Wilkins	350DA	4"	N02710	DCVA	
128	1/19/18	5/29/18	P		Des Moines, WA 98198		NE property corner in grass	Febco	850	1"	H16288	DCVA	
129	1/19/18	5/29/18	P				Pkg garage, in fire sprinkler room	Watts	009M2QT	1"	146923	RPBA	X
130	1/19/18	2/2/18	P	Windward Condos	Windward Condos	22005 6th Ave So	Fire sprinkler room	Watts	007QT	3/4"	12594	DCVA	
131	1/19/18	2/2/18	P		22005 6th Ave So #400	22005 6th Ave So	Fire sprinkler room	Ames	3000 S	4"	3AJ1439	DCVA	
132	1/19/18	2/2/18	P		Des Moines, WA 98198	22005 6th Ave So	Front flower bed	Watts	007M2QT	1 1/2"	A01000	DCVA	
XX	1/19/18	no device yet		Winston Service & Sales	Same as Device Address	21616 Marine View Dr So							X
133	1/19/18	7/13/18	P	Wray, Shain	Same as Device Address	1153 So 229th Pl	Next to water meter	Wilkins	TLX059	3/4"	3150258	DCVA	
212	1/19/18	6/29/18	P	Yee 2 LLC	Yee 2 LLC	21833 Marine View Dr So	In box at meter	Watts	LF009M2QT	1 1/2"	013377	RPBA	X
213	1/19/18	6/29/18	P		PO Box 2407		In box at meter	Watts	LF009M2QT	1 1/2"	018061	RPBA	X
210	1/19/18	6/29/18	P		Issaquah, WA 98027		Basement of Spiro Gyros	Watts	LF009M3QT	3/4"	77479	RPBA	X
XX	1/19/18	6/29/18	P				Basement of Dollar Tree mid wall	Wilkins	975XL	1 1/2"	4155406	RPBA	X
134	1/19/18	2/22/18	P	Wesley Terrace	Hal Okanavik	816 So 216th St	Boiler room	Watts	009M2	1 1/4"	03103	RPBA	
135	1/19/18	2/23/18	P		Wesley Homes	816 So 216th St	Vault So side of bldg	Febco	805YB	3/4"	A005331	DCVA	
136	1/19/18	2/23/18	P		815 So 216th St	816 So 216th St	Next to irrigation meter So of bldg	Febco	805Y	1 1/2"	A012937	DCVA	
137	1/19/18	2/22/18	P		Des Moines, WA 98198	816 So 216th St	Spa supply	Watts	009QT	1"	54005	RPBA	
138	1/19/18	2/22/18	P			816 So 216th St	Behind oven	Watts	009QT	1/2"	59862	RPBA	
139	1/19/18	2/22/18	P			816 So 216th St	Behind oven	Watts	009QT	1/2"	00295	RPBA	
140	1/19/18	2/22/18	P			816 So 216th St	Behind oven	Watts	009QT	1/2"	A13311	RPBA	
141	1/19/18	2/22/18	P			816 So 216th St	By dishwasher	Watts	009QT	1/2"	403349	RPBA	
142	1/19/18	2/23/18	P			816 So 216th St	Vault so of bldg	Febco	856	6"	9710231329	DCVA	
XX		2/22/18	P			816 So 216th St	Storage rm behind dishwasher	Watts	909QT	3/4"	485089	RPBA	
143	1/19/18	2/23/18	P	Wesley Terrace Cottages		816 So 216th St	Unit T101	Febco	805Y	1 1/2"	A104736	DCVA	
144	1/19/18	2/23/18	F/P			816 So 216th St	Unit T102	Febco	805Y	1 1/2"	A033734	DCVA	
145	1/19/18	2/23/18	P			816 So 216th St	Unit T105	Febco	805Y	1 1/2"	A033730	DCVA	
146	1/19/18	2/23/18	P			816 So 216th St	Unit T106	Febco	805Y	1 1/2"	A100911	DCVA	
147	1/19/18	2/23/18	P			816 So 216th St	Unit T108	Febco	805Y	1 1/2"	A100898	DCVA	
148	1/19/18	2/23/18	P	Wesley Health Care Ctr		1122 So 216th St	Next to irrigation meter front of bldg	Febco	805Y	1 1/2"	06771	DCVA	
149	1/19/18	2/23/18	P			1122 So 216th St	In vault in front of bldg	Watts	007M1	3/4"	10806	DCVA	
150	1/19/18	2/28/18	F/P			1122 So 216th St	East mechanical room	Watts	909QT	3/4"	325870	RPBA	
151	1/19/18	4/4/18	F/P			1122 So 216th St	West mechanical room-Laundry & Kitchen	Febco	825Y	4"	15740	RPBA	X
152	1/19/18	4/30/18	F/F/P			1122 So 216th St	East mechanical room-Domestic	Febco	825Y	4"		RPBA	X
153	1/19/18	2/23/18	P			1122 So 216th St	In vault in front of bldg-Fireline	Watts	709	8"	108914	DCVA	
154	1/19/18	2/23/18	P			1122 So 216th St	Under dishwasher	Watts	LF909QTHW	3/4"	35490	RPBA	

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155	1/19/18	2/23/18	P			1122 So 216th St	Kitchen behind dishwasher	Watts	009QT	1/2"	315034	RPBA	
156	1/19/18	2/23/18	P			1122 So 216th St	Kitchen NE sink	Watts	009QT	1/2"	27004	RPBA	
157	1/19/18	2/28/18	F/P			1122 So 216th St	By steam kettle	Watts	009QT	1/2"	37415	RPBA	
158	1/19/18	2/22/18	P	Wesley Gardens		815 So 216th St	Boiler room	Watts	009M2QT	1 1/2"	99599	RPBA	
159	1/19/18	2/22/18	P			815 So 216th St	Sprinkler pump room	Ames	2000 SS	4"	2JL2121	DCVA	
160	1/19/18	2/23/18	F			815 So 216th St	By hydrant No of complex	Febco	850	2"	22547	DCVA	
161	1/19/18	2/23/18	F			815 So 216th St	NE of cottage 52	Febco	805Y	2"	A003657	DCVA	
162	1/19/18	2/22/18	P			815 So 216th St	Spa supply	Watts	009M3QT	3/4"	28031	RPBA	
163	1/19/18	2/23/18	F/P			815 So 216th St	In vault by east pkg lot	Watts	007M3QT	3/4"	A42804	DCVA	
164	1/19/18	2/23/18	P			815 So 216th St	In vault by east entrance	Febco	805Y	4"	9602011319	DCVA	
165	1/19/18	2/22/18	P			815 So 216th St	Phone room	Ames	2000 SS	6"	2IL1744	DCVA	
166	1/19/18	7/5/18	P			815 So 216th St	Under counter to right of dishwasher	Watts	909QTHW	3/4"	37056	RPBA	
167	1/19/18	2/22/18	P			815 So 216th St	Kitchen by ovens	Watts	009QT	1/2"	145613	RPBA	
168	1/19/18	2/22/18	P			815 So 216th St	By ovens under hand sink	Watts	009QT	1/2"	A11993	RPBA	
169	1/19/18	2/23/18	P	Wesley Adult Daycare		816 So 216th St	In vault east of bldg	Febco	805YB	3/4"	020228	DCVA	
170	1/19/18	2/23/18	P			816 So 216th St	In vault east of bldg	Febco	856	4"	F0207251733	DCVA	
171	1/19/18	2/23/18	P	Wesley Conference Ctr		816 So 216th St	In mechanical room	Wilkins	950XL	3/4"	1935266	DCVA	
172	1/19/18	2/23/18	P			816 So 216th St	In mechanical room	Wilkins	950XLT	6"	V00422	DCVA	
173	1/19/18	2/23/18	P			816 So 216th St	In front of Bldg, Irrigation	Wilkins	950XLT	1"	W256151	DCVA	
174	1/19/18	2/23/18	P			816 So 216th St	Mechanical rm	Watts	009M2QT	1 1/4"	36519	RPBA	X
XX	1/19/18	2/22/18	P	Wesley Gardens Cottages		807 So 218th St	Bldg 1, A, Sprinkler riser room	Wilkins	950XLT2	2"	4341273	DCVA	
XX	1/19/18	2/22/18	P			807 So 218th St	Bldg 1, A, Sprinkler riser room	Wilkins	350XL	2"	B117647	DCVA	X
XX	1/19/18	2/22/18	P			807 So 218th St	Bldg 2, B, Sprinkler riser room	Wilkins	950XLT2	2"	4341269	DCVA	
XX	1/19/18	2/22/18	P			807 So 218th St	Bldg 2, B, Sprinkler riser room	Wilkins	350XL	2"	B117639	DCVA	X
XX	1/19/18	2/22/18	P			807 So 218th St	Bldg 3, C, Sprinkler riser room	Wilkins	950XLT2	2"	4341272	DCVA	
XX	1/19/18	2/22/18	P			807 So 218th St	Bldg 3, C, Sprinkler riser room	Wilkins	350AST	2 1/2"	13233A	DCVA	X
XX	1/19/18	2/22/18	F/P			807 So 218th St	Bldg 4, J, Sprinkler riser room	Wilkins	950XLT2	2"	4341275	DCVA	
XX	1/19/18	2/22/18	P			807 So 218th St	Bldg 4, J, Sprinkler riser room	Wilkins	350XL	2"	B107929	DCVA	X
XX	1/19/18	2/22/18	P			807 So 218th St	Bldg 5, K, Sprinkler riser room	Wilkins	950XLT2	2"	4341279	DCVA	
XX	1/19/18	2/22/18	P			807 So 218th St	Bldg 5, K, Sprinkler riser room	Wilkins	350XL	2"	B106930	DCVA	X
XX	1/19/18	2/22/18	P			807 So 218th St	Bldg 6, N, Sprinkler riser room	Wilkins	950XLT2	2"	4341278	DCVA	
XX	1/19/18	2/22/18	P			807 So 218th St	Bldg 6, N, Sprinkler riser room	Wilkins	350XL	2"	B106468	DCVA	X
XX		7/18/18	P			807 So 218th St	Brownstone, H, Riser room in garage	Wilkins	375A	3"	X41881	RPBA	X
XX		7/18/18	P			807 So 218th St	Brownstone, H, 2nd Fl Trash Room	Watts	LF009M3QT	3/4"	198222	RPBA	
XX		7/25/18	P			807 So 218th St	Brownstone, H, Riser room in garage	Wilkins	950XLD	3/4"	HC18306	DCVA	
XX		7/25/18	P			807 So 218th St	Brownstone, H, Riser room in garage	Wilkins	350STDA	6"	04718	DCVA	
XX		5/16/18	P			807 So 218th St	Bldg 10, E, Sprinkler riser room	Wilkins	350AST	2 1/2"	17291A	DCVA	X
XX		7/25/18	P			807 So 218th St	Bldg 10, E, Sprinkler riser room	Wilkins	950XLT2	2"	1549303	DCVA	
XX		7/18/18	P			807 So 218th St	Bldg 11, G, Sprinkler riser room	Watts	007M2QT	1 1/2"	022047	DCVA	X
XX		7/25/18	P			807 So 218th St	Bldg 11, G, Sprinkler riser room	Wilkins	950XLT2	2"	1549307	DCVA	
XX		5/16/18	P			807 So 218th St	Bldg 12, D, Sprinkler riser room	Watts	LF007M1QT	2"	036559	DCVA	X
XX		7/25/18	P			807 So 218th St	Bldg 12, D, Sprinkler riser room	Wilkins	950XLT	2"	4425411	DCVA	
175	1/19/18	6/16/18	P	City of Des Moines	Dick Stites	216th & MVD	In grass by hydrant by meter	Febco	850	1"	HB22103	DCVA	
176	1/19/18	6/23/18	P		City of Des Moines Parks	Beach Park	East of swings	Febco	850	2"	H16739	DCVA	
177	1/19/18	6/16/18	P		21630 11th Ave So	City Hall	Middle of bldg off 11th, left of sidwalk	Febco	850	2'	H16769	DCVA	
178	1/19/18	6/28/18	P		Des Moines, WA 98198	City Hall	Fire sprinkler room	Ames	2000 B	3/4"	0006054	DCVA	
179	1/19/18	6/28/18	P			City Hall	Fire sprinkler room	Watts	009QT	2"	08819	RPBA	X
180	1/19/18	6/28/18	P			City Hall	Fire sprinkler room	Ames	3000 SS	4"	3EN0819	DCVA	
181	1/19/18	6/16/18	P			Boat planter	NW corner of MVD & 7th Ave So	Febco	805Y	1"	AG5925	DCVA	
182	1/19/18	6/28/18	P			Old tank site	921 So 219th St	Febco	850	2"	H16731	DCVA	
183	1/19/18	6/28/18	P			Old tank site	921 So 219th St	Watts	007M1	3/4"	50558	DCVA	
184	1/19/18	6/28/18	F			Old tank site	921 So 219th St	Ames	3000 SS	6"	115591080	DCVA	
185	1/19/18	6/23/18	P			Overlook Park II	223rd & Cliff No corner of park	Febco	850	1"	HA35715	DCVA	
186	1/19/18	6/23/18	P			Overlook Park 1	5th Ave So & Cliff Ave, No end of pk	Febco	850	1"	662494	DCVA	
187	1/19/18	6/23/18	P			So Marina Park	SW corner of park	Febco	850	1"	HD59229	DCVA	
188	1/19/18	6/23/18	P			Police Dept	Next to meter	Wilkins	950XL	2"	21559	DCVA	
189	1/19/18	6/28/18	P			Police Dept	Fire sprinkler room	Ames	3000 SS	3"	3DM1851	DCVA	
190	1/19/18	6/28/18	P			Police Dept	Fire sprinkler room	Watts	007M2QT	3/4"	105710	DCVA	
191	1/19/18	6/23/18	P			Beach Park	SW corner of park in grass, BP Front	Febco	850	1"	HE47300	DCVA	
XX	1/19/18	6/28/18	P			Beach Park	Covered Picnic area restroom	Watts	LF009M2QT	2"	075082	RPBA	X
192	1/19/18	6/16/18	P			Flag Pole	Intersection of MVD & DM Mem Dr	Febco	805Y	3/4"	AG1324	DCVA	

KING COUNTY WATER DISTRICT NO. 54 - CROSS CONNECTION CONTROL DEVICE LIST FOR 2018

ATTACHMENT A

ID Numb	Notice sent	Date returned	Pass/ Fail	Name	Mail to Name & Address	Device Address	Device Location	Make	Model	Size	Serial number	Type	Prem. Iso.
193	1/19/18	6/16/18	P			Public Works Bldg	SW corner of bldg	Wilkins	950DC	3/4"	451085	DCVA	
194	1/19/18	6/16/18	P			21815 MVD	NE corner of Dollar Tree parking lot	Febco	805Y	1"	AK5466	DCVA	
195	1/19/18	6/23/18	P			MVD & 223rd	NE corner in vault in sidewalk	Watts	QT	2"	12901	DCVA	
196	1/19/18	6/23/18	P			223rd & 7th Ave So	NE corner in vault next to meter	Febco	850	2"	H16787	DCVA	
197	1/19/18	6/16/18	P			City Hall (KCLS Irrigation)	Right of sidewalk, by meter	Febco	850	1 1/2"	H17497	DCVA	
198	1/19/18	3/17/18	P			Marina North	Hot box in pkg lot no end	Watts	009M2QT	2"	A31138	RPBA	X
199	1/19/18	3/17/18	P			Marina South	Hot box in so end marina	Watts	009M2QT	2"	A39723	RPBA	X
200	1/19/18	6/16/18	P			Center strip median area	South 216th Street	Febco	850	1"	HC49954	DCVA	
201	1/19/18	6/28/18	P			Auditorium	Auditorium riser room	Wilkins	950XL	3/4"	3215593XLD	DCVA	
202	1/19/18	6/28/18	P			Auditorium	In mechanical room	Watts	009M3QT	3/4"	314087	RPBA	X
203	1/19/18	6/28/18	P			Auditorium	In janitors closet	Wilkins	950XLT	2"	3344534	DCVA	
204	1/19/18	6/28/18	P			Auditorium	Auditorium riser room	Wilkins	350ADA	4"	V24692	DCVA	
214	1/19/18	6/28/18	P			Dining Hall	Front closet	Apollo	DCDA95G	3"	47890	DCVA	
215	1/19/18	6/28/18	P			Dining Hall	Front closet	Apollo	W432100	1/2"	645844	DCVA	
XX	1/19/18	6/28/18	P			Dining Hall	Upstairs	Watts	LF009M2QT	2"	022010	RPBA	X
XX	1/19/18	3/17/18	P			Marina	Hot box by No meter	Febco	850	2"	H32473	DCVA	X
XX	1/19/18	3/17/18	P			Marina	Hot box by No meter	Febco	850	2"	H32684	DCVA	X

⬜	Complete, or OK until next year
🟨	No Report,
🟩	No Report Received, Notice w/late fee
🟥	No Report, No Fee, Locked off
🟦	Failed
date	Date "friendly" reminder sent
date	Date 2nd notice with penalty sent
🟧	Fee Still owed
🟫	Removed or disconnected
▨	Portable assemblies

APPENDIX O

CAPITAL IMPROVEMENT COST ESTIMATES

ATTACHMENT A

KING COUNTY WATER DISTRICT NO.54
Capital Improvement Plan
Oct-19

Project Number	Project Description	Pipe Size (inches)	Pipe Length (feet)	Year to be Completed	Total Estimated Cost
1	8th Ave S - 223rd to 227th	8	1640	2019	$831,000
2	11th Avenue Southeast	8	1700	2022	$664,000
3	Elevated Reservoir	N/A	N/A	2027	$1,033,000
4	North Hill Pressure Zone	N/A	N/A	2029	$730,000
5	New Office Building	N/A	N/A	2031	$1,000,000
6	Marine View Drive Int Crossing at 7th Pl S	12	170		$231,000
7	Cliff Avenue South	12	800		$406,000
8	Rainbow Lane	8	350		$189,000
9	226th Place South	8	350		$205,000
10	13th Avenue South	8	550		$314,000
11	South 229th Street	8	650		$303,000
12	South 216th Street from 1st Court to 6th Avenue South	8	1450		$775,000
				Total:	$6,681,000

ATTACHMENT A

KING COUNTY WATER DISTRICT NO. 54
PRELIMINARY PROJECT COST ESTIMATE
PROPOSED SYSTEM IMPROVEMENT NO. 1
8th Ave S - 223rd to 227th

NO.	ITEM	QUANTITY		UNIT PRICE	Estimated Cost (2018) AMOUNT
1	Unexpected Site Changes	1	FA	$10,000	$10,000
2	Mobilization, Cleanup, and Demobilization	1	LS	$49,000	$49,000
3	Traffic Control	140	HRS	$60	$8,400
4	Clearing, Grubbing, and Roadside Cleanup	1	LS	$8,000	$8,000
5	Sawcutting	400	LF	$4	$1,600
6	Locate Existing Utilities	1	LS	$3,000	$3,000
7	Gravel Backfill	140	TN	$25	$3,500
8	Foundation Gravel	20	TN	$40	$800
9	Crushed Surfacing, Top Course	1,500	TN	$35	$52,500
10	Planing Bituminous Pavement	2550	SY	$9	$22,950
11	Cold Mix Asphalt	90	TN	$150	$13,500
12	HMA Cl. 1/2 PG 58-22	690	TN	$150	$103,500
13	Trench Safety Systems	1	LS	$1,600	$1,600
14	8-inch DI Water Pipe, Including Fittings	1,640	LF	$75	$123,000
15	Additional Pipe Fittings	700	LB	$4	$2,450
16	Connections to Existing System	6	EA	$4,000	$24,000
17	8-inch Gate Valves	12	EA	$2,000	$24,000
18	Fire Hydrants	3	EA	$5,500	$16,500
19	Service Connections, complete	29	EA	$2,500	$72,500
20	Erosion Control	1	LS	$6,560	$6,560
	Subtotal				$547,360
	Tax rate (10%)				$54,736
	Subtotal:				$602,096
	Contingency (20%)				$120,904
	TOTAL ESTIMATED CONSTRUCTION COST:				$723,000
	Engineering and Administrative Costs (15%):				$108,450
	TOTAL ESTIMATED PROJECT COST:				$831,000

ATTACHMENT A

KING COUNTY WATER DISTRICT NO. 54
PRELIMINARY PROJECT COST ESTIMATE
PROPOSED SYSTEM IMPROVEMENT NO. 2
11th Avenue Southeast

NO.	ITEM	QUANTITY		UNIT PRICE	Estimated Cost (2018) AMOUNT
1	Unexpected Site Changes	1	FA	$10,000	$10,000
2	Mobilization, Cleanup, and Demobilization	1	LS	$37,000	$37,000
3	Traffic Control	140	HRS	$60	$8,400
4	Clearing, Grubbing, and Roadside Cleanup	1	LS	$6,000	$6,000
5	Sawcutting	3,400	LF	$4	$13,600
6	Locate Existing Utilities	1	LS	$3,000	$3,000
7	Gravel Backfill	150	TN	$25	$3,750
8	Foundation Gravel	20	TN	$40	$800
9	Crushed Surfacing, Top Course	1,560	TN	$35	$54,600
10	Cold Mix Asphalt	90	TN	$150	$13,500
11	HMA Cl. 1/2 PG 58-22	580	TN	$150	$87,000
12	Trench Safety Systems	1	LS	$1,700	$1,700
13	8-inch DI Water Pipe, Including Fittings	1,700	LF	$75	$127,500
14	Additional Pipe Fittings	800	LB	$4	$2,800
15	Connections to Existing System	4	EA	$4,000	$16,000
16	8-inch Gate Valves	4	EA	$2,000	$8,000
17	Fire Hydrants	4	EA	$5,500	$22,000
18	Service Connections, complete	10	EA	$2,500	$25,000
19	Erosion Control	1	LS	$6,800	$6,800
	Subtotal				$437,450
	Tax rate (10%)				$43,745
	Subtotal:				$481,195
	Contingency (20%)				$95,805
	TOTAL ESTIMATED CONSTRUCTION COST:				$577,000
	Engineering and Administrative Costs (15%):				$86,550
	TOTAL ESTIMATED PROJECT COST:				$664,000

ATTACHMENT A

KING COUNTY WATER DISTRICT NO. 54
PRELIMINARY PROJECT COST ESTIMATE
PROPOSED SYSTEM IMPROVEMENT NO. 3
Elevated Reservoir

NO.	ITEM	QUANTITY		UNIT PRICE	Estimated Cost (2018) AMOUNT
1	Unexpected Site Changes	1	FA	$10,000	$10,000
2	Mobilization, Cleanup, and Demobilization	1	LS	$56,000	$56,000
3	Remove and wastehaul existing reservoir	1	LS	$230,000	$230,000
4	Booster station modifications	1	LS	$60,000	$60,000
5	Well Pump Replacement	2	EA	$40,000	$80,000
6	Erosion Control	1	LS	$10,000	$10,000
7	Electrical system and controls	1	LS	$30,000	$30,000
8	Long Term Storage Rental	1	LS	$150,000	$150,000

Subtotal	$626,000
Tax rate (10%)	$62,600
Subtotal:	$688,600
Contingency (20%)	$137,400
TOTAL ESTIMATED CONSTRUCTION COST:	$826,000
	$690,000
Engineering and Administrative Costs (25%):	$206,500
TOTAL ESTIMATED PROJECT COST:	$1,033,000

KING COUNTY WATER DISTRICT NO. 54
PRELIMINARY PROJECT COST ESTIMATE
PROPOSED SYSTEM IMPROVEMENT NO. 4
North Hill Pressure Zone

NO.	ITEM	QUANTITY		UNIT PRICE	Estimated Cost (2018) AMOUNT
1	Mobilization, Cleanup, and Demobilization	1	LS	$40,000	$40,000
2	Domestic Supply Booster Station	1	LS	$350,000	$350,000
3	Land Acquisition	400	SF	$10	$40,000
4	Check Valve Vault	2	EA	$5,000	$10,000
	Subtotal				$440,000
	Tax rate (10%)				$44,000
	Subtotal:				$484,000
	Contingency (20%)				$96,800
	TOTAL ESTIMATED CONSTRUCTION COST:				$580,800
	Engineering and Administrative Costs (25%):				$145,200
	TOTAL ESTIMATED PROJECT COST:				$730,000

ATTACHMENT A

KING COUNTY WATER DISTRICT NO. 54
PRELIMINARY PROJECT COST ESTIMATE
PROPOSED SYSTEM IMPROVEMENT NO. 5
New Office Building

NO.	ITEM	QUANTITY		UNIT PRICE	Estimated Cost (2018) AMOUNT
1	Unexpected Site Changes	1	FA	$10,000	$10,000
2	Mobilization, Cleanup, and Demobilization	1	LS	$52,000	$52,000
3	New District Office Building	1,200	SF	$400	$480,000
4	Site Work	1	LS	$25,000	$35,000
5	Erosion Control	1	LS	$5,000	$5,000

Subtotal	$582,000
Tax rate (10%)	$58,200
Subtotal:	$640,200
Contingency 25 %	$160,000
TOTAL ESTIMATED CONSTRUCTION COST:	$800,200
Engineering and Administrative Costs (25%):	$200,050
TOTAL ESTIMATED PROJECT COST:	$1,000,000

ATTACHMENT A

KING COUNTY WATER DISTRICT NO. 54
PRELIMINARY PROJECT COST ESTIMATE
PROPOSED SYSTEM IMPROVEMENT NO. 6
Marine View Drive Int Crossing at 7th Pl S

Estimated Cost
(2018)

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Unexpected Site Changes	1	FA	$10,000	$10,000
2	Mobilization, Cleanup, and Demobilization	1	LS	$12,000	$12,000
3	Traffic Control	24	HRS	$60	$1,440
4	Clearing, Grubbing, and Roadside Cleanup	1	LS	$1,000	$1,000
5	Sawcutting	10	LF	$4	$40
6	Locate Existing Utilities	1	LS	$3,000	$3,000
7	Gravel Backfill	20	TN	$25	$500
8	Foundation Gravel	-	TN	$40	$0
9	Crushed Surfacing, Top Course	160	TN	$35	$5,600
10	Cold Mix Asphalt	5	TN	$150	$750
11	HMA Cl. 1/2 PG 58-22	10	TN	$150	$1,500
12	Trench Safety Systems	1	LS	$200	$200
13	18-inch HDPE casing, 12" HDPE water main & bore pits	170	LF	$500	$85,000
14	Additional Pipe Fittings	100	LB	$4	$350
15	Connections to Existing System	2	EA	$4,000	$8,000
16	12-inch Gate Valves	2	EA	$3,000	$6,000
17	Erosion Control	1	LS	$5,000	$5,000
	Subtotal				$140,380
	Tax rate (10%)				$14,038
	Subtotal:				$154,418
	Contingency (20%)				$30,582
	TOTAL ESTIMATED CONSTRUCTION COST:				$185,000
	Engineering and Administrative Costs (25%):				$46,250
	TOTAL ESTIMATED PROJECT COST:				$231,000

KING COUNTY WATER DISTRICT NO. 54
PRELIMINARY PROJECT COST ESTIMATE
PROPOSED SYSTEM IMPROVEMENT NO. 7
Cliff Avenue South

NO.	ITEM	QUANTITY		UNIT PRICE	Estimated Cost (2018) AMOUNT
1	Unexpected Site Changes	1	FA	$10,000	$10,000
2	Mobilization, Cleanup, and Demobilization	1	LS	$21,000	$21,000
3	Traffic Control	60	HRS	$60	$3,600
4	Clearing, Grubbing, and Roadside Cleanup	1	LS	$3,000	$3,000
5	Sawcutting	1,600	LF	$4	$6,400
6	Locate Existing Utilities	1	LS	$2,000	$2,000
7	Gravel Backfill	80	TN	$25	$2,000
8	Foundation Gravel	10	TN	$40	$400
9	Crushed Surfacing, Top Course	730	TN	$35	$25,550
10	Cold Mix Asphalt	40	TN	$150	$6,000
11	HMA Cl. 1/2 PG 58-22	270	TN	$150	$40,500
12	Trench Safety Systems	1	LS	$800	$800
13	12-inch DI Water Pipe, Including Fittings	800	LF	$100	$80,000
14	Additional Pipe Fittings	400	LB	$4	$1,400
15	Connections to Existing System	3	EA	$4,000	$12,000
16	12-inch Gate Valves	4	EA	$3,000	$12,000
17	Fire Hydrants	2	EA	$5,500	$11,000
18	Service Connections, complete	2	EA	$2,500	$5,000
19	Erosion Control	1	LS	$3,200	$3,200
	Subtotal				$245,850
	Tax rate (10%)				$24,585
	Subtotal:				$270,435
	Contingency (20%)				$54,565
	TOTAL ESTIMATED CONSTRUCTION COST:				$325,000
	Engineering and Administrative Costs (25%):				$81,250
	TOTAL ESTIMATED PROJECT COST:				$406,000

ATTACHMENT A

KING COUNTY WATER DISTRICT NO. 54
PRELIMINARY PROJECT COST ESTIMATE
PROPOSED SYSTEM IMPROVEMENT NO. 8
Rainbow Lane

					Estimated Cost (2018)
NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Unexpected Site Changes	1	FA	$5,000	$5,000
2	Mobilization, Cleanup, and Demobilization	1	LS	$10,000	$10,000
3	Traffic Control	10	HRS	$60	$600
4	Clearing, Grubbing, and Roadside Cleanup	1	LS	$2,000	$2,000
5	Sawcutting	700	LF	$4	$2,800
6	Locate Existing Utilities	1	LS	$1,000	$1,000
7	Gravel Backfill	30	TN	$25	$750
8	Foundation Gravel	-	TN	$40	$0
9	Crushed Surfacing, Top Course	320	TN	$35	$11,200
10	Cold Mix Asphalt	20	TN	$150	$3,000
11	HMA Cl. 1/2 PG 58-22	120	TN	$150	$18,000
12	Trench Safety Systems	1	LS	$400	$400
13	8-inch DI Water Pipe, Including Fittings	350	LF	$75	$26,250
14	Additional Pipe Fittings	200	LB	$4	$700
15	Connections to Existing System	1	EA	$4,000	$4,000
16	8-inch Gate Valves	1	EA	$2,000	$2,000
17	Fire Hydrants	1	EA	$5,500	$5,500
18	Service Connections, complete	8	EA	$2,500	$20,000
19	Erosion Control	1	LS	$1,400	$1,400
	Subtotal				$114,600
	Tax rate (10%)				$11,460
	Subtotal:				$126,060
	Contingency (20%)				$24,940
	TOTAL ESTIMATED CONSTRUCTION COST:				$151,000
	Engineering and Administrative Costs (25%):				$37,750
	TOTAL ESTIMATED PROJECT COST:				$189,000

KING COUNTY WATER DISTRICT NO. 54
PRELIMINARY PROJECT COST ESTIMATE
PROPOSED SYSTEM IMPROVEMENT NO. 9
226th Place South

NO.	ITEM	QUANTITY		UNIT PRICE	Estimated Cost (2018) AMOUNT
1	Unexpected Site Changes	1	FA	$5,000	$5,000
2	Mobilization, Cleanup, and Demobilization	1	LS	$11,000	$11,000
3	Traffic Control	10	HRS	$60	$600
4	Clearing, Grubbing, and Roadside Cleanup	1	LS	$2,000	$2,000
5	Sawcutting	700	LF	$4	$2,800
6	Locate Existing Utilities	1	LS	$1,000	$1,000
7	Gravel Backfill	30	TN	$25	$750
8	Foundation Gravel	-	TN	$40	$0
9	Crushed Surfacing, Top Course	320	TN	$35	$11,200
10	Cold Mix Asphalt	20	TN	$150	$3,000
11	HMA Cl. 1/2 PG 58-22	120	TN	$150	$18,000
12	Trench Safety Systems	1	LS	$400	$400
13	8-inch DI Water Pipe, Including Fittings	350	LF	$75	$26,250
14	Additional Pipe Fittings	200	LB	$4	$700
15	Connections to Existing System	1	EA	$4,000	$4,000
16	8-inch Gate Valves	1	EA	$2,000	$2,000
17	Fire Hydrants	3	EA	$5,500	$16,500
18	Service Connections, complete	7	EA	$2,500	$17,500
19	Erosion Control	1	LS	$1,400	$1,400

Subtotal	$124,100
Tax rate (10%)	$12,410
Subtotal:	$136,510
Contingency (20%)	$27,490
TOTAL ESTIMATED CONSTRUCTION COST:	$164,000
Engineering and Administrative Costs (25%):	$41,000
TOTAL ESTIMATED PROJECT COST:	$205,000

ATTACHMENT A

KING COUNTY WATER DISTRICT NO. 54
PRELIMINARY PROJECT COST ESTIMATE
PROPOSED SYSTEM IMPROVEMENT NO. 10
13th Avenue South

					Estimated Cost (2018)
NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Unexpected Site Changes	1	FA	$7,500	$7,500
2	Mobilization, Cleanup, and Demobilization	1	LS	$17,000	$17,000
3	Traffic Control	20	HRS	$60	$1,200
4	Clearing, Grubbing, and Roadside Cleanup	1	LS	$3,000	$3,000
5	Sawcutting	1,100	LF	$4	$4,400
6	Locate Existing Utilities	1	LS	$1,000	$1,000
7	Gravel Backfill	50	TN	$25	$1,250
8	Foundation Gravel	10	TN	$40	$400
9	Crushed Surfacing, Top Course	500	TN	$35	$17,500
10	Cold Mix Asphalt	30	TN	$150	$4,500
11	HMA Cl. 1/2 PG 58-22	190	TN	$150	$28,500
12	Trench Safety Systems	1	LS	$600	$600
13	8-inch DI Water Pipe, Including Fittings	550	LF	$75	$41,250
14	Additional Pipe Fittings	200	LB	$4	$700
15	Connections to Existing System	1	EA	$4,000	$4,000
16	8-inch Gate Valves	1	EA	$2,000	$2,000
17	Fire Hydrants	2	EA	$5,500	$11,000
18	Service Connections, complete	17	EA	$2,500	$42,500
19	Erosion Control	1	LS	$2,200	$2,200

Subtotal	$190,500
Tax rate (10%)	$19,050
Subtotal:	$209,550
Contingency (20%)	$41,450
TOTAL ESTIMATED CONSTRUCTION COST:	$251,000
Engineering and Administrative Costs (25%):	$62,750
TOTAL ESTIMATED PROJECT COST:	$314,000

ATTACHMENT A

KING COUNTY WATER DISTRICT NO. 54
PRELIMINARY PROJECT COST ESTIMATE
PROPOSED SYSTEM IMPROVEMENT NO. 11
South 229th Street

					Estimated Cost (2018)
NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Unexpected Site Changes	1	FA	$10,000	$10,000
2	Mobilization, Cleanup, and Demobilization	1	LS	$16,000	$16,000
3	Traffic Control	60	HRS	$60	$3,600
4	Clearing, Grubbing, and Roadside Cleanup	1	LS	$3,000	$3,000
5	Sawcutting	1,300	LF	$4	$5,200
6	Locate Existing Utilities	1	LS	$1,000	$1,000
7	Gravel Backfill	60	TN	$25	$1,500
8	Foundation Gravel	10	TN	$40	$400
9	Crushed Surfacing, Top Course	600	TN	$35	$21,000
10	Cold Mix Asphalt	30	TN	$150	$4,500
11	HMA Cl. 1/2 PG 58-22	220	TN	$150	$33,000
12	Trench Safety Systems	1	LS	$700	$700
13	8-inch DI Water Pipe, Including Fittings	650	LF	$75	$48,750
14	Additional Pipe Fittings	300	LB	$4	$1,050
15	Connections to Existing System	1	EA	$4,000	$4,000
16	8-inch Gate Valves	2	EA	$2,000	$4,000
17	Fire Hydrants	1	EA	$5,500	$5,500
18	Service Connections, complete	7	EA	$2,500	$17,500
19	Erosion Control	1	LS	$2,600	$2,600
	Subtotal				$183,300
	Tax rate (10%)				$18,330
	Subtotal:				$201,630
	Contingency (20%)				$40,370
	TOTAL ESTIMATED CONSTRUCTION COST:				$242,000
	Engineering and Administrative Costs (25%):				$60,500
	TOTAL ESTIMATED PROJECT COST:				$303,000

ATTACHMENT A

KING COUNTY WATER DISTRICT NO. 54
PRELIMINARY PROJECT COST ESTIMATE
PROPOSED SYSTEM IMPROVEMENT NO. 12
South 216th Street from 1st Court to 6th Avenue South

					Estimated Cost (2018)
NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Unexpected Site Changes	1	FA	$10,000	$10,000
2	Mobilization, Cleanup, and Demobilization	1	LS	$42,000	$42,000
3	Traffic Control	120	HRS	$60	$7,200
4	Clearing, Grubbing, and Roadside Cleanup	1	LS	$7,000	$7,000
5	Sawcutting	2,900	LF	$4	$11,600
6	Locate Existing Utilities	1	LS	$3,000	$3,000
7	Gravel Backfill	130	TN	$25	$3,250
8	Foundation Gravel	20	TN	$40	$800
9	Crushed Surfacing, Top Course	1,330	TN	$35	$46,550
10	Cold Mix Asphalt	80	TN	$150	$12,000
11	HMA Cl. 1/2 PG 58-22	490	TN	$150	$73,500
12	Trench Safety Systems	1	LS	$1,500	$1,500
13	8-inch DI Water Pipe, Including Fittings	1,450	LF	$75	$108,750
14	Additional Pipe Fittings	700	LB	$4	$2,450
15	Connections to Existing System	6	EA	$4,000	$24,000
16	8-inch Gate Valves	12	EA	$2,000	$24,000
17	Fire Hydrants	3	EA	$5,500	$16,500
18	Service Connections, complete	28	EA	$2,500	$70,000
19	Erosion Control	1	LS	$5,800	$5,800

Subtotal...	$469,900
Tax rate (10%)…....………...…...…..…………………………..………………………….	$46,990
Subtotal:..	$516,890
Contingency (20%)………..…....….…………………………..………………………….	$103,110
TOTAL ESTIMATED CONSTRUCTION COST:...	$620,000
Engineering and Administrative Costs (25%):....................................….....................…	$155,000
TOTAL ESTIMATED PROJECT COST:..	$775,000

APPENDIX P

SEPA CHECKLIST

King County Water District 54
2019 Water System Plan

ENVIRONMENTAL CHECKLIST

Purpose of checklist:

The State Environmental Policy Act (SEPA), chapter 43.21C RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Governmental agencies use this checklist to determine whether the environmental impacts of your proposal are significant, requiring preparation of an EIS. Answer the questions briefly, with the most precise information known, or give the best description you can.

You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer, or if a question does not apply to your proposal, write "do not know" or "does not apply." Complete answers to the questions now may avoid unnecessary delays later.

Some questions ask about governmental regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the governmental agencies can assist you.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Use of checklist for nonproject proposals:

Complete this checklist for nonproject proposals, even though questions may be answered "does not apply." IN ADDITION, complete the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D).

For nonproject actions, the references in the checklist to the words "project," "applicant," and "property or site" should be read as "proposal," "proposer," and "affected geographic area," respectively.

A. BACKGROUND

1. Name of proposed project, if applicable:

King County Water District 54 – Water System Plan

2. Name of applicant:

King County Water District 54

3. Address and phone number of applicant and contact person:

Eric Clarke, Manager
922 South 219th Street
Des Moines, WA 98198

4. Date checklist prepared:

April 26, 2019

5. Agency requesting checklist:

King County Water District 54

6. Proposed timing or schedule (including phasing, if applicable):

Water System Plan developed in 2017 and 2018

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

This plan presents a Capital Facilities Plan. The projects will be implemented as financing becomes available.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

None.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

This plan will require approval by the Washington Department of Health and concurrency acceptance by adjoining jurisdictions.

10. List any government approvals or permits that will be needed for your proposal, if known.

Permits for specific construction projects will be obtained prior to construction.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The Water System Plan describes and evaluates the District's water system and recommends capital improvement projects to improve the system. The plan describes standards, policies, service area, operations and maintenance, identifies system deficiencies and outlines a financial plan to implement the capital improvement plan. It will be used by the District for future planning.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

The Water System Plan covers the District's service area of which approximately 90% is within the City of Des Moines with the remainder in the City of Normandy Park.

B. ENVIRONMENTAL ELEMENTS

1. **Earth**

a. General description of the site (circle one): *Flat*, rolling, [✓ ***hilly***], steep slopes,
mountainous,
other . .

b. What is the steepest slope on the site (approximate percent slope)?

There are some steep slopes within the service area. Generally the water system is on slopes of
10% or less.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime
farmland.

Sand and Gravel with Fill material adjacent to the Des Moines Marina

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

None that will impact the District system.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed.
Indicate source of fill.

Fill and grade quantities will be determined on a project specific basis.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Erosion during construction will be addressed through project specific erosion control plans.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

To be determined on a project specific basis.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Measures to reduce and control erosion will be implemented on a project specific basis as construction occurs.

a. **Air**

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

Dust and construction equipment exhaust fumes during construction.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

None.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

Dust control and standard construction equipment exhaust measures during construction.

3. **Water**

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type
and provide names. If appropriate, state what stream or river it flows into.

The District's western boundary to Puget Sound. Des Moines Creek flows through the northern portion of the District's service area.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described
waters? If yes, please describe and attach available plans.

No capital project are proposed within 200 feet of these waters

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected.
Indicate the source of fill material.

None.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

Not applicable.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

No capital projects are proposed within the floodplain.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

No.

b. Ground:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.

The District's water source is from wells. No changes are anticipated as a result of this Water System Plan..

2) Describe waste material that will be discharged into the ground from septic tanks or other
sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.).

Not applicable.

3) Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

Not applicable.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal,
if any (include quantities, if known). Where will this water flow? Will this water flow into
other waters? If so, describe.

To be determined on a project specific basis.

2) Could waste materials enter ground or surface waters? If so, generally describe.

To be determined on a project specific basis.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

To be determined on a project specific basis.

4. **Plants**

a. Check or circle types of vegetation found on the site:

X deciduous tree: alder, maple, aspen, other
X evergreen tree: fir, cedar, pine, other

X shrubs
X grass
X pasture
crop or grain
wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
water plants: water lily, eelgrass, milfoil, other
other types of vegetation

b. What kind and amount of vegetation will be removed or altered?

To be determined on a project specific basis.

c. List threatened or endangered species known to be on or near the site.

To be determined on a project specific basis.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

To be determined on a project specific basis.

5. **Animals**

a. Circle any birds and animals which have been observed on or near the site or are known to be on or near the site:

birds: ***hawk, heron, eagle, songbirds, other***:
mammals: deer, bear, elk, beaver, other:
fish: bass, ***salmon,*** trout, herring, ***shellfish***, other:

b. List any threatened or endangered species known to be on or near the site.

Puget Sound Chinook salmon

c. Is the site part of a migration route? If so, explain.

The District service area is located within the Pacific Flyway

d. Proposed measures to preserve or enhance wildlife, if any:

None anticipated but to be determined on a project specific basis.

6. Energy and natural resources

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Not applicable

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

Not applicable

7. Environmental health

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal?
If so, describe.

Not applicable except for potential impacts during construction.

1) Describe special emergency services that might be required.

Project requirements will include onsite spill response and first aid.

2) Proposed measures to reduce or control environmental health hazards, if any:

Project requirements will include onsite spill response and first aid and will require work to be conducted in compliance with industry standards.

b. **Noise**

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

None.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Noise will be generated during specific construction projects.

3) Proposed measures to reduce or control noise impacts, if any:

Standard muffler systems on construction equipment and work hours restricted to comply with the City of Des Moines and the City of Normandy Park requirements.

8. **Land and shoreline use**

a. What is the current use of the site and adjacent properties?

The District service area land use is a mix of commercial, multifamily/apartments and single family.

b. Has the site been used for agriculture? If so, describe.

Not recently

c. Describe any structures on the site.

To be determined on a project specific basis.

d. Will any structures be demolished? If so, what?

To be determined on a project specific basis.

e. What is the current zoning classification of the site?

To be determined on a project specific basis.

f. What is the current comprehensive plan designation of the site?

To be determined on a project specific basis.

g. If applicable, what is the current shoreline master program designation of the site?

To be determined on a project specific basis.

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

To be determined on a project specific basis.

i. Approximately how many people would reside or work in the completed project?

None.

j. Approximately how many people would the completed project displace?

None.

k. Proposed measures to avoid or reduce displacement impacts, if any:

Not applicable.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

To be determined on a project specific basis.

9. **Housing**

a. Approximately how many units would be provided, if any? Indicate whether high, middle,
or low-income housing.

Not applicable.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or
low-income housing.

Not applicable.

c. Proposed measures to reduce or control housing impacts, if any:

Not applicable.

10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

The tallest features would likely be fire hydrants.

b. What views in the immediate vicinity would be altered or obstructed?

None.

c. Proposed measures to reduce or control aesthetic impacts, if any:

Not applicable.

11. Light and glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

Not applicable.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

Not applicable.

c. What existing off-site sources of light or glare may affect your proposal?

None.

d. Proposed measures to reduce or control light and glare impacts, if any:

12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?

Not applicable.

b. Would the proposed project displace any existing recreational uses? If so, describe.

To be determined on a project specific basis.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

Not applicable.

13. **Historic and cultural preservation**

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation
registers known to be on or next to the site? If so, generally describe.

To be determined on a project specific basis.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

To be determined on a project specific basis.

c. Proposed measures to reduce or control impacts, if any:
To be determined on a project specific basis.

14. **Transportation**

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

Not applicable.

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

Not applicable.

c. How many parking spaces would the completed project have? How many would the project
eliminate?

To be determined on a project specific basis.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets,
not including driveways? If so, generally describe (indicate whether public or private).

To be determined on a project specific basis.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation?
If so, generally describe.

To be determined on a project specific basis.

f. How many vehicular trips per day would be generated by the completed project? If known,
indicate when peak volumes would occur.

Not applicable.

g. Proposed measures to reduce or control transportation impacts, if any:

Not applicable.

15. **Public services**

a. Would the project result in an increased need for public services (for example: fire protection,
police protection, health care, schools, other)? If so, generally describe.

To be determined on a project specific basis.

b. Proposed measures to reduce or control direct impacts on public services, if any.

Not applicable.

16. **Utilities**

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse [✓ service, teleph]one,
sanitary sewer, septic system, other.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the
general construction activities on the site or in the immediate vicinity which might be needed.

None anticipated but to be determined on a project specific basis.

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: Warren W Perkins

Date Submitted: 5/1/19

D. SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS

(do not use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production,
storage, or release of toxic or hazardous substances; or production of noise?

There should be no increased likely discharge to the environment except during construction during specific construction projects.

Proposed measures to avoid or reduce such increases are:

Not applicable.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

There should be no impact to plants or animals except for possible disturbance during specific construction projects. Those impacts, if any, will be assessed during the planning and construction period of specific projects.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

None anticipated but to be determined on a project specific basis.

3. How would the proposal be likely to deplete energy or natural resources?

Not applicable.

Proposed measures to protect or conserve energy and natural resources are:

Not applicable.

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

None impact anticipated but to be determined on a project specific basis.

Proposed measures to protect such resources or to avoid or reduce impacts are:
To be determined on a project specific basis

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

Generally there should be no impact however, any impacts will be determined on a project specific basis

Proposed measures to avoid or reduce shoreline and land use impacts are:

To be determined on a project specific basis

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

Not applicable.

Proposed measures to reduce or respond to such demand(s) are:

Not applicable.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

All work will be completed in compliance with existing laws and codes.

APPENDIX Q

COMMENTS AND CORRESPONDENCE

ATTACHMENT A

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Local Government Consistency Review Checklist

Water System Name: King County Water District No. 54 PWS ID: 39950 4

Planning/Engineering Document Title: Water System Plan Plan Date: February 2011

Local Government with Jurisdiction: City of Normandy Park

WAC 246-290-108 Consistency with local plans and regulations:
Consistency with local plans and regulations applies to planning and engineering documents under WAC 246-290-106, 246-290-107, and 246-290-110(4)(b (ii).

1) Municipal water suppliers must include a consistency review and supporting documentation in its planning or engineering document describing how it has addressed consistency with **local plans and regulations**. This review must include specific elements of local plans and regulations, as they reasonably relate to water service as determined by Department of Health (DOH). Complete the table below and see instructions on back.

Local Government Consistency Statement	Page(s) in Planning Document	Yes – No – Not Applicable
a) The water system service area is consistent with the adopted land use and zoning within the applicable service area.	2-1	✓ Yes
b) The six-year growth projection used to forecast water demand is consistent with the adopted city/county's population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection and methodology.	**Table 2-9** **Page 2-8**	✓ Yes
c) Applies to cities and towns that provide water service: All water service area policies of the city or town are consistent with the utility service extension ordinances of the city or town.	N/A	N/A
d) Service area policies for new service connections are consistent with the adopted local plans and adopted development regulations of all jurisdictions with authority over the service area [City(ies), County(ies)].	Page 1-2	N/A
e) Other relevant elements related to water supply are addressed in the water system plan, if applicable; Coordinated Water System plans, Regional Wastewater plans, Reclaimed Water plans, Groundwater Area Management plans, and Capital Facilities Element of Comprehensive plans.		N/A

I certify that the above statements are true to the best of my knowledge and that these specific elements are consistent with adopted local plans and development regulations.

Signature

6/13/11
Date

Peter Landry P.W. Director City of Normandy Park
Printed Name, Title, & Jurisdiction

Washington State Department of
Health
Division of Environmental Health
Office of Drinking Water

Local Government Consistency Review Checklist

Water System Name: King County Water District 54 PWS ID: 39950

Planning/Engineering Document Title: Water System Plan Plan Date: May 2019

Local Government with Jurisdiction: City of Des Moines

WAC 246-290-108 Consistency with local plans and regulations:
Consistency with local plans and regulations applies to planning and engineering documents under WAC 246-290-106, 246-290-107, and 246-290-110(4)(b (ii).

1) Municipal water suppliers must include a consistency review and supporting documentation in its planning or engineering document describing how it has addressed consistency with **local plans and regulations**. This review must include specific elements of local plans and regulations, as they reasonably relate to water service as determined by Department of Health (DOH). Complete the table below and see instructions on back.

Local Government Consistency Statement	**Page(s) in Planning Document**	**Yes – No – Not Applicable**
a) The water system service area is consistent with the adopted land use and zoning within the applicable service area.	Fig 1-3 2-14 - 2-16	Yes
b) The six-year growth projection used to forecast water demand is consistent with the adopted city/county's population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection and methodology.	2-14 - 2-16	Yes
c) Applies to cities and towns that provide water service: All water service area policies of the city or town are consistent with the utility service extension ordinances of the city or town.		
d) Service area policies for new service connections are consistent with the adopted local plans and adopted development regulations of all jurisdictions with authority over the service area [City(ies), County(ies)].	1-10 - 1-11	Yes
e) Other relevant elements related to water supply are addressed in the water system plan, if applicable; Coordinated Water System plans, Regional Wastewater plans, Reclaimed Water plans, Groundwater Area Management plans, and Capital Facilities Element of Comprehensive plans.		

I certify that the above statements are true to the best of my knowledge and that these specific elements are consistent with adopted local plans and development regulations.

Signature Date

Printed Name, Title, & Jurisdiction

Consistency Review Guidance

For Use by Local Governments and Municipal Water Suppliers

This checklist may be used to meet the requirements of WAC 246-290-108. When using an alternative format, it must describe all of the elements; 1a), b), c), d), and e), when they apply.

For **water system plans (WSP)**, a consistency review is required for the retail service area and any additional areas where a municipal water supplier wants to expand its water right's place of use.

For **small water system management programs**, a consistency review is only required for areas where a municipal water supplier wants to expand its water right's place of use. If no water right place of use expansion is requested, a consistency review is not required.

For **engineering documents**, a consistency review is required for areas where a municipal water supplier wants to expand its water right's place of use (water system plan amendment is required). For non-community water systems, a consistency review is required when requesting a place of use expansion. All engineering documents must be submitted with a service area map per WAC 246-290-110(4)(b)(ii).

A) Documenting Consistency: Municipal water suppliers must document all of the elements in a consistency review per WAC 246-290-108.

1 a) Provide a copy of the adopted **land use/zoning** map corresponding to the service area. The uses provided in the WSP should be consistent with the adopted land use/zoning map. Include any other portions of comprehensive plans or development regulations that are related to water supply planning.

1 b) Include a copy of the **six-year growth projections** that corresponds to the service area. If the local population growth rate projections are not used, provide a detailed explanation on why the chosen projections more accurately describe the expected growth rate. Explain how it is consistent with the adopted land use.

1c) Include water service area policies and show that they are consistent with the **utility service extension ordinances** within the city or town boundaries. This applies to cities and towns only.

1 d) Include all **service area policies** for how new water service will be provided to new customers.

1 e) **Other relevant elements** related to water supply planning as determined by the department (DOH). See Local Government Consistency – Other Relevant Elements, Policy B.07, September 2009.

B) Documenting an Inconsistency: Please document the inconsistency, include the citation from the comprehensive plan or development regulation, and provide direction on how this inconsistency can be resolved.

C) Documenting Lack of Consistency Review by Local Government: Where the local government with jurisdiction did not provide a consistency review, document efforts made and the amount of time provided to the local government for their review. Please include: name of contact, date, and efforts made (letters, phone calls, and e-mails). In order to self-certify, please contact the DOH Planner.

ATTACHMENT A

Warren Perkins

From: Warren Perkins <wperkins@g-o.com>
Sent: Wednesday, June 12, 2019 3:35 PM
To: 'Marc Montieth'
Subject: RE: WD 54

Thank you Marc, great catch!

Warren Perkins, *PE | 206.284.0860 p | 206.283.3206 f*
Gray & Osborne, Inc. *| 1130 Rainier Ave S., Suite 300, Seattle, WA, 98144*

From: Marc Montieth <marc@midwaysewer.org>
Sent: Wednesday, June 12, 2019 2:52 PM
To: 'Warren Perkins' <wperkins@g-o.com>
Subject: WD 54

Hi Warren,

I took a look at the Water District 54 water plan you sent over and I noticed that it may contain a math error in Capital improvement Plan Numbers 4 and 5.

Sincerely,

Marc Montieth
General Manger
Midway Sewer District
(206) 824-4960

ATTACHMENT A

1889

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Regional Office • 3190 160th Ave SE • Bellevue, WA 98008-5452 • 425-649-7000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

June 26, 2019

Eric Clarke
District Manager
922 So 219th Street
Des Moines, WA 98198

Re: King County Water District No. 54; ID #39950, King County; 2019 Comprehensive Water System Plan Review (DOH Submittal #19-0604)

Dear Mr. Clarke:

Consistent with the Memorandum of Understanding between the Departments of Ecology and Health, I have reviewed the relevant portions of the May 2019 King County Water District No. 54 Comprehensive Water System Plan and offer the following comments.

There are differences between the water right information in the Water System Plan (WSP) and Ecology records for the districts water rights portfolio. The total system portfolio quantities in table E-1 (1,850 gpm and 1,319 ac-ft/yr) and 1-3 (2,025 gpm and 1,319 ac-ft/yr) do not agree with each other. Ecology records indicate that the Qi total 2,025 gpm in Table 1-3 is correct. The incorrect 1,850 gpm Qi total also occurs on page 4-6.

Additionally, the entry of Qa in Table 1-3 has errors. Ground water certificate (GWC) 2765A was issued with a provision that capped total system Qa at 734 ac-ft/yr and GWC 6076A is provisioned with a system cap of 896 ac-ft/yr. In each case the cap has the effect of creating non-additive (supplemental) Qi. To make Table 1-3 correct requires placing zero additive (primary) Qa in column 5 for GWC 2765A while entering 734 af-ft/yr in column 6 (supplemental). The entries for GWC 6076A have the right quantities but have confusing superscript references.

Thank you for the opportunity to review the 2019 Comprehensive Water System Plan for King County Water District No 54. Please contact me at (425) 649-7077 or at Doug.Wood@ecy.wa.gov if you have questions regarding this review or need additional information.

Sincerely,

Douglas H. Wood, MS, LHG
Water Resource Program

cc: Richard Rodriguez, DOH NWDWRO

ATTACHMENT A

June 26, 2019

Eric Clarke
King County WD 54
922 So 219th Street
Des Moines, WA 98198

Subject: King County WD 54; PWS ID#39950; King County; Submittal #19-0604; 2019 Comprehensive Water System Plan

Dear Mr. Clarke:

Ecology received a request from the Department of Health (DOH) to review and comment on the type of document for the name of water system water system. Below are Ecology's comments.

_____ Ecology has no comments on the document.

__X__ Attached are Ecology's comments on the document. Please revise the document based on the attached comments.

_____ Ecology has taken regulatory action against name of water system which can be appealed directly to the Pollution Control Hearings Board (attached). Consistent with the *Joint Review Procedures for Planning and Engineering Documents*, Ecology requests DOH use this information in determining the water system's capacity.

_____ A "not inconsistent" determination is not required because there is not approved/adopted watershed plan for WRIA name or the expansion of the place of use is not needed.

_____ Ecology has determined this type of document is "not inconsistent" with the adopted/approved watershed plan for WRIA name.

_____ Ecology has determined this document is inconsistent with the approved/adopted watershed plan for WRIA name. Please revise based on the attached comments.

_____ Ecology has determined this document is inconsistent with the approved/adopted watershed plan for WRIA name in one portion of the service area. The place of use can be expanded to all areas except as identified in the attached map or you may revise based on the attached comments.

Please send a copy of your responses to me and the DOH Regional Office. If you have any questions, please contact me at (425) 649-7077 or via email at Doug.Wood@ecy.wa.gov.

Sincerely,

Water System Plan Reviewer
Department of Ecology

Enclosures: Comments on document

cc: Richard Rodriguez, DOH NWDWRO

ATTACHMENT A

Warren Perkins

From:	Wood, Doug (ECY) <DWOO461@ECY.WA.GOV>
Sent:	Monday, July 01, 2019 12:50 PM
To:	Warren Perkins
Subject:	RE: WD 54

Yes, you are correct.

Doug Wood
Water Resources Program
Dept. of Ecology - NW Region
Bellevue, WA (425) 649-7077

From: Warren Perkins [mailto:wperkins@g-o.com]
Sent: Monday, July 01, 2019 12:30 PM
To: Wood, Doug (ECY) <DWOO461@ECY.WA.GOV>
Subject: WD 54

Doug,

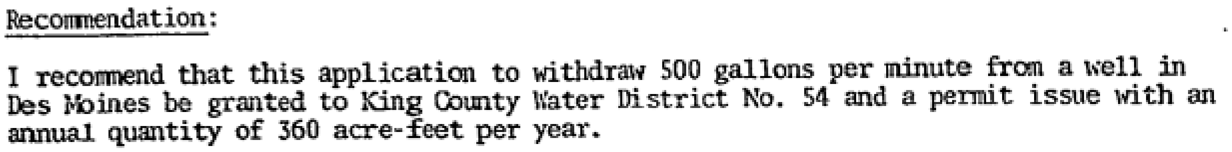
Thanks for the phone call this morning. I would like to clarify Table 1-3 in the Water Plan, and be sure you concur.

(May 3, 1954) 2765-A, and paper trail, caps District at 734 ac-ft/yr
(May 12, 1966) 6076-A, and paper trail, gives District an additional 162 ac-ft/yr for a total of 896 ac-ft/yr

(July 24, 1981) 23881-C, and paper trail, gives District and additional 360 ac-ft/yr for a total 1256 ac-ft/yr. See clips below. I don't see that this is supplemental in the paper trail.

Is this correct?

From the Report of Examination

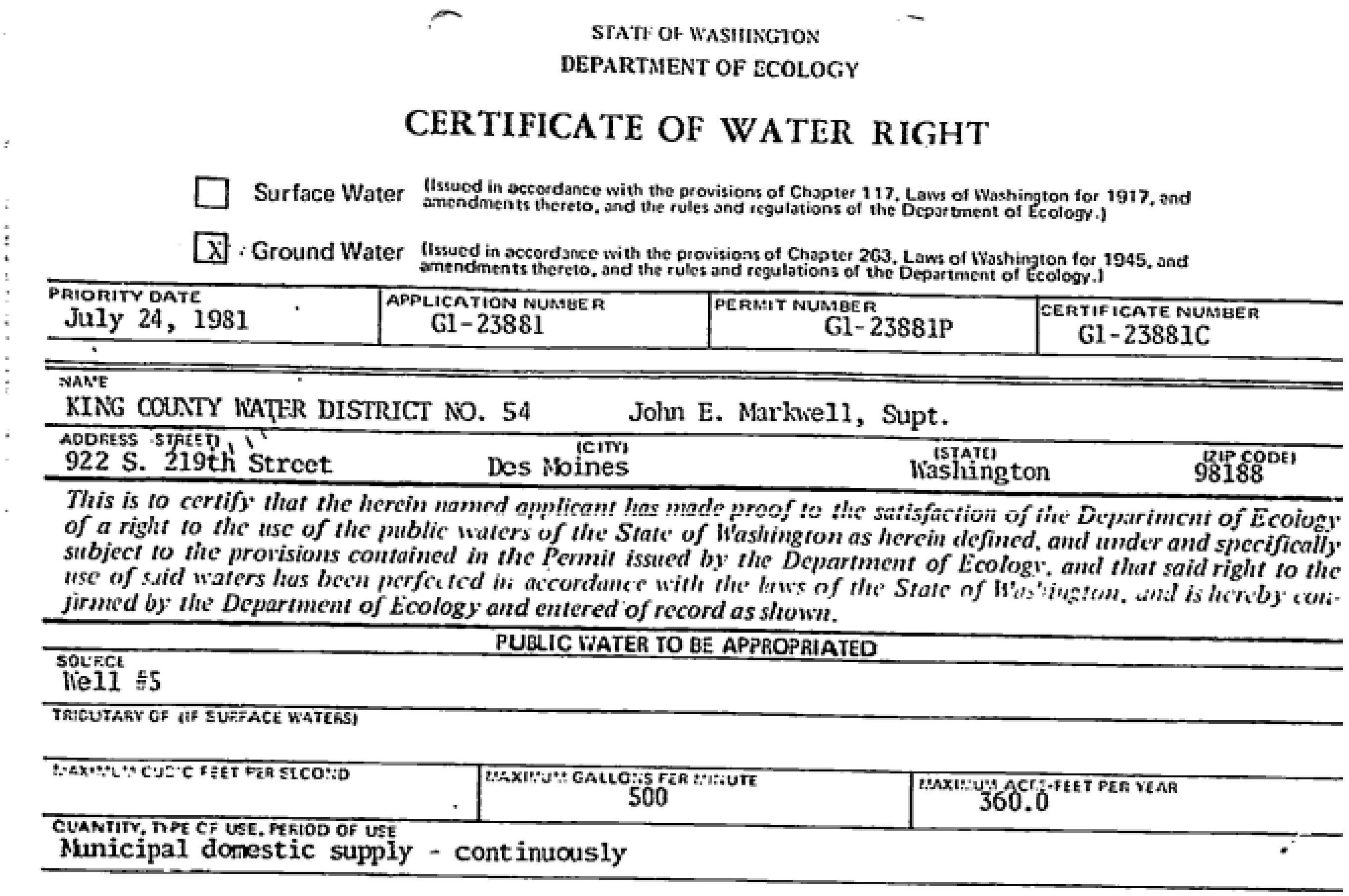


Recommendation:

I recommend that this application to withdraw 500 gallons per minute from a well in Des Moines be granted to King County Water District No. 54 and a permit issue with an annual quantity of 360 acre-feet per year.

Certificate

ATTACHMENT A



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

CERTIFICATE OF WATER RIGHT

☐ Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

☒ Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
July 24, 1981	G1-23881	G1-23881P	G1-23881C

NAME
KING COUNTY WATER DISTRICT NO. 54 John E. Markwell, Supt.

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
922 S. 219th Street	Des Moines	Washington	98188

This is to certify that the herein named applicant has made proof to the satisfaction of the Department of Ecology of a right to the use of the public waters of the State of Washington as herein defined, and under and specifically subject to the provisions contained in the Permit issued by the Department of Ecology, and that said right to the use of said waters has been perfected in accordance with the laws of the State of Washington, and is hereby confirmed by the Department of Ecology and entered of record as shown.

PUBLIC WATER TO BE APPROPRIATED

SOURCE
Well #5

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	500	360.0

QUANTITY, TYPE OF USE, PERIOD OF USE
Municipal domestic supply - continuously

Warren Perkins, PE | 206.284.0860 p | 206.283.3206 f
Gray & Osborne, Inc. | 1130 Rainier Ave S., Suite 300, Seattle, WA, 98144

ATTACHMENT A

King County

Utilities Technical Review Committee
Department of Natural Resources and Parks
King Street Center
210 South Jackson Street, Suite 503
Seattle, WA 98104-3855
www.kingcounty.gov

July 1, 2019

Eric Clarke, District Manager
King County Water District 54
922 So 219th Street
Des Moines, WA 98198

Dear Mr. Clarke:

Thank you for submitting the draft King County Water District 54, Comprehensive Water System Plan, May 2019. The plan was received from you consultant, Mr. Warren Perkins, on June 19, 2019. In accordance with King County Code 13.24, King County's Utilities Technical Review Committee (UTRC) has reviewed the Plan for consistency with the King County Comprehensive Plan and the King County Code (KCC). In reviewing the Plan, the UTRC noted the Plan is well written, easy to follow, and is largely consistent with the County's comprehensive plan and code. We have identified four points of clarification that are necessary before we can make a recommendation to the King County Council for approval of the District's final plan. We request you include the following information in your final plan:

1. Details regarding when the time-period starts for measuring timely and reasonable service for a request for service.
2. Details regarding what constitutes a reasonable response to a request for service.
3. Consistency statements from the Cities of Des Moines and Normandy Park that affirm the water system plan is consistent with their respective planning efforts.
4. The State Environmental Policy Act decision or determination on the checklist.

We look forward to seeing the final Plan and working with you to secure the King County Council's approval. The Council's action will represent King County's final action on the Plan. If you have any questions or concerns about any of the information in this letter, please do not hesitate to call me at 206-477-5387 or email me at Steve.Hirschey@kingcounty.gov.

Sincerely,

MICHAEL GALVAN

Stephen Hirschey
Chair, Utilities Technical Review Committee

cc: Richard Rodriguez, Regional Planner, Washington State Department of Health
Warren Perkins, Gray & Osborne Consulting Engineers, Inc.

ATTACHMENT A

King County

Department of
Natural Resources and Parks
Wastewater Treatment Division

File Name: Q:\WTD\Projects\UTRC\Projects\KCWD54_wells.mxd crosss

Data Source: King County; Washington State Dept. of Health

Group A & B Wells Within King County Water District 54

ATTACHMENT A

HIGHLINE WATER DISTRICT

Serving the Southwest Metropolitan Area since 1946

July 22, 2019

Warren Perkins, PE
Gray and Osborne
1130 Rainier Ave S, Suite 300
Seattle WA 98144

Re: King County Water District 54 Water System Plan
Draft 2019 WSP Review

Dear Warren,

Highline Water District (HWD) appreciates the opportunity to review and comment on the Draft Water District 54 Water System Plan. In general, we find the plan consistent with established policies and mutual understandings between our agencies.

We noticed the HWD Agreement for Services to assist WD54 expired in 2015. We recommend the contract be amended to extend its term if WD54 intends for HWD to provide services in the future. Please let me know the District's intent.

Again, thank you for the opportunity to comment. Please contact me at 206-592-8904 if you have any follow up questions.

Sincerely,

Jeremy S. DelMar, PE
Engineering and Operations Manager
Highline Water District

Cc: Eric Clarke, Water System Manager, Water District 54

Attachment

23828 30th Ave. S. ▪ Kent, WA 98032 ▪ (206) 824-0375 ▪ FAX (206) 824-0806 ▪ www.highlinewater.org

ATTACHMENT A

City of Des Moines

PLANNING, BUILDING AND PUBLIC WORKS
21650 11th AVENUE SOUTH
DES MOINES, WASHINGTON 98198-6398
(206) 870-6522 FAX: (206) 870-6596
WWW.DESMOINESWA.GOV

July 30, 2019

Eric Clarke, District Manager
King County Water District #54
922 South 219th Street
Des Moines, WA 98198-6344

RE: Comprehensive Water System Plan Review – Response to letter dated 7/19/2019

Dear Mr. Clarke,

I would like to thank you and Gray & Osborne for taking the time to present the Comprehensive Water System Plan to our City Council Environment Committee last week. I also appreciate your letter dated 7/19/2019 that does help explain some of the concerns the Committee had about your water system. The City will be passing this information on to Century West Engineering (CWE), who the City has hired to assist in the review of your Plan.

While City staff normally reviews comprehensive plans for consistency with our City Comprehensive Plan, given recent problems related to system bacteria, the recent water main break in our downtown area (8th Avenue), structural concerns with the elevated reservoir and the extent of aging asbestos concrete piping in the system, the City has decided to conduct an independent review using CWE. The focus of the review by CWE will be to determine if the plan adequately evaluates the portion of the system that lies within the City (excludes Normandy Park), identifies system deficiencies, plans for the improvements necessary to address those deficiencies and to accommodate the anticipated growth within the City.

The City would appreciate cooperation and assistance in providing information to CWE needed to conduct its review. Upon completion of the review, and after any comments have been adequately addressed by the District, the City will be able to approve the Plan. While the City is allowed 90 days to conduct the review and either reject, conditionally approve, or approve the plan, we anticipate CWE to complete its review and provide its findings in an expeditious manner and within that timeframe. However, if additional time is needed to conduct the review, the City will be making a formal request to the District to extend the 90-day review period.

A vibrant community depends on a healthy water utility. Therefore, Des Moines wants to make sure that the utilities serving our city have a well thought out, thorough, forward-thinking plan. Thank you for the opportunity to comment on your Comprehensive Water Plan.

Sincerely,

Matt Pina

Matt Pina, Mayor

cc: Des Moines City Council
Michael Matthias, City Manager<
Dan Brewer, Chief Operations Officer
Brandon Carver, Public Works Director
Loren Reinhold, SWM/Environmental Manager

ATTACHMENT A

King County Water District #54
922 South 219th Street
Des Moines, WA 98198-6344
(206)878-7210 Fax: (206)824-1909

August 6, 2019

Mayor Matt Pina
City of Des Moines
21630 11th Ave So
Des Moines, WA 98198

RE: Comprehensive Water System Plan Review - Response to letter dated July 30, 2019

Dear Mayor Pina:

Thank you for your letter of July 30, 2019. We presented the District's Water System Plan to you and the City Council Environment Committee as a courtesy and to solicit the City's input. Per WAC 246-290-108 the District is required to request the completion of a Consistency Statement from the local jurisdiction(s). The Consistency Statement requirements are discussed in the WAC. In addition, as you stated, the review period is 90 days. The Water System Plan was hand delivered to the City on June 6, 2019.

At this time the Water System Plan is under review by the Washington Department of Health. We would appreciate the City's response to the Consistency Statement by the 4th of September. We would also like to take this opportunity to clarify our July 19th letter to you. As shown on Figure 4-2 of the Water System Plan the District can provide fire flow (both flow and duration) per Fire District and City standards with the exception of three hydrants at the west end of 216th Street and three hydrants on short dead-end lines in the southeast portion of the District's service area.

We look forward to successful completion of the Plan and to working with the City to provide a robust and reliable water system that will continue to deliver high quality water to the residents of the City and the District.

Sincerely,

Yoshiko Grace Matsui
President,
Board of Commissioners

Kristi Van Gasken
Commissioner

James Langston
Commissioner

Cc: Des Moines City Council
Michael Matthias, City Manager
Dan Brewer, Chief Operations Officer
Brandon Carver, Public Works Director
Loren Reinhold, SWM/Environmental Manager

City of Des Moines

PLANNING, BUILDING AND PUBLIC WORKS
www.desmoineswa.gov
21650 11TH AVENUE SOUTH
DES MOINES, WASHINGTON 98198-6317
(206) 870-6522 FAX (206) 870-6596

ATTACHMENT A

August 14, 2019

Eric Clarke, District Manager
King County Water District #54
922 South 219th Street
Des Moines WA 98198-6344

RE: Comprehensive Water System Plan Review – Time Extension

Dear Mr. Clarke,

This letter is to inform you that the City is exercising its right under RCW 57.16.10(7) to extend the time for reviewing your Comprehensive Plan for an additional 90 days. The City has contracted with Century West Engineering (CWE) Corporation to review the Plan and an initial report from them is not expected until late September. With the submittal date of June 6, 2019, the time limitation is revised from September 3, 2019 to December 2, 2019.

The City would appreciate cooperation and assistance in providing information to CWE needed to conduct its review as quickly as possible. We too look forward to successful completion of the Plan and working with the District to ensure a robust and reliable water system for the residents of the District and City.

Sincerely,

R. Brandon Carver, P.E., P.T.O.E.
Public Works Director

cc: Council
Michael Matthias, City Manager
Dan Brewer, Chief Operations Officer
Denise Lathrop, Planning and Development Services Manager
Loren Reinhold, SWM/Environmental Manager

ATTACHMENT A

1889

State of Washington
DEPARTMENT OF HEALTH
NORTHWEST DRINKING WATER REGIONAL OPERATIONS
20425 72nd Avenue South, Suite 310 • Kent Washington 98032-2388

September 10, 2019

ERIC CLARKE, DISTRICT MANAGER
KING COUNTY WATER DISTRICT NO. 54
922 SO 219TH STREET
DES MOINES WA 98198

RE: King County Water District No. 54, ID# 39950
King County
Water System Plan - 2019
Submittal #19-0604

Dear Mr. Clarke:

Thank you for submitting the Water System Plan (WSP) for King County Water District No. 54 (the District) received in this office on June 10, 2019. We have reviewed the plan and offer the following comments. These comments must be adequately addressed prior to approval of the WSP.

Description of Water System

1. Please provide determinations of local government consistency from the Cities of Des Moines and Normandy Park.

2. King County provided comments on your WSP on July 1, 2019. Please respond to their issues. Adequate responses to their issues should be included in your final WSP submittal in order to receive a WSP Adoption Ordinance from King County.

Basic Planning Data

No comment.

Water Quality Analysis.

3. Page 3-7 and 3-8 refer to manganese as aesthetic concern and not a health concern. Please note that the Department of Health has removed language from our publications (example publication 331-286) that used to refer to manganese solely as an aesthetic concern. Studies over the past decade have shown possible health concerns related to manganese. The EPA has reported a lifetime health advisory level of 0.3mg/L for manganese in drinking water. Consider updating the language regarding manganese to reflect the potential health impact.

4. Appendix M, Best Management Practices, does a nice job summarizing the water quality sampling strategy for the sources, reservoirs, and distribution system. Given the years of data collected thus far, has the District noticed any trends? Has the District evaluated these data to help prioritize capital projects, main replacement projects for example, or modify system operations in order to optimize water quality?

5. Appendix M, Best Management Practices, page 6 and 7 refers to the main break response with a depressurized situation. Holding the super chlorinated water for a minimum of 30 minutes might be less stringent than AWWA Standard C651. Refer to Water Research Foundation (WRF) Project 4307 for guidance on disinfection practices with main break repairs. Some find the WRF guidance easier to achieve than AWWA C651 for main break response.

6. Regarding the Coliform Monitoring Plan, please consider the following.

    a. Page 6, Procedure for Coliform and HPCs from Test Solutions, step 1 reads, "No sampling will be done on windy or rainy days." As you are aware, repeat samples under the total coliform rule must be collected within 24 hours regardless of the weather conditions. Suggested edit to step 1, "No investigative sampling will be done on windy or rainy days (repeat samples under the total coliform rule must be collected within 24 hours regardless of the weather conditions)."

    b. Update page 1 to indicate the District currently does not provide disinfection treatment and has the capacity for emergency disinfection treatment.

System Analysis

7. Your system analysis appears to use a total source pump capacity of 910gpm whereas Table 1-2 shows a total source pump capacity of 950gpm. Does the system analysis consider Well 4 as an emergency source of supply?

8. Page 4-12 discusses the dead storage volumes for the upper and lower reservoir (33,846 and 57,577 gallons respectively). Please explain why a total dead storage volume of 80,596 gallons is used to determine the total required storage volume.

9. Page 4-16 and 4-17 refer to maximum pipe velocity of 10 feet per second, page 4-4 refers to maximum pipeline velocities of 8 feet per second. Please clarify.

10. We recognize that Figure 4-1 demonstrates that minimum system pressure requirement of 30psi at peak hour demand is met at system build out with the existing infrastructure in place. Page 9-2 refers to the North Hill Pressure Zone project. Please acknowledge that hydraulic model results for the new pressure zone will be required as part of the engineering design submittal for the North Hill Pressure Zone project.

11. We understand the three high flow pumps, at 1,750gpm each, pump directly from the lower reservoir to the distribution system during a high flow event (i.e. fire or main break).

Furthermore, page 4-13 indicates the Highline intertie is needed to meet fire flow requirements while the upper reservoir is off line. Has the District evaluated the storage requirements and storage capacity analysis (Table 4-6) with the lower reservoir alone? Does the 150,000-gallon storage deficit (with the upper reservoir out of service) apply to fire flow storage only?

12. Can the system operate with the lower reservoir out of service?

13. Regarding the hydraulic analysis, we were unable to locate node J-205, J-206, J-208, and J-209 in any of the figures provided. Please address the low system pressures at these nodes identified in Appendix J 2039 Peak Hour Demand Scenario.

Water Use Efficiency/ Water Rights

14. Please respond to the comments contained in Department of Ecology's letter dated June 26, 2019.

Source Protection

15. Chapter 6 summarizes the 2004 Wellhead Protection Program and inventory of potential and actual groundwater contaminant sources. It does not specify when the most recent inventory was completed. Please note that the District must review and update the inventory every two years. Have notification letters been sent to each facility with potential or actual groundwater contaminant source since 2004?

16. Does the District, the City of Des Moines, or Normandy Park have a policy or ordinance related to potential Underground Injection Control (UIC) use? In our experience, Water Districts are not always informed early in the planning process for UICs. Please be aware of the potential impact of UICs on source water quality.

Operations & Maintenance

17. Figure 7-1, Bacteriological Detection and Notification Chart. Please note that the Level 2 Assessment triggers the requirement for a Tier 3 Public Notification within one year and not a Tier 1 Public Notification within 24 hours.

18. Under Recordkeeping and Reporting, please add Construction Completion Reports for all distribution main replacements and extensions.

19. Table 7-4, Routine Inspection and Maintenance Schedule includes inspection of the air relief valves. Is this just a visual inspection or are these tested to see that they operate properly? Related to the distribution construction standards, does the "APCO" or equivalent design accommodate testing the air-vacuum valve?

Distribution Facilities Design and Construction Standards

20. The Standard Detail for the Air & Vacuum Release Assembly shows a weep hole to drain the vent line. The Department considers this a potential cross-connection. Think about eliminating the weep hole from the air vacuum release valve design.

ATTACHMENT A

Improvement Program

21. What is the District doing in regards to implementing asset management techniques in your water utility?

22. Project P-3: Elevated Reservoir, refers the option to remove the upper reservoir and purchase the required storage deficit from Highline Water District. Has the District selected this alternative and is Highline Water District amenable to this arrangement?

Financial Planning

No comment.

Miscellaneous

23. Please provide copies of any comments made by adjacent purveyors or other interested parties, along with the District's response to those comments.

We hope that you have found these comments to be clear, constructive and helpful in the development of your final draft WSP. We ask that you submit the revised WSP on or before **December 10, 2019**. In order to expedite the review of your revised submittal, please include a cover letter summarizing how each of the above comments was addressed in the revised WSP and where each response is located (i.e., page numbers, Appendices, etc.).

Regulations establishing a schedule for fees for review of planning, engineering and construction documents have been adopted (WAC 246-290-990). Please note that we have included an invoice in the amount of **$2,280.00** for the review of the Water System Plan. This fee covers our cost for review of the initial submittal, plus the review of one revised document. Please remit your complete payment in the form of a check or money order within thirty days of the date of this letter to: **DOH, Revenue Section, and P.O. Box 1099, Olympia, WA 98507-1099.**

Thank you again for submitting your draft Water System Plan for our review. If you have any comments or questions concerning our review, please contact either of us.

Sincerely,

John Ryding

for Richard Rodriguez
Regional Planner
(253) 395-6771

Brietta Carter

Brietta Carter, PE
Regional Engineer
(253) 395-6770

Enclosure (invoice)

Cc: Douglas Wood, WSDOE-NWRO
Steve Hirschey, King County UTRC
Warren Perkins, P.E., Gray & Osborne

ATTACHMENT A

Washington State Department of
Health
Division of Environmental Health
Office of Drinking Water

Office of Drinking Water
INVOICE
Engineering, Planning, and Sanitary Survey Review Form

TO: ERIC CLARKE
KING COUNTY WATER DISTRICT #54
922 SO 219TH ST
DES MOINES WA 98189

Invoice Number	N03464
Invoice Date	September 10, 2019
Billing Period	30 days NW

DATE	DESCRIPTION	QTY	COST	AMOUNT
6/10/19	REVIEW AND/OR APPROVAL OF PROJECT REPORT KING COUNTY WATER DISTRICT NO 54 KING COUNTY WATER SYSTEM PLAN SUBMITTAL #: 19-0604	1	1	$2280.00
	Total			**$2280.00**
	Payment due within 30 days. Interest shall accrue at 1% per month after 30 days.			

Make Checks Payable to Department of Health
Return Lower Portion to:
Department of Health
PO Box 1099
Olympia, WA 98507-1099

Office of Drinking Water
Engineering, Planning, and Sanitary Survey Review Form

NAME	KING COUNTY WATER DISTRICT #54
INVOICE NUMBER	N03464
INVOICE DATE	9/10/2019 19-0604 NW
AMOUNT	**$2280.00**

DOH Form #331-332

Return to:
Department of Health
Revenue Section
PO Box 1099
Olympia, WA 98507-1099

For persons with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY 1-800-833-6388).

2 044129 00878

CENTURY WEST
ENGINEERING

September 11, 2019

City of Des Moines
21650 11th Ave. S.
Des Moines, WA 98198

Attention: Loren Reinhold, P.E.

Regarding: Comprehensive Water Plan Review, King County Water District #54

Dear Loren,

Century West Engineering has reviewed the Comprehensive Water Plan for the King County Water District #54 (District). Our observations and comments are as follows.

Chapter 1. Description of Water System

System Background

1. System Map (Figure 1-2) does not show pipe material types.

Source of Supply

2. The well capacities listed in Table 1-2 show a wide difference between the original yields of wells #4 and #5 and their current pump capacities. Has the District experienced declining yields from its wells? The Water Facilities Inventory form in Appendix B also lists higher capacities for Wells #4 and #5 than shown in Table 1-2. Please Clarify.
3. There is no discussion of aquifer levels and if they are stable or declining.
4. Table 1-2 lists a total production capacity of 950 gpm. However, 910 gpm is listed in various places in the system analysis (Chapter 4).

Water Rights

5. No discussion is provided about the referenced pending water right application. Given that the application was submitted in 1991, is this application expected to be approved? Are additional water rights being granted by the Washington State Department of Ecology in Water Resource Inventory Area (WRIA) #9? What is the impact to a future system expansion if the application is not approved? What mitigation measures are anticipated?
6. Are there any anticipated impacts from current WRIA #9 Planning?
7. Documentation for water rights 'Well Field' designation is not provided in Appendix C.

Distribution

8. Provide summary of pipe length by material type and size.

Projected Demand and Equivalent Residential Units (ERUs)

9. Production projections only show 0.75% growth in demand annually and 1.23% annual growth in maximum day demand. Is this reasonable?
10. How were commercial and non-residential ERUs projected?

Chapter 3. Water Quality Analysis

Monitoring Requirements and Analysis

11. Provide copy of District's Unidirectional Flushing Program.
12. Page 3-8 of the Comprehensive Water Plan (Plan) lists a flushing velocity of 2.5 ft. /s for

removing biofilm and brown water. The District's adopted Best Management Practices manual in Appendix M lists recommended minimum flushing velocity of 6.0 ft. /sec. Please clarify.

13. The City of Des Moines (City) has received complaints about a "rotten egg" smell from the water in a new downtown development. Provide discussion on testing and investigations completed to date, additional investigations that may be needed to identify source of issue and recommended solutions. Is this a problem that may occur in other locations?

Chapter 4. System Analysis

14. Provide discussion and analysis on the ability of the system to serve the full buildout of the Marina District. The City has concerns about the capacity of this area.

Water Rights Analysis

15. In Table 4-2, why are water rights reduced in 2024 and 2025?

System Component Analysis

16. Department of Health (DOH) System Capacity Worksheet 6-1 from Water System Design Manual has not been provided.
17. Existing AC pipe is more than 50 years old. Average life expectancy estimates for AC pipe are typically around 50 to 70 years. Provide discussion on projected lifespan of existing AC pipe including current conditions affecting life expectancy, observed failure rates, and need for replacement.
18. Provide discussion of effects of increased pressures on proposed northeast pressure zone mains.

Well Pump and Capacity Analysis

19. Clarify total pump capacity. Capacity listed is not consistent in the Plan. Both 910 gpm and 950 gpm are listed in various places.

Storage Analysis

20. Has there been an analysis of the option to rent or buy storage from Highline as mentioned in Chapter 9 of the Capital Improvement Program (CIP)? Will this properly serve the system? There is not much description of this provided.

Hydraulic Model

21. Water model files in Appendix J do not include input files or pipe output files for any of the model scenarios. There is inadequate information to evaluate analysis of system capacity, pipe capacities and ability to meet fire flow demands.
22. Water model calibration input and output files are not provided.
23. The water model output files appear to indicate that a uniform demand was applied to all of the model nodes. Does this adequately model the system in areas with high service densities and/or top user consumption?

Available Fire Flow Analysis

24. Page 4-17 states that with the addition of the 12-inch water main on Marine View Drive in 2011, "the District now provides fire flow in excess of 3,500 gpm in the downtown area with a 20 psi minimum in the system." However, the water models provided in Appendix J do not support this statement. The output file for the 2039 Maximum Day Demand with fire flow and CIP improvements analysis included in Appendix J indicates numerous locations where a 3500 gpm fire demand in the downtown core will still result in a minimum pressure less than 20 psi at critical nodes in the system.
25. Improvements identified in Figure 4-3 as being required for meeting 20 psi minimum pressure during fire flow are not consistent with improvements listed in CIP.

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26. Clarify types of new meters being installed as part of replacement program. Page 5-8 lists radio read meters while the 2017 Annual Drinking Water Report in Appendix G lists touch read meters.

Chapter 9. Capital Improvement Program

27. Provide analysis of storage replacement options for Upper Reservoir. No comparison costs or analysis are presented to support recommendation for renting storage from Highline. No discussion is provided of adequacy of proposed option, operation changes or issues and challenges that would result from eliminating elevated reservoir.
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31. The description for the 11th Avenue water line replacement (P-2) does not match Figure 9-1. The segment from 220th Street to 223rd Street is not shown as improved.
32. Provide strategy/plan for replacing AC pipe over the next 25-35 years as it reaches the end of its life expectancy.
33. Provide discussion on the adequacy of current manganese/brown water removal efforts and if additional measures are necessary.

Chapter 10. Financial Analysis

34. On Page 10-2, average historical gross revenue stated of $880,000 is not consistent with total revenues shown in Table 10-3. Is that just revenue from rates?
35. Historical Operations fund Table 10-3 shows a declining cash balance and rates that do not appear to be covering all expenses.
36. Historical Capital fund balance information is not provided.
37. Provide detailed District budgets in Appendix.
38. Details and terms of District's debt are not provided (i.e. Marine View Drive water main principal, interest rate, loan term, funding source, etc.)
39. Tables 10-3, 10-4 and 10-5 have several discrepancies including incorrect positive or negative cash flows shown in net revenue lines and inconsistent values for transfers between operating and capital funds.
40. Expand discussion/description of Capital Facility Charge (CFC). Is this applied uniformly to all services? Is CFC directly applied to Capital fund or passed through Operations fund? If there is a District resolution or policy on the CFC, please include with Rate resolution in Appendix.
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42. It is recommended that the District conduct a rate study if a detailed evaluation of rates has not been recently completed to assess the existing rate structure, financial viability and adequacy for meeting capital needs.

Funding Source Alternatives

43. While alternative funding sources may require effort to secure, they can allow the District to adopt a more aggressive CIP schedule and level out the annual cash flow fluctuations in the Capital Fund balance.

General Questions

Operating

1. Options for manganese in the system include additional targeted flushing and installing treatment

☆
What survey

equipment to remove the manganese from the water supply. As a secondary contaminant, DOH does not require manganese to be treated for removal unless it is creating a "significant" problem and a customer survey shows that a majority of the customers are willing to pay for manganese removal treatment. A copy of the District's Unidirectional Flushing program has been requested in Water Quality Analysis comments above to further evaluate the District's current efforts to reduce manganese-related complaints.

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Capital

3. The Plan does not provide adequate information to evaluate the ability of the system to handle the full buildout of the Marina District. Additional information has been requested in System Analysis comments above.
4. A summary of pipe material lengths and locations has been requested in our comments above.
5. An AC pipe replacement plan has been requested in our comments above. Typical estimates for average life expectancy of AC pipe range from 50 to 70 years.
6. The complete CIP appears to be thorough in addressing distribution system pressure deficiencies. However, the schedule is not very aggressive, is ambiguous on plan to complete unfunded/unscheduled CIP projects and does not address water quality questions.

Rates

7. The Operations and Capital Fund projections in Tables 10-5 and 10-6 show a net reserve of about $2.6 million generated for capital projects in years 1-10 after debt payments are subtracted. This appears to be enough to fund the initial CIP Projects #1-#3 ($2.53 million total cost). Projecting a similar level of net cash flow to the capital fund for years 11-20 yields about $3.3 million, less than the cost of the remaining CIP projects ($4.1 million total cost).
8. Additional information is needed on the quantity of AC pipe in the system and overlap with current CIP projects. From the information provided, the rates do not appear to be adequate to add additional large-scale projects to the current CIP projects in the initial 20-year planning period.
9. Monthly rate structures vary widely in base charges and tiered consumption charges to address purveyor specific conditions and direct comparisons of overall rates can be difficult. As a single snapshot comparison, the monthly charge was determined for a single-family residential customer with a typical usage of 700 cubic feet, smallest meter size and winter usage rates. The District's rate was $47.00 while surrounding water purveyor rates ranged from $24.54 to $61.18. These rates did not include added utility taxes or franchise fees.
10. A detailed analysis of the District's rates is outside the scope of this review. The District should complete a rate study to evaluate the adequacy of their current rate and fee structure and ability to meet upcoming needs if a study has not been recently completed.

Sincerely,

Century West Engineering Corporation

Bryan Hicks, P.E.
Project Manager

ATTACHMENT A

King County Water District #54
922 South 219th Street
Des Moines, WA 98198-6344
(206)878-7210 Fax: (206)824-1909

September 25, 2019

Loren Reinhold
City of Des Moines
21630 11th Ave So
Des Moines, WA 98198

Dear Loren,

We are in receipt of the letter from Century West Engineering commenting on the Water District 54 draft Water System Plan.

Per WAC 246-290-108 the District is required to request concurrency in the form of a Consistency Review Checklist from the local jurisdictions, in this case the Cities of Des Moines and Normandy Park. The general intent of the request is to ensure that the Plan is consistent with zoning and growth projections.

The Consistency Checklist sent to the City is a standard form from the Department of Health. The City's input is requested in the following 3 areas:

1) The water system service area is consistent with the adopted <u>land use and zoning</u> within the applicable service area.

2) The <u>six-year growth projection</u> used to forecast water demand is consistent with the adopted city/county's populations growth projections. If a different growth projection is used, provide the explanation of the alternative growth projection and methodology.

3) <u>Service area policies</u> for new service connections are consistent with the adopted local plans and adopted development regulations of all jurisdictions with authority over the service area (City(ies), County(ies).

The District requests that the City sign and return the Consistency Review Checklist. This was originally sent to the City on June 6, 2019.

Sincerely,

Yoshiko Grace

Yoshiko Grace Matsui
Board of Commissioners. President
King County Water District #54

Enclosures: Blank DOH Consistency Statement
CWE Letter, WAC 246-290-108

Cc: Council, Michael Matthias, Dan Brewer, Brandon Carver, Denise Lathrop

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

ATTACHMENT A

Local Government Consistency Determination Form

Water System Name: ______________________________ PWS ID: ______________

Planning/Engineering Document Title: ______________________ Plan Date: ______________

Local Government with Jurisdiction Conducting Review: ______________________________

Before the Department of Health (DOH) approves a planning or engineering submittal under Section 100 or Section 110, the local government must review the documentation the municipal water supplier provides to prove the submittal is consistent with **local comprehensive plans, land use plans and development regulations** (WAC 246-290-108). Submittals under Section 105 require a local consistency determination if the municipal water supplier requests a water right place-of-use expansion. The review must address the elements identified below as they relate to water service.

By signing this form, the local government reviewer confirms the document under review is consistent with applicable local plans and regulations. If the local government reviewer identifies an inconsistency, he or she should include the citation from the applicable comprehensive plan or development regulation and explain how to resolve the inconsistency, or confirm that the inconsistency is not applicable by marking N/A. See more instructions on reverse.

	For use by water system	**For use by local government**
Local Government Consistency Statement	**Identify the page(s) in submittal**	**Yes or Not Applicable**
a) The water system service area is consistent with the adopted land use and zoning within the service area.		
b) The growth projection used to forecast water demand is consistent with the adopted city or county's population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection and methodology.		
c) For cities and towns that provide water service: All water service area policies of the city or town described in the plan conform to all relevant utility service extension ordinances.		
d) Service area policies for new service connections conform to the adopted local plans and adopted development regulations of all cities and counties with jurisdiction over the service area.		
e) Other relevant elements related to water supply are addressed in the water system plan, if applicable. This may include Coordinated Water System Plans, Regional Wastewater Plans, Reclaimed Water Plans, Groundwater Management Area Plans, and the Capital Facilities Element of local comprehensive plans.		

I certify that the above statements are true to the best of my knowledge and that these specific elements are consistent with adopted local plans and development regulations.

______________________________ ______________
Signature Date

____
Printed Name, Title, & Jurisdiction

Consistency Review Guidance

For Use by Local Governments and Municipal Water Suppliers

This checklist may be used to meet the requirements of WAC 246-290-108. When using an alternative format, it must describe all of the elements; 1a), b), c), d), and e), when they apply.

For **water system plans (WSP)**, a consistency review is required for the service area and any additional areas where a municipal water supplier wants to expand its water right's place of use.

For **small water system management programs**, a consistency review is only required for areas where a municipal water supplier wants to expand its water right's place-of-use. If no water right place-of-use expansion is requested, a consistency review is not required.

For **engineering documents,** a consistency review is required for areas where a municipal water supplier wants to expand its water right's place-of-use (water system plan amendment is required). For noncommunity water systems, a consistency review is required when requesting a place-of-use expansion. All engineering documents must be submitted with a service area map (WAC 246-290-110(4)(b)(ii)).

A) Documenting Consistency: The planning or engineering document must include the following when applicable.

a) A copy of the adopted **land use/zoning** map corresponding to the service area. The uses provided in the WSP should be consistent with the adopted land use/zoning map. Include any other portions of comprehensive plans or development regulations that relate to water supply planning.

b) A copy of the **growth projections** that correspond to the service area. If the local population growth projections are not used, explain in detail why the chosen projections more accurately describe the expected growth rate. Explain how it is consistent with the adopted land use.

c) Include water service area policies and show that they are consistent with the **utility service extension ordinances** within the city or town boundaries. *This applies to cities and towns only.*

d) All **service area policies** for how new water service will be provided to new customers.

e) **Other relevant elements** the Department of Health determines are related to water supply planning. See Local Government Consistency – Other Relevant Elements, Policy B.07, September 2009.

B) Documenting an Inconsistency: Please document the inconsistency, include the citation from the comprehensive plan or development regulation, and explain how to resolve the inconsistency.

C) Documenting a Lack of Local Review for Consistency: Where the local government with jurisdiction did not provide a consistency review, document efforts made and the amount of time provided to the local government for review. Please include: name of contact, date, and efforts made (letters, phone calls, and emails). To self-certify, please contact the DOH Planner.

ATTACHMENT A

WAC 246-290-108

Consistency with local plans and regulations.

Consistency with local plans and regulations applies to planning and engineering documents under WAC **246-290-106**, **246-290-107**, and **246-290-110**.

(1) Municipal water suppliers must include a consistency review and supporting documentation in its planning or engineering document describing how it has considered consistency with local plans and regulations. This review must include elements of local plans and regulations, as they reasonably relate to water service to be provided by a municipal water supplier for any new connection, including:

(a) Land use and zoning within the service area;

(b) Growth projections used in the demand forecast;

(c) Utility service extension ordinances of a city or town when water service is provided by the water utility of the city or town;

(d) Provisions of water service for new service connections; and

(e) Other relevant elements related to water supply planning as determined by the department.

(2) Municipal water suppliers must request each local government with jurisdiction over the service area to provide a consistency review. Municipal water suppliers may exclude wholesale areas from the consistency review provided the water system receiving the wholesale water complies with the requirements for a consistency review when developing a water system plan for any new connection within the service area of the system receiving the wholesale water.

(a) Municipal water suppliers shall provide each local government with jurisdiction sixty days to review the planning or engineering document unless another state statute or state regulation requires a different time frame. The municipal water supplier must provide the local government with jurisdiction an additional thirty days for review if requested.

(b) If an inconsistency is documented by the local government with jurisdiction within the time frame outlined in (a) of this subsection, the municipal water supplier must provide the inconsistency information to the department.

(c) If the local government with jurisdiction documents in writing an inconsistency exists with local plans and regulations, the municipal water supplier shall address the inconsistency. The local government with jurisdiction shall be provided sixty days to review any revisions or responses that address the inconsistency.

(3) If the local government with jurisdiction does not provide a consistency review, the municipal water supplier shall complete the consistency review as described in subsection (1) of this section. The municipal water supplier must also document:

(a) The amount of time provided to each local government with jurisdiction to review the planning and engineering documents as defined in subsection (2) of this section; and

(b) The efforts taken to request a consistency review from the local government with jurisdiction.

[Statutory Authority: RCW **43.20.050** and **70.119A.080**. WSR 17-01-062, § 246-290-108, filed 12/14/16, effective 1/14/17. Statutory Authority: RCW **70.119A.180** and **43.20.050**. WSR 08-03-061, § 246-290-108, filed 1/14/08, effective 2/14/08.]

ATTACHMENT A

CENTURY WEST
ENGINEERING

September 11, 2019

City of Des Moines
21650 11th Ave. S.
Des Moines, WA 98198

Attention: Loren Reinhold, P.E.

Regarding: Comprehensive Water Plan Review, King County Water District #54

Dear Loren,

Century West Engineering has reviewed the Comprehensive Water Plan for the King County Water District #54 (District). Our observations and comments are as follows.

Chapter 1. Description of Water System

System Background

1. System Map (Figure 1-2) does not show pipe material types.

Source of Supply

2. The well capacities listed in Table 1-2 show a wide difference between the original yields of wells #4 and #5 and their current pump capacities. Has the District experienced declining yields from its wells? The Water Facilities Inventory form in Appendix B also lists higher capacities for Wells #4 and #5 than shown in Table 1-2. Please Clarify.
3. There is no discussion of aquifer levels and if they are stable or declining.
4. Table 1-2 lists a total production capacity of 950 gpm. However, 910 gpm is listed in various places in the system analysis (Chapter 4).

Water Rights

5. No discussion is provided about the referenced pending water right application. Given that the application was submitted in 1991, is this application expected to be approved? Are additional water rights being granted by the Washington State Department of Ecology in Water Resource Inventory Area (WRIA) #9? What is the impact to a future system expansion if the application is not approved? What mitigation measures are anticipated?
6. Are there any anticipated impacts from current WRIA #9 Planning?
7. Documentation for water rights 'Well Field' designation is not provided in Appendix C.

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8. Provide summary of pipe length by material type and size.

Projected Demand and Equivalent Residential Units (ERUs)

9. Production projections only show 0.75% growth in demand annually and 1.23% annual growth in maximum day demand. Is this reasonable?
10. How were commercial and non-residential ERUs projected?

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removing biofilm and brown water. The District's adopted Best Management Practices manual in Appendix M lists recommended minimum flushing velocity of 6.0 ft. /sec. Please clarify.

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CENTURY WEST
ENGINEERING

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Century West Engineering Corporation

Bryan Hicks, P.E.
Project Manager