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APPENDIX 1 GENERAL INFORMATION

APPENDIX 1 - A WATER FACILITIES INVENTORY

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

WATER FACILITIES INVENTORY (WFI) FORM

ONE FORM PER SYSTEM

Quarter: 1
Updated: 02/24/2014
Printed: 8/19/2014
WFI Printed For: On-Demand
Submission Reason: Source Update

RETURN TO: Northwest Regional Office, 20425 72nd Ave S STE 310, Kent, WA, 98032

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
40950 K	LAKE FOREST PARK WATER DISTRICT	KING	A	Comm

6. PRIMARY CONTACT NAME & MAILING ADDRESS	7. OWNER NAME & MAILING ADDRESS	8. Owner Number 003008
F. ALAN KERLEY [DISTRICT WATER MGR] 4029 NE 178TH ST LAKE FOREST PARK, WA 98155	LAKE FOREST PARK WATER DISTRICT F. ALAN KERLEY 4029 NE 178TH ST LAKE FOREST PARK, WA 98155	TITLE: DISTRICT WATER MGR
STREET ADDRESS IF DIFFERENT FROM ABOVE	**STREET ADDRESS IF DIFFERENT FROM**	
ATTN ADDRESS CITY STATE ZIP	ATTN ADDRESS CITY STATE ZIP	

9. 24 HOUR PRIMARY CONTACT INFORMATION	10. OWNER CONTACT INFORMATION
Primary Contact Daytime Phone: (206) 365-3211	Owner Daytime Phone: (206) 365-3211
Primary Contact Mobile/Cell Phone: (425) 275-2262	Owner Mobile/Cell Phone: (425) 275-2262
Primary Contact Evening Phone: (xxx) xxx-xxxx	Owner Evening Phone: (xxx) xxx-xxxx
Fax: | E-mail: XXXXXX	Owner Fax Phone: | E-mail: XXXXXX

WAC 246-290-420(9) requires that water systems provide 24-hour contact information for emergencies.

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

- [x] Not applicable (Skip to #12)
- [ ] Owned and Managed — SMA NAME: _____ SMA Number:
- [ ] Managed Only
- [ ] Owned Only

12. WATER SYSTEM CHARACTERISTICS (mark all that apply)

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

13. WATER SYSTEM OWNERSHIP (mark only one)				14. STORAGE CAPACITY (gallons)
[ ] Association	[ ] County	[ ] Investor	[x] Special District	
[ ] City / Town	[ ] Federal	[ ] Private	[ ] State	440,000

- SEE NEXT PAGE FOR A COMPLETE LIST OF SOURCES -

1-A
Water Facilities Inventory

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
40950 K	LAKE FOREST PARK WATER DISTRICT	KING	A	Comm

15	16	17	18										19			20	21						22	23	24			
	SOURCE NAME	INTERTIE	SOURCE CATEGORY										USE				TREATMENT						DEPTH		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 IN SPRING FIELD	SPRING FIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANEANT	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 #1 AFJ001				X								X				X						6	300	SW SE	03	26N	04E
S02	Well #2 AFJ002				X								X				X						195	400	SW SE	03	26N	04E
S03	Well #3 AFJ003				X								X				X						144	300	SW SE	03	26N	04E
S04	408005/Northshore	40800 5													X		X							0		03	26N	04E
S05	Shallow Well Field 1-8			X									X				X						25	80	SW SE	03	26N	04E
S06	Well Field 1,2,3			X									X				X						144	1000	SW SE	03	26N	04E
S07	Generic WW				X								X			N	X						0	0			00N	00E
S08	Seattle/77050	77050 Y													X	Y	X							0			00N	00E
S09	Horizon View Well Field			X									X			Y	X						379	550	SE NE	03	26N	04E
S10	Horizon View 1 BAM416				X								X			Y	X						379	300	SE NE	03	26N	04E
S11	Horizon View 2 BAM417				X								X			Y	X						384	250	SE NE	03	26N	04E

1-A
Water Facilities Inventory

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
40950 K	LAKE FOREST PARK WATER DISTRICT	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?)	0	869	Unspecified
A. Full Time Single Family Residences (Occupied 180 days or more per year)	869		
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	0		
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.	10	10	
28. TOTAL SERVICE CONNECTIONS		879	

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 or more days per [illegible]? 2609

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?	508	508	508	508	508	105	105	105	508	508	508	508
B. How many days per month are they present?	23	20	22	21	23	20	22	23	20	23	22	15

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	3	3	3	3	3	3	3	3	3	3	3	3

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: _____

1-A
Water Facilities Inventory

APPENDIX 1 - B HISTORICAL INFORMATION

1-B
Historical Information

Water System History
Ole Hanson & Co. (1909-1913)
Lake Forest Power, Water & Light (1913-1927)
Lake Forest Water Company (1927-1954)
KC District #83 (1954-2014)
AKA Lake Forest Park Water District

1885	Seattle, Lake Shore & Eastern Railway serving North Lake Washington
1885-1892	Initial Logging Operations
1889	Washington Gains Statehood
1902-1906	First Store located near rail station near current day Bothell Way/Ballinger way
1901-1906	Large Scale Logging Operations, French and Fish Co. and Railway at Civic Club location Use of creek water for irrigation and logging. Logging camp utilized by Bechman doing road work and clearing the Park using drinking water piped down from current water system by black pipes.
1909	The North Seattle Improvement Company purchases and names Lake Forest Park, and Ole Hanson and Co. develop infrastructure and water source in East Watershed.
1910	LFP Addition (initial plat) completed
1911/1912	North Seattle Improvement Company Plats Area of Lake Forest Park 1st Addition
1913	.Previous to Franchise agreement, Ole Hanson and Co ran small mains across block 12 to Lots 13 and 14 in Block 12 where a greenhouse was on Dr. Ryan's property. Springs are selected as source. Water used in mains prior to any tank being built. Tanks installed prior to Franchise agreement. Contracts for water service were signed for water service prior to any water company existing. No houses until late in 1913. A subsidiary of North Seattle Improvement Company, Lake Forest Light, Water and Power takes over water system. Lake Forest Light, Water and Power Franchise agreement with King County for Sections 3 and 10 to provide a water system to 'build up and promote Lake Forest Park'. Storage Tank No 1 Built, 20,000 gallon 22' diameter, 8' high
1914	LFP School opens, 2 room school house Puget Sound Power & Light Service to LFP Telephone Service to LFP
1915-1916	Vested water right from the syphon wells that tap spring water.
1915	Wells drilled by residents unsuccessful in 2nd Addition. Residents build homes without a water supply. Contracts for 2nd Addition for 'irrigation purposes only'.
1916	Booster Pump NO 1, Wagner Electric Motor, 1 hp

Booster Pump No 2, Century Electric Motor 2 hp with a 1250 gallon wood stave pressure tank

Booster Tank No 1, 1,800 gallon wood stave tank 6'6" diameter, 6" high completion, Frame tower 22' high

Booster Tank No 2, 2,000 gallon wood stave tank, 8' diameter, 6' high completion, 24' high frame tower

Storage Tank No 4, 10,000 gallon wood stave, 13'6" diameter, 10' high complete

Storage Tank No 5 10,000 wood stave tank, 13'6" diameter 10' high

Water supplied outside of The Park boundary into LFP 2nd Addition onto land without water rights. Property in LFP 2nd Addition sold at half the cost of 1st Addition due to no water rights acquired. Result is less water available to all customers. Understanding by witness that the purchasers of 1st Addition owned water system.

1917 Storage Tank No 2, 20,000 gallon wood stave, 22' diameter, 8' high completion
West End*- Storage Tank 3,500 gallon wood stave tank 10' diameter, 6'4" high, 14' high frame tower, (*West End appears not to be West Watershed but a tank somewhere else but west of old springs)

1918 Low summer water results in night time resident patrols of Park in 1st addition to stop night time irrigation, continues into 1920-1922.

1920 Storage Tank No 3, 20,000 gallon wood stave, 22' diameter, 8' high completion

1922 Severe problems with night watering emptying tanks, patrols continue to stop night watering.

1923 Five Storage Tanks capacity of 80,000 gallons in east watershed, two booster pumps into elevated wooden tank of approximately 2,000 gallons. Two pump Houses. 133 services for domestic water and irrigation. Located on property owned by North Seattle Improvement Company. NSIC also is holding property with springs in LFP Second Addition acquired from Hamlin.

Meters installed to regulate customer use, new fees.

1924 19,956 Lineal Feet of Main and 10,044 lineal feet of secondary mains, flow from springs approximately 200,000 gallons a day

1925 Lake Forest Power, Water and Light Corporation gains possession of Watershed land and facilities from North Seattle Development Company

Acquisition of Lots 14-19, inclusive, of Block 13, First Addition to Lake Forest Park on which springs and storage tanks are located. Seepage water from springs is used during summer months from canyon just below storage tanks. Suggestion by WA State Department of Public Works to acquire all land which seepage from springs takes place and to develop springs in west end in Block 32 which is also held by North

Seattle Development Co. New property would need to be entirely fenced. Also opinion that system mains are too small.

1926 Water Right Certificate #1 page 498

150 Current Customers
LFP Civic Club proposes purchase of facilities and reorganization of present LFPW&L to be run by LFP community as a private company

Contamination of water supply by telephone company work in watershed.

1927 Incorporation of Lake Forest Water Company. It assumes land, water source and structures from Lake Forest Light, Water and Power as well as street lighting.

1930 Update Connections at Old Tank

1931 New Foundations under Tanks at Old Springs

1932 Agreement to Furnish Water from East Watershed to Puget Mill Company in Sheraton Beach

Resolution to Drill 4 New test wells in Old Watershed/Build Wood Stave Tank in Creek Bed

1935 Improvements in Old Water Shed replacement of tanks, betterments of the collecting system

Board Passes Installation of four new wells in Old Water Shed

Wells in Old Watershed carry entire supply of water while repairs in New Watershed Letter to PWA, John Carroll, County and City Building, Seattle, WA re: Lake Forest Park Water Company has water available to serve District, recommendations from Washington Department of Public Works to LFP Water Company to increase its water facilities, notification of Lake Forest Water Company providing ample pure water by gravity flow.

1937 Acceptance of Bid Pump, Piping and Wiring installation in pump house

Letter from White and Bollard to Lake Forest Park Water Company respecting restrictions on Lot 27 Block 10 Plat of Lake Forest Park, positioning building dwelling as not to pollute any stream asking for waiver as no stream exists.

1938 Two sources of water, the East Springs or ‘old springs’ and West

1940 Annual Report of the Manager, Galvanized replacement of old wood pipe, new well drilled in east watershed 50,000 gallons a day, installation of a 6 inch pipe between 1-3rd sandtraps, State Testing reveals exceptionally good water. Management of artesian wells.

New Well #1 Drilled

Water Cert #2 767-D

1-B
Historical Information

1941	New platform around sand trap in the East Water Shed, pump house and tops of settling tanks painted, repairs to #7 well.
	Purchase of tract of land Lot one, Block 3, Lake Forest Park adjoining watershed
1942	Purchase of Lot A Block 9 First Addition adjoining east water shed
	Annual Report of the Manager, 1300 feet of pipe laid on East 187th from Fairview tank, tank repair,
1944	Annual Report of Manager-Replacement of pump and motors in East Watershed pumphouse. Purchase of 1600 linear feet of wood stave pipe to replace from 130,000 wood stave tank to highway by Federal Pipe and Tank Company
1947	Findings on Ground Water Claim #835= 10 Wells in East Water Shed of which 8 are siphon, one a siphon pump and one a pump well
	Certificate of Change of Place of Withdrawal of Ground Water by WA State Department of Water Resources. Described as "from a well located in Lot 15, Block 13 of First Addition to Lake Forest Park, within Section 3, T. 26N., R. 4 E.W.M. That the place of withdrawal has been changed to a point situated within **vacated** East 187th Street…"
1948	Bulldozing to dig ditch for new water main on East 184th from tank to Ballinger Way
1949	8" Steel main installed in 184th and fire hydrant
1953	East Water Shed supply is from shallow wells 24 ft deep from which water is siphoned. One deep well at 172 feet deep which is pumped.
	Letter from Div Water Resources Robert Russel to Ray Heath, President of General Engineering Company 8/13/1953 finding of LFPW Company claims a vested right for 9 siphon wells
	Declaration of Ground Water Claim 835 Pumping and siphon wells May 21, 1948
1954	KC Water District 83 is formed and purchases Land, structures and water source from Lake Forest Park Water Company as well as street lighting. Replacement of sand traps by steel sand trap
	New Main Replacement from high storage tank to existing pump station east watershed
1955	Water Line Extension LID #1 June 1955
	Grading in East Watershed, Well Maintanence
1958	Testing of Wells in East Watershed
	Department of Conservation Director Earl Coe to Carl Lange regarding East Watershed, "please be advised that the older wells here were in existence prior to the 1945 inception of the State Ground Water Code and therefore have a vested water right;

also they were undoubtedly in existence prior to the subdivision and platting of this property into streets and lots, therefore it would appear that the original owner of the wells must have established some agreement or form of easement with the county with respect to the location of the wells within the road right of way."

Lease agreement made with Carl Lange regarding buffer zone at reserve property

1960 Deep Well Drill in East Watershed Contract Executed Copy

Report of examination of Ground Water includes 7 flowing springs, owned by Water District 83 all within ¼ mile.

1961 Town of Lake Forest Park Incorporated
Tolt River Project and LFP Reservior

Pump Control Wiring 5/31/1961 and Approved by DOH

1961 WA State Artesian Water Supply Bulletin 16 by WA State Department of Conservation, Division of Water Resources to determine availability of uncontaminated ground water in the event local or statewide power failures preclude the use of water obtainable by only electrically operated pumping facilities. WD #83 mention.

1962 Felling of tall trees over pump house.

Additional storage tank needs, damage to drainage ditches in East Watershed.

First mention of water service to shopping center.

1963 Bids reviewed for fencing east watershed entirely and reserve separately. Advertising of bids to improve the roadway in east watershed.

Lange on access to Reserve property for himself and assigns

Phone company poles to run line parallel to NE 184th and skirt East Watershed

Storm drainage and access road in East Watershed May 1963

1963 WD #83 to Provide Seattle water to shopping center.

1964 Towne Center Shopping Area Opens

Fence in east watershed

Long range planning Tank

1965 Resolution 136- West Watershed discontinued, East Watershed is sole source as of 1966

1966 Well Drilling Contract

Deep well #3 ready for use.

1-B
Historical Information

	Executed Copy of Storage Tank Contract and Specs
	District street lighting for LFP turned over to City
1967	Reports on drawdown on wells 1,2 and 3.
	NUD in Wellhead, issue with fencing
1968	Existing supply and Recommendations
	Electrical work in watershed complete with automatic controls, booster pump repair.
	Seattle reservoir overflow caused erosion and debris into flume, had to be cleaned. Well pumping and flow tests on wells 1,2 and 3 complete.
	Fencing reserve property issues. Excessive runoff in watershed, extending flume discussed in well #3, performed ditching around pumphouse and well.
1969	Buildings sheltering Well pumps are completed. Motion to cyclone fence east watershed.
1970	Work In canyon along 184th ROW to reroute creek to protect exposed water main. Some damage evident and repaired. Resolution to purchase real property 'Watershed Reserve'. Resurface of driveway into watershed.
1971	Well inspections, flow tests well 1,2 and 3, puchase of flow meter.
1972	Flow meter installed, storage tanks repaired.
	Replaced check valve on well No 2, cost estimates replace wooden flume, repair instead.
1974	Field Work in East Watershed
1975	New well replumbed, drainage problem in watershed eroding the bank and pump house
	Leak/repair in NE 184th canyon, washout has caused line exposure.
1976	New leaks along NE 184th Canyon difficult to repair, superintendent given permission to install/repair culvert pipe in two areas.
	Water System Improvements and suggestions
1977	Mr Chalmers directed to getting pipe foundation and floor slab in security building and pump house.
1978	Wooden storage tank patched and leak stopped.
	French drain installed around Well no 3. Wooden flume along stream needs replacement with galvanized half round.

Electrical fixes in storage tank for well no 1, half round galvanized ordered and will extend just past well no 1 and rock along creek.

Flume work proceeding in watershed, electrical problems repaired, new leak along NE 184th.

1979 Tree damage in watershed knocked pump house off foundation, superintendent instructed to re-route wires. Silent alarm installed at watershed.

Rock placed in creek bed at watershed. Still installing 50 feet of half pipe. Gravel and crushed rock placed in driveway at watershed.

Replace gate at watershed, chained and locked. Foot path for Lange property.

Contact with neighbor who is in watershed cutting trees in informed to stop removal of trees.

1980 *1980 Well Field Geotechnical Report.pdf*

1982 Tank reroofing, pump house roof repair and sand trap repair. Shallow wells test results.

1983 Canyon area pipe exposed, contributing factors are water run off from King County, City of Seattle drainage.

1984 Intertie agreement with Northeast Lake Washington Sewer and Water. Superintendent to remove well no 3 and 1 pumps and rest pump no 3

1985 Intertie with Northeast Lake Washington installed. Well no 3 pulled and cleaned.

1986 Six siphon wells online. Bids received on stream erosion repair in the canyon.

Erosion control project in canyon. Leaks under road constructed to allow trucks hauling large rocks for creek bed. Commissioners instruct to replace main along the road as it will hamper erosion control project.

1987 Vault installation complete in watershed with pumps installed.

Northeast Lake WA Sewer and Water to purchase water from WD #83

1988 Siphon wells all operating with all pumps. Tests submitted on Well No 3.

Letter to Department of Social and Health Services regarding siphon wells reactivation.

1989 Well No 2 and the shallow wells are providing all water to District No 83 customers and to Northeast Lake Washington district.

1991 Newly installed and re-worked pumps. Tree planting project with boy scout troop. Monitoring canyon area for erosion due to offsite surface water from King County, District no. 83, City of Seattle, and City of Lake Forest Park.

1994 Survey of East Watershed

1-B
Historical Information

	Well Piping Project 7/1994 Pump House to Stand Pipe and Valve to Master Meter
1995	12 inch pipe in watershed nearly complete.
	Hazardous Dumping in WHPA Geotech Consultants Findings
1997	Conduit Work In Watershed
1998	Shallow wells back on line.
	Artesian Well Work
	Master meter repaired. Shallow wells running.
	Master meter not reading accurately. Shallow wells pump at 110 gal/min.
	111 alder trees need to be removed from watershed, no response from city.
1999	Emergency declared and 101 alder trees to be removed by District.
	Telephone line to be installed to transfer pump house.
	Contact King County to do mowing in watershed.
2000	Water District #83 name change to Lake Forest Park Water District
	Pump house Electrical Work
	Road, Gate, Valve Work in Watershed
2001	Tree removal.
	Artesian Well Piping, Logging
2002	Tree removal. Perimeter protection at Watershed.
	New No Trespassing signs ordered for WHPA at gate and lower area. Due to security issues the signs should not identify the WHPA.
2003	Reconnection of artesian wells. Two well houses ordered. NUD sewer warning light has also been received.
2003	Sanitary Survey DOH concerned artesian wells are under influence of surface water. Install vents and caulk the pipes in silicon. Starter motor and Phase monitor on Well #2 to be replaced. Probes placed in District wells for Brightwater King County.
2004	City of Lake Forest Park files a Right of Entry Agreement to perform an Inflow and Infiltration Study. Well #1 building almost finished.

	Artesian pump replaced. Scada installed. Fencing at Watershed needs to be cleared of bushes.
	Northshore Utility Signage in WHPA
	Northshore Agreements as to Wellhead
2005	Wood tank dismantled. False alarms at Well #2.
	City Charges to Slope Mow in Vacated ROW
2006	Shallow well wiring project complete. Scada wireless radios in operation.
	New SCADA radios installed
	Staff cleared wellhead of overgrown vegetation. Standing water at pump house diverted away from building. Electric work installing and programming Variable Frequency Drive in Well #2 pump.
2007	Access road completed in wellhead. Vegetation in wellhead cleared. Number 4 pump house rebuilt.
	Covering well casing on Well #1. Cap the inlet pipe for the old cedar tank. Artesian wells are available in case of emergency. Sample station for wellhead purchased.
2009	Tree down in pump house damaged chain link fence and blocking our pathway to easement. English Ivy removal at wellhead and fence repair.
	State of WA DOE Sanitary Zone Radius Requirements
2010	Staff used large quarry rock to shore up roadway by gate eroded by drainage.
	Installation of catch basin in east gate area of watershed. Locked gate installed at 18460 47th Pl NE. Ivy removal in wellhead. Transfer pump work.
	Transmission mains digging up to ascertain type and size. Staff restoring an access track at wellhead.
	Pump house paint. Vegetation control.
	Locating and protection of existing utilities in watershed. Intertie pipeline from Seattle is connected to system.
	Completion of KC work within sensitive area in watershed. Finishing connections and installing a PRV. New variable frequency valve at pump house.
	Wellhead Security in progress.
2011	Northshore Utility completed slip lining of sewer main through watershed.
	Watershed maintenance. Improvements to shallow well system.
	WHPA pump facility In Design phase.

1-B
Historical Information

	Remediation of surface water issue in watershed.
2012	Wellhead ivy maintenance.
	Robinson Noble East Watershed Site Map Wells/ROW
	Increased monitoring due to pipe bomb report. New cameras installed and new No Trespassing signage.
	Well No 1 repair. Leak repair on Pump house roof.
	New cameras at three locations.
2014	Repair of gate at Wellhead.
	Maintenance of pump house and Deep Wells 1 and 2.
	LFPWD Water Rights confirmed
	Sloughing in watershed emergency repair ordered.

APPENDIX 1 - C AGREEMENTS WITH DISTRICT

KC BRIGHTWATER AGREEMENT 2003

Lake Forest Park Water District and King County Wastewater Treatment Division Agreement

This Agreement is made and entered into by King County, a municipal corporation acting through the King County Wastewater Treatment Division, hereinafter referred to as "County," and the Lake Forest Park Water District, a municipal corporation, hereinafter referred to as "District." County and District may also be collectively referred to as the "Parties."

I. Purpose

This Agreement requires the County to engage in specific tasks relating to geotechnical investigation, design, construction, operation and providing community incentives and mitigation for the County's Brightwater Wastewater Treatment System project ("Project"), an essential public facility which may impact District's water source aquifer. This Agreement defines work ("Work") to be conducted as part of the Project as described in Attachment 1 which is incorporated by reference as if set forth in full herein. The geotechnical and water quality monitoring work are part of the four following distinct project stages as set forth in Attachment 1: 1) Hydrogeologic Exploration and Testing, 2) Tunnel Bore and Portal Design Criteria, 3) Construction, and 4) Operation. A Potable Water Supply Replacement Plan is included as section 5 to Attachment 1. Attachment 2, which is attached hereto and incorporated by reference, contains certain definitions that are used in this Agreement and in Attachment 1. Attachment 3 describes a list of pre-authorized services that District may utilize and be reimbursed for during the course of the Project. Attachment 4 consists of a map of the proposed Project Tunnel Alignment. Attachment 5 illustrates the tunnel lining parameters described in Attachment 1, Section 2

II. Project Management

King County shall let, pay for, manage and administer all contracts, personnel and contractors engaged in the Work except as mutually agreed otherwise

III. Responsibilities

A. The District shall:

1. Review reports and data generated by the County as result of the Work, and when appropriate or required by this Agreement, issue comments or decisions with respect to such reports and data.

2. Not have any obligation to County except as expressly provided herein.

B. The County shall:

1. Perform the Work whether through its own personnel or through contracts with third parties for the Work.

2. Give due consideration to District's comments regarding the Work.

3. Pay for any expenses incurred by the District as the result of Work that has been preauthorized by the County, whether on a case by case basis or as set forth in Attachment 3.

4. Provide access to the Tunnel within and near the District's well field during the course of the Tunnel construction for evaluation and inspection purposes subject to reasonable advance notice by District. While such access shall not be unreasonably withheld, safety and construction considerations require an advance request for such access with permission to be granted for an appropriate time. Such access shall be lead by County staff or designee.

5. Promptly deliver to District one (1) written copy of every, as appropriate, written report, summary, log, map and other documents containing facts, analysis or findings concerning the District's water supply that is generated as part of the Work or otherwise prepared in connection with the Project. This obligation shall not include routine field notes unless specifically requested by District.

IV. Definitions

The terms and definitions in Attachment 2 to this agreement shall apply.

V. Costs, Billing, and Payment

The Parties agree to the following regarding project costs:

A. The County shall pay the entire actual costs for the Work.

B. The District shall pay for all costs of its consultants; provided, however, County shall within 30 days after receipt of appropriate documentation pay to District up to the sum of $40,000 as reimbursement for eligible documented costs incurred to date. The County shall further reimburse District for its reasonable and continuing costs of participating in County project meetings as invited, reviewing and commenting on the progress of the monitoring of Tunnel construction and operation through the term of the Project and other requested reviews according to the scope of services and rate and reimbursement schedule in attachment 3. District shall provide written documentation of such costs. Any consultants and/or subcontractors used by the District to fulfill its obligations under this Agreement shall be retained solely by the District, shall be identified in any billings and shall be subject to the scope of services and the total cost ceiling set forth attachment 3. Any such consultant or subcontractor must be qualified and if applicable, licensed in the state of Washington to perform the services for which they are engaged. Such consultant or subcontractor will perform work consistent with the expectations of their profession and applicable regulations. Such consultant or subcontractor shall be considered an independent contractor for the District. They shall not be deemed to have any contractual relationship with the County and the County shall have no obligation to pay such consultants or subcontractors. The District may submit consultant and or subcontractor invoices for reimbursement. All such invoices for consultants and subcontractor services shall be submitted to the County for reimbursement without markup.

The District shall be responsible for ensuring the accuracy and propriety of all billings. King County shall have the right to audit the District's invoices and all supporting documentation for purposes of compliance with this agreement for a period of six years following the completion of the work under this agreement. All books, records, documents and other material relevant to this agreement will be retained for six years and King County, the Office of the State Auditor and federal auditors shall have full access and the right to examine any of these materials during this period.

C. The County represents that funds to pay the costs of the Work are currently included in the Project budget and are committed and available. To the extent that the Work requires the approval of, existence and continuation of the Project, the Parties' obligations under this agreement are contingent upon the continuation of the Project along the preferred alternative as described in the Final EIS. If the Project is terminated for any reason or is modified, so that the Tunnel does not pass or is not bored near the District's water source, then this Agreement will also terminate effective immediately and certain activities undertaken as part of this Agreement then in progress will be closed as soon as possible. If the Agreement is terminated for the reasons set forth herein, then the County's obligation will be only for payment in accordance with the terms of this Agreement for services rendered until activities related to this agreement can be closed.

Notwithstanding any other provision hereof, County's obligations hereunder shall nevertheless survive the termination of this Agreement or the Project if the Tunnel is bored in the proximity of an

aquifer that supplies District with water or an aquifer that has a hydraulic connection to such an aquifer.

The County may also terminate this Agreement, in whole or in part, in writing, for lack of appropriation. If expected or actual funding is withdrawn, reduced or limited in any way prior to the termination of this Agreement, or in any amendment hereto, the County may, upon written notice to the District, terminate this Agreement in whole or in part. In accordance with King County Code 4.04.040, payment shall not exceed the appropriation for the year in which termination is effected.

Within six (6) months of execution of this Agreement, the County will proceed to secure legislation approving this Agreement such that the termination for lack of appropriation clause set forth above shall have no further force or effect.

D. All equipment produced or acquired with funds provided by the County, except as specifically identified within the Agreement, shall be the property of the County and shall be disposed of as instructed by the County.

VI. Duration, Termination, Amendment and Other

A. This Agreement shall be effective and commence upon mutual execution by the Parties and shall, unless terminated as set forth above, remain in effect until the Work in Attachment 1 is completed.

B. This Agreement may be amended, altered, clarified, or extended only by the written agreement of the Parties hereto.

C. This Agreement shall not be assignable by either Party, either in whole or in part except in the event of assumption, consolidation, merger or operation of law.

D. This Agreement is the complete expression of the understanding of the Parties regarding the subject matter hereof and any oral or written representations or understandings not incorporated herein are hereby expressly excluded. The Parties recognize that time is of the essence in the performance of the provisions of this Agreement. Waiver of any default shall not be deemed to be waiver of any subsequent default. Waiver of breach of any provision of this Agreement shall not be deemed to be a waiver of any other or subsequent breach and shall not be construed to be a modification of the terms of the Agreement unless stated to be such through written amendment approved by the Parties.

E. The parties shall use reasonable efforts to mediate any dispute arising under this agreement. In the event of such a dispute, the aggrieved party shall prepare and deliver to the other party a brief written statement of its claims. Such statement shall not be admissible in evidence in any subsequent court proceedings. Each party shall then designate, in writing, not more than 3 candidates it proposes to act as a non-binding mediator within ten (10) days following delivery of the written claim. If the Parties cannot agree on one of the mediators from the combined list within five (5) days, the Parties shall promptly meet and select a mediator by blind draw. Upon selection of the mediator, the Parties shall within thirty (30) days or as soon thereafter as possible, meet and engage in a mediation of the dispute with the assistance of the mediator. The mediator shall determine reasonable procedures. Testimony and briefing provided to the mediator shall be inadmissible in subsequent court proceedings. If mediation fails to resolve the dispute, the Parties may thereafter seek redress in court. Venue and jurisdiction shall lie with the King County Superior Court in Seattle, Washington. The prevailing party in such litigation as determined by the court may recover its reasonable attorney fees and costs from the other party, provided that, such recovery shall not include the cost of mediation. The Parties shall have the right of specific performance of the terms of this Agreement.

F. Attachments 1 through 5 attached hereto are hereby incorporated by reference as if set forth in full herein.

KC BRIGHTWATER AGREEMENT 2003

VII. Indemnification and Hold Harmless

Each Party shall protect, defend, indemnify, and save harmless the other Party, its officers, officials, employees, and agents, while acting within the scope of its employment as such, from any and all costs, claims, judgments, and/or awards of damages, arising out of or in any way resulting from either Party's own negligent acts or omissions. Each Party agrees that its obligations under this paragraph extend to any claim, demand, and/or cause of action brought by, or on behalf of, any of its employees or agents. For this purpose, each Party, by mutual negotiation, hereby waives, with respect to the other Party only, any immunity that would otherwise be available against such claims under the Industrial Insurance provisions of Title 51 RCW. In the event that either Party incurs any judgment, award, and/or cost arising therefrom, including attorneys' fees, to enforce the provisions of this Article, all such fees, expenses, and costs shall be recoverable from the responsible Party to the extent of that Party's culpability.

IN WITNESS WHEREOF, the Parties hereto have executed this agreement on the 5th day of December, 2003

Lake Forest Park Water District:
By:
Title: Commissioner Chair

King County:
By:
Title: Director, King County, Department of Natural Resources and Parks

Attachment 1

The following sections 1-4 define particular geotechnical and water quality monitoring work to be conducted as part of the Tunnel geotechnical investigation, design, construction and operations. Section 5 describes a Potable Water Supply Replacement Plan.

1. Hydrogeologic Expl oration and Testing (Tunnel Design Stage)

The objective of this section is to define the approach and scope of the hydrogeologic exploration and testing planned for the District's source aquifer area. The intent of these investigations is to characterize the topology and hydrogeologic properties in portions of the District's source aquifer, as currently understood in the vicinity of the Conveyance Alignment (as defined in Attachment 2 and mapped in Attachment 4). The findings will be used to establish Tunnel design parameters and to establish benchmark conditions and monitor changing conditions in the aquifer. County will perform this investigation under the immediate direction of a licensed hydrogeologist specializing in water resource development. Input on the investigation scope will be obtained from the District and modifications to the program will be made as reasonable and practicable. Based on current Conveyance Alignment and understanding of subsurface conditions as defined specifically in the Geology and Groundwater Technical Memorandum released on August 6, 2003, it was agreed that Risk Classes S1, S2, and S3 are not considered likely. (See Attachment 2 for definition of Risk Classes) The current Conveyance Alignment does subject the District's resources to Risk Classes S4 or S5. Additional information may adjust this conclusion. Alternatives for the design and location of the Conveyance Alignment are still being considered; provided, however, County shall use its best efforts in preparing the final design of the Tunnel Alignment to avoid the District's source aquifer. All data collected from this investigation will be shared with the District on an ongoing basis.

The following parameters are considered minimum components of this investigation program and will complement the overall pre-design sub-surface investigation:

A. Monitor wells. Monitor wells will be drilled to depths of at least 2 times the Tunnel diameter below the invert in immediate proximity to and within the District's source aquifer. These wells are required for several purposes including profiling of geology, hydrogeologic mapping of aquifers and underground strata, and water quality sampling. The boring locations shall also include two monitoring wells up-gradient and down-gradient of the proposed tunnel boring that will be used to monitor pump testing. Planned monitoring well locations will be reviewed with the District's hydrogeologist. The design of these wells, including drilling, sealing, casing, cap and other appurtenances, shall be consistent with industry practice and meet regulatory standards. The wells shall be sealed from vertical migration of water while providing a sampling tube and conduit for data logging transducers. Data obtained shall be reciprocally shared between the District and the County. The minimum number of monitor wells within the District's water service area shall be based on the risk class as follows: (This applies to all Risk Class scenarios.).

Risk class	Monitor wells/points
S1	6
S2	4
S3	4
S4	3
S5a	3
S5b	2
S5c	2

B. Short-term data logging at each monitor well. Data logging equipment will be installed to record water levels in multiple monitoring wells in addition to wells located in the District's wellfield. The number of wells monitored and duration of monitoring at each location will be reviewed with the District as data are obtained. It is anticipated that instruments will be rotated periodically between wells to maximize coverage of the data collection effort. The portable data loggers shall be capable of capturing hydraulic head readings every 15 minutes continuously over a period of several weeks during testing. Individual piezometers equipped with pressure transducers shall be installed at levels dictated by the strata. Each transducer shall have a minimum accuracy of 0.10% of full scale. Design of the data-logging program shall be reviewed with the District's hydrogeologic consultant. Monitoring will be initiated with data loggers at each of the District's four deep wells and at one location in the shallow artesian system. The number of data loggers installed in the District's wells may be reduced after a mutually agreed period of time if it appears that data obtained from a lesser number of standby wells provides a representative measure of local conditions. Short-term logging is required for all scenarios and shall be completed immediately following drilling and thereafter.

C. Pumping Tests. Several types of hydraulic testing shall be performed in the area where the Tunnel goes underneath or in the vicinity of the District's water supply aquifer to assess aquifer properties and hydraulic continuity between the District well field and the Conveyance Alignment and portals. These tests shall be conducted using transducer-equipped piezometers in wells located in the vicinity of District's source aquifer. The tests shall record both drawdown and recovery data. The testing program will include the following:

1) Hydraulic conductivity (slug) tests completed in standpipe piezometers in the general and immediate vicinity of the District's source aquifer. These tests will provide values for hydraulic conductivity at multiple locations in the area to assess variability within and between water bearing units. Approximately 5 to 10 slug tests are planned in the area.

2) One pumping test coordinated with the District to monitor hydraulic response to a sustained 24-hour "constant-rate" production event from the District's wellfield. Testing will be coordinated with the District and its hydrogeologist and the test will run for 24 hours (depending on pumping rate and water storage capacity). Data loggers will be used to monitor hydraulic response to pumping at multiple depths and locations in piezometers installed along the preferred alignment.

3) One 24-hour aquifer pumping test shall be performed that includes a four-hour step rate test and a 24-hour constant rate pumping test to evaluate aquifer properties and potential well interference effects. Selected wells, including District wells, shall be equipped with data loggers for monitoring water levels during the test.

4) One shorter-term, constant-rate pumping test that consists of an eight-hour pumping period followed by eight-hours of recovery measurements will also be conducted. Projection of long-term response to appreciably greater pumping stresses during construction requires that even small responses be appropriately defined. If the initial test shows any significant boundary effects, it shall be extended as required to clarify the trend.

5) Pumping wells for both the 8-hour and 24-hour tests will be capable of sufficient production rates to induce observable drawdown responses within the practical constraints of the hydrogeology. Several hundred gallons per minute is anticipated to be necessary. This could require an 8-inch or greater bore size to accomplish. Two additional off-alignment observation wells are planned for installation for use as water level monitoring points during testing. Design and evaluation of the pumping test program shall be carried out in conjunction with the District's hydrogeologic consultant prior to drilling. (Pumping tests are required for all Risk Class scenarios.)

D. Water quality sampling. The intent of initial water quality sampling is to define baseline conditions. At a minimum, groundwater quality samples will be collected near the end of both the 8-hour and 24-hour pumping tests and field parameters (pH, temperature, and conductivity) will be measured periodically as the tests proceed. The groundwater quality samples will be tested for major ions, drinking water inorganic and physical parameters, and phosphate. If any odors or sheen are noted, the samples will also be tested for total petroleum hydrocarbons and volatile organic compounds.

E. Data reduction and analysis from investigation program. Results of the investigation program will be summarized in a written report with graphical presentation of the geology in the vicinity of the District's source aquifer as determined by bore holes and hydrogeologic testing. The report provided to the District shall present at a minimum:

1) Geologic profile data surrounding the District well field from land surface to 50 feet below sea level.
2) Detailed hydrogeologic cross sections from land surface to 2 times the tunnel diameter below the tunnel invert oriented roughly 90-degrees from each other and running through the District's well field.
3) Groundwater elevation data.
4) Potentiometric contour maps.
5) Estimates of aquifer properties at multiple depths and locations.
6) Assessment of hydraulic continuity between proposed tunnel alignment/portal areas and the District well field.
7) Data to support dewatering or depressurization analyses for potential inflow.
8) Data reduction and analysis applies to all scenarios.

2. Tunnel Bore and Portal Design Criteria

The objective of this section is to define parameters used by the designers in specifying Tunnel Bore and Portal Design in accordance with the County's Tunnel performance requirements to ensure compliance with the Water Quality Standards for Ground waters of the State of Washington as identified in WAC Chapter 173-200. The issues and criteria stated in the following sections take into consideration the current Conveyance Alignment. They have been developed to set forth design criteria acceptable to both the District and King County.

A. In the event that Risk Classes S1, S2, or S3 Risk Classes are likely to exist, the design will require that additional hydrogeological evaluation be performed to show that the proposed structures will not impact the hydraulic behavior of the District's source aquifer.

B. In the event that Risk Classes S1, S2, or S3 are likely to exist, King County will develop and implement a more extensive hydraulic, groundwater level and water quality-monitoring program than that proposed above in Section 1. The monitoring program will provide piezometric data for both overlying and underlying strata in addition to the District's aquifer unit. This program will include probes and sampling ports in at least five locations in addition to those located along the tunnel alignment.

C. The Tunnel lining design shall in all circumstances meet the minimum criteria for infiltration and exfiltration set forth in the Washington Department of Ecology and King County codes and rules regardless of risk class. In the event that, during the design of the Project, hydrogeologic inspection and testing shows that hydrogeologic separation cannot be met so that S1, S2, and or S3 Risk Classes are likely to exist, the County shall propose such other additional measures to protect the aquifer such as the installation of a secondary tunnel lining system within the Tunnel. These additional measures shall be continuous through those portions of the Tunnel where the distance above the Tunnel invert and the District's source aquifer is less than 2 times the Tunnel inside diameter in immediate proximity to and within the District's source aquifer and at least 100 feet on both sides of the said aquifer boundaries as illustrated in Attachment 5.

D. Pressurized face tunneling methods, ground freezing or other equivalent stabilizing techniques shall be utilized during Tunnel boring to prevent silt migration and cavity formation from occurring adjacent to the Tunnel. These techniques shall be utilized within and at least 100 feet either side of the District's source aquifer boundaries.

E. Portal structures within 500 feet of the District's source aquifer boundaries or within the aquifer area itself shall be designed to include water stop rings incorporated into the structure at a spacing to reflect the site specific geology, but with minimum spacing of 20 vertical feet. Such water stop rings shall be designed to eliminate vertical flow between aquifers, and/or differing geological strata, along the outside of the structure. Alternative construction methods will be considered by the District provided they can be shown to provide equivalent protection.

F. The tunnel lining design shall require injection of grout, under moderate pressure, to fill any excavated annulus outside of pre-cast tunnel liner structure. (Applies to all Risk Class scenarios)

G. Joints, which exist within the tunnel lining, shall have flexible gaskets incorporated into them that allow differential settlement without leakage. (Applies to all Risk Class scenarios).

3. Construction

County agrees to develop and implement a groundwater level and water quality-monitoring program upon start of Tunnel construction in the vicinity of the District's source aquifer and during construction.

A. The monitoring program will include:

1) Groundwater level monitoring points along the Conveyance Alignment within the District’s source aquifers

2) Groundwater level and water quality monitoring in at least one monitoring well located between the Tunnel and District wells.

3) Groundwater level monitoring in three of the District’s existing wells.

Groundwater level monitoring will be performed using redundant or replaceable submersible transducers connected to a portable data logger. The portable data logger shall be capable of recording hourly hydraulic head readings. Each transducer shall have a minimum accuracy of 0.10% of scale. Water quality monitoring shall be performed quarterly and include indicator parameters for organic and inorganic compounds as mutually agreed with District.

B. County agrees to require that the following reporting procedures and construction materials be provided by the contract for the Tunnel work performed in the vicinity of the District's source aquifer:

1) Standard progress reports as provided to the County by the Tunneling contractor including details of soil type, groundwater encountered, and records of construction activities and any unusual problems.

2) Standard records of excavated and pumped grout volumes as provided to the County.

3) Standard project photographic record of construction progress as provided to the County provided on a regular basis.

4) Hydraulic oils and lubricants, used within the tunnel, must meet Department of Ecology standards for use in immediate proximity to potable water.

5) Cement grout, water proof coatings, and any other materials associated with the tunnel lining tunnel construction must conform to Department of Ecology standards for use in water supply environment.

6) Quarterly reports on groundwater level and water quality monitoring.

C. If, following hydrogeologic inspection and testing during Tunnel construction, the results show that Risk Classes S1, S2 or S3 actually exist, County shall, at minimum, install a secondary tunnel lining system that provides a redundant source of protection against infiltration and exfiltration. This secondary lining system shall consist of reinforced concrete (designed as a water retaining structure), continuous pipe sealed at all joints and fully encapsulated in cement grout, or a plastic or composite membrane system. This secondary lining system, shall be continuous through those portions where Risk Classes S1, S2, or S3 exist and 100 feet on either side.

4. Operation

County agrees to the following operation monitoring and inspection procedures and intervals after construction is complete:

Following Project start up, the Parties shall confirm that either the County or the District shall assume responsibility for any future monitoring of District's source aquifer. If the District continues with the monitoring program, the cost of adding a sampling point to its existing monitoring program, reporting efforts and other appropriate expenses of the District will be reimbursed by the County except as specified in Subsection A below. In this event, the County shall have no direct monitoring obligations except as noted below for Major Seismic Events or as specified in Subsection C below. Absent a subsequent agreement for the District to assume monitoring and reporting responsibilities, the County will include such activities in its regular monitoring and inspection regime with copies of all tests forwarded promptly to the District based on the following table:

Task	**Interval for monitoring and sampling after Project Startup**	**Additional Monitoring Triggered by Major Seismic Event (Richter, R) -**
Monitor well hydrographic updates and analyses	Ongoing data logging of monitor wells, annual review	Risk Class S1,S2,S3 R>6.0 Risk Class S4,S5 R>7.0
Water quality sampling (parameters – Nitrates, chloride, coliform, conductivity)	Risk Class S1,S2,S3 – 6 months Risk Class S4,S5 – 5 years	Risk Class S1,S2,S3 R>6.0 Risk Class S4,S5 R>7.0

A. If the District assumes responsibility for long term monitoring, based on a statistical evaluation of historical data obtained from the sampling points assumed by District during the groundwater level monitoring program and the water quality monitoring program, criteria related to expected water level changes in the District's source aquifer near the Tunnel and expected water quality changes will be established by the parties. Water level fluctuations or water quality changes exceeding these criteria shall result in County resuming responsibility for groundwater level monitoring and water quality monitoring for a minimum of one year. The County shall take other actions as appropriate such as Tunnel inspection to determine if the changes result from the leakage into or out of the tunnel.

B. County will conduct a thorough final construction inspection prior to routing flows through the Tunnel. The District will be invited to participate in this inspection. King County will also conduct a comprehensive inspection of the Tunnel ten years after system start up and at a minimum, every ten (10) years thereafter.

C. In addition, King County will undertake an inspection of the Tunnel after the occurrence of any major seismic event outside of the tunnel design parameters for risk classes S4 and S5. For Risk

classes S1, S2 and S3, the County will undertake an inspection of the Tunnel after a Major Seismic Event where R>= 7.5 or the Tunnel Design Parameter which ever is less.

5. Water Supply Replacement Program

Following issuance of a Draft EIS (DEIS") for the Project, the District submitted comments, posed many questions, and called for additional studies in a number of areas. The District agrees that the technical reports subsequently issued by King County address a number of issues which had been raised in the DEIS comments relating to District's source aquifer. The District has received the Final EIS ("FEIS"), and believes that it adequately addresses the probable significant adverse environmental impacts of the Tunnel which relate to the District's source aquifer. The District also believes that the FEIS together with this agreement does a reasonable job of addressing the measures, which will be needed to mitigate the environmental impacts of the Tunnel. Accordingly, the District agrees that it will not file an administrative appeal of the adequacy of the Brightwater SEPA FEIS.

The District has a duty to the Lake Forest Park community and a legal interest in protecting its water sources and supply resources. It wishes, at this early stage in the Tunnel planning process, to address the future possibility that the tunneling within the Lake Forest Park area may in fact turn out to have impacts not contemplated in the FEIS. The parties agree that the likelihood of these impacts actually occurring appears to be remote and speculative based on the analysis contained within the FEIS. Nonetheless, the parties agree to address, in advance, possible mitigation measures that King County will commit to as a reasonable safeguard. King County's willingness to make this offer at this time is one form of community incentive and mitigation for this essential public facility. It will address general community incentives and stated needs. For communities along the Tunnel route, the state Growth Management Act regulations in Chapter 365-195 WAC authorize and encourage such community incentives and mitigation for communities affected by essential public facilities.

Therefore, the County agrees to perform at its sole expense the following options of mitigation: (1) drilling and development of a new deep well water source and, (2) in the event that this mitigation measure is technically or legally infeasible, creating an intertie for the District to obtain potable water from Seattle Public Utilities, and assume the costs related to this endeavor so there is no net loss to the District compared to its existing water source.

The District understands that securing either of these additional mitigation measures may take several years and involve numerous steps with third parties. The parties specifically acknowledge that obtaining a change in its water rights is outside of the control of County and that jurisdiction over that determination is exclusively accorded to the Washington State Department of Ecology. The parties also specifically acknowledge that both the well and the intertie options require permits authorized and approved by permitting authorities other than County. Accordingly, the parties specifically acknowledge that there is no assurance that either the new well or the intertie mitigation option will in fact be legally feasible. Nonetheless, the parties agree that County will exercise good faith efforts to make the District whole, as defined herein, by applying for such approvals and permits, constructing such facilities and paying all costs pursuant to this Agreement within a reasonable time. King County's "good faith efforts" is defined as performing requisite engineering and planning, applying for appropriate permits and approvals and, if appeals are necessary, prosecuting or defending those permits and approvals using competent counsel and experts. Permitting shall be done in consultation with District and with assistance of District as needed.

A. Construction of Replacement Facilities

1) New Well. As set forth above, the County shall at its sole cost, drill and develop an additional back-up water supply well or wells within the District or in the vicinity of the District that will meet the District's current annual and instantaneous ground water withdrawal rights. The County will drill and develop a new well or wells to meet the appropriate Department of Ecology (Ecology) standards or requirements at County's sole expense. The new well or wells will meet the appropriate (current at time of tunnel commissioning) Ecology, EPA and Department of Health requirements without

treatment. The County will also construct and pay the actual costs of any new pumps, piping, electrical service or other appurtenances that are required to connect the new well or wells to the District's water distribution system in accordance with accepted public utility standards, including the costs of design and permitting. Any such improvements and replacement or supplemental water rights, if any, would be vested in the District at no cost to the District. All designs and specifications for such work would be subject to District's prior written approval, which shall not be unreasonably withheld. The County shall reimburse District for its costs of review and ancillary support as identified in Attachment 3.

2) Upgrade Interties. If the new well drilling and development program defined in paragraph 1) is unsuccessful in meeting the District's current annual and instantaneous ground water withdrawal rights, then the County will create an intertie with Seattle Public Utility (SPU). The county will install a new water main, pumps and appurtenances if necessary, so that they will be capable of providing a permanent water service to existing customers of the District. The County, with the District's support, shall be responsible for designing, obtaining permits and constructing such improvements. The District shall be given the opportunity to review and timely comment on the specifications and must participate in the project's design and constructability reviews and field inspections. The County shall reimburse District for its costs of review as identified in Attachment 3.

3) Such facilities shall be constructed in a good and workmanlike manner. District shall own and operate the above facilities upon completion.

Attachment 2

Definitions:

A. Project shall mean Design, Construction and Commissioning of the Brightwater Wastewater Conveyance and Treatment System

B. Tunnel shall mean the sewage effluent conveyance tunnel that runs from the Brightwater Sewage Treatment Plant to a marine outfall discharging to Puget Sound.

C. Conveyance Alignment shall mean the route and depth of the Tunnel.

D. Water Quality shall be based on Washington State Dept. of Health criteria as it may be amended from time to time.

E. Design Criteria shall mean sound and accepted tunnel construction standards for municipally owned and operated underground sewer effluent conveyance tunnels.

F. Risk and Risk Classes shall mean Risk has been expressed as the product of probability and potential loss. A comprehensive program for limiting risk must account for the product of these factors. i.e. Risk = Probability of Failure X Magnitude of Potential Loss

G. S1. TUNNELING OR PORTALS WITHIN THE DISTRICT'S SOURCE AQUIFER

H. S2. TUNNELING THAT CROSSES THROUGH THE DISTRICT'S SOURCE AQUIFER

I. S3. TUNNELING OR TRENCHING ABOVE THE DISTRICT'S SOURCE AQUIFER OR WHERE THERE IS A POTENTIAL FOR EXFILTRATION

J. S4. TUNNELING THROUGH THE CONFINING MATERIALS BELOW THE DISTRICT'S SOURCE AQUIFER

K. S5. TUNNELING BELOW THE DISTRICT'S SOURCE AQUIFER WITH NATURAL SILT OR CLAY AQUITARD SEPARATING THE DISTRICT'S AQUIFER FROM THE PROPOSED TUNNEL OR PORTALS

L. Aquifer: shall mean the District's source aquifer to be determined by testing and completing as Defined in section 1 of the attachment to this Agreement and as otherwise found by subsequent activities.

M. Major Seismic Event: An earthquake which has an epicenter within 100 Miles of the Conveyance Alignment, and which also has a Magnitude 6.0 or 7.0 or greater depending on the Risk Category, as measured by the Richter Scale as determined by the University of Washington Pacific Northwest Seismograph Network.

N. Richter Scale: A logarithmic scale for expressing the magnitude of a Seismic Event in terms of energy dissipated. Defined by the United States Geological Survey (USGS) as ML Local ("Richter") Magnitude **ML = log A - log Ao** . Defined by Richter (1935) where **A** is the maximum trace amplitude in millimeters recorded on a standard short-period seismometer and is a standard value as a function of distance where distance <= 600 kilometers.

O. EPA shall mean Environmental Protection Agency

P. "to make the District whole" is defined as the County ensuring there is no financial burden incurred or borne by the District due to reduced water quality or capacity from the District's water source aquifer caused directly or indirectly by the installation or operation of the Tunnel. The County's obligation "to make the District whole" shall include, but not be limited to, reimbursement of costs incurred or borne by District as a result of such reduction.

KC BRIGHTWATER AGREEMENT 2003

Attachment 3

Scope of Services
December 1, 2003 to December 31, 2011

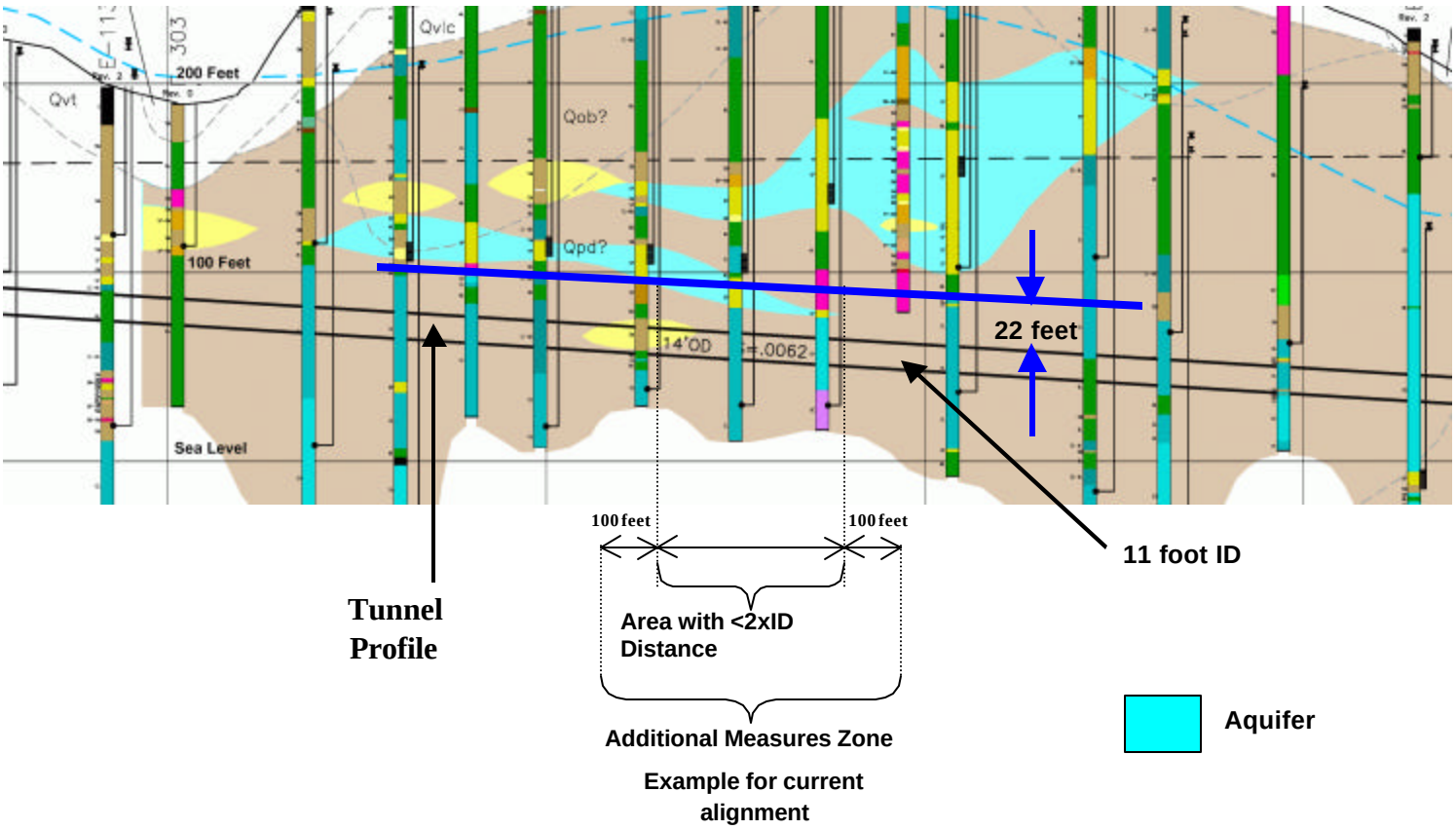
Work Task	Dates Start (End)	Professional Services	Estimated Hours per year	Nominal Rate	Estimated Total Hours	Extension
Participating in County project meetings as invited.	11/25/2003 (12/31/2011)	Professional Services	58	87.5	410	35880
Consulting on the Tunnel project with the District as required and providing comments and recommendations to the Project design and construction teams	11/25/2003 (12/31/2011)	Professional Services	67	87.5	480	42080
Review/comment on the progress of the monitoring of Tunnel construction	12/31/2008 (12/31/2009) (est.)	Professional Services	160	76.67	161.7	12400
Review and ancillary assistance with Development of Alternate Water Supply or Intertie	12/31/2003 (12/31/2008)	Professional Services	235	87.5	934	81750
Total						172110

KC BRIGHTWATER AGREEMENT 2003

Attachment 4



Attachment 5



LFP FRANCHISE
2013

ORDINANCE NO. 979

AN ORDINANCE OF THE CITY OF LAKE FOREST PARK, WASHINGTON, GRANTING TO THE LAKE FOREST PARK WATER DISTRICT, A SPECIAL PURPOSE MUNICIPAL CORPORATION, A FIVE YEAR, NON-EXCLUSIVE FRANCHISE TO USE CITY RIGHTS-OF-WAY TO CONSTRUCT, MAINTAIN, OPERATE, REPLACE AND REPAIR DISTRICT WATER MAINS AND FACILITIES.

WHEREAS, The Lake Forest Park Water District, ("District"), a special purpose municipal corporation, owns and operates a water supply system located within the City of Lake Forest Park ("City"), a municipal corporation; and

WHEREAS, the District has requested the City Council grant it a franchise to install, operate and maintain its water supply system in the public rights of way of the City; and

Whereas, the District and the City agree it is in the best interests of the residents they serve to continue to work cooperatively in the future on long-range plans and to share necessary information, and

WHEREAS, the City Council has the authority to grant franchises for the use of its streets and other public properties (RCW 35A.47.040), and the City is agreeable to granting the District a franchise for its water system, including changes and expansions to the system, on the terms and conditions set forth below. NOW, THEREFORE,

THE CITY COUNCIL OF THE CITY OF LAKE FOREST PARK, WASHINGTON, DOES ORDAIN AS FOLLOWS:

Section 1. Franchise Granted.

1.1 Subject to the terms and conditions hereinafter set forth, the City grants to the District a franchise for a water supply and distribution system. The initial term of the franchise shall be five (5) years commencing on the date of acceptance by the District. At the expiration of the initial term, this franchise shall be extended for an additional term of five (5) years, unless the City gives the District written notice of intent to terminate, which notice shall be given at least six (6) months before the expiration date.

1.2 This franchise grants to the District the right, privilege and authority to construct, operate, maintain, remove, replace, and repair all necessary facilities for a water supply and distribution system, in, under, on, across, over, through, along or below the public rights-of-way located in the City, as approved under City permits issued pursuant to applicable City codes and regulations. Public "rights-of-way" means all streets, roads, alleys, and.highways, of the City as now or hereafter laid out, platted, dedicated or improved that are dedicated for public use.

City owned real property, including easements not dedicated as right-of-way, and property dedicated as open space are not public rights-of-way

1.3 Any work performed under this franchise shall be performed in accordance with applicable federal, state, and City laws, rules and regulations, including City Department of Public Services Policies and Plans.

1.4 District facilities shall be located, relocated, and maintained so as not to unreasonably interfere with the free and safe passage of pedestrian and vehicular traffic or access to abutting property. The City reserves the right to maintain clear zones for the location of City utilities. If adequate clear zones cannot be established for a right-of-way, the District shall locate in an alternate right-of-way, obtain private easements, or propose alternate construction methods to maintain the clear zone.

1.5 The District shall not abandon any facility located in City rights-of-way without receiving prior approval from the City. Abandoned facilities shall become the property of the City. Facilities abandoned without City approval may be removed by the City at District expense.

1.6 Except in cases of emergency, the City reserves the right to prohibit open trenching in City rights-of-way for a period of five years following any street overlay or improvement project.

Section 2. Non-Exclusive Franchise.

This franchise is non-exclusive and the City reserves the right to grant other or further franchises in, along, over, through, under, below or across any of its public rights-of-way. This franchise shall in no way prevent or prohibit the City from using any of its public rights-of-way or other public properties nor affect its jurisdiction over them or any part of them; and the City shall retain power to make all necessary changes, relocations, repairs, maintenance, establishment, improvement, dedication of same, including the dedication, establishment, maintenance, and improvement of all new rights-of-way, thoroughfares and other public properties of every type and description.

Section 3 Franchise Fees.

3.1 Franchise Fee Purpose: The City levies a franchise fee pursuant to this franchise agreement to ensure that the City's transportation, landscape, drainage, and sewer system infrastructure is maintained and preserved during the ongoing operation of utility work in the City. Utility work within the City's right-of-way causes a deterioration of the right-of-way and requires the City to perform annual maintenance and longer-term capital improvements to maintain and preserve the City's right-of-way infrastructure. Administration of this franchise and the annual maintenance and preservation work includes the work and cost for City employees, materials, engineering, inspection, administration of the franchise agreement, planning, electronic mapping, pavement management, and other outside services for shoulder maintenance, street drain maintenance, roadside maintenance, street overlays, sweeping and mowing, and street and

drainage capital projects. The annual City expenses incurred for the maintenance and preservation work of the City's rights-of-ways utilized by the District covered by this agreement exceed the 6% franchise fee levied upon the District pursuant to this agreement.

3.2 Commencing within 60 days after the District's unconditional acceptance of this Ordinance, the District shall collect and pay to the City in consideration of the right to use City rights-of-way a fee equal to 6% of the regular bimonthly water utility service revenue of the District received from properties in the City. Payment shall be made no later than thirty (30) days after the end of the District's bi-monthly billing period.. The District agrees the franchise fee established by this Section is appropriate and that the District will not be a party to or directly support legal or legislative action intended to result in judicial determinations or legislative action referred to above. The City shall defend, indemnify and hold the District harmless from and against any and all claims, suits, actions or liabilities (including costs and attorneys' fees) incurred or asserted against the District directly or indirectly arising out of the creation and imposition of the franchise fee.

Section 4 Cooperative Planning.

4.1 The District and the City each recognize its respective obligation to plan in accordance with the laws of the State. When planning for that portion of its service area within City limits, the District will plan in a manner consistent with State Law, both substantively and procedurally, so that it is compatible with City planning documents and the planning documents of other jurisdictions that are served by, or are adjacent to, the District. To assure such compatibility, the District will solicit input from the City with regard to District planning activities early in the planning process, so that City comments may be considered by the District and, if appropriate, incorporated into the draft District plan(s). To facilitate the District's efforts to comply with State Law for that portion of its service area within City limits, the City will supply the District with requested information in a timely manner.

4.2 The District and the City shall exercise best efforts to coordinate construction work undertaken by either in City's rights-of-way to promote orderly and expeditious performance of the work.

Section 5 Relocation of Water System Facilities.

5.1 The District shall, protect, support, temporarily disconnect, relocate or remove from any public right-of-way any of its installations when so required by the City by reason of traffic conditions or public safety, dedications of new rights of-way and the establishment and improvement thereof, widening and improvement of existing rights-of-way, storm drainage construction, street vacations, freeway construction, change or establishment of street grade, or any other City project; provided that, with City approval, the District may temporarily bypass, in the authorized portion of the same street, any section of main required to be temporarily disconnected or removed. Unless the District is otherwise reimbursed by a third-party, the cost of relocating such Facilities existing within the limits of the City shall be paid as follows:

(a) if the relocation occurs within six (6) years after District initially constructed such Facility, then the relocation shall be at the City's sole cost;

(b) if the relocation occurs more than six (6) years after District initially constructed such Facility, then the relocation shall be at District's sole cost.

5.2 Any condition or requirement imposed by the City upon any person or entity which reasonably necessitates the relocation of the District's facilities within the franchise area shall be a required relocation under subsection 5.1, subject to the District's right to establish terms for such utility relocation with such person; provided such arrangements do not unduly delay a City construction project.

5.3 If the City determines that a project necessitates the relocation of District facilities, the City shall:

A. Provide the District with written notice requiring a utility relocation before commencement of the improvement project according to the timeframes in the Notification Table below. ; provided that, the City shall notify the District of a relocation required by a City capital improvement project as soon as the City acting with reasonable diligence learns that relocation of utilities are required;
Notification Table – Time Periods
   i. 30 days notice for projects under $5,000
   ii. 90 days notice for projects under $25,000
   iii. 120 days notice for projects over $25,000; and,

B. Promptly provide the District with copies of pertinent portions of thirty percent plans for such improvement project and a proposed location for District facilities so that the District may relocate its facilities in other City rights-of-way in order to accommodate such improvement project; and

C. Unless the parties otherwise agree, after receipt of such notice and such plans, the District shall complete relocation of its facilities at least ten (10) days prior to commencement of the City's project at no charge or expense to the City except as provided otherwise herein. Relocation shall be accomplished in such a manner as to accommodate the City's project. The District shall not be considered in breach of this Section if the City fails to give the required notice, or if it is delayed by the time required

   (i) to comply with state bid law requirements for contracting out any of the relocation work and the District has diligently pursued the award of the necessary contract; or

   (ii) to obtain or comply with any permits necessitated by environmental or endangered species requirements.

5.4 The District may submit to the City written alternatives to any requested relocation, which the City shall give full and fair consideration. The District shall submit

additional information requested by the City to aid its evaluation. The City shall advise the District in writing if one or more of the alternatives is acceptable. If the City determines that no other reasonable or feasible alternative exists, the District shall relocate its facilities as otherwise provided in this Section.

5.5 The District may establish terms and conditions for any utility relocation that is requested by a third party if the utility is not being relocated at the direction of the City; provided such arrangements are consistent with this franchise, applicable City requirements concerning work in the rights-of-way and do not unduly delay a City construction project.

Section 6. Maps and Records.

After construction of new facilities, or relocation of existing facilities in the City rights-of-way, the District shall provide to the City, upon request and at no cost, a copy of all as-built plans, maps and records detailing the location and condition of its facilities within the public right-of-ways and public places.

Section 7. Excavations.

7.1 All work performed by the District or its contractors shall be accomplished in a safe and workmanlike manner, and in a manner that will minimize interference with traffic and the use of adjoining property. The District shall post and maintain proper barricades and comply with all applicable safety regulations during construction as required by the ordinances of the City or the laws of the State of Washington.

7.2 The District shall secure City right-of-way permit(s) to work in the public rights-of-way and including but not limited to Capital Improvement Program projects, water main repairs, and work involving vehicles or mechanical equipment used in the right of way. This would include disruption of all motorized and non-motorized travel portions of the right of way, including all surface water drainage facilities. In addition, the district shall provide the City at least five (5) working days notice of its intent to commence work in the public rights-of-way. For all routine maintenance and repair work in the public right-of-way such as flushing, painting hydrants, vegetation maintenance, meter trimming, and work within existing chambers, no permit fee will be required.

7.3 If either party plans to excavate in the public rights-of-way, then upon a written request from the other, that party may share such excavation upon mutually agreed terms and conditions. The City may, if authorized by law require the District to share an excavation or jointly trench with another party proposing to work in the right-of-way; provided that the requirement will not unreasonably delay the District's project.

Section 8. Restoration.

After completion of work in a public right-of-way, the District shall restore the surface of the right-of-way to a condition as good as or better than existed immediately prior to the work and to the standards established on the approved plans, or permit conditions, whichever

is greater. The Public Works Director shall have final approval of the condition of such streets and public places after restoration. All concrete encased monuments which have been disturbed or displaced by such work shall be restored pursuant to all federal, state and local standards and specifications. The District shall complete all restoration work promptly and promptly repair any damage caused by such work.

Section 9. Emergency Work -- Permit Waiver.

If a District facility located in a right-of-way or a District construction area presents a condition that endangers property, health or safety, the District shall immediately take proper emergency measures, without first obtaining a permit as required by this franchise. However, the District shall notify the City of the work not later than the next succeeding business day and apply for a right-of-way permit within forty-eight (48) hours.

Section 10. Authority for City to Abate Dangerous Conditions,.

If work related to facilities authorized by this franchise endangers property or the public's health and safety, the Public Works Director may direct the District, at the District's own expense, to take appropriate protective action, including compliance within a prescribed time. Unless otherwise notified in writing by the District, the City shall notify the District as follows: General Manager or Duty Officer: phone number: (206) 365-3211.

If the District does not comply with such directions, or if immediate action is required to protect property or the public's health and safety, the City may take reasonable emergency measures, and the District shall be liable to the City for the costs thereof.

Section 11. Indemnification.

District shall indemnify, defend and hold the City, its agents, officers, employees, volunteers and assigns harmless from and against any and all claims, demands, liability, loss, cost, damage or expense of any nature whatsoever, including all costs and attorney's fees, made against them on account of injury, sickness, death or damage to persons or property that is caused by or arises out of, in whole or in part, the willful, tortious or negligent acts, failures and/or omissions of District or its agents, servants, employees, contractors, subcontractors or assigns in the construction, operation or maintenance of its Facilities or in exercising the rights granted District in this Franchise; provided, however, such indemnification shall not extend to injury or damage caused by the negligence or willful misconduct of the City, its agents, officers, employees, volunteers or assigns.

In the event any such claim or demand be presented to or filed with the City, the City shall promptly notify District thereof, and District shall have the right, at its election and at its sole cost and expense, to settle and compromise such claim or demand, provided further, that in the event any suit or action be begun against the City based upon any such claim or demand, the City shall likewise promptly notify District thereof, and District shall have the right, at its election and its sole cost and expense, to settle and compromise such suit or action, or defend the same at its sole cost and expense, by attorneys of its own election. District shall have no right, by virtue of this paragraph, to settle any claims against the City for which District is not required to

reimburse, nor shall District have any control or authority over any claims or portions of claims against the City for which District is not required to reimburse.

Section 12. Insurance. The District shall procure and maintain for the duration of the franchise, insurance against claims for injuries to persons or damages to property which may arise from or in connection with the exercise of the rights, privileges and authority granted hereunder to the District, its agents, representatives or employees. The District shall provide a insurance endorsement, naming the City as an additional insured, to the City for its inspection prior to the adoption of this franchise ordinance, and such endorsement shall evidence a policy of insurance that includes:

A. Automobile Liability insurance with limits no less than $1,000,000 Combined Single Limit per occurrence for bodily injury and property damage; and

B. Commercial General Liability insurance, written on an occurrence basis with limits no less than $1,000,000 combined single limit per occurrence and $2,000,000 aggregate for personal injury, bodily injury and property damage. Coverage shall include but not be limited to: blanket contractual; products and completed operations; broad form property damage; explosion, collapse and underground (XCU); and employer's liability.

The District may satisfy the requirements of this section by a self-insurance program or membership in an insurance pool providing coverage substantially the same as set forth above.

Section 13. Non-Assumption.

In consideration for the franchise fee and acceptance of and substantial compliance with the terms and conditions of this franchise, the City agrees that it will not exercise its statutory authority (RCW Chapter 35.13A as currently written, or as may hereafter be amended) to assume jurisdiction over District or any District responsibilities, property, facilities or equipment within the City's corporate limits, including future annexed areas, for the term of this franchise.

Section 14. Modification.

The terms and conditions of this franchise may be modified upon written agreement of the parties.

Section 15. Forfeiture and Revocation.

If The District willfully fails to comply with any provision of this franchise, or through willful misconduct or gross negligence fails to comply with any notice given the District by the City under the provisions of this franchise, then this franchise may be revoked by the City Council after a hearing held upon notice to the District.

Section 16. Remedies to Enforce Compliance.

In addition to any other remedy, the City may obtain a superior court order compelling the District to comply with the provisions of this Ordinance and seek to recover damages and costs incurred by the City by reason of the District's failure to comply. The pursuit of any right or remedy by the City shall not prevent the City from acting under Section 15.

Section 17. City Ordinances and Regulations.

This franchise shall not prevent the City from adopting and enforcing all necessary and appropriate ordinances regulating the performance of the conditions of this franchise, including any valid ordinance made in the exercise of its police powers. The City retains its authority to control by reasonable regulations the location, elevation, manner of construction and maintenance of District water delivery facilities in the public rights-of-way, and the District shall conform with all such regulations, unless compliance would cause the District to violate other requirements of law. The City reserves the right to enact legislation in an exercise of its police powers consistent with its constitutional obligation not to impair contracts.

Section 18. Acceptance.

Unless extended by Ordinance, the District shall have sixty days after the passage and approval of this Ordinance to file with the City Clerk its unconditional written acceptance of this franchise; otherwise, the District shall be deemed to have rejected this franchise.

Section 19. Survival.

Sections 3, Relocation of Water and Wastewater Facilities; 4, Excavation; 7, Restoration after Construction; 9, Dangerous Conditions; and 11, Indemnification shall be in addition to any and all other obligations and liabilities the District may have to the City at common law, by statute, or by contract, and shall survive the City's franchise to the District for the use of the City rights of way for a reasonable period. This Ordinance is binding upon the successors and assigns of the District and all privileges, as well as all obligations and liabilities of the District shall inure to its successors and assigns.

Section 20. Dispute Resolution.

The parties will attempt in good faith to resolve through negotiation any dispute, claim or controversy arising out of or relating to this Agreement. Either party may initiate negotiations by providing written notice in letter form to the other party, setting forth the subject of the dispute and the relief requested. The recipient of such notice shall respond within five days with a written statement of its position on, and recommended solution to, the dispute. If the dispute is not resolved by this exchange of correspondence, then representatives of each party with full settlement authority will meet at a mutually agreeable time and place within ten days of the date of the initial notice in order to exchange relevant information and perspectives, and to attempt to resolve the dispute. If the parties are not able to resolve the dispute, the parties may

agree to submit the dispute to a mutually acceptable third party mediator. If mediation is unsuccessful or the dispute is not submitted to mediation, the parties shall be free to pursue any available judicial remedies.

Section 20. Assignment.

This franchise may not be assigned or transferred without the written approval of the City, which shall not be unreasonably withheld.

Section 21. Notice. Any notice required or permitted by this franchise may be sent to the following addresses unless otherwise specified in writing:

CITY OF LAKE FOREST PARK
Director of Public Works
17425 Ballinger Way N.E.
Lake Forest Park, WA 98155

LAKE FOREST PARK WATER DISTRICT
District Office Administrator
4029 NE 178th Street
Lake Forest Park, WA 98155

Section 22. Severability.

If any section, sentence, clause or phrase of this ordinance should be held to be invalid or unconstitutional by a court, the validity or constitutionality of any other section, sentence, clause or phrase of this ordinance shall not be affected, unless the rights, privileges, duties, or obligations hereunder are materially altered, whereupon either party may request renegotiation of those remaining terms.

Section 23. Effective Date.

This ordinance, being an exercise of a power specifically delegated to the City legislative body, is not subject to referendum, and shall take effect (5) days after passage and publication of an approved summary thereof consisting of the title.

PASSED BY A MAJORITY VOTE of the members of the City of Lake Forest Park City Council this 28th day of August 2008 and signed into authentication this 4th day of September 2008.

APPROVED:

Dwight A. Thompson, Mayor *pro tempore*

Attest:

Susan Stine, City Clerk

LFP FRANCHISE
2013

ACCEPTANCE OF FRANCHISE

The Lake Forest Park Water District accepts the nonexclusive franchise to The Lake Forest Park Water District approved by the City of Lake Forest Park City Council on August 28, 2008, by the adoption of Ordinance No. 979.

DATED this 8 day of September, 2008

LAKE FOREST PARK WATER DISTRICT

By: _____
President, Board of Commissioners

President

SPU EMERGENCY INTERTIE 2012

EMERGENCY INTERTIE AGREEMENT

BETWEEEN

SEATTLE PUBLIC UTILITIES

AND

LAKE FOREST PARK WATER DISTRICT

This Agreement is made and entered into this 7th day of July, 2012 by and between the City of Seattle, a Washington municipal corporation, acting through its Seattle Public Utilities ("SPU") and Lake Forest Park Water District, a Washington municipal corporation ("Water Utility").

WHEREAS, SPU and Water Utility each own and operate public water supply systems ("Water System") within their respective service areas in accordance with the laws of the State of Washington; and

WHEREAS, Water Utility has requested that SPU provide it with an emergency back-up water supply through an existing intertie connection between SPU's and Water Utility's Water Systems, which will increase reliability for operating Water Utility's Water System during temporary periods when its Water System is impaired or disrupted; and

WHEREAS, SPU agrees to use its best efforts to provide Water Utility an emergency back-up water supply under certain terms and conditions from its available existing sources of water supply.

NOW THEREFORE, both parties agree as follows:

1. TERM: The initial term of this Agreement shall be for fifty (50) years commencing on January 1, 2012 and expiring on December 31, 2062.

2. DESCRIPTION OF EMERGENCY INTERTIE: SPU will deliver water to Water Utility through service connection(s), which include the water meter and appurtenances ("Emergency Intertie"), as described below and as more particularly described, including the location(s) and specific operating conditions, in Exhibit I, a copy of which is attached and incorporated herein. Exhibit I may be revised in writing upon mutual agreement of the Director of SPU and the President of Water Utility, except that SPU may modify the minimum hydraulic gradient once during any fifteen (15) year period upon four (4)

years' advance written notice, unless a shorter notice is agreed to by Water Utility. SPU Facilities include: the outlet from the supply pipeline, the pipeline from the outlet to the meter vault, and the meter vault and its contents. Water Utility Facilities include: everything past the external wall of the meter vault. SPU will provide water for use at the Emergency Intertie at any time except as otherwise allowed by the terms of this Agreement.

3. USE OF EMERGENCY INTERTIE: Water Utility's use of the Emergency Intertie is limited to temporary, emergency backup water supply for up to one week, unless SPU approves a longer period in writing, which will not be unreasonably withheld. The parties agree that in the event a substantially longer period is approved, the Director of SPU may require additional reasonable terms and conditions that will be in effect during the approved longer period. For the purposes of this Agreement, an emergency means an unforeseen event that causes damage or disrupts Water Utility's normal operations of its Water System or requires immediate action to protect public health and safety, which includes fire flow purposes.

4. LIMITATIONS ON USE OF EMERGENCY INTERTIE:

a. The Emergency Intertie may not be used to respond to routine or seasonal peak demands or water shortages.

b. Before using the Emergency Intertie, Water Utility shall use best efforts to activate its own emergency sources of supply or alternative operations to cope with the emergency.

c. SPU will provide water at the point of delivery in accordance with this Agreement during use of the Emergency Intertie as defined in Exhibit I, as revised from time to time.

d. Water Utility will endeavor to not exceed flows defined in Exhibit I during use of the Emergency Intertie without specific written authorization by SPU.

e. Water Utility may use up to the number of gallons of water per year through the Emergency Intertie identified in Exhibit 1 for administrative purposes only, such as hydrant or valve exercising/testing, flushing or other measures taken to maintain water quality, which is included as part of the Annual Fee ("Administrative Allowance"). The Director of SPU and the President of Water Utility may revise the Administrative Allowance in Exhibit I as necessary, upon mutual written agreement between the Director of SPU and President of Water Utility.

SPU EMERGENCY INTERTIE 2012

f. Water Utility agrees and acknowledges that in the event of a general emergency or weather-related water shortage affecting SPU's Water System, SPU may interrupt or reduce its deliveries of water to its wholesale customers (except for fire protection), including Water Utility under this Agreement.

g. Water Utility agrees and acknowledges that in the event of a general emergency or weather-related water shortage affecting SPU's Water System or the region, SPU may implement emergency water use curtailment measures that impact Water Utility's retail customers' use of water in accordance with its Water Shortage Contingency Plan or other necessary action. Water Utility will assist and support any emergency curtailment measures that are implemented and related to use of the Emergency Intertie.

h. Water Utility agrees and acknowledges that SPU may temporarily interrupt use or reduce availability of water through the Emergency Intertie if SPU determines that the interruption or reduction is necessary or reasonable in case of a localized or SPU Water System emergency or in order to perform any required maintenance, improvement, repair, inspection or testing of SPU's Water System. Except in cases of emergency affecting SPU's Water System, SPU will provide Water Utility reasonable notice of any temporary interruptions or reductions and will endeavor to minimize interruptions and reductions of water available through the Emergency Intertie, especially when the Emergency Intertie is in active use by Water Utility. In the case of emergency, SPU will provide Water Utility notice as soon as practicable.

5. NOTIFICATION: Whenever general notice is required or prudent under this Agreement, notice shall be giving to the following representatives, which may be amended in writing:

SPU:	Water Utility:
Wholesale Contracts Manager PO Box 34018 Seattle, WA 98124-4018	Office Administrator 4029 NE 178th St Lake Forest Park, WA 98155
206-733-9815	206-365-3211
Email: terri.gregg@seattle.gov	Email:office@lfpwd.org

a. Water Utility will verbally notify SPU Operations Control Center at 206-386-1818 whenever the Emergency Intertie is used for emergency use. Water Utility will endeavor

to notify SPU within 1 hour after the use of the Emergency Intertie begins, or as soon as practicable, and will state the nature of the emergency and estimated/actual duration.

b. Water Utility will send written notice to SPU Wholesale Contracts Manager at the address above within 10 days after each use of the Emergency Intertie, in a form acceptable to SPU, stating the duration and estimated quantity of water use.

6. WATER QUALITY: SPU will provide water to the point of delivery that meets all state and federal drinking water standards and shall be of the same standard and quality as that normally delivered by SPU to its retail and wholesale customers. Water Utility acknowledges and agrees that because the Emergency Intertie is used intermittently, it may result in water being stagnant at the point of delivery for periods of time that may affect water quality. Water Utility is solely responsible for implementing operational best practices, such as flushing the service connection, prior to use of the Emergency Intertie for potable or other use. Water Utility is solely responsible for compliance with all applicable local, state and federal drinking water quality laws and regulations within its Water System.

7. INTERTIE MAINTENANCE: Each utility shall be responsible for maintenance of their portion of the Emergency Intertie as described in Section 2 of this Agreement as SPU and Water Utility Facilities respectively.

8. METER EQUIPMENT: SPU shall own, maintain and pay the cost of the metering equipment for the Emergency Intertie, including periodic inspection and testing. If Seattle changes the location of the intertie connection to Water Utility for Seattle's benefit, then Seattle shall pay the cost of constructing a new wholesale meter installation at the new location. If Water Utility requests the change in location, then Water Utility shall pay the cost of the new connection.

9. EMERGENCY INTERTIE FEES: Water Utility will pay the following charges within 30 days of an invoice from SPU:

a. An Annual Fee, paid in advance by January 1 of each calendar year, which covers SPU's expenses to administer this Agreement and the Administrative Allowance for Water Utility under Section 4.e and Exhibit 1 of this Agreement. The Director of SPU may revise the Annual Fee reasonably to account for any change in the Administrative Allowance mutually agreed under Section 4.e above. Each year during the term of this Agreement, the Director of SPU may revise the Annual Fee by the same percentage as the change in the average of the Peak and Off-Peak Commodity Charge Rates from the

prior year to the current year then in effect for wholesale customers under Seattle Municipal Code Section 21.04.440.E.2, as it may be amended from time to time. The initial Annual Fee due January 1, 2012 is $4,700. SPU will provide 30 days' written notice of any subsequent revisions to the Annual Fee, which will become incorporated herein by this reference at the time the revised Annual Fee becomes effective.

b. A Commodity Charge for the metered amount of water used through the Emergency Intertie minus the Administrative Allowance at the then applicable average of the Peak and Off-Peak Commodity Charge Rates in effect for wholesale customers under Seattle Municipal Code Section 21.04.440.E.2, as it may be amended from time to time, plus any emergency surcharge, if applicable generally to the wholesale customers at that time.

c. A one-time transaction fee of $1500 is due January 1 2012.

d. Any late payment will accrue interest at 1% per month.

10. LIMIT OF LIABILITY: Water Utility understands and agrees that SPU obligations under this Agreement are subject to the limitations herein. SPU shall not be held liable, under any circumstances, for loss or damage from a deficiency or failure to supply water caused by an emergency, unforeseen event, or for any other reason allowed under this Agreement.

11. TERMINATION: Water Utility may terminate this Agreement at any time upon twelve (12) months' written notice to SPU. SPU may terminate this Agreement upon sixty (60) days' written notice to Water Utility that it has materially breached this Agreement and does not cure the material breach within the 60-day cure period, or a longer time period as SPU may approve in writing if Water Utility is making substantial progress towards curing the material breach. In the event of termination under this provision, Water Utility will be responsible for any reasonable costs SPU incurs to disconnect or remove the service connection as may be required by industry or SPU operating practices then in effect.

12. DISPUTE RESOLUTION: If a dispute arises out of or relates to this Agreement, the parties agree to negotiate in good faith to resolve the dispute within 90 days. Unless the parties agree to a longer time, if the dispute remains unresolved after 90 days, the parties agree to try in good faith to settle it by mediation before resorting to arbitration, litigation or some other legal dispute resolution procedure. Venue and jurisdiction shall lie in the King County Superior Court for the State of Washington in Seattle.

SPU EMERGENCY
INTERTIE 2012

13. MISCELLANEOUS. This Agreement represents the entire agreement between the parties concerning the subject matter. This agreement shall be interpreted in accordance with the laws of the State of Washington. This agreement will inure to the benefit of and be binding upon the parties and their successors and assigns. If any of this Agreement or its application is determined by a court of law to be illegal, invalid, or void without rendering performance of this Agreement impossible or infeasible, then the Parties intend that the validity of the remaining provisions of this Agreement or their application shall not be affected and shall continue in full force and effect.

IN WITNESS WHEREOF, the parties hereby execute this Agreement.

WATER UTILITY:

BY: Julie G. Hungar

TITLE: President

DATE June 20, 2011

THE CITY OF SEATTLE:

BY: Ray Hoffman

Director, Seattle Public Utilities

DATE: 7-6-11

EXHIBIT I

SERVICE CONNECTIONS, MINIMUM HYDRAULIC GRADIENTS, MAXIMUM AND MINIMUM FLOW RATES, AND ANNUAL ADMINISTRATIVE ALLOWANCE OF WATER SUPPLIED

SERVICE CONNECTION				MINIMUM HYDRAULIC GRADIENT FOR PLANNING PURPOSES AT STATION UPSTREAM OF METER (FEET NAVD-88 Datum)	MAXIMUM FLOW RATE UP TO WHICH THE MINIMUM HYDRAULIC GRADIENT APPLIES (gpm)*	MINIMUM USAGE RATE (gpm)*	ANNUAL ADMINISTRATIVE ALLOWANCE
LOCATION	STATION NUMBER	SIZE OF METER (IN.)	METER TYPE/ OPERATING. RANGE				
NE 195th & Tolt ROW, next to SPU Reservoir	188	8"	Neptune/TBD	535	3500	10	1,000,000 gallons
				TOTAL:	3500		

* Flow shall be either 0 or between the minimum and maximum flow rate.

SPU EMERGENCY INTERTIE 2012

SPU EMERGENCY INTERTIE 2012

City of Seattle
Seattle Public Utilities

July 19, 2011

Alan Kerley, District Manager
Lake Forest Park Water District
4029 NE 178th Street
Lake Forest Park, WA 98155

Re: Emergency Intertie Agreement

Dear Mr. Kerley:

I am pleased to send you a signed copy of the Emergency Intertie Agreement. We look forward to a continued long-term working relationship with Lake Forest Park Water District.

This new Agreement will go into effect on January 1, 2012. At that time the 1982 Water Supply Contract under which SPU has been providing service to the District at Station 97 located near the intersection of Bothell Way and Ballinger Way will terminate.

As we informed you in our letter of November 3, 2009, SPU intends on decommissioning the 16-inch pipeline in Bothell Way. The letter states that the line will not be available for service after the contract expires on December 31, 2011. A copy of the letter is attached. If the District is interested in continued supply at Station 97, SPU is willing to discuss transferring pipeline ownership to the District from the PRV installation at NE 156th Street to Station 97. This could be done at little or no cost, although any costs incurred in setting up a new service connection at NE 156th would be the responsibility of the District. Please let us know if the District would like to pursue this option, otherwise service at Station 97 will not be available after December 31, 2011.

Sincerely,

Ray Hoffman

Attachments: Emergency Intertie Agreement
SPU letter of 11/3/09

Ray Hoffman, Director
Seattle Public Utilities
700 5th Avenue, Suite 4900
PO Box 34018
Seattle, WA 98124-4018

Tel (206) 684-5851
Fax (206) 684-4631
TDD (206) 233-7241
ray.hoffman@seattle.gov

http://www.seattle.gov/util

An equal employment opportunity, affirmative action employer. Accommodations for people with disabilities provided on request.

SPU EMERGENCY INTERTIE 2012

112804

City of Seattle
Seattle Public Utilities

COPY

February 3, 2012

Alan Kerley, General Manager
Lake Forest Park Water District
4029 NE 178th St
Lake Forest Park, WA 98155

RE: Emergency Intertie Agreement One-Time Transaction Fee and Initial Annual Fee

Dear Mr. Kerley:

I want to congratulate Lake Forest Park Water District on the signing of the 50-year Emergency Intertie Agreement. The effective date of your agreement is January 1, 2012. In accordance with Section 9 of the Agreement, the one-time transaction fee and initial annual fee are now due as follows:

1. The initial Annual Fee of $4700 (See Section 9.a.)
2. A one-time transaction fee of $1500 (See Section 9.b.)

Please submit your payment to Terri Gregg, Wholesale Contracts Manager no later than February 29, 2012, at which time late charges will begin to accrue. Regarding future annual fees, Seattle Public Utilities (SPU) will send an invoice 30 days prior to the due date of January 1 each year.

Finally, as of the date of this letter, the contact person at SPU will transfer from Judi Gladstone on the contract negotiations team to Terri Gregg who manages wholesale contracts. All future inquires relating to your contract can be made to Terri Gregg, Wholesale Contract Manager @ (206) 684-7975 or terri.gregg@seattle.gov.

Sincerely,

Ray Hoffman, Director
Seattle Public Utilities

Fund: Maint
Class: DW Tunnel / Intertie
Reviewed by: [signature]
Date: FEB 21 2012

cc: Judi Gladstone, Contract Negotiations
Terri Gregg, Wholesale Contracts Manager
Regina Carpenter, Sr. Economist

Ray Hoffman, Director
Seattle Public Utilities
700 5th Avenue, Suite 4900
PO Box 34018
Seattle, WA 98124-4018

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NUD INTERTIE
1987

COPY

RESOLUTION 1987-6-16

A RESOLUTION of Northeast Lake Washington Sewer and Water District of King county, Washington, authorizing Interlocal Agreement for Purchase and Sale of Water with Water District No. 83.

WHEREAS, the District has previously entered into a Contract For Supply Of Water dated June 3, 1985 wherein the District has agreed to sell water to Water District No. 83 on an emergency basis; and

WHEREAS, the District desires to obtain a supplemental source of water supply, and Water District No. 83 is willing to furnish the supplemental requirements of the District; and

WHEREAS, both Districts are authorized by Chapter 39.34 of the Revised Code of Washington to enter into Intergovernmental Cooperative Agreements; and

WHEREAS, both Districts are desirous of assisting one another, now, therefore,

BE IT RESOLVED that Northeast Lake Washington Sewer and Water District is hereby authorized and directed to enter into an Interlocal Agreement for Purchase and Sale of Water with Water District No. 83, a copy of which is attached hereto as Exhibit A and incorporated herein by this reference, and the Commissioners are authorized to execute said Agreement on behalf of the District.

PASSED BY THE BOARD OF COMMISSIONERS of Northeast Lake Washington Sewer and Water District of King County, Washington, at the regular meeting held June 15, 1987.

a Contract For Supply Of Water dated June 3, 1985 wherein the District has agreed to sell water to Water District No. 83 on an emergency basis; and

WHEREAS, the District desires to obtain a supplemental source of water supply, and Water District No. 83 is willing to furnish the supplemental requirements of the District; and

WHEREAS, both Districts are authorized by Chapter 39.34 of the Revised Code of Washington to enter into Intergovernmental Cooperative Agreements; and

WHEREAS, both Districts are desirous of assisting one another, now, therefore,

BE IT RESOLVED that Northeast Lake Washington Sewer and Water District is hereby authorized and directed to enter into an Interlocal Agreement for Purchase and Sale of Water with Water District No. 83, a copy of which is attached hereto as Exhibit A and incorporated herein by this reference, and the Commissioners are authorized to execute said Agreement on behalf of the District.

PASSED BY THE BOARD OF COMMISSIONERS of Northeast Lake Washington Sewer and Water District of King County, Washington, at the regular meeting held June 15, 1987.

NUD INTERTIE
1987

D. A. ELLIS, President and
Commissioner

BEN H. SEBASTIAN, Secretary
and Commissioner

C. W. DAVIDSON, Vice-President
and Commissioner

NUD INTERTIE
1987

INTERLOCAL AGREEMENT FOR PURCHASE AND SALE OF WATER

THIS AGREEMENT, is made this 15TH day of JUNE, 1987, by and between KING COUNTY WATER DISTRICT NO. 83, a municipal corporation in King County, Washington (hereinafter called "District 83"), and NORTHEAST LAKE WASHINGTON SEWER AND WATER DISTRICT, a municipal corporation in King County, Washington (hereinafter called "Northeast").

R E C I T A L S

A. Northeast and District 83 are the owners and operators of water systems and are engaged in the distribution of water to consumers in King County; and

B. Northeast's corporate boundary is located adjacent to District 83's corporate boundary; and

C. Northeast desires to obtain a supplemental source of water supply, and District 83 is willing to furnish said supplemental requirements of Northeast, subject to the terms and conditions hereinafter set forth; and

D. Northeast and District 83 have previously entered into a Contract for Supply of Water dated June 3, 1985 wherein Northeast agreed to supply water to District 83 (hereinafter called "Contract for Supply"); and

E. Northeast and District 83 desire to consolidate all agreements regarding the purchase and sale of water between the parties into one Agreement and to replace the Contract for Supply with this Agreement.

EXHIBIT A

NUD INTERTIE
1987

NOW, THEREFORE, in consideration of the mutual covenants herein contained, the parties agree as follows:

1. Sale of Water by District 83 to Northeast.

a. Sale of Water. District 83 agrees to sell and deliver to Northeast, and Northeast agrees to purchase and receive from District 83 surplus water to supplement Northeast's existing and future sources of water supply which water delivered shall not exceed 200 gallons per minute and shall be based upon the amount of water reasonably available to District 83 to supply as surplus to Northeast, subject to District 83 requirements. Should District 83 determine that its wells are capable of supplying surplus water in a greater volume than that described herein, and after further negotiation, the parties agree that the amount of water supplied may be increased, provided, however, nothing herein shall obligate District 83 to provide additional water.

b. Interconnection Point. The water to be delivered by District 83 shall be delivered by District 83 to Northeast at an interconnection point approximately six hundred feet (600') southwesterly of the intersection of N.E. 187th Place and 47th Avenue N.E., provided that the costs of such connection shall be borne by Northeast at its sole expense. Additional interconnections may be made as determined by the parties, acting reasonably, provided that all costs of such additional interconnections shall be borne by Northeast.

c. Charges. Subject to Paragraph 3 below, Northeast shall pay District 83 for all water delivered hereunder at the

rate of $.217 per hundred cubic feet, provided that the rate shall be reviewed annually by District 83 for such increase as may be appropriate based upon District 83 costs of operations at the time of review.

d. Billings. District 83 shall bill Northeast on or before the tenth day of each month for all water delivered hereunder for the preceding calendar month. Subject to Paragraph 3 below, payment shall be made by Northeast to District 83 on or before the first day of the month following each billing month.

e. Supply. District 83 shall use reasonable efforts to provide a regular uninterrupted supply of water to Northeast. District 83 shall not be liable for any shortage or interruption in the delivery of water. In addition, District 83 shall not be liable for any failure, interruption or shortage of water or any loss or damage resulting therefrom, occasioned by any cause beyond the control of District 83.

2. Sale of Water by Northeast to District 83.

a. Sale of Water. Northeast agrees to sell and deliver to District 83, and District 83 agrees to purchase and receive from Northeast water required or desired by District 83 for temporary and/or emergency use to supplement existing and future sources of water supply. District 83's source of water supply is primarily from wells, and District 83 anticipates it may need a temporary and/or emergency source of water supply in the event of failure of any of District 83's wells.

NUD INTERTIE
1987

b. Notification. District 83 shall notify Northeast in writing at least thirty (30) days in advance of the date District 83 desires to commence to receive water. Northeast shall provide water thirty (30) days after receipt of said notice. In case of emergency need by District 83, Northeast shall provide water immediately upon oral notification of such emergency. Follow-up written notice of such emergency request shall be made by District 83 to Northeast.

c. Interconnection Point. The water to be delivered by Northeast shall be delivered by Northeast to District 83 at an interconnection point approximately six hundred feet (600') southwesterly of the intersection of N.E. 187th Place and 47th Avenue N.E. provided that the costs of such connection shall be borne by District 83 at its sole expense. Additional interconnections may be made as determined by the parties, acting reasonably, provided that all costs of such additional interconnections shall be borne by District 83.

d. Charges. Subject to Paragraph 3 below, District 83 shall pay Northeast for all water delivered hereunder at the wholesale rate charged by Northeast as revised by Northeast from time to time. In addition, District 83 shall pay Northeast any demand charge charged by the City of Seattle to Northeast as a result of water supplied to District 83 by Northeast pursuant to the terms of this agreement.

e. Billings. Northeast shall bill District 83 on or before the tenth day of each month for all water delivered

hereunder for the preceding calendar month. Subject to Paragraph 3 below, payment shall be made by District 83 to Northeast on or before the first day of the month following each billing month.

f. Supply. Northeast shall use reasonable efforts to provide a regular uninterrupted supply of water to District 83. Northeast shall not be liable for any shortage or interruption in the delivery of water. In addition, Northeast shall not be liable for any failure, interruption or shortage of water or any loss or damage resulting therefrom, occasioned by any cause beyond the control of Northeast.

g. Limitation on Resale. All water purchased and delivered hereunder may be resold by District 83 only to the consumers in the corporate limits of District 83.

3. Exchange of Water. In the event during any calendar month District 83 receives water from Northeast and Northeast likewise receives water from District 83 during the same calendar month, the charges for water delivered shall be offset, each against the other, and the charges for the excess shall be paid by the party receiving the excess water delivered.

4. Metering.

a. All water delivered by District 83 shall be measured by suitable metering equipment by standard manufacture (to be furnished, paid for, installed, maintained and calibrated by Northeast at its expense and read by District 83 at its expense).

b. All water delivered by Northeast shall be measured by suitable metering equipment by standard manufacture, (to be furnished, paid for and installed by District 83 at its expense, and maintained, calibrated and read by Northeast at its expense).

c. Northeast shall periodically inspect and test the meters installed by Northeast and District 83 at intervals not exceeding one year. At the written request of District 83, made not more than once each year, Northeast shall make an additional test in the presence of a representative or representatives of District 83. No meter shall be placed in service or allowed to remain in service which has an error in registration in excess of two percent (2%) under normal operating conditions.

d. In the event any meter is found to be more than two percent (2%) slow or fast, an appropriate adjustment shall be made in the next succeeding monthly bill, based upon the actual period of error if such can be definitely determined and agreed upon, and if not, upon a period not to exceed three (3) months. For the purpose of this paragraph, any meter which registers not more than two percent (2%) slow or fast shall be deemed correct.

5. Indemnification.

a. By Northeast. Northeast hereby agrees to hold District 83 harmless from any and all of the following claims and from any and all expenses, attorney's fees and costs incurred by District 83 as a result of said claims:

(1) Arising out of any use by Northeast of water provided through the interconnection point(s), including emergency use for fire purposes and normal domestic use by the hookups anticipated herein;

(2) Arising out of any other action taken by Northeast which relates in any way to supplying water under this Agreement; and

(3) Made by or on behalf of consumers residing within the geographical limits of Northeast against District 83 which relate in any way to supplying water under this Agreement.

Northeast shall, after notice of any such suit or action, defend and pay the expenses of defending any suit which may be commenced against District 83 by counsel satisfactory to District 83.

b. By District 83. District 83 hereby agrees to hold Northeast harmless from any and all of the following claims and from any and all expenses, attorney fees and costs incurred by Northeast as a result of said claims:

(1) Arising out of any use by District 83 of water provided through the interconnection points(s), including emergency use for fire purposes and normal domestic use by the hookups anticipated herein;

(2) Arising out of any other action taken by District 83 which relates in any way to supplying water under this Agreement; and

(3) Made by or on behalf of consumers residing within the geographical limits of District 83 against Northeast which relate in any way to supplying water under this Agreement.

District 83 shall, after notice of any such suit or action, defend and pay the expenses of defending any suit which may be commenced against Northeast by counsel satisfactory to Northeast.

6. Right to Cancel. Each party has the right to cancel this Agreement upon giving three hundred sixty-five (365) days advance written notice to the other party.

7. Effective Date. This Agreement is to take effect upon ratification by the Board of Commissioners of District 83 and ratification by the Board of Commissioners of Northeast, and upon such ratification by each Board the Contract for Supply shall be terminated on the effective date of this Agreement insofar as it applies to rates and charges or other terms of the Contract for Supply after said effective date; however the Contract for Supply shall remain in effect insofar as it applies to rates and charges or other terms of the Contract for Supply prior to the effective date of this Agreement.

8. Entire Agreement. This document constitutes the entire agreement of the parties with respect to the subject matter hereof and may be modified only by an agreement in writing signed by both parties hereto.

NUD INTERTIE
1987

9. Benefit. This Agreement shall be binding upon and shall inure to the benefit of the parties hereto and their respective heirs, successors and assigns.

KING COUNTY WATER DISTRICT NO. 83

By _____
Gordon Hungar, President

By _____
May 18, 1987, Secretary

NORTHEAST LAKE WASHINGTON SEWER AND WATER DISTRICT

By _____
D. A. Ellis, President

By _____
Ben Sebastian, Secretary

ab/1682A

APPENDIX 1 - D CROSS CONNECTION CONTROL

LAKE FOREST PARK
WATER DISTRICT

Commissioners:
William F. Donahue
David A. Hammond
Eli Zehner

(206) 365-3211
FAX: (206) 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155

GOOD WATER, NATURALLY

FIRST NOTICE OF PERIODIC TEST FOR BACKFLOW PREVENTION ASSEMBLY

November 10, 2014

Dear Water District Customer:

Our records show that you have a backflow prevention assembly or assemblies installed in your water plumbing system that is due for annual testing as required by Washington Administrative Code 246.290.490. Please have the test performed by a person holding a certificate of competency as a Backflow Assembly Tester, issued by the State Department of Health.

If an assembly fails the backflow test, please have the necessary repairs made or replace the assembly. Upon completion of a satisfactory test, have the tester fill out a test report form and return it to our office.

Often times test report forms are sent to the wrong water district by mistake. Please contact your Backflow Assembly Tester if this is the case.

More information on backflow and a list of backflow assembly testers is available on our website at www.lfpwd.org.

If you have any questions please feel free to contact the District office at (206) 365-3211, between 8:00 AM and 4:00 PM, Monday through Friday.

Sincerely,

F. Alan Kerley
General Manager

1-D
Cross Connection

Commissioners:
William F. Donahue
David A. Hammond
Eli B. Zehner

LAKE FOREST PARK
WATER DISTRICT

GOOD WATER, NATURALLY

(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155

BACKFLOW PREVENTION ASSEMBLY TEST – SECOND NOTICE

First letter sent on November 10, 2014

Test due by: December 2, 2014

<FIRST NAME> <LAST NAME> Account No.: <ACCOUNT#>
<ADDRESS>
Lake Forest Park, WA 98155 Make: <MAKE/SERIAL NO.>

Device Location: <DESCRIPTION>

Action Date: December 9th, 2014

A reminder notice for the testing of your backflow assembly device(s) was sent to you on November 10, 2014. The annual testing of your assembly/assemblies is required by State Code (WAC 246-290-490). As of today, we have neither heard from you nor received your report.

If you feel you have received this notice in error, please check with your backflow tester to ensure that your test report was sent to the correct water provider.

Failure to comply with this request by the action date referenced above could result in the discontinuance of your water service.

If you have any questions please feel free to contact the District office at (206) 365-3211, between 8:00 am and 4:00 pm, Monday through Friday.

Sincerely,

F.Alan Kerley
General Manager

1-D
Cross Connection

LAKE FOREST PARK WATER DISTRICT
4029 NE 178th Street
Lake Forest Park, WA 98155
(206) 365-3211

BACKFLOW PREVENTION ASSEMBLY TEST -- FINAL NOTICE

December 9, 2014

<FIRST NAME> <LAST NAME> Account No.: <ACCOUNT#>
<ADDRESS>
Lake Forest Park, WA 98155 Make: WATTS 909QT 461750

LAST TEST DATE: 10/21/13

Device Location: DCVA IRRIGATION DOWNSTAIRS IN MECHANICAL ROOM.

As of this date the District has not received a response to your Annual Backflow Prevention Assembly Test requests sent to you on November 10, and November 25nd 2014. The annual testing of your assembly/assemblies is required by State Code (WAC 246-290-490).

The water service to this property will be discontinued effective December 24, 2014 for failure to respond to our previous Test Due Notifications. Service will remain discontinued until proof of testing has been received. DISCONNECT DATE: DECEMBER 24, 2014

If you feel you have received this notice in error, please check with your backflow tester to ensure that your test report was sent to the correct water provider.

If you have any questions please feel free to contact the District office at (206) 365-3211, between 8:00 AM and 4:30 PM, Monday through Friday.

Sincerely,

Alan Kerley
District Manager

1-D
Cross Connection

APPENDIX 1 - E NEW SERVICE CONNECTIONS

WATER AVAILIBILITY
INFORMATION ATTACHMENT

SERVICE ADDRESS

BILLING NAME

BILLING ADDRESS

CITY, STATE, ZIP CODE

PHONE NUMBER/AREA CODE

LAKE FOREST PARK
WATER DISTRICT

Commissioners:
William Currie
Timothy M. Davis
Gordon Hungar

GOOD WATER, NATURALLY

(206) 365-3211
FAX: .365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155

DO NOT WRITE IN THIS BOX

_____ NUMBER	_____ NAME

Building Permit
Short Subdivision
Lot Line Adjustment
Rezone or other_____

APPLICANT'S NAME :_____
PROPOSED USE: _____
LOCATION: _____
LEGAL DESCRIPTION: _____
(Attach map & legal description if necessary)

WATER SYSTEM INFORMATION:

1. a. Water will be provided by service connection only to an existing_____water main_____feet from the site.
   or
   b. Water service will require an improvement to the water system of:
   (1)_____feet of water main to reach the site; and/or
   (2) the construction of a distribution system on the site; and/or
   (3) other (describe)_____

2. a. The water system is in conformance with a County approved water comprehensive plan.
   or
   b. The water system improvement will require a water comprehensive plan amendment.

3. a. The proposed project is within the corporate limits of the district, or has been granted Boundary Review Board approval for extension of service outside the district or city, or is within the County approved service area of a private water purveyor.
   or
   b. Annexation or BRB approval will be necessary to provide service.

4. Water is/or will be available at the rate of flow and duration indicated below at no less than 20 psi measured at the nearest fire hydrant _____feet from the building/property (or as marked on the attached map):

Rate of flow	duration
less than 500 gpm (approx._____gpm)	less than 1 hour
500 to 999 gpm	1 hour to 2 hours
1000 gpm or more	2 hours or more
flow test of_____gpm	other_____
calculation of_____gpm	(Commercial Building Permits require flow test or calculation)

COMMENTS/CONDITIONS_____
_____

I hereby certify that the above water purveyor information is true. This certification shall be valid for five years from date of signature.

_____ Date
_____ Signatory Name

APPENDIX 2 WATER PRODUCTION CONSUMPTION FORECAST

APPENDIX 2 - A MASTER METER RECORDS 1995

MASTER METER READINGS: RAW DATA

TURBINE METER - SHOWN TO UNDER-REGISTER LOW FLOWS - REPLACED 1999

1995 X 1000 GAL

	JANUARY	FEBRUAR	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMB	OCTOBEF	NOVEMBE	DECEMBER
1		83227	89267		103427	114775		142571	153307			
2		83430	89493		103737	115234		143069				
3	76886	83644	89650	96604	104002		128827			164474		
4	77004			96827	104202			144097		164751		
5	77209			97065	104431	116670	129274		154907	165068		
6	77583	84306	90323	97237		116924	129660		155200	165301	174484	
7		84467	90545	97484		117278	129886	145411	155480			
8		84746	90754		105234	117640		145920	155682			182396
9	78006	85021	90974		105549	118066		146323		166035		
10	78481	85304	91183	98185	105780		131290	146784		166277	175385	
11	78695			98417	105962		131584	147017	166743	166507		
12	78907			98660	106266	119206	132006		157090	166726		
13	79122	85836	91863	98870		119519	132348		157476	166960		
14		86006	92075	99043		119839	132904	147522	157840			
15		86325	92113		107240	120155		147886	158240			
16		86742	92545		107544	120492		148196		167703		183806
17	79997	86822	92718	99823	107920		134655	148429		168002		
18	80201			100037	108208		135321	148802	159546			
19	80430			100241	108534	121526	135984		159730	168730		
20	80658		93406	100493		121877	136660		160109	168962		
21		87580	93614	100734		122180	137127	149562	160487			
22		87700	93842		109730	122514		149824	160883			
23	81307	87925	94002		110168	122923		150193		169923		184548
24	81532	88240	94287	101523	110584		138817	150545		170271		184913
25	81760			101807	111073		139365	150865	162130			
26	81900			102076	111556	124464	139901		162471	170887		
27	82135	88818	94985	102336		124948	140224		162794	171253		
28		89007	95196	102603		125631	140556	151687	163064			
29			95419			126406		152209				
30	82795		95640	103427	113696	127019		152534				
31	83015		95898		114231		142098	152906				
TOTALS	6129	5780	6631	6823	10804	14052	13271	10365	9757	6779	7011	2517

MASTER METER READINGS: CALCULATED DAILY USE

1995 X 1000 GAL

DATE	JANUARY	FEBRUAR	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMB	OCTOBEF	NOVEMBE	DECEMBER
1		212	260	----	----	544	----	473	401	----	----	----
2	----	203	226	----	310	459	----	498	----	----	----	----
3	----	214	157	----	265	----	----	----	----	----	----	----
4	118	----	----	223	200	----	----	----	----	277	----	----
5	205	----	----	238	229	----	----	----	----	317	----	----
6	374	----	----	172	----	254	386	----	293	233	----	----
7	----	161	222	247	----	354	226	----	280	----	----	----
8	----	279	209	----	----	362	----	509	202	----	----	----
9	----	275	220	----	315	426	----	403	----	----	----	----
10	475	283	209	----	231	----	----	461	----	242	----	----
11	214	----	----	232	182	----	294	233	----	230	----	----
12	212	----	----	243	304	----	422	----	----	219	----	----
13	215	----	----	210	----	313	342	----	386	234	----	----
14	----	170	212	173	----	320	556	----	364	----	----	----
15	----	319	----	----	----	316	----	364	400	----	----	----
16	----	417	432	----	304	337	----	310	----	----	----	----
17	----	80	173	----	376	----	----	233	----	299	----	----
18	204	----	----	214	288	----	666	373	----	----	----	----
19	229	----	----	204	326	----	663	----	184	----	----	----
20	228	----	----	252	----	351	676	----	379	232	----	----
21	----	----	208	241	----	303	467	----	378	----	----	----
22	----	120	228	----	----	334	----	262	396	----	----	----
23	----	225	160	----	438	409	----	369	----	----	----	----
24	225	315	285	----	416	----	----	352	----	348	----	365
25	228	----	----	284	489	----	548	320	----	----	----	----
26	140	----	----	269	483	----	536	----	341	----	----	----
27	235	----	----	260	----	484	323	----	323	366	----	----
28	----	189	211	267	----	683	332	----	270	----	----	----
29	----	----	223	----	----	775	----	522	----	----	----	----
30	----	----	221	----	----	613	----	325	----	----	----	----
31	220	----	258	----	535	----	----	372	----	----	----	----

	JANUARY	FEBRUAR	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMB	OCTOBEF	NOVEMBE	DECEMBER	MONTHS OF ZERO	TOTAL SUM	YEAR STAT'S	
MAX DAY	475	417	432	284	535	775	676	522	401	366	----	365	1	5248	775	MAX
MIN DAY	118	80	157	172	182	254	226	233	184	219	----	365	1	2190	80	MIN
AVG DAY	234.8	230.8	228.56	233.06	334.76	424.28	459.79	375.24	328.36	272.45	----	365	1	3487.1	317.0091	AVG
NUL DAYS	11	9	8	9	9	8	11	9	11	14	28	27		154	211	READINGS
TOTALAV	7278.8	6462.4	7085.36	6991.8	10377.56	12728.4	14253.49	11632.44	9850.8	8445.95	#VALUE!	11315	#VALUE!			
SUMDIFF	6129	5780	6631	6823	10804	14052	13271	10365	9757	6779	7011	2517	8326.583			
DIFF	-1149.8	-682.4	-454.36	-168.8	426.44	1323.6	-982.49	-1267.44	-93.8	-1666.95	#VALUE!	-8798	#VALUE!			

APPENDIX 3 FACILITY CONDITION AND PERFORMANCE ANALYSIS

APPENDIX 3 - A CURRENT DOH SANITARY SURVEY REPORT

3-A
Sanitary Survey

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
NORTHWEST DRINKING WATER REGIONAL OPERATIONS
20425 72nd Avenue South, Suite 310, Kent Washington 98032-2388

August 22, 2014

F. ALAN KERLEY GENERAL MANAGER
LAKE FOREST PARK WATER DISTRICT
4029 NE 178TH STREET
LAKE FOREST PARK WA 98155

Subject: Lake Forest Park Water District (ID#40950)
King County
Water System Sanitary Survey

Dear Alan:

This letter is in follow up to the Department's inspection of the Lake Forest Park Water District water system on July 2, 2014. I apologize for the delay in getting this report to you. Thanks to you and Dan Mundall for facilitating the survey site visit. It is obvious that you and your staff are committed to operating your system in a thoughtful and professional manner. The purpose of the routine survey was to assess the overall operation, maintenance and management of the water system towards ensuring the distribution of safe and reliable drinking water.

Enclosed is a copy of my Sanitary Survey Notes. They reflect my understanding of your water system and highlight the key issues we discussed during my visit. Please, **in the next 45 days**, send photos of things you can complete in the short term and send me an action plan of how and when you are able to address the remaining issues.

Significant Deficiencies:
None observed.

Significant Findings:
None observed.

Observations:

1) Biological contamination can enter a water system via insects, birds, bats, and unsealed openings vulnerable to rainwater runoff. Since we were unable to climb each reservoir, please verify that all seals and screens on the storage tank roof vents, access hatches, overflows, and access points where the level gauge wire enters each tank are in excellent condition. Next time you visit each reservoir for routine inspection, please take a photo of the seals and screens in place and send them to the Department.

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Sanitary Survey

2) The District's Water System Plan Update was due January 17, 2014. From our discussion during the survey, I understand that you are working on it. Please submit the Update as soon as possible. Please make sure to provide relevant updates to the following elements: Emergency Response Plan, Wellhead Protection Plan and Coliform Monitoring Plan.
3) To help monitor any changes in well production and ensure compliance with water rights limitations, recommend the District install individual source meters on the deep wells.
4) Please provide the water right certificate for the Horizon View Wells for our files.
5) You are required to update your water use efficiency (WUE) goal once every six years. Please provide an updated WUE goal for the District. Your distribution system leakage (DSL) continues to be greater than 10%. Please provide a Water Loss Control Action Plan (WLCAP) for how the District plans to reduce its DSL to less than 10%. It is fine to include your updated WUE goal and WLCAP in the WSP Update.
6) The District plans to build a new booster pump station on the property recently purchased. This station will replace the existing High Head Booster Pump Station and the Artestian/Shallow Well Transfer Pump Station. The District will need to submit a project report and construction documents to the Department for review and approval. If treatment is planned, please contact the Department to discuss the need for a pilot study.

Recommendations:
None proposed.

As of January 2014, fees for sanitary surveys (established in WAC 246 290 990) are based on the actual number of hours spent preparing for, conducting and documenting the survey. Please pay the invoice amount of $1,071 (Sanitary Survey Fee Worksheet is attached). Please remit your complete payment in the form of a check or money order within thirty days of the date of this letter to: **WSDOH, Revenue Section, PO Box 1099, Olympia WA 99507-1099.**

If you have any questions or any corrections to the report, please contact me at Paige.Igoe@doh.wa.gov or (253) 395-6764.

Sincerely,

Paige S. Igoe, PE
Northwest Regional Office
Office of Drinking Water

Enclosures

cc: Public Health – Seattle & King County
Dan Mundall – Mundall Engineering
DOH – Krista Chavez

SANITARY SURVEY FEE WORKSHEET

Department of Health
Office of Drinking Water
Sanitary Survey Time Tracking

System Name	Lake Forest Park Water District	PWS ID #	40950K
County	King		
Surveyor	Paige Igoe and Krista Chavez	Date:	07/02/14

System over 10,000 Connections?	NO

	Quantity			Cost
Department of Health Paid Costs	**Hours/Miles**			
Survey program RO Coordination	1	$ 102	$	102.00
Survey Program Administrative Support	1	$ 102	$	102.00
Travel expenses (Mileage)	56	(# Miles) x ($.337/Mile)	$	18.85
Technical Assistance	0.5	$ 102	$	51.00
Travel Time <10,000	1.5	102	$	153.00
Total Department of Health Costs to Perform All Surveys			$	426.85
Water System Paid Costs	**Hours**			
Scheduling, research, prep	1	$ 102	$	102.00
Survey Field Work	3.5	$ 102	$	357.00
Survey documentation – preparation of survey report to the purveyor	6	$ 102	$	612.00
Additional Water System Paid Costs for systems serving 10,000 or more connections				
	Hours			
		$ -	$	-

Total Cost of Survey	$	1,497.85
Total Department of Health Unreimbursed Costs	$	426.85
Water System Paid Costs (Less than 10,000 Connections)	**$**	**1,071.00**

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Sanitary Survey

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
NORTHWEST DRINKING WATER REGIONAL OPERATIONS
20425 72nd Avenue South, Suite 310, Kent Washington 98032-2388

SYSTEM INSPECTION / MEETING SUMMARY
Date: July 2, 2014

LAKE FOREST PARK WATER DISTRICT - King County (ID# 40950K)

Persons Attending:
F. Alan Kerley, Dan Mundall – Lake Forest Park Water District
Paige Igoe, Krista Chavez - Washington State Department of Health

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Purpose: Routine Sanitary Survey

WATER FACILITIES INVENTORY:

Group A Community System

Existing Connects	=	879 Total (869 single family residential; 10 non-residential)
Population	=	2,609
Engineering Capacity	=	Unspecified, see Water System Plan

LAST SANITARY SURVEY:

The last sanitary survey was conducted by Washington State Department of Health (the Department) staff on July 19, 2011. The following recommendations were made:

- **Recommendation**: The well information included on the WFI does not match the information presented in Table 3-2 of the Water System Plan. Update the WFI. ***Status: Uncertain.***
- **Recommendation**: Send photos of reservoir seals and screens on hatches, vents and gauge board cable penetrations. ***Status: Not received.***
- **Recommendation:** The District's Water System Plan Update is due January 17, 2012. Please contact the Department to schedule a pre-plan meeting. ***Status: Ongoing.***
- **Recommendation:** For the Shallow Well source (S05), make the following improvements: install screens on each well vent (or confirm they are in place), fix or install an access hatch lid that is properly sealed on the Shallow Well cistern, and fix leak on pump suction piping penetration at the cistern. ***Status: Completed.***
- **Recommendation:** For the Deep Wells, ensure that a properly screened well vent is installed to allow air to enter and leave the well casing when the well pump is turned on and off. Please install a screen on the air release valves at each of the wells (or confirm they are in place). ***Status: Completed.***

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Sanitary Survey

SYSTEM OVERVIEW:
The Lake Forest Park Water District (the District) is located at the north end of Lake Washington, within the City of Lake Forest Park. The following utilities border the District's service area: Northshore Utility District to the north and Shoreline Water District to the west and south. The District operates as an independent utility, governed by an elected board of three commissioners.

The District water system own and operate five deep wells (including two new Horizon View Wells), eight shallow wells, two booster pump stations, four reservoirs and approximately 12 miles of distribution system and associated appurtenances. The District provides no treatment on its groundwater sources. The distribution system consists of four pressure zones; fire protection is provided.

SITE VISIT:
During the survey, we visited the following facilities:

- Deep Well 3
- Shallow Wells Cistern and transfer pump station
- Standby Tank and Lower Reservoir
- High Head Transfer Pump Station
- Horizon View Wells, 50,000 gallon Storage Tank and Pump Station

SOURCES AND INTERTIES:
Currently, the District receives all of its water from five active groundwater wells (Deep Wells 1, 2 and 3 and Horizon View Wells 1 and 2) and its Shallow Wells source. The District wishes to call the area where the Shallow and Deep Wells are located the McKinnon Creek Wellfield. A short description of the physical facility and operations for each source is included below.

Deep Wells (Wells 1, 2 and 3) part of McKinnon Creek Wellfield:
Deep Wells 1, 2 and 3 are located on District-owned land, 12 acres which comprise the wellhead protection area (WHPA). The District owned wellhead protection area is a forested valley with steep sides, bisected by a drainage course (McKinnon Creek). The District can access the wellhead protection area from two directions with recent purchase of land; both entrances are locked, gated. Security cameras were recently installed onsite. The City of Lake Forest Park has an abandoned right-of-way through the property and there has been discussion by the City about the creation of walking trails through the WHPA. If this project were to go forward, the District would require more stringent protection of groundwater sources against vandalism, traffic and potential risk of contamination.

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The following provides a short summary of each of the District's three deep groundwater wells. The Deep Wells are classified as a well field (S05).

SOURCE NAME	DOH SOURCE ID	WELL TAG ID	WELL DEPTH (FT)	DEPTH TO OPEN INTERVAL (FT)	PUMP CAPACITY FROM WFI (GPM)	TESTED CAPACITY FROM WELL LOG (GPM)	YEAR DRILLED	SURFACE SEAL
Deep Well 1	S01	AFJ001	172	6	300	100	1940	Unknown
Deep Well 2	S02	AFJ002	216	195	400	440	1961	Unknown
Deep Well 3	S03	AFJ003	161	144	300	350	1974	Yes 20 ft

Since the last survey, staff equipped Well 3 with a screened well vent and improved the seal at the base of the well casing. The base of each wellhouse structure has been fortified with wood to prevent rodent infestation. A Deep Well 4 has been drilled but water rights are not in place and the well is physically disconnected from the water system. If the District wishes to use this well for emergency water, please contact the Department for what is required to put this source online.

Operations: Water from the Deep Wells is pumped through the District's master meter, located above the Lower Reservoir. Well pumps convey water at a rate of 300 to 350 gpm each; controlled by levels in the Lower Reservoir. Historically, Wells 1 and 2 were used as primary wells; Well 3 provided water during peak demands. Well 1 and Well 2 are not operated together as significant drawdown occurs.

Flows from the Deep Wells combine prior to entry into the Lower Reservoir. A source meter is installed on the common header; the PLC for the magmeter is located in the shed near Well 4 (where the temporary chlorination equipment is located). No source meters on individual wells. **Recommend individual source meters be installed on the deep wells**. District is considering installation of individual source meters as part of the new pump station project planned for 2015. The individual source meters will help District staff determine whether each well is producing a steady flow or if well capacity may be declining. Another benefit of installation of individual source meters is to ensure compliance with water rights.

A portable generator located adjacent to the Standby Tank, when hooked up to the High Head Transfer Pump Station, can power the wells and the pump station, keeping a majority of the District in power during an emergency. The District is susceptible to power outages, typically getting one or two per year.

Horizon View Wells:
The new Horizon View Wells, located north of SPU's Lake Forest Park Reservoir, went online in early 2014. This source was developed to be a backup water source in the event drilling of the Brightwater tunnel impaired the productivity or quality of the existing McKinnon Creek wellfield.

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Sanitary Survey

A summary of well information is presented in the table below.

Source Name	DOH Source ID	Well Tag ID	Well Depth (ft)	Depth to Open Interval (ft)	Pump Capacity from WFI (gpm)	Tested Capacity From Well Log (gpm)	Year Drilled	Surface Seal
Horizon View Well 1	S10	BAM416	465	379	300	--	2009	Yes 50 ft
Horizon View Well 2	S11	BAM417	465	384	250	--	2009	Yes 53 ft

Wells are 465 feet deep with a 50-foot surface seal installed; confining layer evident in well log. No treatment installed. Wells located in a park setting; covered by DuraRock covers, which lock. Sanitary control area is 102 feet from SPU boundary and 75 feet on City side. Security cameras were recently installed onsite to monitor any nefarious actions.

Operations: Wells 1 and 2 are called on by level in 50,000 gallon Storage Tank. Alternate use of wells; run each for 12 hours per day at 50 gpm. Approximately 36,000 gallons out of storage is used per day. Operator onsite daily to read meters, check equipment and survey the site for hazards. A pigtail hookup is available for a portable generator to power wells in the event of a power outage.

Shallow Wells also part of McKinnon Creek Wellfield:
The District also captures water through eight shallow, artesian wells. The artesian shallow wells are located in the vicinity of the deep wells. Water flows by artesian pressure and gravity into a common manifold that discharges to a clearwell or concrete cistern (see photos). Pumps convey water from the cistern into the Lower Reservoir. The District has the ability to valve each of the wells off; currently the wells are a small portion of overall production for the system. The combined production of the Shallow Wells in recent years ranges from 80 to 100 gpm. District recently installed Omni strap-on, ultrasonic meters to measure flow from the Shallow Wells. The eight artesian, shallow wells are considered a wellfield (S08). Source monitoring samples collected at the cistern collection.

The wells are cased with six and eight inch PVC with slots on the lower portion (depths unknown). The approximate depth of the wells ranges from 17 to 25 feet. The District made improvements at the shallow wellheads including installation of a pitless adaptor, installation of a well vent, replacement of bentonite and construction of a small enclosure (meter lid with lock).

The cistern or clearwell has a metal hatch which does not close completely. The District has installed a gasket on the lid to ensure a better seal. Two overflows at the cistern are screened.

Interties: The system currently has emergency interties with Northshore Utility District (NUD) and Seattle Public Utilities (SPU). Both interties would provide water to the District in the event of an emergency; if High Tank water levels dropped, the interties would be called on.

The Northshore Utility District intertie is located in a vault in the wellhead protection area. Two-way intertie; two 250 gpm pumps can transfer water from the District to NUD; water will feed the District's High zone if pressures drop below a set pressure. Agreement in place since 1987.

The intertie with Seattle Public Utilities is an emergency intertie; one-way (SPU to the District); metered. SPU water is chlorinated and fluoridated, so the District will only use this intertie in an emergency situation; serves High zone. This intertie would also provide water in the event of a fire in the commercial area (Town Center area); a PRV would drop water into the Low zone; able to provide adequate fire flow with this connection.

TREATMENT:
The District provides no treatment for its groundwater sources. A GWI determination of the Shallow Wells completed on December 19, 2003 resulted in the source being designated as groundwater.

Temporary chlorination equipment was installed (in 1999) at the master meter where all flow from the Shallow and Deep Wells enters the Lower Reservoir. The District can use this equipment in the event of unsatisfactory water quality events.

STORAGE:
The District has four storage facilities, which are summarized in the table below.

NAME	VOLUME (GALLONS)	MATERIAL	YEAR CONSTRUCTED	OVERFLOW ELEVATION (FT)
Lower Reservoir	240,000	Steel	1967	292
Standby Tank	12,000	HDPE	2000	292
High Tank/Standpipe	200,000	Steel	1963	449
Horizon View Tank	50,000	Steel	2014	571

During the survey, only the Lower Reservoir, the Standby Tank and the Horizon View Tank were visited.

The Lower Reservoir and the Standby Tank are adjacent to each other located on the McKinnon Creek Wellfield site. The Lower Reservoir has a separate inlet/outlet configuration. The internal overflow pipe combines with the drain pipe; screened with a flapper valve.

The Standby Tank was constructed with the intent to provide emergency equalizing storage for use when the District conducted repairs and/or maintenance on the Lower Reservoir. To avoid having to take the tank on and off line, the tank is now online continually. The external overflow line is screened; this also serves as the reservoir vent. Staff added a ladder and improved the railing so that staff could safely climb tank as needed. Screw-type hatch fitted with a gasket for better seal.

The Horizon View Tank was recently constructed. Observed an external overflow line which is appropriately screened with an air gap. The drain line exits into a vault (screened) and then daylights onsite with a flapper valve (see photos). A sampling station is available to take water quality samples.

Monthly inspections by staff of the reservoirs, which include inspection of the seals and screens. **During the next inspection, please take photos of each tank vent, hatch and overflow line to ensure that they are appropriately screened and sealed to prevent contamination from entering the reservoirs.** Lower Reservoir and Standby Tank are located in WHPA; fenced. The District installed a video camera on the Lower Reservoir to monitor activities. The Horizon View Tank is located in a park like setting, no fence. Security camera located on pump station building to monitor activity.

DISTRIBUTION:

The existing distribution system is comprised of approximately 12 miles of water mains ranging in size from 2-inches to 12-inches in diameter. Pipe material was predominantly hot dipped and coupled steel pipe installed in the mid 19th century, with small amounts of asbestos cement, cast iron and PVC. The District started replacing steel pipe in the 1980s with ductile iron pipe. Approximately 40 percent of the existing distribution pipe is steel.

Fire protection is provided by the District. The District operates approximately 93 fire hydrants; working to replace older hydrants and small hydrant service lines (4-inches). Several dead ends exist in the system; working to loop and upsize small diameter pipe.

In general, water from the Deep and Shallow Wells is conveyed to the Lower Reservoir; the Transfer Pump Station pumps water from the Lower Reservoir to the High Tank. The system is comprised of four pressure zones: high (449 ft HGL), intermediate (338 ft HGL), low (292 ft HGL), and beach (229 ft HGL). The High Tank serves the high (by gravity) and intermediate zones (through pressure reducing valves); this tank is filled by the transfer pump station which is supplied by the Lower Reservoir. The Low and Beach zones are also fed through pressure reducing valve (PRV) stations. The PRV station feeding the Beach Zone located at 175th and Ballinger Way was replaced in 2013. The new Horizon View facilities provide water from the Horizon View Tank (573 ft HGL) into the Low Zone by gravity.

Currently, the District operates two pump stations.

PUMP STATION	PUMP NUMBER	CAPACITY (GPM)	HEAD (FT)	PUMP FROM	PUMP TO	COMMENTS
Artesian Transfer	1 2	230 230	30 30	Shallow Well Cistern	Lower Reservoir	Pumps replaced in 2005
High Head Transfer	1 2	400 400	175 175	Lower Reservoir	High Tank	Pumps replaced in 2005

Operations: For the High Head Transfer Pump Station, the lead pump has variable speed drive controls, can serve high zone directly when High Tank is down for maintenance. Lag pump normally comes on during fire flow events. Monthly inspections by staff at pump stations.

The District plans to build a new booster pump station on the property recently purchased. This station will replace the existing High Head Booster Pump Station and the Artestian/Shallow Well Transfer Pump Station. Using Public Works Trust Fund (PWTF) money; may include treatment for iron and manganese removal. **The District will need to submit a project report and construction documents to the Department for review and approval. If treatment is planned, please contact the Department to discuss the need for a pilot study.**

WATER QUALITY MONITORING:
A short summary of recent water quality sampling results and monitoring compliance is provided below. Water quality results entered into our Sentry data system can be reviewed at http://www.doh.wa.gov/ehp/dw/sentry.htm.

Distribution System Monitoring Requirements

Coliform Monitoring:
Required to take 3 samples per month at representative locations in the distribution system.

Recent history:
2014: Positive routine and repeat coliform hit in August, non-acute MCL violation.
2013: Positive coliform hit in September and October; non-acute in September only. Staff did thorough investigation of system and conducted extra sampling to try and find problem. Occurred around time PRV work being conducted for Horizon View wells; flushed out SPU line of suspected stagnant water, etc.
2012: None.
2011: Three positive coliform samples in July; non-acute MCL violation.

Coliform monitoring program will be updated and included in WSP submittal; includes instructions on how to collect routine samples and repeat samples. Seven coliform monitoring stations; standard station design per SPU; good geographic coverage. Staff collect approximately 20 investigative samples per month to check for presence of total coliform and run membrane filtration test in house. Typically take one investigative sample per month at storage facilities (alternate between Lower Reservoir and High Tank).
Lead and Copper: The District is on a three year reduced monitoring schedule and is required to collect 10 samples from specific homes in the distribution system between January 2012 and December 2014. The District collected 10 samples in June 2011 and the results were all below the action level of 1.3 mg/L for copper. One sample was equal to the action level of 0.015 mg/L for lead; however, the 90th percentile results were all below.

Source Monitoring Requirements

Nitrate: Levels of less 3.0 mg/L observed in Shallow Wells wellfield (S05) samples from 2010 through 2013. Low levels (less than 0.5 mg/L) observed in the Deep Wells wellfield (S06) samples from 2010 through 2013. Low levels of less than 0.6 mg/L observed in Horizon View Wellfield (S11) in 2009.

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Arsenic: In 2010 samples, arsenic detected in Shallow Wells (S05) and Horizon View Wellefield (S11) at 0.003 mg/L and detected in Deep Wells (S06) at 0.004 mg/L. MCL for arsenic is 0.010 mg/L.

Inorganic Chemicals: All analytes below MCL. Manganese and iron observed at approximately one half of the secondary MCL in individual wells of S06 (Deep Wells) at 0.022 mg/L and 0.15 mg/L, respectively. Secondary MCL limit is 0.05 mg/L for manganese and 0.3 mg/L for iron.

Volatile Organic Chemicals: Low levels of chloromethane observed in Shallow Wells (S05) in 2007. No other analytes detected.

Synthetic Organic Chemicals: No analytes detected.

Radionuclides: Radium 228 observed in Shallow Wells (S05) at 0.86 pCi/L in 2009. Gross beta observed in S10 at 4.85 pCi/L in 2009.

Please refer to the source monitoring requirements outlined in the Water Quality Monitoring Schedule (WQMS) which can now be found online on our Sentry Internet.

MANAGEMENT & OPERATIONS:
The District is governed by a three member board of commissioners; all new as of 2012. The Board meets monthly and the public is allowed to attend. The District's General Manager oversees day to day operations of the water system and reports directly to the Board. The District is working to develop/train a small, part-time field and administrative staff. Mundall Engineering has served as the District's engineer for several years.

Item	Status
Water System Plan	• Water System Plan was approved by Department on January 17, 2006. District submitted a letter stating their plan was relevant for an approval extension. Department extended approval through June 17, 2014. • **Your WSP is past due. Understand you are working on the submittal; please submit as soon as possible.**
WFI Update	• WFI sent out annually to system for review and update.
Water Rights	• The Department of Ecology (DOE) has jurisdiction with respect to the water rights associated with your water system. • **Please provide the certificate for the Horizon View Wells for our files.**
Treatment Overview	• No treatment provided for groundwater sources. • Temporary chlorination equipment available at master meter; can add chlorine to groundwater sources if necessary.
Consumer Confidence Report	In compliance

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Operating Permit	Green
Overall Design Approval	Yes, unspecified. See WSP for information.
Certified Operator	• WDM2 required. In compliance with F. Alan Kerley, WDM2.
Operations and Maintenance Procedures	• Active program in place. O&M Manual developed in 2013; reviewed during survey. Details for system components included below.
Hydrants	• Staff inspects hydrants; try to get to each once every four years; have standard procedure for inspection. • Staff tries to wash once per year; water flows through.
Pumps	• Regular monthly visit High Head Transfer Pump Station. Staff checks on packing, motor draw, vibration, noise, leaks, etc. Have checklist of items to complete.
Valves	• No formal program to exercise valves; exercise a majority of valves through UDF flushing program. • Inspect five PRV stations regularly; conduct major maintenance every five years.
Meters	• Working to replace under-registering residential meters; unsure of end date.
Reservoirs	• Regular monthly visit to check security, equipment, etc. Look at seals and screens during this inspection. • Clean and inspect reservoir interior and exterior on a five year schedule.
Flushing Program	• Unidirectional flushing program; flush approximately 95 percent of system once per year. • Developed flushing maps; some areas do not have blow offs or way to drain water. • Flush area if have water quality event or complaint.
Telemetry	• Telemetry in place; currently monitor well levels, pump hours, source meter flows, and tank levels. Can trend historical data for up to one year. • Plan to upgrade system as part of design of new booster pump station.
Cross Connection Control Program	• Program in place; approximately 120 devices installed; mainly implement at hazard protection. No high hazard facilities; mainly double check valve devices for boiler feed lines and irrigation systems. • Recently conducted a survey of their system; added approximately 15 devices as a result. • Track testing with a database. Typically get 100 percent compliance for testing. Conduct reminder phone calls; have a list of testers customers can use. • Have authority to implement program and disconnect user if non-compliant.

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Wellhead Protection Program	• Did not discuss in detail. • **Recommend that the District update their Wellhead Protection Plan.** The Plan should include the new HorizonView/Brightwater Backup Wells. Source contaminant inventory should be updated every two years. This update can be included in the WSP Update.
Reliability	• Portable generator at wellhead protection area; hook up to Transfer Pump Station; able to power wells and pumps. • Ability to receive water from Northshore Utility District and SPU in High zone; fire flow for Town Center provided by SPU. • Recently added a redundant feed from High Zone to the Low Zone. • New Horizon View Wells source is able meet demands in the winter.
Water Use Efficiency	• Goal set in public forum in April 2010. **Your WUE goal must be updated and adopted in a public form once every 6 years.** Please provide an updated goal as part of the upcoming WSP Update submittal. • Goal is to reduce average customer usage by 0.33 percent per year over next three years for 1 percent reduction in average ERU by 2012. Historical ERU consumption of 215 gpd/ERU (from 2005 WSP). Met goal in 2012 customers using 183 gpd/ERU and in 2013 customers using 211 gpd/ERU. • On demand side, District has committed to a schedule to replace older residential water meters, conduct monitoring for residential and commercial leaks and provide educational material to promote water conservation.
Production Data	• Source meters read daily.
Consumption Data	• System is fully metered. Customers are billed bi-monthly.
Distribution System Leakage	• In 2011, DSL reported as 13.0% • In 2012, DSL reported as 16.5% • In 2013, DSL reported as 17.8%. • 3-year annual average 15.8%. • The District recognizes the 10% leakage standard and is committed to taking the following measures to reduce their DSL: quick response to known leaks; estimating non-revenue water use, replacement of under registering water meters; replacement of aging watermains; and implementation of a leak detection program to survey 25% of system until compliance is achieved. • **The District must develop a Water Loss Control Action Plan as your DSL is greater than 10%;** must include a schedule and budget for implementation; refer to WAC 246 290 820 for more information. Submit Plan as part of your WSP Update. • Several water main replacement projects have been completed in last few years; significantly reduced leakage rate (39% in 2008).

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Emergency Response Program	• Did not discuss in detail; program in place according to 2005 WSP. **Update as necessary with WSP Update.**
Complaints	• District staff handles complaints received; respond within 24 hours. • DOH has received no complaints in last 6 years.
Financial Viability Program	• Primary funding source for capital projects is Public Works Trust Fund loans. • Typically have reserves in place; large water main replacement projects in last few years have depleted funds; in process of building reserves.
Asset Management	• Informal asset management program in place to determine which steel/AC pipes to replace. Focusing on steel pipe replacement. • Program prioritized by available funding, hydraulic limitations on fire flow, leaks and coordination with other utility projects.

SANITARY SURVEY FINDINGS:

The following summarizes findings from the sanitary survey site visit that need your attention. Please provide me with a plan of how you plan to address each of the categories below within 45 days.

Significant Deficiencies:
None observed.

Significant Findings:
None observed.

Observations:

1) Biological contamination can enter a water system via insects, birds, bats, and unsealed openings vulnerable to rainwater runoff. Since we were unable to climb each reservoir, please verify that all seals and screens on the storage tank roof vents, access hatches, overflows, and access points where the level gauge wire enters each tank are in excellent condition. Next time you visit each reservoir for routine inspection, please take a photo of the seals and screens in place and send them to the Department.
2) The District's Water System Plan Update was due January 17, 2014. From our discussion during the survey, I understand that you are working on it. Please submit the Update as soon as possible. Please make sure to provide relevant updates to the following elements: Emergency Response Plan, Wellhead Protection Plan and Coliform Monitoring Plan.
3) To help monitor any changes in well production and ensure compliance with water rights limitations, recommend the District install individual source meters on the deep wells.
4) Please provide the water right certificate for the Horizon View Wells for our files.

3-A
Sanitary Survey

5) You are required to update your water use efficiency (WUE) goal once every six years. Please provide an updated WUE goal for the District. Your distribution system leakage (DSL) continues to be greater than 10%. Please provide a Water Loss Control Action Plan (WLCAP) for how the District plans to reduce its DSL to less than 10%. It is fine to include your updated WUE goal and WLCAP in the WSP Update.
6) The District plans to build a new booster pump station on the property recently purchased. This station will replace the existing High Head Booster Pump Station and the Artestian/Shallow Well Transfer Pump Station. The District will need to submit a project report and construction documents to the Department for review and approval. If treatment is planned, please contact the Department to discuss the need for a pilot study.

Recommendations:
None.

When items are completed, please send me a status update and/or photo verification of the corrections made (as applicable). Include the system name, ID number, and the date the deficiencies were corrected. You can send them to me by e-mail at paige.igoe@doh.wa.gov or by mail at 20425 72nd Ave S, Suite 310, Kent, WA 98032.

3-A
Sanitary Survey



NOTE: THE PHOTO ABOVE WAS TAKEN AT THE 2011 SANITARY SURVEY; Included to show overview of facilities at McKinnon Creek Wellfield. This site visit for this survey focused on the Horizon View Wellfield and related facilities. For more detailed pictures of other Lake Forest Park facilities, please refer to the 2011 Routine Sanitary Survey Report.

Wellhead Protection Area/System Overview: (L) Overview of wellhead protection area. Foreground: shallow well piping gallery/manifold, cistern collection chamber, transfer pump station (pumps water up through master meter and then into Lower Reservoir). Background: HDPE Standby Tank (12,000 gallon) and Lower Reservoir. Transfer Pump Station located across road. Deep Wells (S01, S02 and S03) and Shallow Wells (S05) are located behind where photo is taken.





Horizon View Wells Site: (L) Overview of site showing two wells (under fake rock structures), pump station and reservoir. (R) Horizon View Well 1. Wellhead is located under fake rock like structure.



Horizon View Well 1: (L) Well casing and DOE Well Tag BAM416. (C) Air relief valve is screened. (R) Overview of wellhead. Vent is screened. Source meter and raw water sample tap located in pump station building.

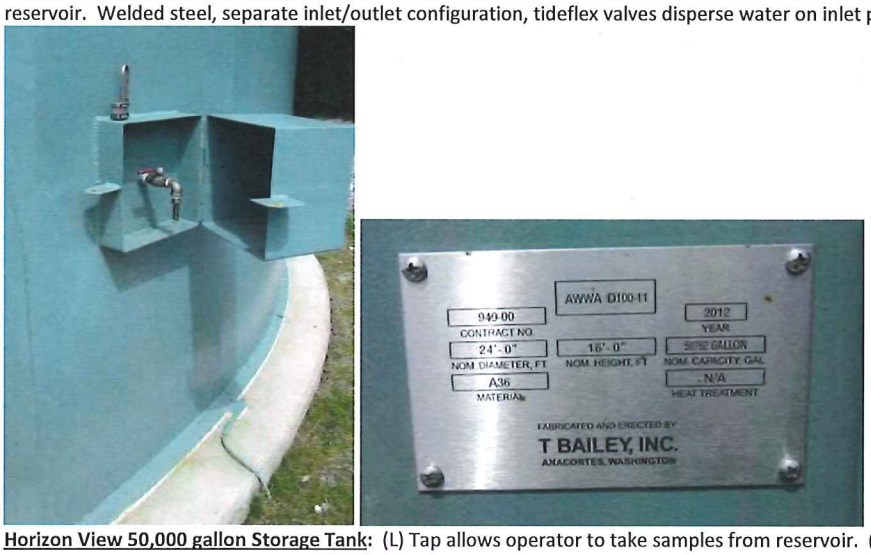
3-A
Sanitary Survey



Horizon View Well 2: (L) Overview of wellhead. Vent screened. (C) Well casing, DOE Well ID Tag BAM417. (R) Air relief valve is screened. Source meter and raw water sample tap located in pump station building.



Horizon View 50,000 gallon Storage Tank: (L) 50,000 gallon equalizing storage tank. Wells pump lead/lag twice daily on a timer to maintain water quality in the reservoir. Welded steel, separate inlet/outlet configuration, tideflex valves disperse water on inlet pipe. (C) Close up of overflow pipe shown. (R) Screen intact.



Horizon View 50,000 gallon Storage Tank: (L) Tap allows operator to take samples from reservoir. (R) Nameplate for tank.

3-A
Sanitary Survey





Horizon View Wells Site: (L) Duckbill valve at end of where tank drain ends. (C) Photo taken at location of duckbill valve looking back at wells and tank. (R) Reservoir drain exits in this vault; screened. Flow goes from this vault and daylights at duckbill shown in photo on the left. A perimeter drain and floor drain for the pump station building also drain into this vault.





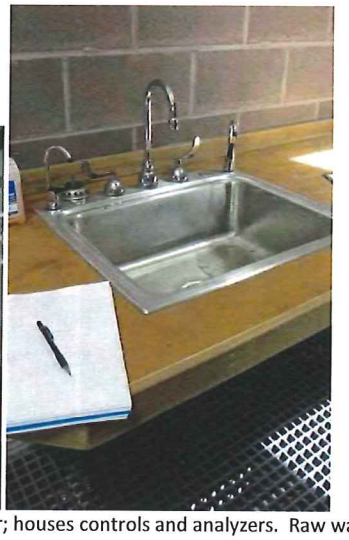
Horizon View Pump Station: (L) Pump station building located next to 50,000 gallon storage tank. Pigtail for portable emergency generator shown. (C) and (L) Internal piping showing incoming lines from Wells 1 and 2, source meters and air vacuum valves shown. Piping located subgrade.




Horizon View Pump Station: (L) and (R) Internal piping at pump station. Small pump and pressure tanks serve drinking water fountain and sink onsite.

3-A
Sanitary Survey



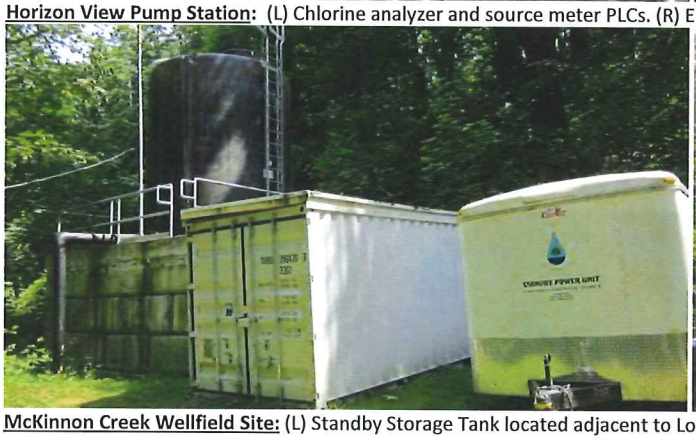


Horizon View Pump Station: (L) and (C) Lab/office space located on main floor; houses controls and analyzers. Raw water sample taps for each well are located at sink.





Horizon View Pump Station: (L) Chlorine analyzer and source meter PLCs. (R) Electrical panel and motor control panel.





McKinnon Creek Wellfield Site: (L) Standby Storage Tank located adjacent to Lower Reservoir. This tank is now continually online. Installed ladder and made improvements on roof so staff could access hatch. (R) Lower Reservoir.



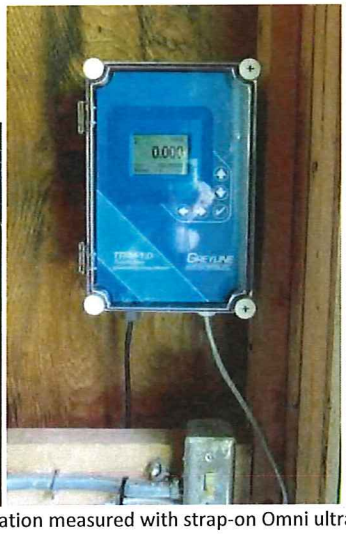
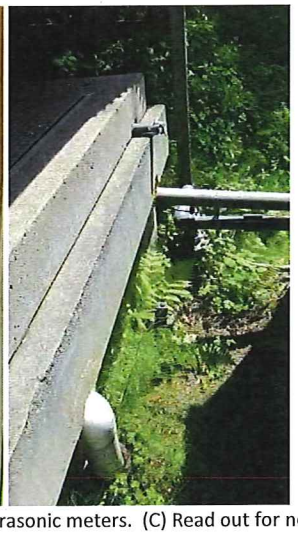


McKinnon Creek Wellfield Site: (L) View of Well 4 and temporary chlorination equipment. Photo taken from edge of Lower Reservoir. (C) Photo taken from Lower Reservoir site looking at the wellhead protection area. Dirt road leads to where the Deep and Shallow Wells are located. (R) View of Lower Reservoir and Standby Tank from Shallow Wells cistern/transfer pump station site.






McKinnon Creek Well 3: (L) Exterior of wellsite. Floors of all wells recently fortified with wood to prevent rodent infestation. Well houses all have recently been cleaned and painted. (C1) Air Vacuum valve at wellhead; screened. (C2) Staff resealed base to prevent any water/potential contamination from entering casing. (R) Two sounding ports, both sealed.

McKinnon Creek Wellfield Site: (L) Discharge at Shallow Well transfer pump station measured with strap-on Omni ultrasonic meters. (C) Read out for new meter. (R) Edge of cistern that collects flow from Shallow Wells. Leak on pump suction piping at has been fixed.

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Sanitary Survey




McKinnon Creek Wellfield Site: (L) Cistern access hatch, still not close fully. Staff has added a gasket to improve seal. Monitor on regular visit. (R) Looking inside cistern.




McKinnon Creek Wellfield Site: (L) Gasket on cistern access hatch lid. (R) Overflow line from cistern. **Keep free from vegetation; check screens regularly.**

APPENDIX 3 - B HORIZON VIEW WELLFIELD – RECORDS

Recording Requested By And
When Recorded Mail To:

After Recording Return To:

Lake Forest Park Water District
4029 NE 178th Street
Lake Forest Park, WA 98155

20111021001207
PACIFIC NW TIT QCD 258.00
PAGE-001 OF 011
10/21/2011 12:34
KING COUNTY, WA

E2514892
10/21/2011 12:34
KING COUNTY, WA
TAX $10.00
SALE $0.00

PAGE-001 OF 001

QUIT CLAIM DEED WITH RESERVED EASEMENTS AND COVENANTS AND ENVIRONMENTAL RELEASE

11/72

Reference #s of Document Released or Assigned:	None
Grantor:	The City of Seattle, Seattle Public Utilities
Grantee:	Lake Forest Park Water District
Legal Description (abbreviated):	Lot B, Short Subdivision 2010-14002, Lake Forest Park, WA
Assessor's Tax Parcel ID#:	402770-0071

SPU R/W File #205-904

KNOW ALL MEN BY THESE PRESENTS, that the GRANTOR, THE CITY OF SEATTLE, acting by and through SEATTLE PUBLIC UTILITIES, for and in consideration of good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, hereby conveys and quitclaims to the GRANTEE, LAKE FOREST PARK WATER DISTRICT, all interest in the following described real estate, situated in King County, Washington, described as follows:

Lot B, Lake Forest Park, Washington, Amended Short Subdivision No. 2010-14002 recorded at 20111013900002 in records of King County, Washington (superseding AF#20110428900002) (the "Property") and further described in Exhibit D,

reserving unto Grantor and its successors and assigns easements and covenants to be located over, under and upon portions of the Property conveyed herein, which easements shall benefit Grantor and the adjacent real property owned by Grantor as of the date of this deed, and which are more particularly described as follows:

FIRST AMERICAN 1159576

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Horizon View Wellfield

I. RESERVED EASEMENTS AND COVENANTS

Grantor hereby reserves easements and covenants for the benefit of Grantor's Adjacent Property as set forth below. As used herein, "Adjacent Property" refers to Lot A, Lake Forest Park, Washington Amended Short Subdivision No. 2010-14002 recorded at 20111013900002 in records of King County, Washington (superseding AF#20110428900002).

Area A: That portion of the Property described as follows and as depicted on Exhibit A:

Beginning at the southern-most point of said Lot B;
Thence N 28° 49' 06" E 268.21 feet along the border between said Lot B and Lot A of said Short Subdivision to an angle and the true point of beginning;
Thence S 89° 39' 03" E 410.60 feet;
Thence N 0° 15' 41" E 10 feet;
Thence N 89° 39' 03" W 416.54 feet;
Thence S 30° 24' 58" E 11.64 feet to the true point of beginning.

Area B: That portion of the Property described as follows and as depicted on Exhibit B:

Beginning at the southern-most point of said Lot B;
Thence N 28° 49' 06" E 268.21 feet along the border between said Lot B and Lot A of said Short Subdivision to an angle;
Thence N 30° 24' 58" W 11.64 feet;
Thence S 28° 49' 06" W 255.71 feet;
Thence S 0° 21' 58" W 20.99 feet to the point of beginning.

Area C: That portion of the Property described as follows and as depicted on Exhibit C:
Beginning at the southern-most point of said Lot B;
Thence N 28° 49' 06" E 268.21 feet along the border between said Lot B and Lot A of said Short Subdivision to an angle;
Thence N 30° 24' 58" W 48.64 feet;
Thence S 53° 13' 19" W 129.08 feet;
Thence S 0° 21' 58" W 199.66 feet to the point of beginning.

1. Grantor reserves a non-exclusive easement over, across, and upon Areas A and B for purposes of access to Grantor's Adjacent Property and reservoir, and for Grantor's maintenance of its fence, landscaping, and water utility infrastructure on Grantor's Adjacent Property.

2. Additionally, Grantor reserves a non-exclusive access and utility easement in Area B for the benefit of Grantor, its lessees, and authorized third party users of Grantor's Adjacent Property, for purposes of installing, maintaining, and removing utilities, telecommunications infrastructure, or other utility-related installations.

3-B
Horizon View Wellfield

3. For security and health protections to Grantor's water reservoir on the Adjacent Property, Grantee shall not install any aboveground structures, amenities, or any other item in Area A or Area B that violates Seattle Public Utilities security guidelines or Washington State Department of Health (or successor agency) regulations applicable to the area adjacent to a water reservoir or water facility. The structures that are prohibited in Areas A and B include but are not limited to trees, shrubs, benches, and play structures.

4. For the protection of structural integrity of Grantor's infrastructure and water reservoir on adjacent property, Grantee covenants that Grantee shall not install any drinking water well within 100 feet of Grantor's Adjacent Property. Additionally, Grantee's activities in Area C shall be limited as follows:

(i) Grantee shall not install any underground utilities or excavate for any purpose whatsoever in Area C without the prior written approval of an authorized representative of Grantor.

(ii) Grantee shall not expand, upgrade or alter the gravel path in Area C or create any future road capable of supporting service trucks in Area C without prior written approval of an authorized representative of Grantor.

(iii) Grantee shall not perform any construction or other alteration in Area C, nor shall Grantee remove or alter any of the vegetation in Area C, other than routine maintenance and pruning, without the prior written approval of an authorized representative of Grantor.

Grantor shall not unreasonably withhold its approval to any consent required herein.

5. Grantor shall repair any damage resulting from its use of the Property under the easements described in Sections 1 and 2 herein, or the use by Grantor's authorized third party users and contractors. Grantor shall indemnify, defend and hold Grantee harmless from any injuries to persons or damage to property to the extent resulting from use of the Property by Grantor, its employees, agents or authorized third party users.

6. Exhibits A, B and C attached hereto are incorporated by reference as if set forth in full herein.

II. ENVIRONMENTAL RELEASE AND INDEMNITY

The Property described herein is conveyed AS-IS, WHERE-IS, WITH-ALL-FAULTS, AND WITHOUT ANY REPRESENTATION OR WARRANTY WHATSOEVER, EXPRESS OR IMPLIED, AS TO ITS CONDITION, ENVIRONMENTAL OR OTHERWISE, OR ITS SUITABILITY OR SUFFICIENCY FOR THE GRANTEE'S INTENDED USES AND PURPOSES. Grantee acknowledges that adverse physical, economic or other conditions (including without limitation, adverse soils and ground-water conditions), either latent or patent, may exist on the Property. Grantee assumes responsibility for all environmental conditions of

3-B
Horizon View Wellfield

the Property, known or unknown, including but not limited to responsibility, if any, for investigation, removal or remediation actions relating to the presence, release or threatened release of any Hazardous Substance or other environmental contamination on, under, emanating from or otherwise relating to the Property, except for releases of any Hazardous Substance caused or permitted by Grantor on Grantor's Adjacent Property. Grantee also releases, covenants not to sue, and shall indemnify, defend, and hold Grantor and its past, present and future officials, employees, and agents, harmless from and against any and all claims, demands, penalties, fees, damages, losses, expenses (including but not limited to fees and costs of regulatory agencies, attorneys, contractors and consultants), and liabilities arising out of, or in any way connected with, the condition of the Property, including but not limited to any alleged or actual past, present or future presence, release or threatened release of any Hazardous Substance in, on, under or emanating from the Property whatsoever; provided, however, this provision shall not apply to releases of any Hazardous Substance caused or permitted by Grantor on Grantor's Adjacent Property. Grantee is aware of the rights it might otherwise have to seek recovery from Grantor for costs of remediation and cleanup of Hazardous Substances under applicable law, including without limitation the Washington Model Toxics Control Act ("MTCA") and the federal Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), and Grantee hereby knowingly waives all such rights, now existing or hereafter arising, and voluntarily relinquishes those rights and forever releases the Grantor from any such obligation, except with respect to releases caused or permitted by Grantor on Grantor's Adjacent Property. As used in this deed, "Hazardous Substance" means any hazardous, toxic, or dangerous substance, waste, or material that is regulated under any environmental or safety law, ordinance, rule or regulation.

3-B
Horizon View Wellfield

IN WITNESS WHEREOF, the parties have caused this instrument to be executed.

THE CITY OF SEATTLE

By Ray Hoff
Ray Hoffman, Director Seattle Public Utilities

This Deed is executed and delivered pursuant to City of Seattle Ordinance 123496.

//

//

STATE OF WASHINGTON)
) ss.
COUNTY OF KING)

On this 20 day of October, 2011, before me, the undersigned, a Notary Public in and for the State of Washington, duly commissioned and sworn, personally appeared **Ray Hoffman**, known to me (or proved to me on the basis of satisfactory evidence) to be the Director of **Seattle Public Utilities** of The City of Seattle, the municipal corporation in the State of Washington which executed the foregoing document, and stated on oath that he was authorized to execute the foregoing document on behalf of said municipal corporation and signed the same as the free and voluntary act and deed of said municipal corporation for the uses and purposes therein mentioned.

WITNESS my hand and official seal hereto affixed the day and year in this certificate above written.

Wendy J. Hochnadel

WENDY J. HOCHNADEL NOTARY PUBLIC STATE OF WASHINGTON COMMISSION EXPIRES MAY 31, 2014

Print Name: Wendy J. Hochnadel
NOTARY PUBLIC in and for the State of Washington, residing at:
808 210th Pl. SW
Lynnwood, WA 98036

My commission expires: 5/31/2014

next page for signature by Grantee

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Horizon View Wellfield

LAKE FOREST PARK WATER DISTRICT

By_____
WILLIAM F. DONAHUE, PRESIDENT OF LAKE FOREST PARK WATER DISTRICT
// BOARD OF COMMISSIONERS

//

STATE OF WASHINGTON)
)ss
COUNTY OF KING)

On this 20 day of October, 2011, before me, the undersigned, a Notary Public in and for the State of Washington, duly commissioned and sworn, appeared William F. Donahue, and I personally know or have satisfactory evidence that he/she is the person that executed the within and foregoing instrument for the **Lake Forest Park Water District,** and acknowledged the said instrument to free and voluntary act and deed of said corporation for the uses and purposes therein mentioned, and on oath stated that he/she was authorized to execute said instrument.

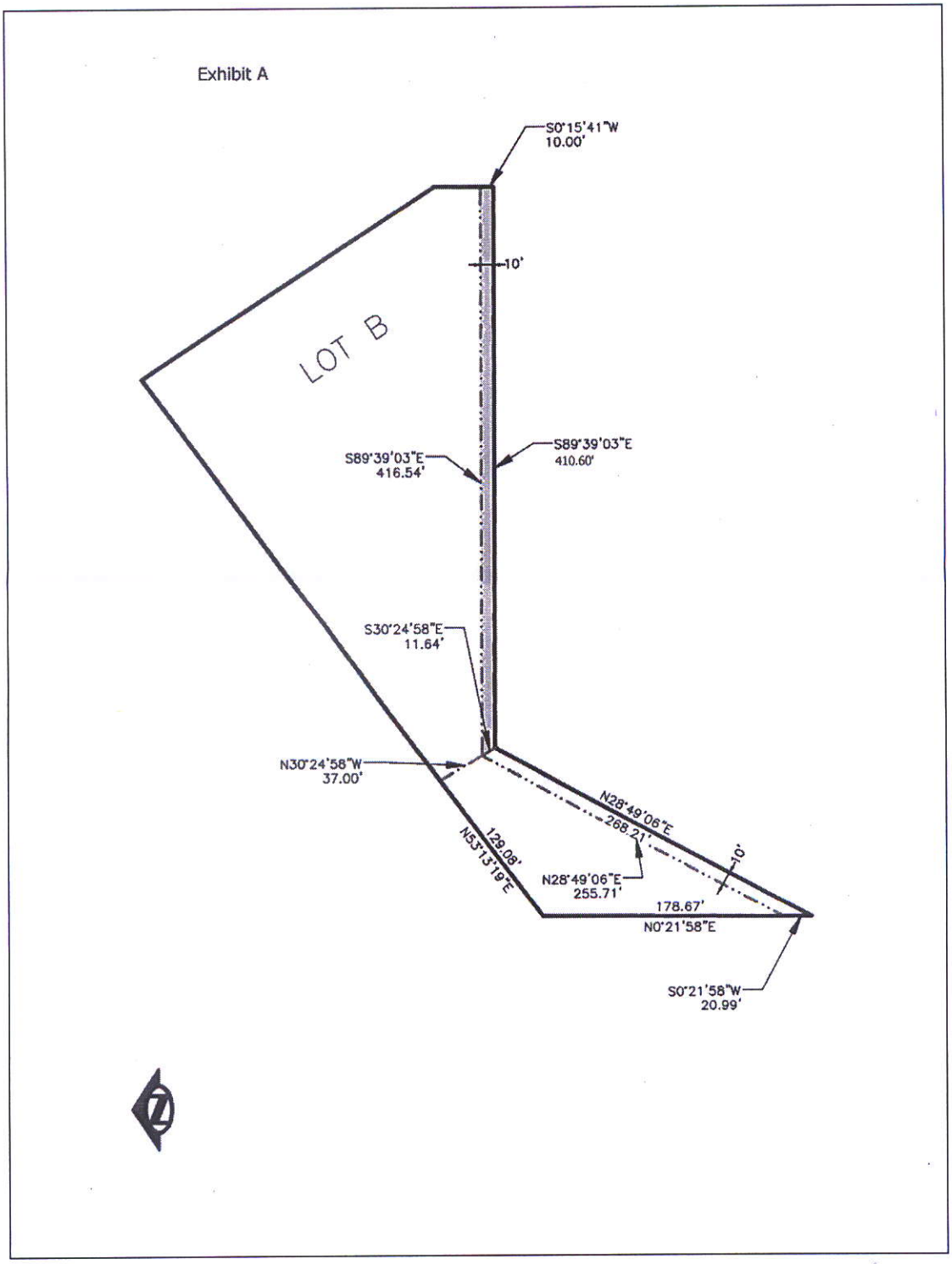
WITNESS MY HAND AND OFFICIAL SEAL hereto affixed the day and year first above written.

R E Jonson
(TYPE OR PRINT NAME)
Notary Public in and for the State of Washington, residing at Issaquah WA.
My Commission expires on 12-16-13.

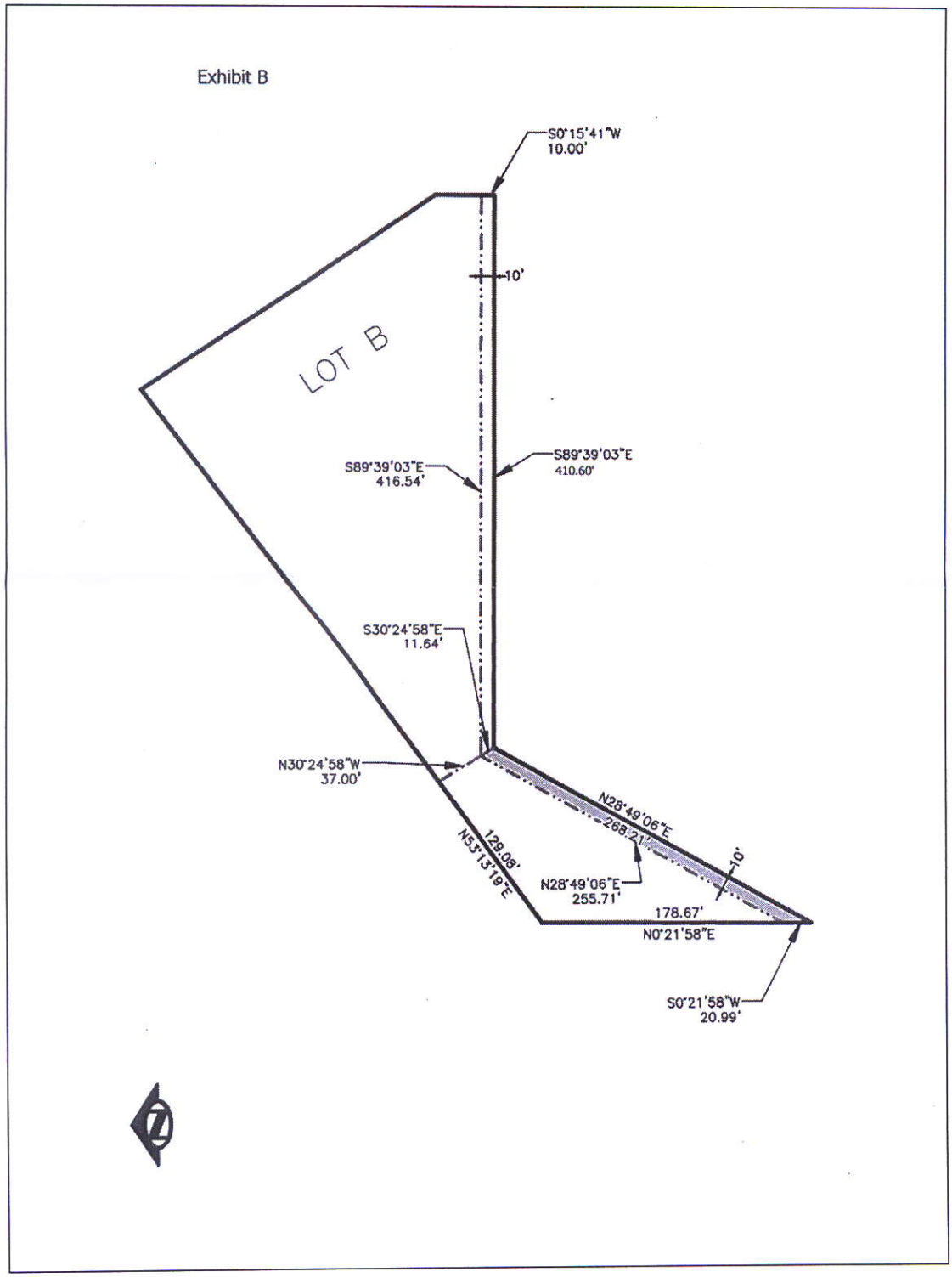
[SEAL]

RICHARD E. JONSON
NOTARY PUBLIC
STATE OF WASHINGTON
COMMISSION EXPIRES 12-16-13

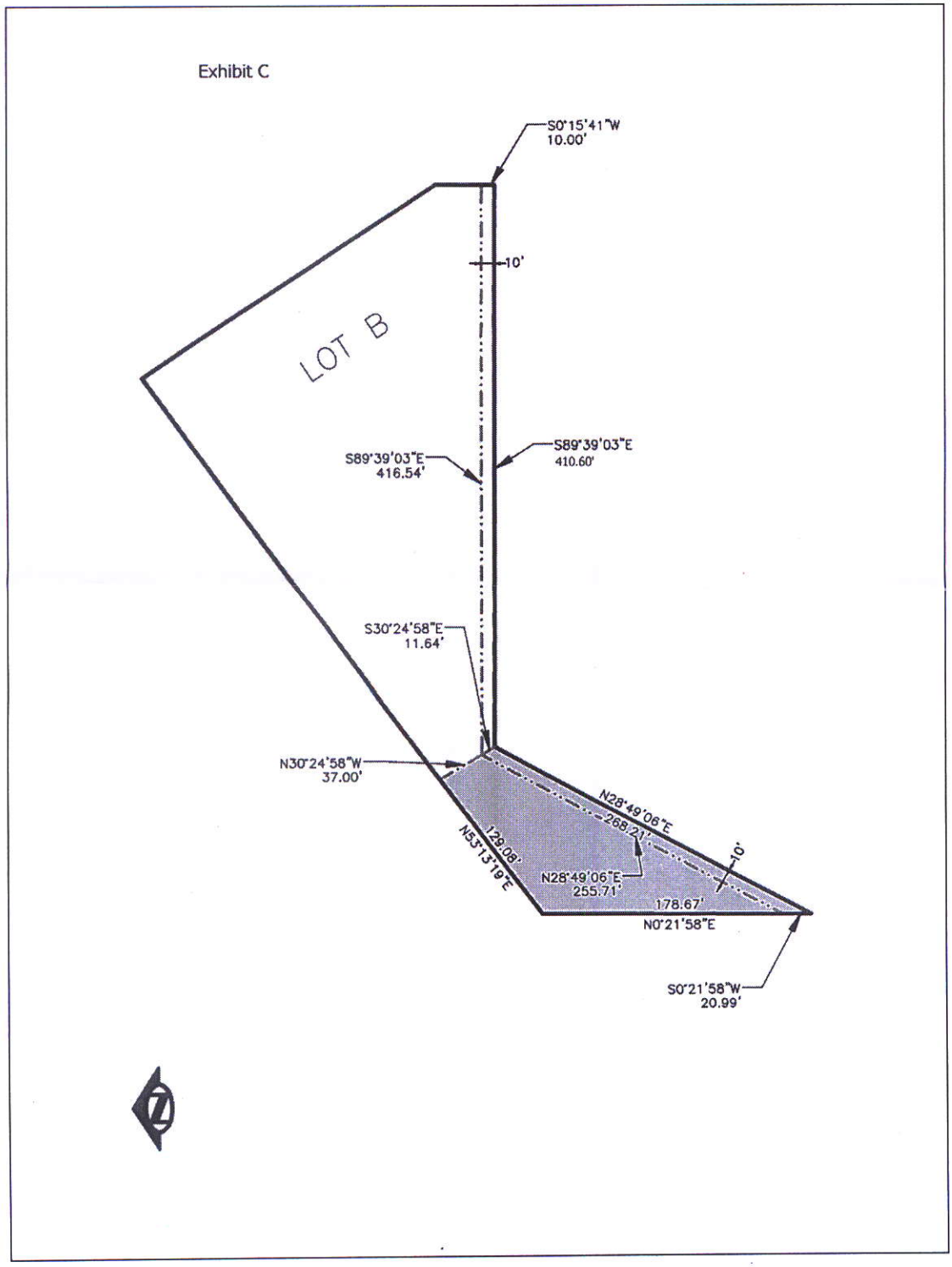
3-B
Horizon View Wellfield



3-B
Horizon View Wellfield



3-B
Horizon View Wellfield



3-B
Horizon View Wellfield

EXHIBIT D

LEGAL DESCRIPTION:

LOT B, LAKE FOREST PARK AMENDED SHORT SUBDIVISION NO. 2010-14002, RECORDED UNDER KING COUNTY RECORDING NUMBER 20111013900002, SAID LOT DEFINED AS FOLLOWS:

THAT PORTION OF LOT 30, BLOCK 1, LAKE FOREST PARK ESTATES, ACCORDING TO THE PLAT THERE OF RECORDED IN VOLUME 34 OF PLATS, PAGE 8, IN KING COUNTY, WASHINGTON, DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF SAID LOT 30, SAID POINT ALSO BEING THE TRUE POINT OF BEGINNING;
THENCE NORTH 00°21'58" EAST, 80.02 FEET ALONG THE WESTERLY LINE TO THE NORTHWEST CORNER OF SAID LOT;
THENCE NORTH 53°13'19" EAST ALONG THE NORTHWESTERLY LINE OF SAID LOT A DISTANCE OF 494.60 FEET;
THENCE SOUTH 33°07'57" EAST A DISTANCE OF 164.15 FEET TO A POINT ON THE EASTERLY LINE OF SAID LOT;
THENCE SOUTH 04°59'51" WEST ALONG SAID EASTERLY LINE 125.91 FEET;
THENCE NORTH 89°39'03" WEST, 346.90 FEET;
THENCE SOUTH 28°49'06" WEST, 132.01 FEET TO THE SOUTH LINE OF SAID LOT 30;
THENCE NORTH 89°44'19" WEST, ALONG THE SOUTH LINE OF SAID LOT 30; 64.89 FEET TO THE TRUE POINT OF BEGINNING.

TOGETHER WITH THAT PORTION OF VACATED 45TH AVENUE NORTHEAST BY KING COUNTY COMMISSIONER RECORDS IN VOLUME 68, AT PAGE 297, ADJOINING LOT 29, BLOCK 1, LAKE FOREST PARK ESTATES, ACCORDING TO THE PLAT THEREOF RECORDED IN VOLUME 34 OF PLATS, PAGE 8, IN KING COUNTY, WASHINGTON DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHEAST CORNER OF LOT 29, BLOCK 1, LAKE FOREST PARK ESTATES, ACCORDING TO THE PLAT THEREOF RECORDED IN VOLUME 34 OF PLATS, PAGE 8, IN KING COUNTY, WASHINGTON;
THENCE NORTH 89°44'19" WEST ALONG THE SOUTH LINE OF SAID LOT, AND THE EXTENSION OF THE LINE OF SAID LOT 29, 453.99 FEET TO THE EAST MARGIN OF AMENDED 45TH AVENUE NORTHEAST BY KING COUNTY COMMISSIONERS;
THENCE NORTH 00°21'58" EAST ALONG THE EAST LINE OF AMENDED 45TH AVENUE NORTHEAST 20.41 FEET TO THE TRUE POINT OF BEGINNING;
THENCE CONTINUING NORTH 00°21'58" EAST, ALONG THE EAST MARGIN OF AMENDED 45TH AVENUE NORTHEAST BY KING COUNTY COMMISSIONERS 119.63 FEET TO THE SOUTH LINE OF SAID LOT 30;
THENCE SOUTH 89°44'19" EAST, ALONG THE SOUTH LINE OF SAID LOT 30, 64.89 FEET;
THENCE SOUTH 28°49'06" WEST, 136.20 FEET TO THE TRUE POINT OF BEGINNING;

TOGETHER WITH THAT PORTION OF LOT 14, BLOCK 1, LAKE FOREST PARK ESTATES, ACCORDING TO THE PLAT THERE OF RECORDED IN VOLUME 34 OF PLATS, PAGE 8, IN KING COUNTY, WASHINGTON, DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF SAID LOT 14;
THENCE NORTH 04°59'51" EAST ALONG THE WESTERLY LINE 55.59 FEET TO THE TRUE POINT OF

3-B
Horizon View Wellfield

BEGINNING;
THENCE CONTINUE NORTH 04°59'51" EAST, 44.78 FEET TO THE NORTHWEST CORNER OF SAID LOT 14;
THENCE SOUTH 89°44'19" EAST, 60.00 FEET;
THENCE SOUTH 00°15'41" WEST, 44.73 FEET;
THENCE NORTH 89°39'03" WEST, 63.70 FEET TO THE POINT OF BEGINNING.

TOGETHER WITH THAT PORTION OF LOT 13, BLOCK 1, LAKE FOREST PARK ESTATES, ACCORDING TO THE PLAT THEREOF RECORDED IN VOLUME 34 OF PLATS, PAGE 8, IN KING COUNTY, WASHINGTON, DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF SAID LOT 13;
THENCE NORTH 04°59'51" EAST ALONG THE WESTERLY LINE OF SAID LOT 13 A DISTANCE OF 81.13 FEET;
THENCE SOUTH 33°07'57" EAST, 96.84 FEET TO A POINT ON THE SOUTH LINE OF SAID LOT, SAID POINT BEING LOCATED 60.00 FEET EAST OF THE SOUTHWEST CORNER OF SAID LOT;
THENCE NORTH 89°44'19" WEST 60.00 FEET ALONG THE SAID SOUTH LINE TO THE POINT OF BEGINNING.

3-B
Horizon View Wellfield

APPENDIX 3 - C WATER QUALITY RECORDS

Conservation Tips

Lake Forest Park Water District sources its water from an excellent aquifer that bears no indication of overuse. Nevertheless, water conservation helps to save you money. Most homes can conserve water without any significant change in life-style. Here are some tips that will help your next bill:

- Compost vegetable food waste instead of using the garbage disposal.
- Spread 2-3 inches of mulch around plants to reduce evaporation.
- Repair all plumbing leaks promptly. This is especially important to monitor in older homes.
- Deep water your lawn early in the morning before the heat of the sun.
- Repair any leaking pipes or malfunctioning sprinkler heads on your irrigation system.
- Sweep off any leaf litter before pressure-washing or hosing off your driveway.

Contact Information

LAKE FOREST PARK WATER DISTRICT
F. Alan Kerley, General Manager
4029 N.E. 178th St.
Lake Forest Park, WA 98155

Phone:(206)-365-3211
FAX: (206)-365-3357
e-mail: office@lfpwd.org

District website has ongoing information and news: **www.lfpwd.org**
Washington State Department of Health Website: **www.doh.wa.gov/gov/ehp/dw**
Environmental Protection Agency Website: **www.epa.gov/safewater**
Safe Drinking Water Hotline Phone: 1-800-426-4791
e-mail: hotline-sdwa@epamail.epa.gov

Participate in District Board Meetings! The District's Board of Commissioners has regular meetings on the third Monday of each month at 8:00 AM in the District office on 178th Street. We invite any interested persons to participate.

Maintenance and Improvement Program

Residents in our District should be aware of several ongoing projects and scheduled activities that ensure a reliable supply of quality water now and in the future:

- Annual flushing of water mains ensures that mineral sediments like iron and manganese oxides do not accumulate in the pipes. Customers may briefly notice discoloring sediments in the tap while flushing is underway. This is not hazardous to your health. If you have any concerns, please contact the District.

- Water is sampled routinely several times a month from sample stations throughout the District. These samples are tested for bacterial contamination in-house or by an independent laboratory.

- This Fall the District will undertake a construction project on NE 178th St. near Brookside Elementary. The project will replace an aging 2inch watermain with 8inch ductile iron, and add two fire hydrants. The District will also relocate infrastructure to accommodate the City of Lake Forest Park's proposed culvert, sidewalk and road improvements.

Lake Forest Park Water District
4029 N.E. 178th St.
Lake Forest Park, WA 98155

PLACE STAMP HERE

Board of Commissioners
William F. Donahue
David A. Hammond
Eli B. Zehner

3-C Water Quality



- New watermain that is installed as part of our replacment schedule is upsized to provide fire flow. Data from our recent calibration study shows a marked improvement in fire flow capacity over the last eight years.

- The District is nearing completion of an update to its six-year Comprehensive System Plan, which also outlines a twenty-year capital improvement program. The plan update includes a rate analysis component. District customers are always welcome to attend board meetings.

PRINTED ON 30% RECYCLED PAPER

LAKE FOREST PARK WATER DISTRICT

2013 Annual Water Quality Report

Mission

"Lake Forest Park Water District strives to provide high quality water, sourced from our local aquifer, at the lowest reasonable cost, while investing in our infrastructure and maintaining the highest level of customer service."

The Source of Your Water

Lake Forest Park Water District (LFPWD) water comes from two wellfields. **McKinnon Creek Wellfield** is located on District-owned acreage in the northern end of the community. There are eight artesian aquifer wells less than 30 feet deep that produce a combined flow of around 100 gallons per minute (gpm) and three drilled wells that are over 200 feet deep and pump up to 800 gpm.

Horizon View Wellfield is located next to Horizon View Park and consists of two deep wells which draw from the same aquifer as our other deep wells. Water is gravity fed from an equalizing tank into the distribution system.

LFPWD stores water in two steel reservoirs with a combined capacity of 440,000 gallons. The system uses an average of 275,000 gallons per day and during hot summer days that figure can rise to 625,000 gallons per day. Through conservation and leak repairs our usage has been reduced substantially in recent years.

Interested customers are welcome to receive a full field tour of our production facilities. Just call the District office to arrange your visit.

Protecting Our Resource...

3-C Water Quality



This report contains water quality results for the calendar year 2013. We have also included additional information regarding maintenance, conservation, and special advisories.The district ensures the quality and safety of our water through our maintenance program, a water testing program that exceeds state requirements and stewardship of our watershed.

Our Wellhead Protection Program is monitored by the Washington State Department of Health. Our shallow artesian wellfield in the McKinnon Creek Wellfield is classified as "highly susceptible" while the deep well fields are rated as moderately susceptible, based on the depth of the wells. From a groundwater protection standpoint, the wellhead areas are considered relatively safe from contamination because potential contaminant sources are limited. The District owns and manages a combined area of around 14 acres immediately surrounding the wells in the McKinnon Creek and Horizon View Wellfields.

"This Fall the District will be completing its updated comprehensive system plan which outlines the District's long-term goals. We look forward to public involvment and comment. Board meetings are held on the third monday of each month at 8am. Prior to final approval, there will be formal opportunities for public comment."
-Alan Kerley, General Manager

Water Content and Treatment

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. State and Federal guidelines have suggested a Maximum Contaminant Level (MCL) for most substances found in water. Table 1 compares the detected values with the MCL for current test results. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

The Total Coliform Rule requires water systems to meet a strict limit for coliform bacteria all the way to the customer connection. 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 happens, we will notify the public by written notice, newspaper, television or radio. To comply with the stricter regulation while still maintaining chlorine free water, we have installed automated standby chlorination equipment which can be used immediately in the event of contamination with harmful bacteria.



Table 1 - 2013 Water Quality as tested in Distribution System

	Violation Y/N	Most Recent Sample	Avg Value	Max Value	Unit	MCLG	MCL	Likely Source of Contamination
Coliform Bact	Y	12/18/2013	0	2	cfu/dl	0	+/-	Sept. Violation from Sampling error
Fecal Coliform and *E. coli*	N	12/18/2013	0	0	cfu/dl	0	0	N/A
Turbidity	Y	6/2/2010	1.390	1.39	NTU	n/a	1	Suspended mineral deposits
Radioactive Contaminants								
Beta/photon emitters	N	6/9/2009	1.892	4.4	pCi/L	0	50	Decay of natural and man-made deposits
Inorganic Contaminants								
Arsenic	N	6/2/2010	4	4	ppb	n/a	50	Erosion of natural deposits; runoff from orchards; runoff from glass and electronics production wastes
Fluoride	N	6/2/2010	ND	ND	ppm	4	4	Erosion of natural deposits, water additive, discharge from fertilizer and aluminum factories
Iron	N	6/2/2010	0.15	0.15	ppm	0.3	0.3	natural deposits in ground
Lead	N	6/2/2010	ND	ND	ppb	0	15	Corrosion of household plumbing systems
Copper	N	6/2/2010	ND	ND	ppm	1.3	1.3	Natural Deposits
Nitrate	N	6/19/2013	1.23	2.87	ppm	10	10	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion

Lead and Copper Sampling at Residential Taps

Lead and copper monitoring is conducted as directed by the State in ten homes categorized as high risk. The District tests these homes under worst-case conditions. 2011 test results did not exceeded the 90th percentile allowable level for lead or copper. Table 2 summarizes these results.
In Washington State, lead in drinking water comes primarily from materials and components used in household plumbing. The more time water has been sitting in pipes, the more dissolved metals, such as lead, it may contain. Elevated levels of lead can cause serious health problems, especially in pregnant women and young children.

To help reduce potential exposure to lead: for any drinking water tap that has not been used for 6 hours or more, flush water through the tap until the water is noticeably colder before using for drinking or cooking. You can use the flushed water for watering plants, washing dishes, or general cleaning. Only use water from the cold-water tap for drinking, cooking, and especially for making baby formula. Hot water is likely to contain higher levels of lead. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water is available from EPA's Safe Drinking Water Hotline at 1-800-426-4791 or online at http://www.epa.gov/safewater/lead.

Table 2 - Lead and Copper Levels at Residential Taps

Variable	Contaminant Level (90% samples below this level)	Number of Sites Exceeding Action Level (AL)	Maximum Contaminant Level (MCL) / Action Level (AL)	Contamination Source
Copper	0.606 ppm	All Sample results below AL	Exceeds if >10% of homes tested >1.3ppm	Corrosion of household plumbing systems
Lead	5 ppb	All Sample results below AL	Exceeds if >10% of homes tested > 15ppb	Corrosion of household plumbing systems

Water Use Efficiency (WUE) Report

Lake Forest Park Water District is subject to Municipal Water Law that is regulated by Washington State Department of Health (DOH). DOH has implemented regulations (Water Use Efficiency Rules) that are intended to create a more efficient use of the resource so that future demands are met appropriately. The process of developing WUE goals includes engaging customer and public participation.



Our WUE Goal:
Reduce average customer usage by 0.33% per year over the next three years for a 1% reduction in the Equivalent Residential Unit (ERU) average consumption by 2012, which, given the historical ERU consumption of 215 gallons/day (Comprehensive System Plan 2005), will achieve a reduction of 2.15 gallons/day per ERU by 2012.

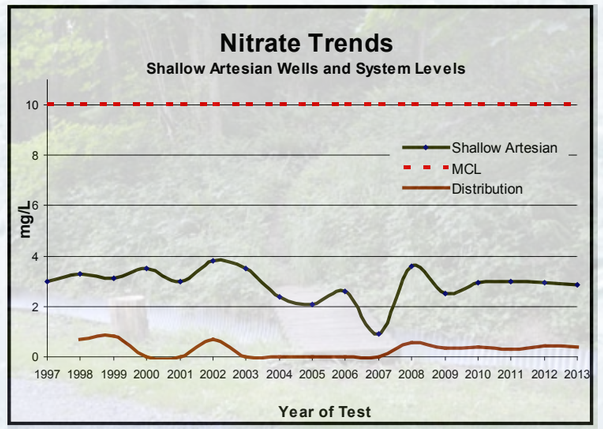
Our Progress:
The District has exceeded it's WUE Goal of 1% ERU average consumption reduction over three years and will continue with this goal of 0.33% reduction until completion of the updated Water System Comprehensive System Plan.

Water Quality Testing

The State Department of Health and the EPA require water purveyors to sample their water on a regular basis to ensure its safety. The Department of Health (DOH) establishes specific testing requirements for each water purveyor, based on their risk assessment for each contaminant. Because of this, many tests are infrequent for reason of economy. Our District is required to test for bacterial contamination three times per month. To insure high quality water the District actually averages 15 bacterial tests per month.

Nitrate Monitoring

The District has been closely tracking nitrate level trends in our source and distribution. We appreciate the attention of residents in our ground water recharge area who avoid the use of high nitrate containing fertilizers and other chemicals to protect our water source. Nitrate levels continue to remain well below the MCL



DEFINITIONS

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

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

NTU - Nephelometric Turbidity Unit
The unit of measurement for turbidity. Turbidity is caused by suspended sediments in water.

ppm - Parts per million
or mg/l - 1 Milligram per liter (One part per million corresponds to one minute in two years or a single penny in $10,000.)

ppb - Parts per billion
or mg/l - Micrograms per liter (One part per billion corresponds to one minute in 2,000 years, or a single penny in $10,000,000.)

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

ND - Not Detected

Distribution Leakage Summary

Total Water Produced and obtained:	112 Million Gal.
Total Water Accounted for:	92.1 Million Gal.
Distribution System Leakage %:	17.8%

Advisories

Our water is not chlorinated or fluoridated. Families with growing children may contact their dentist regarding the use of fluoride supplements such as toothpaste containing fluoride.

The District water is tested for arsenic in accordance with federal guidelines and levels remain within these standards.

Some people are more vulnerable to contaminants in drinking water than the general population. Immuno-compromised people such as those undergoing chemotherapy, people 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 from their health care providers about drinking water. EPA/CDC guidelines on appropriate means to lessen the risk of infection by microbial contaminates are available from the Safe Drinking Water Hotline (1-800-426-4791).

Water Quality Monitoring Schedule

System: LAKE FOREST PARK WATER DISTRICT
Contact: F. Alan Kerley

PWS ID: 40950 K
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

	Jun 2015	Jul 2015	Aug 2015	Sep 2015	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016
Coliform Monitoring Population	2714	2714	2714	3117	3117	3117	3117	3117	3117	3117	3117	3117
Number of Routine Samples Required	3	3	3	3	3	3	3	3	3	3	3	3

- 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.
- Collect no less than 5 routine samples in the month following one or more unsatisfactory samples, in accordance with your system's Coliform Monitoring Plan.
- 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	10	Jan 2015 - Dec 2017	standard - 3 year	07/23/2014	Jul 2017

Notes on Distribution System Chemical Monitoring

For *Lead and Copper*:
- Collect samples from indoor faucets after the water has sat unused in the pipes for at least 6 hours, but no more than 12 hours.
- Flush sample faucets with cold water the evening prior to collecting the sample.
- If your sampling frequency is annual or once every 3 years, collect samples between June 1 and September 30.

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 or 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.
- If "R&C" is listed in a monitoring requirement's frequency, the requirements are based on detections which are reliably and consistently below the health standard.

Source S05 *Shallow Well Field 1-8* | *Well Field* | *Use - Permanent* | *Susceptility - High*

Test Panel/Analyte	# Samples Required	Compliance Period	Frequency	Last Sample Date	Next Sample Due
Nitrate	1	Jan 2015 - Dec 2015	standard - 1 year	06/19/2013	***Jul 2015***
Complete Inorganic (IOC)	1	Jan 2011 - Dec 2019	waiver - 9 year	04/27/2010	Apr 2019
Volatile Organics (VOC)	1	Jan 2014 - Dec 2019	waiver - 6 year	06/03/2011	Jun 2017
Herbicides	1	Jan 2014 - Dec 2022	waiver - 9 year	04/30/2015	
Pesticides	0	Jan 2014 - Dec 2016	waiver - 3 year	04/12/2006	
Soil Fumigants	0	Jan 2014 - Dec 2016	waiver - 3 year		
Gross alpha	1	Jan 2014 - Dec 2019	standard - 6 year	06/09/2009	***Jun 2015***
Radium 228	1	Jan 2014 - Dec 2019	standard - 6 year	06/09/2009	***Jun 2015***

Source S06 *Well Field 1,2,3* | *Well Field* | *Use - Permanent* | *Susceptility - Moderate*

Test Panel/Analyte	# Samples Required	Compliance Period	Frequency	Last Sample Date	Next Sample Due
Nitrate	1	Jan 2015 - Dec 2015	standard - 1 year	07/24/2014	***Jul 2015***
Complete Inorganic (IOC)	1	Jan 2011 - Dec 2019	waiver - 9 year	06/02/2010	Jun 2019
Iron	1	Jan 2014 - Dec 2016	standard - 3 year	06/02/2010	***May 2015***
Volatile Organics (VOC)	1	Jan 2014 - Dec 2019	waiver - 6 year	06/03/2011	Jun 2017
Herbicides	1	Jan 2014 - Dec 2022	waiver - 9 year	06/09/2009	Jun 2018
Pesticides	0	Jan 2014 - Dec 2016	waiver - 3 year	06/09/2009	
Soil Fumigants	0	Jan 2014 - Dec 2016	waiver - 3 year		
Gross alpha	1	Jan 2014 - Dec 2019	standard - 6 year	06/09/2009	***Jun 2015***
Radium 228	1	Jan 2014 - Dec 2019	standard - 6 year	06/09/2009	***Jun 2015***

Source S09 *Horizon View Well Field* | *Well Field* | *Use - Permanent* | *Susceptility - Low*

Test Panel/Analyte	# Samples Required	Compliance Period	Frequency	Last Sample Date	Next Sample Due
Nitrate	1	Jan 2015 - Dec 2015	standard - 1 year	07/24/2014	***Jul 2015***

Source S09	*Horizon View Well Field*	*Well Field*	*Use - Permanent*	*Susceptility - Low*	
Test Panel/Analyte	*# Samples Required*	*Compliance Period*	*Frequency*	*Last Sample Date*	*Next Sample Due*
Complete Inorganic (IOC)	1	Jan 2014 - Dec 2016	standard - 3 year	07/10/2009	Jul 2016
Volatile Organics (VOC)	1	Jan 2014 - Dec 2016	standard - 3 year	07/10/2009	Jun 2016
Herbicides	1	Jan 2014 - Dec 2016	standard - 3 year		Jun 2016
Pesticides	1	Jan 2014 - Dec 2016	standard - 3 year		Jun 2016
Soil Fumigants	0	Jan 2014 - Dec 2016	waiver - 3 year		
Gross alpha	1	Apr 2015 - Jun 2015	initial - quarterly		***May 2015***
Gross alpha	1	Jul 2015 - Dec 2015	initial - quarterly		***Oct 2015***
Radium 228	1	Apr 2015 - Jun 2015	initial - quarterly		***May 2015***
Radium 228	1	Jul 2015 - Dec 2015	initial - quarterly		***Oct 2015***

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Other Information

Other Reporting Schedules	Due Date
Submit Consumer Confidence Report (CCR) to customers and ODW (Community systems only):	07/01/2015
Submit CCR certification form to ODW (Community systems only):	10/01/2015
Submit Water Use Efficiency report online to ODW (Community and other municipal water systems only):	07/01/2015
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 end of monitoring period

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:	Jolyn Leslie, p.e.: (253) 395-6762 or jolyn.leslie@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.

3-C Water Quality

Burlington, WA	*Corporate Laboratory (a)*	1620 S Walnut St	Burlington, WA 98233	**800.755.9295** • 360.757.1400
Bellingham, WA	*Microbiology (b)*	805 Orchard Dr Ste 4	Bellingham, WA 98225	360.715.1212
Portland, OR	*Microbiology/Chemistry (c)*	9150 SW Pioneer Ct Ste W	Wilsonville, OR 97070	503.682.7802
Corvallis, OR	*Microbiology (d)*	540 SW Third Street	Corvallis, OR 97333	541.753.4946

FL NELAP E871040

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Lake Forest Park Water District
4029 NE 178th Street
Seattle, WA 98155

System Name: KING COUNTY WATER DISTRICT #83
System ID Number: 40950K
DOH Source Number: 06
Multiple Sources:
Sample Type: D - Drinking Water
Sample Purpose: C - Compliance
Sample Location: SO6
County: King

Reference Number: 14-13878
Project: NO3 Testing

Sample Number:
Lab Number: 046-32391
Collect Date: 7/24/14 08:30
Date Received: 7/24/14
Report Date: 7/28/14
Sampled By: Shawn
Sampler Phone:
Approved by: bj
Authorized by:

Bryce Jensen
Chemist

DOH#	ANALYTES	RESULTS	UNITS	SRL	Trigger	MCL	Analyst	METHOD	Lab	Analyzed	COMMENT
	EPA Regulated										
20	NITRATE-N	**0.58**	mg/L	0.100	5	10	srf	300.0		07/24/14 23:47	

3-C Water Quality

NOTES:

SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.
ND (Not Detected): indicates that the parameter was not detected above the Specified Reporting Limit (SRL).
An * in front of the parameter name indicates it is not NELAP accredited but it is accredited through WSDOH or USEPA Region 10.

These test results meet all the requirements of NELAC, unless otherwise stated in writing, and relate only to these samples.
If you have any questions concerning this report contact Bryce Jensen, Chemist, at the toll-free phone number above.

FORM: IOC_ST

EDGE ANALYTICAL

Burlington, WA	*Corporate Laboratory (a)*	1620 S Walnut St	Burlington, WA 98233	**800.755.9295** • 360.757.1400
Bellingham, WA	*Microbiology (b)*	805 Orchard Dr Ste 4	Bellingham, WA 98225	360.715.1212
Portland, OR	*Microbiology/Chemistry (c)*	9150 SW Pioneer Ct Ste W	Wilsonville, OR 97070	503.682.7802
Corvallis, OR	*Microbiology (d)*	540 SW Third Street	Corvallis, OR 97333	541.753.4946

NELAP ACCREDITED TNI LABORATORY
FL NELAP E871040

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Lake Forest Park Water District
4029 NE 178th Street
Seattle, WA 98155

System Name: KING COUNTY WATER DISTRICT #83
System ID Number: 40950K
DOH Source Number: 05
Multiple Sources:
Sample Type: D - Drinking Water
Sample Purpose: Investigative or Other
Sample Location: SO5
County: King

Reference Number: 14-13878
Project: NO3 Testing

Sample Number:
Lab Number: 046-32392
Collect Date: 7/24/14 08:30
Date Received: 7/24/14
Report Date: 7/28/14
Sampled By: Shawn
Sampler Phone:
Approved by: bj
Authorized by:

Bryce Jensen
Chemist

DOH#	ANALYTES	RESULTS	UNITS	SRL	Trigger	MCL	Analyst	METHOD	Lab	Analyzed	COMMENT
	EPA Regulated										
20	NITRATE-N	**2.89**	mg/L	0.100	5	10	srf	300.0		07/25/14	

3-C Water Quality

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Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.
ND (Not Detected): indicates that the parameter was not detected above the Specified Reporting Limit (SRL).
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FORM: IOC_ST

Burlington, WA	*Corporate Laboratory (a)*	1620 S Walnut St	Burlington, WA 98233	**800.755.9295** • 360.757.1400
Bellingham, WA	*Microbiology (b)*	805 Orchard Dr Ste 4	Bellingham, WA 98225	360.715.1212
Portland, OR	*Microbiology/Chemistry (c)*	9150 SW Pioneer Ct Ste W	Wilsonville, OR 97070	503.682.7802
Corvallis, OR	*Microbiology (d)*	540 SW Third Street	Corvallis, OR 97333	541.753.4946

FL NELAP E871040

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Lake Forest Park Water District
4029 NE 178th Street
Seattle, WA 98155

System Name: KING COUNTY WATER DISTRICT #83
System ID Number: 40950K
DOH Source Number: 09
Multiple Sources:
Sample Type: D - Drinking Water
Sample Purpose: C - Compliance
Sample Location: SO9
County: King

Reference Number: 14-13878
Project: NO3 Testing

Sample Number:
Lab Number: 046-32393
Collect Date: 7/24/14 08:30
Date Received: 7/24/14
Report Date: 7/28/14
Sampled By: Shawn
Sampler Phone:
Approved by: bj
Authorized by:

Bryce Jensen
Chemist

DOH#	ANALYTES	**RESULTS**	UNITS	SRL	Trigger	MCL	Analyst	METHOD	Lab	Analyzed	COMMENT
	EPA Regulated										
20	NITRATE-N	**0.87**	mg/L	0.100	5	10	srf	300.0		07/25/14 01:18	

3-C Water Quality

NOTES:

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MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.
ND (Not Detected): indicates that the parameter was not detected above the Specified Reporting Limit (SRL).
An * in front of the parameter name indicates it is not NELAP accredited but it is accredited through WSDOH or USEPA Region 10.

These test results meet all the requirements of NELAC, unless otherwise stated in writing, and relate only to these samples.
If you have any questions concerning this report contact Bryce Jensen, Chemist, at the toll-free phone number above.

FORM: IOC_ST

ANALYTICAL LABORATORIES

Burlington WA (Main Lab) | 1620 S. Walnut St. – 98233 | 800.755.9295 • 360.757.1400 • 360.757.1402fax
Bellingham WA | 805 Orchard Dr Suite 4 – 98225 | 888.725.1212 • 360.715-1212• 360.671.1577fax

DRINKING WATER SAMPLE INFORMATION (WSI)

INORGANIC & ORGANIC CHEMICAL ANALYSIS

REPORT TO & BILLING INFORMATION

Report To:	Lake Forest Park Water District	Bill To:	
Ship Address:	4029 NE 178th St.	Address:	
City:	Seattle St: WA Zip: 98155	City:	SAME St: Zip:
Phone:	206.365-3211 Fax: 206-365-3357	Phone:	
Email:	~~alan~~ allan@lfpwd.org	P.O.#	
Contact:	Alan Kerley	☐ Visa ☐ M/C ☐ A/E	Expires /
Project		Card #	

SAMPLING INFORMATION REQUIRED

1. ☐ Investigative ☒ Compliance – is for State regulations for Public Water Systems. (Results will be sent to you and the State)
2. Date Collected: 1/24/14 Time Collected: ☐ AM ☐ PM
3. Collected By: Telephone:
4. Specific Location:

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PUBLIC WATER SYSTEM (ONLY)

5. System ID Number: 40950K
6. DOH Source Number: 506 ☐ Check here if this a New Source.
   (Without a source number DOH will not accept the samples. If sample is blended from more than one source, list all.)
7. Group: ☒ A ☐ B
8. System Name: Lake Forest Park Water Dist.
9. Source Type: ☐ Surface ☐ Well/Ground Water ☒ Well Field ☐ Spring ☐ Purchased
10. County: King
11. Sample taken: ☒ No Treatment ☐ After Treatment ☐ Before Treatment ☐ In Distribution
12. Utility's Name for this source: well field 1,2,3
13. Treatment Type: ☒ None ☐ Fluoridation ☐ Chlorination ☐ Filtration ☐ Aeration ☐ Softener ☐ Other
14. **COMPOSITE INFORMATION** (Applies to Multiple Sources Only) If sample is to be composited in lab, list all sources.
    If you want the lab to composite samples from your system **INITIAL here** _____.
    1. 2. 3. 4. 5. 6.
15. Remarks: 14-13878

ANALYSIS TO PERFORM

FREQUENTLY REQUESTED TESTS ARE LISTED BELOW. FOR OTHERS, PLEASE LIST UNDER OTHER ANALYSIS.

Organic Compounds
- ☐ 531.1 Carbamates
- ☐ 549.2 Diquat
- ☐ 504.1 EDB, DBCP/1,2,3-TCP
- ☐ 548.2 Endothall
- ☐ 547 Glyphosate
- ☐ 515.1 or 4 Herbicides
- ☐ 525.2 Pesticides (Regulated)
  Pest 1 test Pannel
- ☐ 524.2 VOC
- ☐ 552.2 Haloacetic Acids (HAA)
- ☐ 524.2 Trihalomethanes (THM)

- ☐ 508.1 Organochlorine Pesticides/PCB
- ☐ 1613 Dioxins

Inorganic Compounds
- ☐ Bromate
- ☐ Bromide
- ☐ Chloride
- ☐ Chlorine
- ☐ Conductivity
- ☐ Complete Inorganics (IOC)
- ☐ Cyanide
- ☐ Fluoride
- ☐ Lead and Copper Rule (Special Sampling)
- ☐ Metals (List or circle each metal individually)*

- ☒ Nitrate
- ☐ Nitrite
- ☐ pH
- ☐ Total Dissolved Solids (TDS)
- ☐ Total Organic Carbon (TOC)
- ☐ Turbidity
- ☐ Sulfate

Radionuclides
- ☐ Gross Alpha/Beta
- ☐ Radium 226
- ☐ Radium 228
- ☐ Radon

General Testing
- ☐ Building Permit
  List the County: _____
- ☐ EWS Well Report
- ☐ Nuisance Test (Fe,Mn,pH,Hardness)
- ☐ Arsenic

Other Analysis Please List:

METALS: Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, K, Se, Si, Ag, Na, Sr, Tl, Sn, Ti, U, V, Zn

RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME
X	1-24-14	0830	X	1/24/14	1100
X			X		

CUSTODY SEALS INTACT (Tim) YES ☐ NO ☐ N/A ☒ SAMPLES RECEIVED INTACT YES ☒ NO ☐

SAMPLE TEMP_____°C SATISFACTORY YES ☒ NO ☐ CHAIN OF CUSTODY & LABELS AGREE YES ☒ NO ☐

CO022743

ANALYTICAL LABORATORIES

Burlington WA (Main Lab) | 1620 S. Walnut St. – 98233 | 800.755.9295 • 360.757.1400 • 360.757.1402fax
Bellingham WA | 805 Orchard Dr Suite 4 – 98225 | 888.725.1212 • 360.715-1212• 360.671.1577fax

DRINKING WATER SAMPLE INFORMATION (WSI)

INORGANIC & ORGANIC CHEMICAL ANALYSIS

REPORT TO & BILLING INFORMATION

Report To:	Lake Forest Park Water District	Bill To:	
Ship Address:	4029 NE 178th St.	Address:	
City:	Seattle St: WA Zip: 98155	City:	SAME St: Zip:
Phone:	206.365-3211 Fax: 206-365-3357	Phone:	
Email:	alan ~~alan~~@lfpwd.org	P.O.#	
Contact:	Alan Kerley	☐ Visa ☐ M/C ☐ A/E	Expires /
Project		Card #	

SAMPLING INFORMATION REQUIRED

1. ☐ Investigative ☒ Compliance - is for State regulations for Public Water Systems. (Results will be sent to you and the State)
2. Date Collected: 7/24/14 Time Collected: ☐ AM ☐ PM
3. Collected By: Telephone:
4. Specific Location:

3-C Water Quality

PUBLIC WATER SYSTEM (ONLY)

5. System ID Number: 40950 K
6. DOH Source Number: 505 ☐ Check here if this a New Source.

(Without a source number DOH will not accept the samples. If sample is blended from more than one source, list all.)

7. Group: ☒ A ☐ B
8. System Name: Lake Forest Park Water Dist
9. Source Type: ☐ Surface ☐ Well/Ground Water ☒ Well Field ☐ Spring ☐ Purchased
10. County: King
11. Sample taken: ☒ No Treatment ☐ After Treatment ☐ Before Treatment ☐ In Distribution
12. Utility's Name for this source: Shallow wells
13. Treatment Type: ☒ None ☐ Fluoridation ☐ Chlorination ☐ Filtration ☐ Aeration ☐ Softener ☐ Other
14. **COMPOSITE INFORMATION** (Applies to Multiple Sources Only) If sample is to be composited in lab, list all sources. If you want the lab to composite samples from your system **INITIAL here** _____.

1. 2. 3. 4. 5. 6.

15. Remarks:

ANALYSIS TO PERFORM

FREQUENTLY REQUESTED TESTS ARE LISTED BELOW. FOR OTHERS, PLEASE LIST UNDER OTHER ANALYSIS.

Organic Compounds

- ☐ 531.1 Carbamates
- ☐ 549.2 Diquat
- ☐ 504.1 EDB, DBCP/1,2,3-TCP
- ☐ 548.2-Endothall
- ☐ 547 Glyphosate
- ☐ 515.1 or 4 Herbicides
- ☐ 525.2 Pesticides (Regulated) Pest 1 test Pannel
- ☐ 524.2 VOC
- ☐ 552.2 Haloacetic Acids (HAA)
- ☐ 524.2 Trihalomethanes (THM)
- ☐ 508.1 Organochlorine Pesticides/PCB
- ☐ 1613 Dioxins

Inorganic Compounds

- ☐ Bromate
- ☐ Bromide
- ☐ Chloride
- ☐ Chlorine
- ☐ Conductivity
- ☐ Complete Inorganics (IOC)
- ☐ Cyanide
- ☐ Fluoride
- ☐ Lead and Copper Rule (Special Sampling)
- ☐ Metals (List or circle each metal individually)*
- ☒ Nitrate
- ☐ Nitrite
- ☐ pH
- ☐ Total Dissolved Solids (TDS)
- ☐ Total Organic Carbon (TOC)
- ☐ Turbidity
- ☐ Sulfate

Radionuclides

- ☐ Gross Alpha/Beta
- ☐ Radium 226
- ☐ Radium 228
- ☐ Radon

General Testing

- ☐ Building Permit List the County: _____
- ☐ EWS Well Report
- ☐ Nuisance Test (Fe,Mn,pH,Hardness)
- ☐ Arsenic

Other Analysis Please List:

METALS: Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, K, Se, Si, Ag, Na, Sr, Tl, Sn, Ti, U, V, Zn

RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME
X [signature]	7-24-14	0830	X		
X			X		

	YES	NO	N/A		YES	NO
CUSTODY SEALS INTACT	☐	☐	☐	SAMPLES RECEIVED INTACT	☐	☐
SAMPLE TEMP_____°C SATISFACTORY	☐	☐	☐	CHAIN OF CUSTODY & LABELS AGREE	☐	☐

CO022743

ANALYTICAL LABORATORIES

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DRINKING WATER SAMPLE INFORMATION (WSI)

INORGANIC & ORGANIC CHEMICAL ANALYSIS

REPORT TO & BILLING INFORMATION

Report To:	Lake Forest Park Water District	Bill To:	
Ship Address:	4029 NE 178th St.	Address:	SAME
City:	Seattle St: WA Zip: 98155	City: St: Zip:	
Phone:	206.365-3211 Fax: 206-365-3357	Phone:	
Email:	alan ~~allan~~@lfpwd.org	P.O.#	
Contact:	Alan Kerley	☐ Visa ☐ M/C ☐ A/E	Expires /
Project		Card #	

SAMPLING INFORMATION REQUIRED

1. ☐ **Investigative** ☒ **Compliance** - is for State regulations for Public Water Systems. (Results will be sent to you and the State)
2. Date Collected: 7/24/14 Time Collected: ☐ AM ☐ PM
3. Collected By: Telephone:
4. Specific Location:

3-C Water Quality

PUBLIC WATER SYSTEM (ONLY)

5. System ID Number: 40950 K
6. DOH Source Number: S09 ☐ Check here if this a New Source.

(Without a source number DOH will not accept the samples. If sample is blended from more than one source, list all.)

7. Group: ☐ A ☐ B
8. System Name: Lake Forest Park Water Dist.
9. Source Type: ☐ Surface ☐ Well/Ground Water ☒ Well Field ☐ Spring ☐ Purchased
10. County: King
11. Sample taken: ☒ No Treatment ☐ After Treatment ☐ Before Treatment ☐ In Distribution
12. Utility's Name for this source: Horizon View Well Field
13. Treatment Type: ☒ None ☐ Fluoridation ☐ Chlorination ☐ Filtration ☐ Aeration ☐ Softener ☐ Other
14. **COMPOSITE INFORMATION** (Applies to Multiple Sources Only) If sample is to be composited in lab, list all sources. If you want the lab to composite samples from your system **INITIAL here** _____.

1. 2. 3. 4. 5. 6.

15. Remarks:

ANALYSIS TO PERFORM

FREQUENTLY REQUESTED TESTS ARE LISTED BELOW. FOR OTHERS, PLEASE LIST UNDER OTHER ANALYSIS.

Organic Compounds

- ☐ 531.1 Carbamates
- ☐ 549.2 Diquat
- ☐ 504.1 EDB, DBCP/1,2,3-TCP
- ☐ 548.2 Endothall
- ☐ 547 Glyphosate
- ☐ 515.1 or 4 Herbicides
- ☐ 525.2 Pesticides (Regulated) Pest 1 test Pannel
- ☐ 524.2 VOC
- ☐ 552.2 Haloacetic Acids (HAA)
- ☐ 524.2 Trihalomethanes (THM)
- ☐ 508.1 Organochlorine Pesticides/PCB
- ☐ 1613 Dioxins

Inorganic Compounds

- ☐ Bromate
- ☐ Bromide
- ☐ Chloride
- ☐ Chlorine
- ☐ Conductivity
- ☐ Complete Inorganics (IOC)
- ☐ Cyanide
- ☐ Fluoride
- ☐ Lead and Copper Rule (Special Sampling)
- ☐ Metals (List or circle each metal individually)*
- ☒ Nitrate
- ☐ Nitrite
- ☐ pH
- ☐ Total Dissolved Solids (TDS)
- ☐ Total Organic Carbon (TOC)
- ☐ Turbidity
- ☐ Sulfate

Radionuclides

- ☐ Gross Alpha/Beta
- ☐ Radium 226
- ☐ Radium 228
- ☐ Radon

General Testing

- ☐ Building Permit List the County: _____
- ☐ EWS Well Report
- ☐ Nuisance Test (Fe,Mn,pH,Hardness)
- ☐ Arsenic

Other Analysis Please List:

*METALS: Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, K, Se, Si, Ag, Na, Sr, Tl, Sn, Ti, U, V, Zn

RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME
X Alan Kerley	7-24-14	0830	X		
X			X		

	YES	NO	N/A		YES	NO
CUSTODY SEALS INTACT	☐	☐	☐	SAMPLES RECEIVED INTACT	☐	☐
SAMPLE TEMP_____°C SATISFACTORY	☐	☐	☐	CHAIN OF CUSTODY & LABELS AGREE	☐	☐

CO022743

WSID	WS Name	Grp/Type	SamPurp	CollectDate	Lab/Sample	Total	Fecal	Ecoli	S.Suit	OrgCllctDate	OrgLab/Sample	Sample Location
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	R	09/05/2014	164 39754	P		A		09/03/2014	164 39286	3007 NE 185th St
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	R	09/05/2014	164 39756	P		A		09/03/2014	164 39286	18015 NE 53rd
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	R	09/05/2014	164 39757	P		A		09/03/2014	164 39286	5215 NE 180th
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	RC	09/03/2014	164 39285	P		A				18005 53rd Ave NE
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	RC	09/03/2014	164 39286	P		A				3021 185th St
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	R	08/15/2014	164 36361	P		A		08/13/2014	164 35819	Residence 4004 NE 185th
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	RC	08/13/2014	164 35819	P		A				4004 NE 185th
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	RC	10/16/2013	164 45113	P		A				18005 53rd Ave NE
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	R	09/12/2013	164 39024	P		A		09/11/2013	164 38778	11301 Beach Dr Civic Club
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	RC	09/11/2013	164 38778	P		A				17301 Beach Dr NE
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	R	07/28/2011	164 25767	P		A		07/27/2011	164 25578	3202
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	R	07/28/2011	164 25769	P		A		07/27/2011	164 25578	3007 NE 185th St
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	RC	07/27/2011	164 25578	P		A				3021 NE 185th St
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	RC	10/05/2010	164 33913	P		A				18903 35th Ave NE
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	R	10/07/2009	164 33535	P		A		10/06/2009	164 33053	<NOT PROVIDED>
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	R	10/07/2009	164 33536	P		A		10/06/2009	164 33053	5221 NE 180th St
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	RC	10/06/2009	164 33053	P		A				18005 53rd Ave NE
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	R	07/09/2009	164 21498	P		A		07/07/2009	164 20988	18724 35th Ave NE
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	RC	07/07/2009	164 20988	P		A				18903 35th Ave NE
40950 K	LAKE FOREST PARK WATER DISTRICT	A-Comm	RC	06/09/2009	164 17464	P		A				17301 Beach Dr.

3-C Water Quality

ANALYTICAL LABORATORIES

Burlington WA | 1620 S Walnut St · 98233
800.755.9295 • 360.757.1400 • 360.757.1402fax
Bellingham WA | 805 Orchard Dr Suite 4 · 98225
360.671.0688 • 360.671.1577fax

ACCREDITED IN ACCORDANCE WITH nelac
Florida Dept of Health Lab E871040

HERBICIDES IN DRINKING WATER

Client Name: Lake Forest Park Water District
4029 NE 178th Street
Seattle, WA 98155

System Name: LAKE FOREST PARK WATER DISTRICT
System ID Number: 40950K
DOH Source Number: 06
Multiple Sources:
Sample Type: D - Drinking Water
Sample Purpose: C - Compliance
Sample Location: Low Tank
County: King
Sampled By: Alan Kerley
Sampler Phone:

Reference Number: 09-08292
Project: Lake Forest Park SO5 & SO6

Field ID: SO6
Lab Number: 046-17296
Date Collected: 6/9/09 13:00
Date Extracted: 515.4_090617
Date Analyzed: 06/17/09
Report Date: 6/22/09
Analyst: CO
Peer Review:

EPA Method 515.4 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	UNITS	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
37	*2,4 - D	ND	ug/L	0.5	0.2	70	
38	*2,4,5 - TP (SILVEX)	ND	ug/L	1.0	0.4	50	
134	*PENTACHLOROPHENOL	ND	ug/L	0.2	0.08	1	
137	*DALAPON	ND	ug/L	5	2	200	
139	*DINOSEB	ND	ug/L	1.0	0.4	7	
140	*PICLORAM	ND	ug/L	0.5	0.2	500	
	Other						
138	*DICAMBA	ND	ug/L	0.2	0.2		
225	*DCPA (ACID METABOLITES)	ND	ug/L	0.1	0.1		
135	*2,4 DB	ND	ug/L	1.0	1.0		
136	*2,4,5 T	ND	ug/L	0.4	0.4		
220	*BENTAZON	ND	ug/L	0.5	0.5		
221	*DICHLORPROP	ND	ug/L	0.5	0.5		
223	*ACIFLUORFEN	ND	ug/L	2.0	2.0		
224	*CHLORAMBEN	ND	ug/L	0.2	0.2		
226	*3,5 - DICHLOROBENZOIC ACID	ND	ug/L	0.5	0.5		

3-C Water Quality

NOTES:
If a compound is detected > or = to the State Reporting Level, SRL, specified increased monitoring frequencies may occur per DOH.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.
ND (Not Detected): indicates that the parameter was not detected above the State Reporting Limit (SRL).
An * in front of the parameter name indicates it is not NELAP accredited but it is accredited through WSDOH or USEPA Region 10.

These test results meet all the requirements of NELAC, unless otherwise stated in writing, and relate only to these samples.
If you have any questions concerning this report contact Allen French at the above phone number.

FORM SOC

ANALYTICAL LABORATORIES

Burlington WA (Corporate Office) | 1620 S Walnut St - 98233
800.755.9295 • 360.757.1400 • 360.757.1402fax
Bellingham WA | 805 Orchard Dr Suite 4 - 98225
360.671.0688 • 360.671.1577fax

ACCREDITED IN ACCORDANCE WITH nelac
Florida Dept of Health Lab E871040

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Lake Forest Park Water District
4029 NE 178th Street
Seattle, WA 98155

Reference Number: 09-08292
Project: Lake Forest Park SO5 & SO6

System Name: LAKE FOREST PARK WATER DISTRICT
System ID Number: 40950K
DOH Source Number: 05
Multiple Sources:
Sample Type: D - Drinking Water
Sample Purpose: C - Compliance
Sample Location: Shallow Well Resivoir
County: King

Sample Number: SO5
Lab Number: 046-17291
Collect Date: 6/9/09 13:29
Date Received: 6/9/09
Report Date: 7/16/09
Sampled By: Alan Kerley
Sampler Phone:
Released by:

DOH#	ANALYTES	RESULTS	UNITS	SRL	Trigger	MCL	Analyst	METHOD	Analyzed	COMMENT
	EPA Regulated									
20	NITRATE-N	**2.52**	mg/L	0.100	5	10	bi	300.0	06/09/09 23:07	

3-C Water Quality

NOTES:

SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office
ND (Not Detected): indicates that the parameter was not detected above the Specified Reporting Limit (SRL).
An * in front of the parameter name indicates it is not NELAP accredited but it is accredited through WSDOH or USEPA Region 10.

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If you have any questions concerning this report contact us at the above phone number.

FORM IOC_ST

ANALYTICAL LABORATORIES

Burlington WA | 1620 S Walnut St 98233
Corporate Office | 800.755.9295 • 360.757.1400 • 360.757.1402fax
Bellingham WA | 805 Orchard Dr Suite 4 - 98225
Microbiology | 360.671.0688 • 360.671.1577fax

ACCREDITED IN ACCORDANCE WITH nelac Florida Dept of Health Lab E871040

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Lake Forest Park Water District
4029 NE 178th Street
Seattle, WA 98155

Reference Number: 09-08292
Project: Lake Forest Park SO5 & SO6

System Name: LAKE FOREST PARK WATER DISTRICT
System ID Number: 40950K
DOH Source Number: 05
Multiple Sources:
Sample Type: D - Drinking Water
Sample Purpose: C - Compliance
Sample Location: Shallow Well Resivoir
County: King

Sample Number: SO5
Lab Number: 156-17293
Collect Date: 6/9/09 12:26
Date Received: 6/9/09
Report Date: 7/16/09
Sampled By: Alan Kerley
Sampler Phone:
Released by:

DOH#	ANALYTES	RESULTS	UNITS	SRL	Trigger	MCL	Analyst	METHOD	Analyzed	COMMENT
	*RADIUM 228	**0.86**	pCi/L	1		5	iv	904.0	07/06/09	Analyzed by UL

3-C Water Quality

NOTES:

SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office
ND (Not Detected): indicates that the parameter was not detected above the Specified Reporting Limit (SRL).
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FORM IOC_ST

ANALYTICAL LABORATORIES

Everett WA 1620 S Walnut St 98203
800.755.9295 • 360.757.1400 • 360.757.1402fax
Bellingham WA 805 Orchard Dr Suite 4 - 98225
360.671.0688 • 360.671.1577fax

ACCREDITED IN ACCORDANCE WITH nelac
Florida Dept of Health Lab E871040

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Lake Forest Park Water District
4029 NE 178th Street
Seattle, WA 98155

Reference Number: 09-08292
Project: Lake Forest Park SO5 & SO6

System Name: LAKE FOREST PARK WATER DISTRICT
System ID Number: 40950K
DOH Source Number: 05
Multiple Sources:
Sample Type: D - Drinking Water
Sample Purpose: C - Compliance
Sample Location: Shallow Well Resivoir
County: King

Sample Number: SO5
Lab Number: 156-17294
Collect Date: 6/9/09 12:22
Date Received: 6/9/09
Report Date: 7/16/09
Sampled By: Alan Kerley
Sampler Phone:
Released by:

DOH#	ANALYTES	RESULTS	UNITS	SRL	Trigger	MCL	Analyst	METHOD	Analyzed	COMMENT
	GROSS BETA	**4.4**	pCi/L	4		50	jv	900.0	07/07/09	Analyzed by UL
	GROSS ALPHA	**ND**	pCi/L	3		15	jv	900.0	07/07/09	Analyzed by UL

3-C Water Quality

NOTES:

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MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office
ND (Not Detected) indicates that the parameter was not detected above the Specified Reporting Limit (SRL).
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If you have any questions concerning this report contact us at the above phone number.

FORM IOC_ST

ANALYTICAL LABORATORIES

Bellingham WA 1620 S Walnut St - 98225
800.755.9295 • 360.757.1400 • 360.757.1402fax
Bellingham WA 805 Orchard Dr Suite 4 - 98225
360.671.0688 • 360.671.1577fax

ACCREDITED IN ACCORDANCE WITH nelac Florida Dept of Health Lab E871040

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Lake Forest Park Water District
4029 NE 178th Street
Seattle, WA 98155

Reference Number: 09-08292
Project: Lake Forest Park SO5 & SO6

System Name: LAKE FOREST PARK WATER DISTRICT
System ID Number: 40950K
DOH Source Number: 06
Multiple Sources:
Sample Type: D - Drinking Water
Sample Purpose: C - Compliance
Sample Location: Low Tank
County: King

Sample Number: SO6
Lab Number: 046-17295
Collect Date: 6/9/09 13:05
Date Received: 6/9/09
Report Date: 7/16/09
Sampled By: Alan Kerley
Sampler Phone:
Released by:

DOH#	ANALYTES	RESULTS	UNITS	SRL	Trigger	MCL	Analyst	METHOD	Analyzed	COMMENT
	EPA Regulated									
20	NITRATE-N	**0.33**	mg/L	0.100	5	10	bi	300.0	06/09/09 23:29	

3-C Water Quality

NOTES:

SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).
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Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office
ND (Not Detected): indicates that the parameter was not detected above the Specified Reporting Limit (SRL).
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FORM IOC_ST

ANALYTICAL LABORATORIES

Burlington WA (Corporate Office) | 1620 S Walnut St - 98233
800.755.9295 • 360.757.1400 • 360.757.1402fax
Bellingham WA (Project Office) | 805 Orchard Dr Suite 4 - 98225
360.671.0688 • 360.671.1677fax

ACCREDITED IN ACCORDANCE WITH nelac Florida Dept of Health Lab E871040

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Lake Forest Park Water District
4029 NE 178th Street
Seattle, WA 98155

Reference Number: 09-08292
Project: Lake Forest Park SO5 & SO6

System Name: LAKE FOREST PARK WATER DISTRICT
System ID Number: 40950K
DOH Source Number: 06
Multiple Sources:
Sample Type: D - Drinking Water
Sample Purpose: C - Compliance
Sample Location: Low Tank Sample Station
County: King

Sample Number: SO6
Lab Number: 156-17298
Collect Date: 6/9/09 12:40
Date Received: 6/9/09
Report Date: 7/16/09
Sampled By: Alan Kerley
Sampler Phone:
Released by:

DOH#	ANALYTES	RESULTS	UNITS	SRL	Trigger	MCL	Analyst	METHOD	Analyzed	COMMENT
	*RADIUM 228	**ND**	pCi/L	1		5	iv	904.0	07/06/09	Analyzed by UL

3-C Water Quality

NOTES:

SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.
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FORM: IOC_ST

ANALYTICAL LABORATORIES

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800.755.9295 • 360.757.1400 • 360.757.1402fax
Bellingham WA 805 Orchard Dr Suite 4 - 98225
360.671.0688 • 360.671.1577fax

ACCREDITED IN ACCORDANCE WITH nelac Florida Dept of Health Lab E871040

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Lake Forest Park Water District
4029 NE 178th Street
Seattle, WA 98155

Reference Number: 09-08292
Project: Lake Forest Park SO5 & SO6

System Name: LAKE FOREST PARK WATER DISTRICT
System ID Number: 40950K
DOH Source Number: 06
Multiple Sources:
Sample Type: D - Drinking Water
Sample Purpose: C - Compliance
Sample Location: Low Tank Sample Station
County: King

Sample Number: SO6
Lab Number: 156-17299
Collect Date: 6/9/09 12:35
Date Received: 6/9/09
Report Date: 7/16/09
Sampled By: Alan Kerley
Sampler Phone:
Released by:

DOH#	ANALYTES	RESULTS	UNITS	SRL	Trigger	MCL	Analyst	METHOD	Analyzed	COMMENT
	GROSS BETA	**ND**	pCi/L	4		50	jv	900.0	07/07/09	Analyzed by UL
	GROSS ALPHA	**ND**	pCi/L	3		15	jv	900.0	07/07/09	Analyzed by UL

3-C Water Quality

NOTES:

SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.
ND (Not Detected): indicates that the parameter was not detected above the Specified Reporting Limit (SRL).
An * in front of the parameter name indicates it is not NELAP accredited but it is accredited through WSDOH or USEPA Region 10.

These test results meet all the requirements of NELAC, unless otherwise stated in writing, and relate only to these samples.
If you have any questions concerning this report contact us at the above phone number.

FORM IOC_ST

ANALYTICAL LABORATORIES

Everett, WA 1620 S Walnut St 98203
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Bellingham, WA 805 Orchard Dr Suite 4 98225
(Client Svcs) 360.671.0688 • 360.671.1577fax

ACCREDITED IN ACCORDANCE WITH nelac Florida Dept of Health Lab E871040

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

Client Name: Lake Forest Park Water District
4029 NE 178th Street
Seattle, WA 98155

Reference Number: 09-08292
Project: Lake Forest Park SO5 & SO6

System Name: LAKE FOREST PARK WATER DISTRICT
System ID Number: 40950K
DOH Source Number: 06
Multiple Sources:
Sample Type: D - Drinking Water
Sample Purpose: C - Compliance
Sample Location: Low Tank
County: King
Sampled By: Alan Kerley
Sampler Phone:

Field ID: SO6
Lab Number: 046-17297
Date Collected: 6/9/09 12:48
Date Extracted: 508_090612
Date Analyzed: 06/15/09
Report Date: 6/22/09
Analyst: GEB
Peer Review:

EPA Method 508.1 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	UNITS	SRL	Trigger	MCL	COMMENT
	PCBs/Toxaphene						
153	PCBS (Total Aroclors)	**ND**	ug/L	0.2	0.2	0.5	
173	AROCLOR 1221	**ND**	ug/L	20	20		
174	AROCLOR 1232	**ND**	ug/L	0.5	0.5		
175	AROCLOR 1242	**ND**	ug/L	0.5	0.3		
176	AROCLOR 1248	**ND**	ug/L	0.1	0.1		
177	AROCLOR 1254	**ND**	ug/L	0.1	0.1		
178	AROCLOR 1260	**ND**	ug/L	0.2	0.2		
180	AROCLOR 1016	**ND**	ug/L	0.1	0.1		
36	TOXAPHENE	**ND**	ug/L	2	2	3	

3-C Water Quality

NOTES:
If a compound is detected > or = to the State Reporting Level, SRL, specified increased monitoring frequencies may occur per DOH.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.
ND (Not Detected) indicates that the parameter was not detected above the State Reporting Limit (SRL)
An * in front of the parameter name indicates it is not NELAP accredited but it is accredited through WSDOH or USEPA Region 10.

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FORM SOC

ANALYTICAL LABORATORIES

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Corporate Office 800.755.9295 • 360.757.1400 • 360.757.1402fax
Bellingham WA 805 Orchard Dr Suite 4 98225
360.671.0688 • 360.671.1577fax

ACCREDITED IN ACCORDANCE WITH nelac Florida Dept of Health Lab E871040

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

Client Name: Lake Forest Park Water District
4029 NE 178th Street
Seattle, WA 98155

Reference Number: 09-08292
Project: Lake Forest Park SO5 & SO6

System Name: LAKE FOREST PARK WATER DISTRICT
System ID Number: 40950K
DOH Source Number: 06
Multiple Sources:
Sample Type: D - Drinking Water
Sample Purpose: C - Compliance
Sample Location: Low Tank
County: King
Sampled By: Alan Kerley
Sampler Phone:

Field ID: SO6
Lab Number: 046-17297
Date Collected: 6/9/09 12:48
Date Extracted: 525_090612
Date Analyzed: 06/12/09
Report Date: 6/22/09
Analyst: CO
Peer Review:

EPA Method 525.2 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	UNITS	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
33	ENDRIN	ND	ug/L	0.02	0.02	2	
34	LINDANE (BHC - GAMMA)	ND	ug/L	0.04	0.04	0.2	
35	METHOXYCHLOR	ND	ug/L	0.2	0.2	40	
117	ALACHLOR	ND	ug/L	0.4	0.4	2	
119	ATRAZINE	ND	ug/L	0.2	0.2	3	
120	BENZO(A)PYRENE	ND	ug/L	0.04	0.04	0.2	
122	CHLORDANE, TECHNICAL	ND	ug/L	0.4	0.4	2	
124	DI(ETHYLHEXYL)-ADIPATE	ND	ug/L	1.3	1.3	400	
125	DI(ETHYLHEXYL)-PHTHALATE	ND	ug/L	1.3	1.3	6	
126	HEPTACHLOR	ND	ug/L	0.08	0.08	0.4	
127	HEPTACHLOR EPOXIDE	ND	ug/L	0.04	0.04	0.2	
128	HEXACHLOROBENZENE	ND	ug/L	0.2	0.2	1	
129	HEXACHLOROCYCLO-PENTADIENE	ND	ug/L	0.2	0.2	50	
133	SIMAZINE	ND	ug/L	0.15	0.15	4	
134	PENTACHLOROPHENOL	ND	ug/L	0.4	0.08	1	screening only / compliance by 515.1
	EPA Unregulated						
118	ALDRIN	ND	ug/L	0.2	0.2		
121	BUTACHLOR	ND	ug/L	0.4	0.4		
123	DIELDRIN	ND	ug/L	0.2	0.2		
130	METOLACHLOR	ND	ug/L	1.0	1.0		
131	METRIBUZIN	ND	ug/L	0.2	0.2		
132	PROPACHLOR	ND	ug/L	0.2	0.2		
	State Unregulated - Other						
179	BROMACIL	ND	ug/L	0.2	0.2		
254	FLUORENE	ND	ug/L	0.2	0.2		

3-C Water Quality

NOTES:
If a compound is detected > or = to the State Reporting Level, SRL, specified increased monitoring frequencies may occur per DOH.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
Trigger Level DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.
ND (Not Detected) indicates that the parameter was not detected above the State Reporting Limit (SRL).
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FORM SOC

EDGE ANALYTICAL LABORATORIES

Burlington WA
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1620 S Walnut St - 98233
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Bellingham WA
Microbiology
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Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

ACCREDITED IN ACCORDANCE WITH nelac
Florida Dept of Health Lab E871040

VOLATILE ORGANIC COMPOUNDS (VOC) REPORT

Client Name: Lake Forest Park Water District
4029 NE 178th Street
Seattle, WA 98155

Reference Number: 11-08361
Project: King County Water District

System Name: KING COUNTY WATER DISTRICT #83
System ID Number: 40950K
DOH Source Number: 05
Multiple Sources:
Sample Type: D - Drinking Water
Sample Purpose: C - Compliance
Sample Location: Shallow Well Reservoir
County: King
Sampled By: Mick Holte
Sampler Phone: 206-365-3211

Field ID: VOC
Lab Number: 046-18187
Date Collected: 6/3/11 07:55
Date Extracted: 524_110607
Date Analyzed: 06/07/11
Report Date: 6/8/11
Analyst: HY
Peer Review:

EPA Method 524.2 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	UNITS	SRL	Trigger	MCL	COMMENT
	EPA/State Regulated						
102	*ETHYLENE DIBROMIDE (EDB)	ND	ug/L	0.5	0.02	0.05	Screening Only / PQL 0.5 ug/L
103	1,2-DIBROMO-3-CHLOROPROPANE	ND	ug/L	0.5	0.04	0.2	Screening Only / PQL 0.5 ug/L
160	TOTAL XYLENES	ND	ug/L	0.5	0.5	10000	
57	T - 1,2 - DICHLOROETHYLENE	ND	ug/L	0.5	0.5	100	
60	CIS - 1,2 - DICHLOROETHYLENE	ND	ug/L	0.5	0.5	70	
47	1,1,1 - TRICHLOROETHANE	ND	ug/L	0.5	0.5	200	
48	CARBON TETRACHLORIDE	ND	ug/L	0.5	0.5	5	
49	BENZENE	ND	ug/L	0.5	0.5	5	
50	1,2 - DICHLOROETHANE	ND	ug/L	0.5	0.5	5	
51	TRICHLOROETHYLENE	ND	ug/L	0.5	0.5	5	
63	1,2 - DICHLOROPROPANE	ND	ug/L	0.5	0.5	5	
66	TOLUENE	ND	ug/L	0.5	0.5	1000	
67	1,1,2 - TRICHLOROETHANE	ND	ug/L	0.5	0.5	5	
68	TETRACHLOROETHYLENE	ND	ug/L	0.5	0.5	5	
71	CHLOROBENZENE	ND	ug/L	0.5	0.5	100	
73	ETHYLBENZENE	ND	ug/L	0.5	0.5	700	
74	M/P - XYLENE	ND	ug/L	0.5	0.5		
45	VINYL CHLORIDE	ND	ug/L	0.5	0.5	2	
75	O - XYLENE	ND	ug/L	0.5	0.5		
76	STYRENE	ND	ug/L	0.5	0.5	100	
52	P - DICHLOROBENZENE	ND	ug/L	0.5	0.5	75	
84	O - DICHLOROBENZENE	ND	ug/L	0.5	0.5	600	
95	1,2,4, - TRICHLOROBENZENE	ND	ug/L	0.5	0.5	70	
46	1,1 - DICHLOROETHYLENE	ND	ug/L	0.5	0.5	7	
56	METHYLENE CHLORIDE	ND	ug/L	0.5	0.5	5	
	EPA/State Unregulated						

3-C Water Quality

NOTES:
If a compound is detected > or = to the State Reporting Level, SRL, specified increased monitoring frequencies may occur per DOH.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.
ND (Not Detected): indicates that the parameter was not detected above the State Reporting Limit (SRL).
An * in front of the parameter name indicates it is not NELAP accredited but it is accredited through WSDOH or USEPA Region 10.

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If you have any questions concerning this report contact Allen French at the above phone number.

FORM: VOC

VOLATILE ORGANIC COMPOUNDS (VOC) REPORT

DOH#	COMPOUNDS	RESULTS	UNITS	SRL	Trigger	MCL	COMMENT
58	1,1 - DICHLOROETHANE	ND	ug/L	0.5	0.5		
59	2,2 - DICHLOROPROPANE	ND	ug/L	0.5	0.5		
86	BROMOCHLOROMETHANE	ND	ug/L	0.5	0.5		
62	1,1 - DICHLOROPROPENE	ND	ug/L	0.5	0.5		
104	DICHLORODIFLUOROMETHANE	ND	ug/L	0.5	0.5		
64	DIBROMOMETHANE	ND	ug/L	0.5	0.5		
65	CIS - 1,3 - DICHLOROPROPENE	ND	ug/L	0.5	0.5		
69	TRANS- 1,3 - DICHLOROPROPENE	ND	ug/L	0.5	0.5		
53	CHLOROMETHANE	ND	ug/L	0.5	0.5		
70	1,3 - DICHLOROPROPANE	ND	ug/L	0.5	0.5		
72	1,1,1,2 - TETRACHLOROETHANE	ND	ug/L	0.5	0.5		
87	ISOPROPYLBENZENE	ND	ug/L	0.5	0.5		
79	1,2,3 - TRICHLOROPROPANE	ND	ug/L	0.5	0.5		
78	BROMOBENZENE	ND	ug/L	0.5	0.5		
80	1,1,2,2 - TETRACHLOROETHANE	ND	ug/L	0.5	0.5		
81	O - CHLOROTOLUENE	ND	ug/L	0.5	0.5		
88	N - PROPYLBENZENE	ND	ug/L	0.5	0.5		
89	1,3,5 - TRIMETHYLBENZENE	ND	ug/L	0.5	0.5		
54	BROMOMETHANE	ND	ug/L	0.5	0.5		
82	*P - CHLOROTOLUENE	ND	ug/L	0.5	0.5		
90	TERT - BUTYLBENZENE	ND	ug/L	0.5	0.5		
91	1,2,4 - TRIMETHYLBENZENE	ND	ug/L	0.5	0.5		
92	SEC - BUTYLBENZENE	ND	ug/L	0.5	0.5		
83	M - DICHLOROBENZENE	ND	ug/L	0.5	0.5		
93	P - ISOPROPYLTOLUENE	ND	ug/L	0.5	0.5		
94	N - BUTYLBENZENE	ND	ug/L	0.5	0.5		
55	CHLOROETHANE	ND	ug/L	0.5	0.5		
97	HEXACHLOROBUTADIENE	ND	ug/L	0.5	0.5		
96	NAPHTHALENE	ND	ug/L	0.5	0.5		
98	1,2,3 - TRICHLOROBENZENE	ND	ug/L	0.5	0.5		
85	TRICHLOROFLUOROMETHANE	ND	ug/L	0.5	0.5		
	EPA Regulated - Under Trihalomethanes Program						
31	TOTAL TRIHALOMETHANE	ND	ug/L	0.5	60	80	
27	CHLOROFORM	ND	ug/L	0.5			
28	BROMODICHLOROMETHANE	ND	ug/L	0.5			
29	CHLORODIBROMOMETHANE	ND	ug/L	0.5			
30	BROMOFORM	ND	ug/L	0.5			
	State Unregulated - Other						
0	METHYL TERT-BUTYL ETHER	ND	ug/L	1.0			

3-C Water Quality

NOTES:
If a compound is detected > or = to the State Reporting Level, SRL, specified increased monitoring frequencies may occur per DOH.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.
ND (Not Detected): indicates that the parameter was not detected above the State Reporting Limit (SRL).
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FORM: VOC

EDGE ANALYTICAL LABORATORIES

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ACCREDITED IN ACCORDANCE WITH nelac
Florida Dept of Health Lab E871040

VOLATILE ORGANIC COMPOUNDS (VOC) REPORT

Client Name: Lake Forest Park Water District
4029 NE 178th Street
Seattle, WA 98155

Reference Number: 11-08361
Project: King County Water District

System Name: KING COUNTY WATER DISTRICT #83
System ID Number: 40950K
DOH Source Number: 06
Multiple Sources:
Sample Type: D - Drinking Water
Sample Purpose: C - Compliance
Sample Location: Low Tank Sample Station
County: King
Sampled By: Mick Holte
Sampler Phone: 206-365-3211

Field ID: VOC
Lab Number: 046-18185
Date Collected: 6/3/11 07:45
Date Extracted: 524_110607
Date Analyzed: 06/07/11
Report Date: 6/8/11
Analyst: HY
Peer Review:

EPA Method 524.2 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	UNITS	SRL	Trigger	MCL	COMMENT
	EPA/State Regulated						
102	*ETHYLENE DIBROMIDE (EDB)	ND	ug/L	0.5	0.02	0.05	Screening Only / PQL 0.5 ug/L
103	1,2-DIBROMO-3-CHLOROPROPANE	ND	ug/L	0.5	0.04	0.2	Screening Only / PQL 0.5 ug/L
160	TOTAL XYLENES	ND	ug/L	0.5	0.5	10000	
57	T - 1,2 - DICHLOROETHYLENE	ND	ug/L	0.5	0.5	100	
60	CIS - 1,2 - DICHLOROETHYLENE	ND	ug/L	0.5	0.5	70	
47	1,1,1 - TRICHLOROETHANE	ND	ug/L	0.5	0.5	200	
48	CARBON TETRACHLORIDE	ND	ug/L	0.5	0.5	5	
49	BENZENE	ND	ug/L	0.5	0.5	5	
50	1,2 - DICHLOROETHANE	ND	ug/L	0.5	0.5	5	
51	TRICHLOROETHYLENE	ND	ug/L	0.5	0.5	5	
63	1,2 - DICHLOROPROPANE	ND	ug/L	0.5	0.5	5	
66	TOLUENE	ND	ug/L	0.5	0.5	1000	
67	1,1,2 - TRICHLOROETHANE	ND	ug/L	0.5	0.5	5	
68	TETRACHLOROETHYLENE	ND	ug/L	0.5	0.5	5	
71	CHLOROBENZENE	ND	ug/L	0.5	0.5	100	
73	ETHYLBENZENE	ND	ug/L	0.5	0.5	700	
74	M/P - XYLENE	ND	ug/L	0.5	0.5		
45	VINYL CHLORIDE	ND	ug/L	0.5	0.5	2	
75	O - XYLENE	ND	ug/L	0.5	0.5		
76	STYRENE	ND	ug/L	0.5	0.5	100	
52	P - DICHLOROBENZENE	ND	ug/L	0.5	0.5	75	
84	O - DICHLOROBENZENE	ND	ug/L	0.5	0.5	600	
95	1,2,4, - TRICHLOROBENZENE	ND	ug/L	0.5	0.5	70	
46	1,1 - DICHLOROETHYLENE	ND	ug/L	0.5	0.5	7	
56	METHYLENE CHLORIDE	ND	ug/L	0.5	0.5	5	
	EPA/State Unregulated						

3-C Water Quality

NOTES:
If a compound is detected > or = to the State Reporting Level, SRL, specified increased monitoring frequencies may occur per DOH.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.
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FORM: VOC

VOLATILE ORGANIC COMPOUNDS (VOC) REPORT

DOH#	COMPOUNDS	RESULTS	UNITS	SRL	Trigger	MCL	COMMENT
58	1,1 - DICHLOROETHANE	ND	ug/L	0.5	0.5		
59	2,2 - DICHLOROPROPANE	ND	ug/L	0.5	0.5		
86	BROMOCHLOROMETHANE	ND	ug/L	0.5	0.5		
62	1,1 - DICHLOROPROPENE	ND	ug/L	0.5	0.5		
104	DICHLORODIFLUOROMETHANE	ND	ug/L	0.5	0.5		
64	DIBROMOMETHANE	ND	ug/L	0.5	0.5		
65	CIS - 1,3 - DICHLOROPROPENE	ND	ug/L	0.5	0.5		
69	TRANS- 1,3 - DICHLOROPROPENE	ND	ug/L	0.5	0.5		
53	CHLOROMETHANE	ND	ug/L	0.5	0.5		
70	1,3 - DICHLOROPROPANE	ND	ug/L	0.5	0.5		
72	1,1,1,2 - TETRACHLOROETHANE	ND	ug/L	0.5	0.5		
87	ISOPROPYLBENZENE	ND	ug/L	0.5	0.5		
79	1,2,3 - TRICHLOROPROPANE	ND	ug/L	0.5	0.5		
78	BROMOBENZENE	ND	ug/L	0.5	0.5		
80	1,1,2,2 - TETRACHLOROETHANE	ND	ug/L	0.5	0.5		
81	O - CHLOROTOLUENE	ND	ug/L	0.5	0.5		
88	N - PROPYLBENZENE	ND	ug/L	0.5	0.5		
89	1,3,5 - TRIMETHYLBENZENE	ND	ug/L	0.5	0.5		
54	BROMOMETHANE	ND	ug/L	0.5	0.5		
82	*P - CHLOROTOLUENE	ND	ug/L	0.5	0.5		
90	TERT - BUTYLBENZENE	ND	ug/L	0.5	0.5		
91	1,2,4 - TRIMETHYLBENZENE	ND	ug/L	0.5	0.5		
92	SEC - BUTYLBENZENE	ND	ug/L	0.5	0.5		
83	M - DICHLOROBENZENE	ND	ug/L	0.5	0.5		
93	P - ISOPROPYLTOLUENE	ND	ug/L	0.5	0.5		
94	N - BUTYLBENZENE	ND	ug/L	0.5	0.5		
55	CHLOROETHANE	ND	ug/L	0.5	0.5		
97	HEXACHLOROBUTADIENE	ND	ug/L	0.5	0.5		
96	NAPHTHALENE	ND	ug/L	0.5	0.5		
98	1,2,3 - TRICHLOROBENZENE	ND	ug/L	0.5	0.5		
85	TRICHLOROFLUOROMETHANE	ND	ug/L	0.5	0.5		
	EPA Regulated - Under Trihalomethanes Program						
31	TOTAL TRIHALOMETHANE	ND	ug/L	0.5	60	80	
27	CHLOROFORM	ND	ug/L	0.5			
28	BROMODICHLOROMETHANE	ND	ug/L	0.5			
29	CHLORODIBROMOMETHANE	ND	ug/L	0.5			
30	BROMOFORM	ND	ug/L	0.5			
	State Unregulated - Other						
0	METHYL TERT-BUTYL ETHER	ND	ug/L	1.0			

3-C Water Quality

NOTES:
If a compound is detected > or = to the State Reporting Level, SRL, specified increased monitoring frequencies may occur per DOH.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.
ND (Not Detected): indicates that the parameter was not detected above the State Reporting Limit (SRL).
An * in front of the parameter name indicates it is not NELAP accredited but it is accredited through WSDOH or USEPA Region 10.

These test results meet all the requirements of NELAC, unless otherwise stated in writing, and relate only to these samples.
If you have any questions concerning this report contact Allen French at the above phone number.

FORM: VOC

APPENDIX 3 - D SAMPLE VALVE RECORD FORM

3-D Valve Records

Address	Coord	Size	Street	Type	ValveID	Year	X	Y
4610		6	Ballinger Way	Hydrant	0	0	1285254.69	278476.72
0		10		Line	0	0	1284377.02	278731.29
0		10		Line	0	0	1284383.06	278738.47
0		6		Hydrant	0	0	1284371.73	278738.72
0		10		Line	0	0	1284420.11	278777.78
0		10		Line	0	0	1284420.21	278790.72
0		8		Line	0	0	1284424.01	278784.48
18403	E2	2	51st Pl NE	Line	0	2005	1285998.45	281249.23
18403	E2	6	51st Pl NE	Hydrant	0	2005	1285996.40	281242.08
18403	E2	8	51st Pl NE	Line	0	2005	1286002.80	281238.89
0	0	12	NE 184th	Line	0	0	1284464.29	281015.60
0		12	WHPA	Line	0	0	1284691.24	281659.32
0		4	WHPA	Line	0	0	1284802.96	281811.39
0		12	WHPA	Line	0	0	1284755.74	281879.61
0		12	WHPA	Line	0	0	1284759.79	281875.08
0		12	WHPA	Line	0	0	1284757.86	281865.64
0		6	WHPA	Line	0	0	1284772.55	281839.59
0		6	WHPA	Line	0	0	1284877.07	282091.98
0		6	WHPA	Line	0	0	1284884.08	282092.96
0		0			0	0	1284819.01	281624.93
0		8	WHPA	Line	0	2011	1284832.91	281834.88
0		8	WHPA	Line	0	2011	1284829.17	281840.79
18934	D0	8	46th Ave Ne	Line	0	2009	1284645.21	283017.19
4510	C1	6	45th Pl Ne	Hydrant	0	2005	1284008.24	283117.85
4510	C1	8	45th Pl Ne	Line	0	2005	1283999.51	283116.32
18535	B2	10	Ballinger Way	Line	0	1988	1281389.35	282014.16
18535	B2	6	Ballinger Way	Hydrant	0	1988	1281396.99	282013.13
17846	C4	6	40th Ave Ne	Hydrant	0	2010	1283138.83	279598.47
17846	C4	8	40th Ave Ne	Line	0	2010	1283131.53	279600.61
17846	C4	8	40th Ave Ne	Line	0	2010	1283134.32	279592.18
0	0	6	0	Line	0	2012	1284650.08	285113.21
0	0	8	0	Line	0	2013	1284663.57	285117.87
0	0	8	0	Line	0	2013	1284658.92	285113.09
19565	0	8	45th Ave NE	Line	0	2013	1284403.21	284856.74
19505	0	8	45th Ave NE	Line	0	2013	1284393.25	284224.62
19431	0	2	NE 195th St	ARV	0	2013	1284654.29	284204.79
19431	0	8	NE 195th St	Line	0	2013	1284636.29	284198.17
19431	0	10	NE 195th St	Line	0	2010	1284662.19	284196.11
19430	0	10	46th Ave NE	Line	0	2013	1284665.74	284120.34
19431	0	8	46th Ave NE	Line	0	2013	1284640.60	284087.78
19431	0	8	46th Ave NE	Line	0	2013	1284634.46	284095.23
4029	C4	6	NE 178th St	Line	841	0	1283673.05	279185.45
18503	B2	6	Ballinger	Line	695	0	1281960.81	281654.45
18250	C3	6	40th Ave	Line	633	0	1283261.04	280645.28
18250	C3	6	40th Ave	Hydrant	0	0	1283253.31	280640.70
18926	B1	2	33rd Ave Ne	ARV	570	0	1281221.37	282872.73
18505	B2	4	37th Ave Ne	Line	501	0	1282372.44	281791.57
18486	B2	8	37th Ave Ne	Line	500	0	1282372.70	281659.03

3-D Valve Records

18744	D1	8	45th Pl Ne	Line	0	2005	1284170.10	282597.27
4227	C1	6	NE 187th Pl	Hydrant	0	2009	1284045.11	282291.10
4227	C1	8	NE 187th Pl	Line	0	2009	1284050.60	282283.23
18707	D2	8	45th Pl Ne	Line	456	2005	1284304.07	282126.64
18492	C2	8	43rd Ave Ne	Hydrant	0	2011	1284045.75	281366.13
18503	C2	6	43rd Ave Ne	Aband Hyd	0	0	1283980.73	281618.24
4416	C2	6	NE 186th St	Line	455	1994	1284003.68	281758.35
4416	C2	1	NE 186th St	AirVac	0	1994	1284004.26	281747.39
4308	C2	8	NE 186th St	Hydrant	0	1994	1284014.12	281877.53
4308	C2	8	NE 186th St	Aband	0	1994	1283959.18	281882.10
4308	C2	8	NE 186th St	Aband	0	1994	1283966.24	281889.76
4308	C2	8	NE 186th St	Line	454	1994	1284939.76	281544.68
4308	C2	8	NE 186th St	Blind	454	1994	1284915.28	281539.11
4308	C2	8	NE 186th St	Line	454	1994	1284921.91	281545.22
4500	D2	6	NE 186th St	Hydrant	0	2011	1284399.82	281535.55
4500	D2	10	NE 186th St	Line	0	2011	1284408.29	281541.80
4500	D2	10	NE 186th St	Line	0	2011	1284392.62	281542.20
18496	C2	8	43rd Ave Ne	Line	0	2011	1284030.72	281551.68
18496	C2	8	43rd Ave Ne	Line	0	2011	1284026.96	281543.59
18496	C2	8	43rd Ave Ne	Line	0	2011	1284022.50	281555.88
18604	C2	8	NE 186th St	Hydrant	0	1994	1283622.36	281924.86
18604	C2	6	NE 186th St	Aband	0	0	1283600.09	281936.71
18604	C2	8	NE 186th St	Line	451	1994	1283593.92	281922.79
4002	C2	8	NE 186th St	Line	450	0	1283333.81	281916.33
18035	E3	6	53rd Ave Ne	Hydrant	0	0	1286288.50	280819.10
18403	E2	4	51st Pl NE	Blind	290	0	1286077.33	281134.35
18403	E2	8	51st Pl NE	Line	280	0	1286078.26	281127.78
5011	D3	8	NE 180th St	Line	0	2008	1285444.95	280222.13
5084	E3	6	NE 178th St	Line	213	0	1286585.57	280105.34
5084	E3	6	NE 178th St	Line	211	0	1286575.49	280104.50
17571	E4	8	Lakeview Ln	Line	160	2008	1286198.98	279174.84
17571	E4	8	Lakeview Ln	Line	163	2008	1286206.18	279174.17
17571	E4	8	Lakeview Ln	Line	162	2008	1286198.87	279167.47
17430	D4	8	Ballinger Way	Line	90	2013	1285050.38	278696.86
17430	D4	8	Ballinger Way	Line	91	2013	1285057.25	278697.12
17430	D4	8	Ballinger Way	Line	92	2013	1285050.62	278703.93
4700	D5	0	NE Shore Pl	Hydrant	0	0	1285365.74	277535.79
4700	D5	8	NE Shore Pl	Line	60	0	1285369.74	277522.78
18815	B1	8	33rd Ave Ne	Line	580	0	1281217.26	282530.16
18242	C3	8	Ballinger Way	Line	810	0	1283711.11	280616.22
18403	C3	12	Ballinger Way	Line	0	0	1283667.43	280562.81
0		8	WHPA	Line	0	2010	1284817.39	281840.20
0		8	WHPA	Line	0	2010	1284807.85	281841.51
0		0	WHPA	Line	0	0	1284779.60	281833.56
0		0	WHPA	Line	0	0	1284802.91	281751.36
0		0	WHPA		0	0	1284789.70	281712.05
0		0	WHPA		0	0	1284782.35	281712.72
0		0	WHPA		0	0	1284770.86	281712.55
0		0	WHPA		0	0	1284777.62	281706.74

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0		12	WHPA	Line	0	0	1284694.49	281654.52
0		6	WHPA	Line	0	0	1284762.36	281642.08
0		12	WHPA	Line	0	0	1284765.70	281632.08
0		0	WHPA	Line	0	0	1284770.41	281636.10
0		12	WHPA	Line	0	0	1284774.10	281631.32
18500	E2	8	NE 184th St	Line	330	0	1286827.60	281520.32
18035	E3	6	53rd Ave Ne	Line	270	0	1286285.61	280835.23
5110	E2	8	NE 184th St	Line	320	0	1286134.82	281147.36
5110	E2	8	NE 184th St	Line	300	0	1286132.08	281138.86
5110	E2	8	NE 184th St	Line	310	0	1286124.04	281143.77
18403	E2	8	51st Pl NE	Line	0	2005	1286050.81	281124.17
18403	E2	8	51st Pl NE	Line	0	2005	1286057.73	281120.47
18403	E2	8	51st Pl NE	Line	0	2005	1286047.64	281117.32
18403	E2	0	51st Pl Ne	Hydrant	0	0	1286020.23	281109.32
0		8		Line	0	0	1285375.09	280947.13
0		8		Line	0	0	1285368.71	280941.03
0		6		Hydrant	0	0	1285342.61	280908.06
4932	D3	8	NE 184th St	Line	230	0	1285311.52	280857.84
5011	D3	2	NE 180th St	Line	0	2008	1285445.08	280204.93
5011	D3	8	NE 180th St	Line	0	2008	1285439.50	280209.44
5011	D3	8	NE 180th St	Line	0	2008	1285445.64	280213.43
5011	D3	6	NE 180th St	Hydrant	0	2008	1285439.50	280227.11
5011	D3	8	NE 180th St	Line	0	2008	1285444.95	280231.89
5010	D3	6	NE 180th	Line	290	1975	1285456.61	280256.35
5050	E3	6	NE 180th St	Line	250	0	1285895.00	280252.06
5306	E3	6	NE 180th	Line	260	0	1286411.03	280523.40
5320	E3	6	NE 180th St	Line	275	0	1286598.78	280677.01
5024	E3	6	NE 178th St	Line	0	0	1286826.15	280257.49
5084	E3	6	NE 178th St	Line	212	0	1286587.73	280116.60
5050	E4	6	NE 178th St	Line	210	0	1286343.94	279664.42
5050	E4	6	NE 178th St	Hydrant	209	0	1286338.09	279664.42
5026	E4	0	NE 178th St	Hydrant	175	0	1286052.48	279385.24
5026	E4	6	NE 178th St		180	0	1286042.46	279373.04
5026	E4	6	NE 178th St	Line	170	0	1286037.66	279370.54
4780	E4	6	178th	Line	200	0	1285797.37	279329.70
4780	E4	6	178th	Line	201	0	1285790.50	279335.10
0		0		Hydrant	0	0	1285610.80	279430.94
17804	D4	6	47th Ave Ne	Line	221	0	1285082.85	279488.54
17559	D4	8	47th Ave Ne	Line	220	0	1285039.65	279478.25
4663	D3	8	NE 178th St	Line	380	0	1285005.40	279789.31
4663	D4	8	NE 178th St	Line	370	0	1284997.45	279780.40
18400	D3	8	NE 184th Ave	Line	819	0	1285025.74	280460.16
18400	D3	8	NE 184th Ave	Line - Clos	818	0	1285034.75	280443.41
18350	D3	2	47th Pl Ne	Line	0	2009	1284438.48	280566.78
18350	D3	8	47th Pl Ne	Line	0	2009	1284447.62	280569.39
18350	D3	6	47th Pl Ne	Hydrant	0	2009	1284444.26	280563.39
18345	D3	8	47th Pl NE	Line	0	2009	1284554.69	280583.26
18345	D3	8	47th Pl NE	Line	0	2009	1284561.03	280592.46
18345	D3	8	47th Pl NE	Line	340	2009	1284553.29	280591.01

3-D Valve Records

18402	D3	8	47th Ave Ne	Line	430	1990	1284834.47	280755.73
18402	D3	8	47th Ave Ne	Line	420	1990	1284827.81	280755.87
18487	D3	8	47th Pl Ne	Line	360	1990	1284736.56	280847.35
18487	D3	8	47th Pl Ne	Line	350	1990	1284732.44	280841.18
18461	D2	8	47th Pl Ne	Aband	395	0	1284940.97	281390.09
18461	D2	8	47th Pl Ne	Blind	410	0	1284924.33	281377.79
18461	D2	8	47th Pl Ne	Line	392	0	1284936.08	281378.91
18461	D2	8	47th Pl Ne	Line	391	0	1284942.79	281371.36
18461	D2	8	47th Pl Ne	Line	390	0	1284929.93	281370.80
18461	D2	8	47th Pl Ne	Line	400	0	1284919.86	281369.83
18704	D2	6	46th Ave Ne	Hydrant	0	2005	1284546.46	281986.34
18704	D2	8	46th Ave Ne	Line	0	2005	1284548.89	281980.01
18704	D2	8	46th Ave Ne	Line	0	2005	1284541.42	281981.48
18704	D2	6	46th Ave Ne	Blind	0	2005	1284538.40	281989.28
18707	D2	8	45th Pl Ne	Line	0	2005	1284306.24	282137.07
18707	D2	8	45th Pl Ne	Line	0	2005	1284314.18	282124.76
4227	C1	2	NE 187th Pl	Line	0	2009	1284040.45	282283.41
18727	D1	6	45th Pl Ne	Hydrant	0	2005	1284231.67	282286.01
18727	D1	8	45th Pl Ne	Line	0	2005	1284224.68	282287.89
18727	D1	8	45th Pl Ne	Line	0	2005	1284229.36	282279.44
18727	D1	8	45th Pl Ne	Line	0	2005	1284217.48	282303.42
18727	D1	8	45th Pl Ne	Line	457	2005	1284215.35	282295.21
18922	D1	8	45th Pl Ne	Line	0	2005	1284185.82	282893.31
18922	D1	6	45th Pl Ne	Hydrant	0	2005	1284191.54	282899.55
18922	D1	8	45th Pl Ne	Line	0	2005	1284186.17	282906.33
4510	C1	8	45th Pl Ne	Line	0	2005	1284010.54	283109.54
19018	C1	8	45th Pl Ne	Line	459	1990	1283781.51	283256.25
19018	C1	8	45th Pl Ne	Line	458	2005	1283788.25	283255.61
0		2	40TH PL NE	Line	0	0	1283418.07	282634.47
0		2		Line	0	0	1283462.91	282516.72
0		6		Hydrant	0	0	1283457.86	282522.07
0		6		Line	0	0	1283452.44	282516.87
18906		8	40TH PL NE	Line	0	0	1283408.00	282522.81
18906		6	40TH PL NE	Line	0	0	1283413.49	282517.17
18906		8	40TH PL NE	Line	0	0	1283408.00	282512.12
4308	C2	8	NE 186th St	Line	454	1994	1283988.36	281867.47
4308	C2	8	NE 186th St	Line	452	1994	1283988.82	281881.51
4308	C2	8	NE 186th St	Line	453	1994	1283981.16	281874.22
18718	C1	8	40th Pl	Line	0	2011	1283366.78	282314.20
18718	C1	8	40th Pl	Line	440	2011	1283358.45	282310.53
18718	C1	8	40th Pl	Line	441	2011	1283363.47	282303.04
18723		6	40TH PL NE	Hydrant	0	2011	1283206.32	282316.04
18723		8	40TH PL NE	Line	0	2011	1283212.21	282309.73
18723		8	40TH PL NE	Line	0	2011	1283200.35	282309.67
3753		6	NE 188TH ST	Hydrant	0	2011	1282969.78	282398.95
3753		8	NE 188TH ST	Line	0	2011	1282973.55	282393.44
0		8	NE 188TH ST	Line	0	0	1282931.23	282400.15
3705		6	NE 188th ST	Hydrant	0	0	1282426.03	282418.66
3705		8	NE 188TH ST	Line	0	0	1282421.15	282424.66

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3705		8	NE 188TH ST	Line	0	0	1282431.03	282424.58
18926	B1	8	33rd Ave Ne	Line	565	0	1281218.15	282962.64
3419	B1	8	190th St	Line	560	0	1281713.58	282916.80
3356	B3	8	Ne 182nd St	Line	0	2010	1281666.41	280688.68
3356	B3	6	Ne 182nd St	Hydrant	0	2010	1281673.33	280688.89
3356	B3	8	Ne 182nd St	Line	0	2010	1281672.44	280682.12
3300	B3	2	182nd St	Line	650	0	1281215.23	280959.48
3300	B3	8	182nd St	Line	0	0	1281219.87	280953.87
3300	B3	8	182nd St	Line	0	0	1281209.68	280951.04
3300	B3	8	182nd St	Line	0	0	1281205.96	280956.78
3300	B3	8	182nd St	Line	0	0	1281171.53	280965.50
3300	B3	8	182nd St	Line	0	0	1281167.42	280964.10
18204	A2	8	30th Ave Ne	Line	0	0	1280640.66	281066.86
18204	A2	8	30th Ave Ne	Line	660	0	1280646.37	281069.91
18204	A2	8	30th Ave Ne	Line	0	0	1280642.66	281073.68
3001	A2	6	30th Ave Ne	Hydrant	0	0	1280617.52	281038.71
0		8		Line	0	0	1280155.43	281137.50
2906		8	NE 182nd St	Line	0	0	1280175.29	281123.28
3007		6	NE 182nd St	Hydrant	0	0	1280203.78	281105.77
2906		8	NE 182nd St	Line	0	0	1280112.93	281047.49
3007	A2	8	185th St	Line	0	0	1280462.99	281656.94
3007	A2	8	185th St	Line	0	0	1280467.42	281661.49
3007	A2	8	185th St	Line	680	0	1280476.10	281667.79
3007	A2	8	185th St	Hydrant	0	0	1280501.83	281657.87
3211	B2	8	185th St	Line	690	0	1281059.67	281643.46
3211	B2	8	185th St	Line	0	0	1281070.05	281642.94
3211	B2	6	185th St	Hydrant	0	0	1281064.67	281639.09
3313	B2	8	185th St	Line	0	0	1281244.01	281634.66
3313	B2	8	185th St	Line	0	0	1281254.39	281634.13
3313	B2	6	185th St	Hydrant	0	0	1281249.01	281630.29
3341	B2	8	NE 185th St	Line	0	0	1281606.33	281618.03
0		6		Hydrant	0	2006	1281971.00	281864.11
18503	B2	8	Ballinger	Line	0	2006	1281978.32	281659.77
18503	B2	8	Ballinger	Line	0	2006	1281972.85	281654.32
18503	B2	8	Ballinger	Line	0	2006	1281978.16	281649.39
18499	B2	8	Ballinger	Line	691	2006	1281976.74	281599.03
18499	B2	10	Ballinger	Line	0	2006	1281982.05	281593.45
18499	B2	10	Ballinger	Line	0	2006	1281971.30	281593.79
18487	B2	10	Ballinger Way	Line	0	2006	1282319.77	281553.27
18487	B2	10	Ballinger Way	Line	0	2006	1282331.58	281545.49
18487	B2	10	Ballinger Way	Hydrant	0	2006	1282319.89	281546.20
18487	B2	10	Ballinger Way	Line	851	2006	1282325.92	281549.50
18487	B2	10	Ballinger Way	Line	701	2006	1282331.72	281553.95
18487	B2	6	Ballinger Way	Line - Clos	700	0	1282339.09	281540.04
0		8	40TH AVE NE	Line	0	0	1283007.11	280302.99
18250	C3	8	40th Ave	Line	631	0	1283241.71	280645.42
18250	C3	6	40th Ave	Line	632	0	1283251.07	280647.98
17586	D4	8	Ballinger Way	Line	610	0	1284404.76	279439.26
17586	D4	8	Ballinger Way	Line	600	0	1284403.84	279432.19

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3507		8	NE 180TH ST	Line	0	0	1281497.22	280233.10
3558	B4	8	NE 180th St	Line	675	0	1282081.21	279685.85
0	B4	0	NE 180th St	Hydrant	0	0	1282202.93	279599.39
3732	C4	6	NE 180th St	Line	671	0	1282737.16	279329.12
3732	C4	6	NE 180th St	Line	670	0	1282751.87	279323.33
3732	C4	2	NE 180th St	Line	672	0	1282755.87	279313.31
3859	C4	0	NE 178th St	Hydrant	0	0	1283262.52	279217.82
17803	C4	8	40th Ave Ne	Line	0	0	1283296.91	279242.16
17803	C4	8	40th Ave Ne	Line	0	0	1283289.32	279239.00
17803	C4	8	40th Ave Ne	Line	0	0	1283294.06	279249.52
17868	C3	6	40th Ave Ne	Hydrant	0	2010	1283135.26	279836.66
17868	C3	8	40th Ave Ne	Line	0	2010	1283133.38	279830.59
17868	C3	8	40th Ave Ne	Line	0	2010	1283128.40	279838.12
17890	C3	8	40th Ave Ne	Line	0	2010	1282977.75	279935.45
18208	C3	8	40th Ave Ne	Line	630	2010	1282852.56	280060.19
18208	C3	8	40th Ave Ne	Line	0	2010	1282853.91	280053.07
3816	C3	6	Ne 182nd St	Hydrant	0	2010	1282776.17	280069.61
3816	C3	8	Ne 182nd St	Line	0	2010	1282781.72	280065.31
3816	C3	8	Ne 182nd St	Line	0	2010	1282772.17	280063.81
3804	C3	8	NE 182nd St	Line	0	2010	1282594.64	280084.60
3574	B3	6	Ne 182nd St	Hydrant	0	2010	1282394.89	280204.67
3574	B3	8	Ne 182nd St	Line	0	2010	1282397.13	280198.18
3574	B3	8	Ne 182nd St	Line	0	2010	1282388.75	280203.30
3552	B3	8	Ne 182nd St	Line	0	2010	1282186.77	280291.01
3534	B3	6	Ne 182nd St	Hydrant	0	2010	1281970.52	280374.03
3534	B3	8	Ne 182nd St	Line	0	2010	1281971.18	280367.47
3534	B3	8	Ne 182nd St	Line	0	2010	1281964.61	280373.56
3520	B3	6	NE 182nd St	Line	642	0	1281836.44	280500.93
3520	B3	6	NE 182nd St	Line	641	0	1281830.01	280508.58
3510	B3	8	NE 182nd Ave	Line	636	2004	1281752.43	280596.18
3510	B3	8	NE 182nd Ave	Line	634	2004	1281752.89	280602.75
3510	B3	8	NE 182nd Ave	Line	635	2004	1281746.07	280602.66
3510	B3	8	NE 182nd Ave	Line	0	0	1281746.17	280625.22
18450	B2	8	35th Ave Ne	Line	852	0	1281736.91	281614.15
18450	B2	8	35th Ave Ne	Line	854	0	1281742.66	281612.77
18450	B2	8	35th Ave Ne	Line	853	0	1281747.17	281608.67
18450	B2	8	35th Ave Ne	Line	850	0	1281742.65	281603.63
18498	B2	8	Ballinger Way	Line	855	0	1281742.84	281736.27
18498	B2	10	Ballinger Way	Line	856	0	1281737.80	281736.29
18512	B2	10	Ballinger Way	Line	849	1988	1281695.53	281737.93
18512	B2	8	Ballinger Way	Line	857	1988	1281700.76	281741.94
18541	B2	6	35th Ave Ne	Hydrant	0	0	1281709.51	282071.79
18541	B2	8	35th Ave Ne	Line	545	0	1281716.40	282108.05
18541	B2	8	35th Ave Ne	Line	0	0	1281711.20	282102.35
18541	B2	8	35th Ave Ne	Line	550	0	1281711.46	282113.67
3527		8	NE 187TH ST	Line	0	0	1282031.37	282096.88
0		6		Hydrant	0	0	1282792.48	282118.03
0		8		Line	0	0	1282785.10	282118.40
0	B2	6		Hydrant	0	0	1282408.29	282140.06

3-D Valve Records

0	B2	8		Line	0	0	1282397.74	282139.96
0	B2	8		Line	0	0	1282402.78	282133.72
3705	B2	8	NE 187th St	Line	540	2006	1282408.37	282094.09
18549	B2	8	37th Ave Ne	Line	0	2006	1282366.86	282086.31
18549	B2	8	37th Ave Ne	Line	535	2006	1282372.37	282093.87
18549	B2	8	37th Ave Ne	Line	0	2006	1282360.51	282094.11
18535	B2	8	37th Ave Ne	Line	510	0	1282377.31	281929.68
18535	B2	8	37th Ave Ne	Line	520	2006	1282369.85	281936.63
18535	B2	8	37th Ave Ne	Line	530	0	1282369.87	281924.91
0		8		Line	0	0	1282951.72	281921.48
3844	C2	8	NE 185th St	Line	482	2011	1283037.01	281606.71
3844	C2	6	NE 185th St	Hydrant	0	2011	1283032.17	281601.84
3844	C2	8	NE 185th St	Line	0	2011	1283037.24	281597.10
3844	C2	6	NE 185th St	Hydrant	0	2011	1283061.90	281580.18
3844	C2	8	NE 185th St	Line	0	2011	1283057.47	281574.47
3844	C2	8	NE 185th St	Line	481	2011	1283066.04	281574.58
18476	C2	8	40th Pl Ne	Line	480	0	1283366.46	281573.04
4004	C2	8	NE 185th St	Line	460	1990	1283370.19	281616.96
4004	C2	6	NE 185th St	Line	470	1990	1283375.50	281611.00
18439	C2	8	40th Pl Ne	Line - Clos	490	0	1283465.52	281083.80
18251	C3	6	Ballinger Way	Hydrant	0	0	1283688.18	280538.45
18251	C3	12	Ballinger Way	Line	0	0	1283695.48	280536.31
18242	C3	8	Ballinger Way	Line	780	0	1283702.01	280617.38
18242	C3	12	Ballinger Way	Line	800	0	1283712.08	280593.10
18242	C3	12	Ballinger Way	Line	790	0	1283719.52	280591.08
18242	C3	8	Ballinger Way	Hydrant	0	0	1283736.25	280564.50
18217	C3	2	Ballinger Way	Line	620	2011	1283885.68	280224.32
18211	C3	12	Ballinger Way	Line	0	2011	1283907.98	280191.65
18211	C3	6	Ballinger Way	Hydrant	0	2011	1283905.93	280183.45
18211	C3	12	Ballinger Way	Line	0	2011	1283913.30	280182.12
17851	D4	12	Ballinger Way	Line	0	2011	1284150.13	279784.95
17851	D4	6	Ballinger Way	Hydrant	0	2011	1284147.70	279777.14
17851	D4	12	Ballinger Way	Line	0	2011	1284155.47	279775.55
4420	D4	8	NE 178th ST	Line	0	0	1284375.71	279342.90
4420	D4	6	NE 178th ST	Hydrant	0	0	1284366.85	279343.57
4420	D4	8	NE 178th ST	Line	0	0	1284365.15	279336.75
1771	D4	12	Ballinger Way NE	Line	0	0	1284385.77	279319.89
1771	D4	12	Ballinger Way NE	Line	0	0	1284393.35	279317.79
1771	D4	12	Ballinger Way NE	Line	0	0	1284389.81	279311.22
17576	D4	12	Ballinger Way	Line	840	0	1284454.50	279359.40
0		6		Line	0	0	1284482.02	279326.32
0		6		Hydrant	0	0	1284540.63	279137.16
0		12		Line	0	0	1284547.48	279137.36
0		12		Line	0	0	1284649.97	279024.31
0		10		Line	0	0	1284649.06	279017.37
0		12		Line	0	0	1284655.74	279018.52
0	D4	0		Line	0	0	1284991.26	278646.23
0	D4	12		Line	0	0	1284984.58	278645.67
0	D4	12		Line	0	0	1284989.73	278640.44

3-D Valve Records

0		2		Line	0	0	1285143.42	278478.72
0		6		Hydrant	0	0	1285147.42	278473.58
0		12		Line	0	0	1285155.01	278472.90
4610		6	Ballinger Way	Line	82	0	1285269.03	278459.53
4610		6	Ballinger Way	Line	0	0	1285273.98	278462.65
4610		6	Ballinger Way	Line	81	0	1285274.43	278454.96
4616		8	Ballinger Way	Line	83	0	1285369.56	278369.27
4626	E5	8	Ballinger/Bothell Way	Line	84	0	1285626.30	278341.29
0	E4	8	Beach DR	Line	0	0	1286438.58	278814.01
17337	E5	8	Beach Dr	Line	21	0	1285691.61	278230.86
17337	E5	8	Beach Dr	Line	20	0	1285700.20	278227.91
17336	E5	8	Beach Dr	Line	30	0	1285689.51	278221.77
17228	D5	2	Beach Dr	Line	40	0	1285335.50	277965.23
17114	D5	8	Brentwood Pl NE	Line	80	0	1285063.20	277839.94
17102	D5	8	Brentwood Pl NE	Line	70	0	1285207.10	277669.93
17012	D5	2	47th Ave NE	Line	50	0	1285272.84	277611.90
5017	E4	8	Lakeview LN	Hydrant	168	2008	1286303.41	279271.33
5017	E4	8	Lakeview LN	Line	167	2008	1286310.11	279270.33
5017	E4	8	Lakeview LN	Line	166	2008	1286303.55	279264.41
4777	E4	0	Fern Ln	Hydrant	165	0	1286188.41	279185.69
4777	E4	8	Fern Ln	Line	164	2008	1286195.66	279185.75
17404	E4	6	47th Ave Ne	Line	140	2008	1285755.29	278763.54
17503	D4	6	47th Ave Ne	Line	130	0	1285448.35	278999.62
4640	D4	8	NE 175th	Line	120	0	1285417.77	278982.44
0	D4	0		Hydrant	0	0	1285378.46	278959.19
17510	D4	6	Ballinger Way	Line	100	0	1285052.09	278741.81
17510	D4	6	Ballinger Way	Line	110	0	1285021.35	278733.22

APPENDIX 3 - E NETWORK MODEL – PIPE AND JUNCTION LISTINGS

3-E Waternetwork Junctions

Appendix 3 - E
LFPWD Waternetwork Junctions 2014

FID	ID	LABEL	ELEV	HGL	IS_ACTIVE	PSI	ZONE	X	Y	ERU's
0	161	J-1	396	448.49	1	22.8	ExemptPress	1,285,248.36	281,997.24	0
1	162	J-139	92	292.94	1	87.1	Low Zone	1,283,228.14	280,622.61	0
2	163	J-101	114	292.95	1	77.6	Low Zone	1,283,665.56	280,565.33	0
3	164	J-99	118	292.95	1	75.8	Low Zone	1,283,631.22	280,663.46	0
4	165	J-97	312	448.45	1	59.2	High Zone	1,284,550.79	281,979.80	5
5	166	J-85	30	195.35	1	71.7	Beach Zone	1,284,788.45	277,655.70	8
6	167	J-198	180	342.9	1	70.6	Intermediate Zone	1,280,792.55	280,531.13	14
7	168	J-131	137	292.95	1	67.6	Low Zone	1,283,533.99	280,909.81	5
8	169	J-135	74	292.93	1	94.9	Low Zone	1,284,203.14	279,689.29	9
9	170	J-75	26	195.35	1	73.4	Beach Zone	1,286,382.25	278,764.89	12
10	171	J-57	146	292.89	1	63.7	Low Zone	1,285,655.08	279,401.33	0
11	172	J-3	286	448.47	1	70.4	High Zone	1,284,942.71	281,544.95	0
12	173	J-123	258	448.45	1	82.6	High Zone	1,284,025.11	281,548.39	6
13	174	J-210	122	292.89	1	74.1	Low Zone	1,285,282.00	279,488.63	5
14	175	J-208	135	342.9	1	90.1	Intermediate Zone	1,280,108.40	281,042.39	1
15	176	J-206	190	342.9	1	66.3	Intermediate Zone	1,280,010.87	281,330.74	7
16	177	J-204	148	342.9	1	84.5	Intermediate Zone	1,280,180.00	281,119.20	6
17	178	J-202	175	342.9	1	72.8	Intermediate Zone	1,280,624.26	281,039.91	0
18	179	J-200	190	342.9	1	66.3	Intermediate Zone	1,280,542.45	280,570.66	7
19	180	J-196	182	342.9	1	69.8	Intermediate Zone	1,281,212.84	281,178.17	2
20	181	J-194	190	342.9	1	66.3	Intermediate Zone	1,281,213.40	280,955.51	14
21	182	J-192	151	342.9	1	83.2	Intermediate Zone	1,281,744.93	280,602.33	18
22	183	J-190	184	342.9	1	68.9	Intermediate Zone	1,280,401.31	282,020.67	3
23	184	J-188	182	342.9	1	69.8	Intermediate Zone	1,280,463.18	281,661.38	12
24	185	J-186	143	342.64	1	86.5	Intermediate Zone	1,281,056.34	281,926.69	6
25	186	J-184	148	342.9	1	84.5	Intermediate Zone	1,281,052.61	281,643.08	17
26	187	J-182	150	342.91	1	83.6	Intermediate Zone	1,281,073.67	282,329.26	0
27	188	J-180	152	342.91	1	82.8	Intermediate Zone	1,281,037.55	282,367.30	10
28	189	J-178	148	342.91	1	84.5	Intermediate Zone	1,281,217.17	282,650.54	5
29	190	J-176	158	342.91	1	80.2	Intermediate Zone	1,281,217.96	282,967.47	23
30	191	J-174	141	342.91	1	87.5	Intermediate Zone	1,281,711.06	282,107.53	20
31	192	J-172	126	342.91	1	94	Intermediate Zone	1,281,700.30	281,737.21	7
32	193	J-170	124	342.91	1	94.9	Intermediate Zone	1,281,742.86	281,608.78	11
33	194	J-168	139	342.91	1	88.4	Intermediate Zone	1,281,980.32	281,870.04	9
34	195	J-166	132	342.91	1	91.4	Intermediate Zone	1,281,976.35	281,593.10	5
35	196	J-164	138	342.91	1	88.8	Intermediate Zone	1,282,328.66	281,547.38	1
36	197	J-162	173	342.91	1	73.7	Intermediate Zone	1,282,400.19	282,425.28	0
37	198	J-160	180	342.91	1	70.6	Intermediate Zone	1,282,793.30	282,118.46	7
38	199	J-158	159	342.91	1	79.7	Intermediate Zone	1,282,400.73	282,094.12	0
39	200	J-156	155	342.92	1	81.5	Intermediate Zone	1,282,371.39	281,927.58	2
40	201	J-154	168	448.37	1	121.5	High Zone	1,283,063.80	281,574.97	5
41	202	J-152	135	292.94	1	68.5	Low Zone	1,282,477.39	281,381.69	12
42	203	J-150	143	342.9	1	86.7	Intermediate Zone	1,281,847.67	280,490.44	0
43	204	J-148	118	292.92	1	75.8	Low Zone	1,280,836.48	280,215.79	10
44	205	J-146	128	292.91	1	71.5	Low Zone	1,281,199.76	279,689.53	2
45	206	J-144	78	292.92	1	93.2	Low Zone	1,282,758.31	279,320.83	19
46	207	J-142	66	292.93	1	98.4	Low Zone	1,283,294.51	279,244.71	13
47	208	J-140	109	292.93	1	79.7	Low Zone	1,282,851.00	280,055.81	18
48	209	J-138	92	292.94	1	87.1	Low Zone	1,283,245.94	280,649.85	14
49	210	J-136	85	292.93	1	90.1	Low Zone	1,283,579.18	280,031.83	4
50	211	J-134	98	292.94	1	84.5	Low Zone	1,283,896.05	280,211.28	14
51	212	J-130	182	448.39	1	115.5	High Zone	1,283,363.76	281,534.41	0
52	213	J-126	184	448.39	1	114.6	High Zone	1,283,366.93	281,572.26	7
53	214	J-124	250	448.45	1	86	High Zone	1,284,043.47	281,244.12	2
54	215	J-122	268	448.45	1	78.2	High Zone	1,284,295.10	281,760.81	4
55	216	J-120	270	448.45	1	77.4	High Zone	1,283,993.08	281,759.11	0
56	217	J-118	260	448.44	1	81.7	High Zone	1,283,991.31	281,876.44	5
57	218	J-116	248	448.42	1	86.9	High Zone	1,283,673.67	282,079.55	5
58	219	J-114	231	448.42	1	94.3	High Zone	1,283,594.05	281,912.44	7
59	220	J-112	208	448.41	1	104.2	High Zone	1,283,302.25	281,932.57	8
60	221	J-108	223	448.42	1	97.7	High Zone	1,283,159.97	282,309.92	4
61	222	J-106	235	448.42	1	92.5	High Zone	1,283,364.47	282,307.05	4
62	223	J-104	308	448.43	1	60.9	High Zone	1,283,783.90	283,258.85	25

3-E Waternetwork Junctions

63	224	J-102	272	448.44	1	76.5	High Zone	1,283,933.04	282,404.42	9
64	225	J-100	289	448.44	1	69.1	High Zone	1,284,220.21	282,296.79	7
65	226	J-98	293	448.45	1	67.4	High Zone	1,284,307.32	282,131.14	5
66	227	J-132	118	292.95	1	75.8	Low Zone	1,283,705.52	280,613.67	7
67	228	J-96	252	292.99	1	17.8	ExemptPress	1,284,693.33	281,650.83	0
68	229	J-94	256	448.47	1	83.4	ExemptPress	1,284,708.70	281,702.75	0
69	230	J-92	264	448.47	1	80	High Zone	1,284,828.92	281,836.54	2
70	231	J-68	58	292.86	1	101.8	Low Zone	1,285,027.06	278,725.56	7
71	232	J-90	25	195.35	1	73.8	Beach Zone	1,285,206.41	277,518.30	2
72	233	J-88	23	195.35	1	74.7	Beach Zone	1,285,402.82	277,484.27	8
73	234	J-86	27	195.35	1	73	Beach Zone	1,285,276.48	277,617.80	0
74	235	J-84	30	195.35	1	71.7	Beach Zone	1,284,629.69	277,580.76	2
75	236	J-80	25	195.34	1	73.8	Beach Zone	1,285,527.19	277,723.09	6
76	237	J-78	28	195.35	1	72.5	Beach Zone	1,285,322.67	277,972.68	2
77	238	J-76	26	195.35	1	73.4	Beach Zone	1,287,056.86	279,440.85	9
78	239	J-74	30	195.35	1	71.7	Beach Zone	1,285,696.24	278,231.46	7
79	241	J-70	55	292.85	1	103.1	Low Zone	1,284,988.63	278,642.98	0
80	242	J-64	67	292.93	1	97.9	Low Zone	1,284,388.58	279,315.56	13
81	243	J-62	70	292.92	1	96.6	Low Zone	1,284,402.12	279,438.47	0
82	244	J-61	176	448.46	1	118.1	High Zone	1,285,011.34	280,410.17	0
83	245	J-60	126	292.9	1	72.4	Low Zone	1,285,005.82	279,780.33	13
84	246	J-58	104	292.89	1	81.9	Low Zone	1,285,040.70	279,479.24	9
85	247	J-56	122	292.89	1	74.1	Low Zone	1,285,906.33	279,064.77	3
86	248	J-54	154	292.89	1	60.2	Low Zone	1,285,796.52	279,334.28	9
87	249	J-52	74	292.89	1	94.9	Low Zone	1,285,418.21	278,982.71	15
88	250	J-50	67	292.89	1	97.9	Low Zone	1,285,752.82	278,760.21	8
89	251	J-48	120	292.88	1	74.9	Low Zone	1,286,511.48	279,426.08	4
90	253	J-44	130	292.89	1	70.6	Low Zone	1,286,205.09	279,175.27	6
91	254	J-42	172	292.89	1	52.4	Low Zone	1,286,035.45	279,373.65	9
92	255	J-40	187	448.45	1	113.3	High Zone	1,286,588.35	280,106.10	3
93	256	J-38	300	448.45	1	64.4	High Zone	1,287,017.26	280,981.63	5
94	257	J-36	312	448.45	1	59.2	High Zone	1,286,589.94	280,691.82	4
95	258	J-34	212	447.97	1	102.3	High Zone	1,285,225.07	280,000.26	7
96	259	J-32	232	448.45	1	93.8	High Zone	1,285,452.05	279,992.38	4
97	260	J-30	270	448.45	1	77.4	High Zone	1,285,459.42	280,259.14	7
98	261	J-28	305	448.45	1	62.2	High Zone	1,286,412.74	280,519.05	9
99	262	J-26	340	448.45	1	47	ExemptPress	1,286,803.74	281,570.09	5
100	263	J-24	287	448.45	1	70	High Zone	1,286,129.44	281,146.03	8
101	264	J-22	347	448.44	1	44	High Zone	1,285,849.10	281,340.52	7
102	265	J-20	286	448.45	1	70.4	High Zone	1,286,056.45	281,119.79	8
103	266	J-18	224	448.46	1	97.3	High Zone	1,285,309.47	280,857.66	9
104	267	J-16	180	448.46	1	116.4	High Zone	1,285,037.81	280,448.10	0
105	268	J-14	221	448.47	1	98.6	High Zone	1,284,830.72	280,753.56	10
106	269	J-12	212	448.47	1	102.5	High Zone	1,284,732.64	280,213.00	9
107	270	J-10	198	448.46	1	108.6	High Zone	1,284,273.93	280,524.04	6
108	271	J-8	240	448.47	1	90.4	High Zone	1,284,557.99	280,589.08	5
109	272	J-6	228	448.47	1	95.6	High Zone	1,284,734.21	280,843.21	8
110	273	J-4	279	448.47	1	73.5	High Zone	1,284,939.37	281,371.43	16
111	274	J-2	310	448.48	1	60	High Zone	1,284,962.17	281,790.02	0
112	275	J-5	70	292.93	1	96.6	Low Zone	1,284,454.74	279,360.32	0
113	276	J-9	257	448.45	1	83	High Zone	1,285,406.07	280,320.90	0
114	277	J-11	31	195.35	1	71.2	Beach Zone	1,285,055.06	277,834.68	4
115	278	J-13	27	195.35	1	73	Beach Zone	1,285,213.48	277,677.18	9
116	279	J-17	141	342.91	1	87.5	Intermediate Zone	1,281,757.24	282,105.44	0
117	280	J-15	158	342.91	1	80.2	Intermediate Zone	1,282,366.13	282,093.55	14
118	281	J-19	126	342.91	1	94	Intermediate Zone	1,281,737.50	281,736.72	0
119	282	J-21	124	342.91	1	94.9	Intermediate Zone	1,281,736.97	281,613.43	0
120	283	J-23	173	342.9	1	73.7	Intermediate Zone	1,280,642.63	281,071.83	22
121	284	J-25	117	292.95	1	76.3	Low Zone	1,283,715.57	280,594.37	0
122	285	J-27	262	448.44	1	80.8	High Zone	1,284,165.71	281,914.34	3
123	286	J-29	56	292.85	1	102.7	Low Zone	1,285,052.07	278,698.73	0
124	287	J-31	264	448.45	1	80	High Zone	1,285,445.11	280,221.11	0
125	288	J-35	187	448.39	1	113.3	High Zone	1,283,370.80	281,606.71	0
126	289	J-37	212	448.39	1	102.5	High Zone	1,283,629.46	281,605.09	4
127	290	J-39	63	292.93	1	99.7	Low Zone	1,284,041.97	279,285.18	4
128	291	J-41	155	448.39	1	127.2	High Zone	1,283,449.24	281,133.19	10
129	292	J-43	274	292.99	1	8.2	ExemptPress	1,284,786.61	281,630.03	0
130	293	J-45	288	292.99	1	2.2	Well Zone	1,284,883.53	282,090.14	0

3-E Waternetwork Junctions

131	294	J-47	270	292.99	1	10	Well Zone	1,284,796.16	281,824.22	0
132	295	J-51	330	448.45	1	51.4	High Zone	1,286,289.45	280,828.63	5
133	296	J-53	283	292.99	1	4.3	Well Zone	1,284,842.74	281,660.98	0
134	297	J-55	240	448.45	1	90.4	High Zone	1,285,327.73	280,190.36	3
135	298	J-59	306	448.45	1	61.8	High Zone	1,286,662.09	281,285.28	6
136	299	J-63	66	292.93	1	98.4	Low Zone	1,284,377.33	279,345.20	0
137	300	J-65	65	292.93	1	98.8	Low Zone	1,284,545.08	279,139.21	2
138	301	J-66	209	342.91	1	58.1	Intermediate Zone	1,282,932.64	282,399.26	0
139	302	J-67	262	448.47	1	80.8	High Zone	1,284,809.37	281,840.67	0
140	303	J-69	310	569	1	112.3	Horizon_View	1,284,530.17	281,949.72	0
141	304	J-71	430	569	1	60.3	Horizon_View	1,284,638.73	282,891.03	0
142	305	J-73	509	569	1	26	Horizon_View	1,284,634.81	284,087.93	0
143	306	J-77	545	569	1	10.4	ExemptPress	1,284,401.84	284,853.40	0
144	307	J-79	555	569	1	6.1	ExemptPress	1,284,663.08	285,113.78	0
145	308	J-81	516	650	1	58.1	SPU Tolt	1,285,017.16	284,157.37	0
146	309	J-82	553	569	1	6.9	ExemptPress	1,284,708.40	285,122.21	0
147	310	J-83	306	448.45	1	61.8	High Zone	1,286,007.61	281,230.15	0
148	311	J-87	125	292.89	1	72.8	Low Zone	1,286,330.54	279,289.53	0
149	312	J-89	50	292.85	1	105.3	Low Zone	1,285,151.52	278,474.32	2
150	313	J-91	51	275.08	1	97.1	Towne Centre	1,284,921.51	278,573.27	100
151	314	J-93	256	448.46	1	83.4	High Zone	1,284,445.34	281,540.51	1
152	315	J-95	220	448.47	1	99	High Zone	1,284,452.53	280,569.18	0
153	316	J-103	310	440.05	1	56.4	High Zone	1,284,582.50	281,942.79	0
154	577	J-212	518	650	1	57.2	SPU Tolt	1,284,661.59	284,199.73	0
155	580	J-213	211	448.45	1	102.9	High Zone	1,286,832.16	280,245.16	5
156	583	J-214	285	448.45	1	70.9	High Zone	1,285,839.36	280,225.43	13
157	593	J-215	45	195.35	1	65.2	Beach Zone	1,285,327.31	278,397.88	4.5
158	597	J-216	55	195.37	1	60.9	Beach Zone	1,285,078.30	278,671.49	0
159	607	J-218	210	448.42	1	103.4	High Zone	1,282,971.48	282,394.37	1
160	615	J-219	168	342.99	1	75.9	Intermediate Zone	1,283,034.68	281,602.25	0
161	628	J-223	262	440.05	1	77.2	High Zone	1,284,817.70	281,881.99	0
162	631	J-224	274	-1	0	-1	ExemptPress	1,284,789.66	281,515.60	0
163	635	J-225	274	-1	0	-1	ExemptPress	1,284,789.62	281,529.95	0
164	658	J-226	274	292.99	1	8.2	ExemptPress	1,284,825.52	281,967.58	0
165	662	J-227	285	448.47	1	70.9	High Zone	1,284,910.50	281,544.39	0
166	665	J-228	274	-1	0	-1	ExemptPress	1,284,769.77	281,537.36	0
167	667	J-229	274	-1	0	-1	ExemptPress	1,284,752.02	281,522.55	0
168	769	J-230	306	448.46	1	61.8	High Zone	1,284,401.55	281,989.22	0
169	772	J-231	306	440.05	1	58.1	High Zone	1,284,457.17	281,963.45	0
170	775	J-232	59	292.93	1	101.4	Low Zone	1,284,653.07	279,020.67	0
171	777	J-233	49	292.93	1	105.7	Low Zone	1,284,420.57	278,784.70	0
172	779	J-234	47	292.93	1	106.6	Low Zone	1,284,370.07	278,738.11	0
173	785	J-235	143	292.93	1	65	Low Zone	1,281,859.74	280,477.23	16
174	808	J-236	132	342.91	1	91.4	Intermediate Zone	1,281,977.17	281,654.12	0
175	812	J-237	185	292.88	1	46.8	Low Zone	1,286,557.50	280,056.97	7
176	836	J-238	143	342.91	1	86.7	Intermediate Zone	1,282,368.48	281,659.19	15
177	839	J-239	140	342.91	1	88	Intermediate Zone	1,282,592.48	281,400.09	1
178	841	J-240	245	448.42	1	88.2	High Zone	1,283,408.05	282,517.70	9
179	844	J-241	253	448.42	1	84.7	High Zone	1,283,457.90	282,558.35	0
180	884	J-244	108	-1	0	-1	Intermediate Zone	1,280,738.07	280,207.86	0
181	888	J-245	108	-1	0	-1	Low Zone	1,280,766.74	280,205.13	0
182	972	J-247	0	342.91	1	148.7		1,282,350.02	281,533.03	0
183	1,002.00	J-249	325	-1	0	-1	Horizon_View	1,285,193.78	282,444.48	0

APPENDIX 3 - E
LFPWD CURRENT WATERNETWORK PIPE LIST

ID	LABEL	DIA	MATERIAL	NOTES	CFACTOR	L__SCALED_	USER_L	L__USER_	ZONEL	INSTALL_YR	FLOW	CHECK_V	HEADLOSS	CIP_PROJ	IS_ACTIVE	MINORLOS	START_NODE	START_NLAB	STAT_INIT	STOP_NODE	STOP_NLAB	VELOCITY	ZONE
345	P-1	8	Steel	Steel	70	16.84	0	16.84	Well Zone	0	27.69	0	0	0	1	10	324	Upper Res SSP	Open	161	J-1	0.18	154
346	P-2	12	Ductile Iron	Steel	115	356.75	0	356.75	High Zone	1994	27.69	0	0	0	1	0	161	J-1	Open	274	J-2	0.08	150
347	P-153	8	PVC	Asbestos Cement	125	32.54	0	32.54	Low Zone	1971	4.39	0	0	2033	1	0	209	J-138	Open	162	J-139	0.03	149
348	P-154	8	Asbestos Cement	Asbestos Cement	115	681.96	0	681.96	Low Zone	1971	4.39	0	0	2033	1	0	162	J-139	Open	208	J-140	0.03	149
349	P-152	8	PVC	Permastrand	125	434.43	0	434.43	Low Zone	1981	-5.67	0	0	2033	1	0	209	J-138	Open	163	J-101	0.04	149
350	P-99	8	Ductile Iron	Ductile Iron	130	264.84	0	264.84	Low Zone	1990	-0.25	0	0	0	1	0	168	J-131	Open	164	J-99	0	149
351	P-145	8	PVC	Permastrand	125	91.73	0	91.73	Low Zone	1990	0.25	0	0	0	1	0	227	J-132	Open	164	J-99	0	149
353	P-112	8	Ductile Iron		130	299.39	0	299.39	High Zone	2005	8.69	0	0	0	1	0	165	J-97	Open	226	J-98	0.06	150
354	P-96	8	Ductile Iron	Ductile Iron	130	191.87	0	191.87	Beach Zone	1990	-0.1	0	0	0	1	0	235	J-84	Open	166	J-85	0	152
355	P-222	6	Steel	Steel	85	705.45	0	705.05	Intermediate Zone	0	1.03	0	0	2019	1	0	181	J-194	Open	167	J-198	0.01	151
356	P-224	6	Steel	Steel	85	253.21	0	253.56	Intermediate Zone	0	-0.34	0	0	2019	1	0	179	J-200	Open	167	J-198	0	151
357	P-149	12	Ductile Iron	Ductile Iron	115	605.64	0	605.64	Low Zone	2011	14.32	0	0	0	1	0	211	J-134	Open	169	J-135	0.04	149
358	P-85	8	Ductile Iron		130	869.98	0	869.98	Beach Zone	1990	-1.03	0	0	0	1	0	170	J-75	Open	239	J-74	0.01	152
359	P-87	8	Ductile Iron		130	960.76	0	960.76	Beach Zone	1990	-0.44	0	0	0	1	0	238	J-76	Open	170	J-75	0	152
360	P-61	6	Steel		85	156.58	0	156.58	Low Zone	0	1.51	0	0	2021	1	0	171	J-57	Open	248	J-54	0.02	149
361	P-62	6	Steel		85	389.88	0	389.88	Low Zone	0	1.51	0	0	2021	1	0	174	J-210	Open	171	J-57	0.02	149
362	P-236	8	Ductile Iron	New Ductile Iron	130	52.46	0	52.46	Intermediate Zone	1994	0.59	0	0	0	1	0	187	J-182	Open	188	J-180	0	151
363	P-47	8	Ductile Iron		130	261.13	0	261.13	Low Zone	1988	-0.13	0	0	0	1	0	253	J-44	Open	254	J-42	0	149
364	P-3	12	Ductile Iron		115	247.03	0	247.03	High Zone	1994	18.6	0	0	0	1	0	274	J-2	Open	172	J-3	0.05	150
365	P-4	12	Ductile Iron		115	173.56	0	173.56	High Zone	1994	7.97	0	0	0	1	0	172	J-3	Open	273	J-4	0.02	150
366	P-143	8	Ductile Iron		130	306.14	0	306.14	High Zone	1994	0.1	0	0	0	1	0	173	J-123	Open	214	J-124	0	150
367	P-140	8	Ductile Iron		130	215.08	0	226.19	High Zone	1994	-10.19	0	0	0	1	0	216	J-120	Open	173	J-123	0.07	150
368	P-63	6	Steel		85	243.33	0	243.33	Low Zone	0	-1.75	0	0	2021	1	0	174	J-210	Open	246	J-58	0.02	149
369	P-168	6	Steel	Steel	85	1,070.51	0	1,070.51	Low Zone	0	0.59	0	0	2019	1	0	209	J-138	Open	202	J-152	0.01	149
371	P-170	8	Ductile Iron	Ductile Iron	130	303.18	0	303.18	High Zone	2011	13.13	0	0	0	1	0	213	J-126	Open	201	J-154	0.08	150
372	P-204	10	Ductile Iron	Ductile Iron	140	873.33	0	873.33	Intermediate Zone	1988	-0.59	0	0	0	1	0	187	J-182	Open	192	J-172	0	151
373	P-202	8	Ductile Iron	Ductile Iron	130	379.54	0	379.54	Intermediate Zone	1985	-0.1	0	0	0	1	0	189	J-178	Open	188	J-180	0	151
374	P-200	8	Ductile Iron	Steel	130	316.93	0	316.93	Intermediate Zone	1994	0.15	0	0	0	1	0	190	J-176	Open	189	J-178	0	151
375	P-198	8	Ductile Iron	Steel	130	1,324.07	0	1,324.07	Intermediate Zone	1994	1.28	0	0	0	1	0	191	J-174	Open	190	J-176	0.01	151
376	P-142	8	Ductile Iron	Ductile Iron	130	37.98	0	37.98	High Zone	1990	-0.49	0	0	0	1	0	212	J-130	Open	213	J-126	0	150
378	P-110	12	Ductile Iron	Ductile Iron	115	1,591.39	0	1,591.39	Low Zone	1986	21.46	0	0	0	1	0	228	J-96	Open	227	J-132	0.06	149
379	P-66	8	Ductile Iron	Ductile Iron	130	636.38	0	636.38	Low Zone	1984	0	0	0	0	1	0	244	J-61	Closed	245	J-60	0	149
381	P-64	8	Ductile Iron	Ductile Iron	130	306.16	0	306.16	Low Zone	1984	-7.99	0	0	0	1	0	246	J-58	Open	245	J-60	0.05	149
382	P-78	8	Ductile Iron	Ductile Iron	130	623.76	0	623.76	Low Zone	1984	-5.79	0	0	0	1	0	249	J-52	Open	246	J-58	0.04	149
383	P-20	8	Ductile Iron	Ductile Iron	130	492.68	0	492.68	High Zone	1984	5.31	0	0	0	1	0	267	J-16	Open	266	J-18	0.03	150
384	P-22	8	Ductile Iron	Ductile Iron	130	823.96	0	823.96	High Zone	1984	3.15	0	0	0	1	0	266	J-18	Open	265	J-20	0.02	150
385	P-16	8	Ductile Iron	Ductile Iron	130	131.76	0	131.76	High Zone	1990	2.74	0	0	0	1	0	272	J-6	Open	268	J-14	0.02	150
387	P-93	8	Ductile Iron	Ductile Iron	130	184.77	0	184.77	Beach Zone	1990	0.39	0	0	0	1	0	234	J-86	Open	233	J-88	0	152
388	P-88	8	Ductile Iron	Ductile Iron	130	461.88	0	461.88	Beach Zone	1990	2.02	0	0	0	1	0	239	J-74	Open	237	J-78	0.01	152
389	P-56	6	Steel	Steel	85	425.39	0	425.39	Low Zone	0	0.75	0	0	2024	1	0	249	J-52	Open	250	J-50	0.01	149
390	P-76	6	Steel	Steel	85	468.11	0	468.11	Low Zone	0	4.3	0	0	2019	1	0	249	J-52	Open	231	J-68	0.05	149
391	P-54	8	Ductile Iron		130	613.86	0	613.86	Low Zone	2008	0.36	0	0	0	1	0	250	J-50	Open	253	J-44	0	149
392	P-58	6	Steel		85	248.14	0	248.14	Low Zone	0	0.92	0	0	2021	1	0	248	J-54	Open	254	J-42	0.01	149
393	P-162	2	Galvanized iron		120	1,969.79	0	1,969.79	Low Zone	0	0.1	0	0	2019	1	0	206	J-144	Open	205	J-146	0.01	149
394	P-14	8	Ductile Iron	Ductile Iron	130	1,092.78	0	1,092.78	High Zone	1990	3.06	0	0	0	1	4	273	J-4	Open	268	J-14	0.02	150
395	P-6	8	Ductile Iron	Ductile Iron	130	586.78	0	586.78	High Zone	1990	-4.12	0	0	0	1	1	272	J-6	Open	273	J-4	0.03	150
396	P-12	8	Ductile Iron	Ductile Iron	130	436.47	0	436.47	High Zone	1990	0.44	0	0	0	1	0	271	J-8	Open	269	J-12	0	150
397	P-8	8	Ductile Iron		130	310.47	0	310.47	High Zone	1990	0.98	0	0	0	1	0	272	J-6	Open	271	J-8	0.01	150
398	P-18	8	Ductile Iron	Ductile Iron	130	369.67	0	369.67	High Zone	1990	5.31	0	0	0	1	0	268	J-14	Open	267	J-16	0.03	150
399	P-26	8	Ductile Iron	Ductile Iron	130	77.56	0	77.56	High Zone	1984	2.41	0	0	0	1	0	265	J-20	Open	263	J-24	0.02	150
400	P-68	8	Ductile Iron	Ductile Iron	130	46.26	0	46.26	High Zone	1984	0	0	0	0	1	0	244	J-61	Open	267	J-16	0	150
402	P-42	6	Steel	Steel	85	528.48	0	528.48	High Zone	0	0.25	0	0	2019	1	0	257	J-36	Open	256	J-38	0	150
403	P-102	8	Ductile Iron	Steel	130	141.18	0	141.18	High Zone	2011	9.09	0	0	0	1	0	274	J-2	Open	230	J-92	0.06	150
404	P-136	8	Ductile Iron	Ductile Iron	130	117.34	0	107.56	High Zone	1994	-9.99	0	0	0	1	0	217	J-118	Open	216	J-120	0.06	150
405	P-132	8	Ductile Iron	Steel	130	404.96	0	412.09	High Zone	1994	11.12	0	0	0	1	0	217	J-118	Open	219	J-114	0.07	150
406	P-128	8	Ductile Iron	Steel	130	305.19	0	297.84	High Zone	1994	-10.53	0	0	0	1	0	220	J-112	Open	219	J-114	0.07	150
407	P-134	6	Asbestos Cement	Asbestos Cement	115	557.38	0	557.38	High Zone	0	1.52	0	0	2033	1	0	226	J-98	Open	217	J-118	0.02	150
408	P-126	8	Ductile Iron	Ductile Iron	130	381.86	0	381.86	High Zone	1990	-4.02	0	0	0	1	0	220	J-112	Open	222	J-106	0.03	150
409	P-194	8	Ductile Iron	Steel	130	371.55	0	371.55	Intermediate Zone	1994	-2.47	0	0	0	1	0	192	J-172	Open	191	J-174	0.02	151

3-E Waternetwork Pipes

ID	LABEL	DIA	MATERIAL	NOTES	CFACTOR	L__SCALED_	USER_L	L__USER_	ZONEL	INSTALL_YR	FLOW	CHECK_V	HEADLOSS	CIP_PROJ	IS_ACTIVE	MINORLOS	START_NODE	START_NLAB	STAT_INIT	STOP_NODE	STOP_NLAB	VELOCITY	ZONE
410	P-214	8	Ductile Iron	Steel	130	1,013.45	0	1,013.45	Intermediate Zone	1994	3.38	0	0	0	1	0	193	J-170	Open	182	J-192	0.02	151
411	P-184	10	Ductile Iron	Steel	140	360.61	0	360.61	Intermediate Zone	2006	6.04	0	0	0	1	0	196	J-164	Open	195	J-166	0.02	151
412	P-190	10	Ductile Iron	Steel	140	236.68	0	236.68	Intermediate Zone	2006	4.82	0	0	0	1	0	195	J-166	Open	193	J-170	0.02	151
414	P-176	8	Ductile Iron	Steel	130	410.49	0	410.49	Intermediate Zone	2006	0.34	0	0	0	1	0	199	J-158	Open	198	J-160	0	151
415	P-232	8	Ductile Iron	Ductile Iron	130	278.95	0	278.95	Intermediate Zone	1990	0.34	0	0	0	1	0	177	J-204	Open	176	J-206	0	151
416	P-234	8	Ductile Iron	Steel	130	105.01	0	105.01	Intermediate Zone	2003	0.05	0	0	0	1	0	177	J-204	Open	175	J-208	0	151
418	P-178	8	Ductile Iron	Ductile Iron	130	334.51	0	334.51	Intermediate Zone	2006	0	0	0	0	1	0	197	J-162	Open	199	J-158	0	151
419	P-230	8	Ductile Iron	Steel	130	452.87	0	452.87	Intermediate Zone	2003	0.69	0	0	0	1	0	178	J-202	Open	177	J-204	0	151
420	P-164	8	Ductile Iron	Ductile Iron	130	2,314.65	0	2,313.38	Low Zone	1992	0.49	0	0	0	1	0	206	J-144	Open	204	J-148	0	149
421	P-160	6	Steel	Steel	85	557.14	0	557.14	Low Zone	0	1.52	0	0	2019	1	0	207	J-142	Open	206	J-144	0.02	149
422	P-156	8	Ductile Iron	Steel	130	1,040.18	0	1,040.18	Low Zone	2010	2.72	0	0	0	1	0	208	J-140	Open	207	J-142	0.02	149
423	P-148	2	Galvanized iron	Galvanized Iron	120	364.15	0	364.15	Low Zone	0	0.2	0	0	2024	1	0	211	J-134	Open	210	J-136	0.02	149
426	P-94	2	PVC	PVC	150	121.7	0	121.7	Beach Zone	1990	0.1	0	0	0	1	0	234	J-86	Open	232	J-90	0.01	152
427	P-60	6	Steel		85	315.11	0	315.11	Low Zone	0	0.15	0	0	2024	1	0	248	J-54	Open	247	J-56	0	149
428	P-138	6	PVC	PVC	150	302.02	0	301.02	High Zone	1978	0.2	0	0	0	1	0	216	J-120	Open	215	J-122	0	150
429	P-116	8	Ductile Iron	End Half is 2"" HDI	130	361.22	0	361.22	High Zone	2009	0.44	0	0	0	1	0	225	J-100	Open	224	J-102	0	150
430	P-130	8	Ductile Iron	Steel	130	232.87	0	236.35	High Zone	1994	0.25	0	0	0	1	0	219	J-114	Open	218	J-116	0	150
431	P-212	6	Asbestos Cement	Cast Iron	140	403.89	0	403.89	Intermediate Zone	1975	0.15	0	0	2021	1	0	184	J-188	Open	183	J-190	0	151
432	P-208	1	HDPE	Galvanized Iron	155	283.63	0	283.63	Intermediate Zone	2005	0.3	0	0	0	1	0	186	J-184	Open	185	J-186	0.12	151
433	P-90	2	HDPE	Galvanized Iron	155	322.69	0	322.69	Beach Zone	2003	0.3	0	0	0	1	0	237	J-78	Open	236	J-80	0.03	152
434	P-146	12	Ductile Iron		115	423.94	0	423.94	Low Zone	2011	15.2	0	0	0	1	0	163	J-101	Open	211	J-134	0.04	149
435	P-147	8	PVC	Permastrand	125	94.22	0	94.22	Low Zone	0	-8.62	0	0	0	1	0	243	J-62	Open	275	J-5	0.06	149
436	P-150	12	Ductile Iron		115	399.38	0	399.38	Low Zone	2011	13.87	0	0	0	1	0	169	J-135	Open	299	J-63	0.04	149
437	P-122	8	Ductile Iron	Asbestos Cement	130	204.83	0	204.83	High Zone	2011	0.25	0	0	0	1	0	222	J-106	Open	221	J-108	0	150
438	P-70	8	PVC	Permastrand	125	772.08	0	772.08	Low Zone	1981	8.62	0	0	2033	1	0	243	J-62	Open	245	J-60	0.06	149
441	P-220	2	Galvanized iron	Polyvinyl Chloride	120	222.67	0	222.67	Intermediate Zone	0	0.1	0	0	2024	1	0	181	J-194	Open	180	J-196	0.01	151
442	P-326	8	Ductile Iron		130	8.03	0	8.03	Intermediate Zone	0	0	0	0	0	1	0	334	PRV-150	Open	203	J-150	0	151
443	P-336	6	Ductile Iron		130	7.83	0	7.83	High Zone	0	0	0	0	0	1	0	255	J-40	Open	335	PRV-40	0	150
445	P-356	6	Ductile Iron		130	38.93	0	38.93	High Zone	2011	12.88	0	0	0	1	2	201	J-154	Open	337	PRV-154	0.15	150
446	P-40	6	Steel		85	255.06	0	255.06	High Zone	0	-0.84	0	0	2019	1	0	257	J-36	Open	261	J-28	0.01	150
447	P-7	6	Steel		85	854.99	0	854.99	Low Zone	0	4.87	0	0	2021	1	0	275	J-5	Open	231	J-68	0.06	149
448	P-9	12	Ductile Iron		115	79.88	0	79.88	Low Zone	1980	-13.5	0	0	0	1	0	275	J-5	Open	242	J-64	0.04	149
449	P-34	6	Asbestos Cement		115	603.53	0	603.53	High Zone	1975	1.72	0	0	2033	1	0	266	J-18	Open	276	J-9	0.02	150
450	P-17	8	Ductile Iron		130	302.06	0	302.06	Beach Zone	1990	1.62	0	0	0	1	0	237	J-78	Open	277	J-11	0.01	152
451	P-21	8	Ductile Iron		130	224.19	0	224.19	Beach Zone	1990	1.43	0	0	0	1	0	277	J-11	Open	278	J-13	0.01	152
452	P-23	8	Ductile Iron		130	86.57	0	86.57	Beach Zone	1990	0.49	0	0	0	1	0	278	J-13	Open	234	J-86	0	152
453	P-95	8	Ductile Iron		130	435.3	0	435.3	Beach Zone	1990	-0.49	0	0	0	1	0	166	J-85	Open	278	J-13	0	152
454	P-210	8	Ductile Iron		130	591.92	0	591.92	Intermediate Zone	2005	1.83	0	0	0	1	0	186	J-184	Open	184	J-188	0.01	151
455	P-216	8	Ductile Iron		130	151.91	0	151.91	Intermediate Zone	2004	0	0	0	0	1	0	203	J-150	Open	182	J-192	0	151
456	P-218	8	Ductile Iron		130	661.75	0	661.75	Intermediate Zone	2010	2.5	0	0	0	1	0	182	J-192	Open	181	J-194	0.02	151
457	P-39	8	Ductile Iron		130	46.35	0	46.35	Intermediate Zone	1994	4.73	0	0	0	1	0	279	J-17	Open	191	J-174	0.03	151
458	P-41	8	Ductile Iron		130	34.62	0	34.62	Intermediate Zone	2006	-0.34	0	0	0	1	0	199	J-158	Open	280	J-15	0	151
459	P-43	8	Ductile Iron		130	169.48	0	169.48	Intermediate Zone	2006	-5.76	0	0	0	1	0	280	J-15	Open	200	J-156	0.04	151
460	P-196	8	Ductile Iron		130	612.83	0	612.83	Intermediate Zone	2006	4.73	0	0	0	1	0	280	J-15	Open	279	J-17	0.03	151
461	P-48	10	Ductile Iron		140	37.21	0	37.21	Intermediate Zone	1994	1.53	0	0	0	1	0	192	J-172	Open	281	J-19	0.01	151
462	P-49	8	Ductile Iron	In 20"" Casing	130	123.3	0	123.3	Intermediate Zone	1994	2.07	0	0	0	1	0	281	J-19	Open	282	J-21	0.01	151
463	P-51	8	Ductile Iron		130	10.45	0	10.45	Intermediate Zone	0	-0.9	0	0	0	1	0	282	J-21	Open	193	J-170	0.01	151
464	P-206	8	Ductile Iron		130	687.27	0	687.27	Intermediate Zone	2005	2.96	0	0	0	1	0	282	J-21	Open	186	J-184	0.02	151
465	P-55	8	Ductile Iron		130	39.2	0	39.2	Intermediate Zone	2003	-0.69	0	0	0	1	0	178	J-202	Open	283	J-23	0	151
466	P-57	8	Ductile Iron		130	582.53	0	582.53	Intermediate Zone	2010	-0.68	0	0	0	1	0	283	J-23	Open	181	J-194	0	151
467	P-228	6	Steel		85	626.21	0	626.21	Intermediate Zone	0	1.09	0	0	2019	1	0	184	J-188	Open	283	J-23	0.01	151
468	P-59	12	Ductile Iron		115	21.75	0	21.75	Low Zone	1981	20.87	0	0	0	1	0	227	J-132	Open	284	J-25	0.06	149
469	P-65	12	Ductile Iron		115	57.83	0	57.83	Low Zone	1981	20.87	0	0	0	1	0	284	J-25	Open	163	J-101	0.06	149
470	P-67	8	Ductile Iron		130	179.5	0	179.5	High Zone	1994	-0.15	0	0	0	1	0	285	J-27	Open	217	J-118	0	150
471	P-69	8	Ductile Iron		130	187.16	0	187.16	High Zone	2005	6.92	0	0	0	1	0	226	J-98	Open	225	J-100	0.04	150
472	P-118	8	Ductile Iron		130	1,178.58	0	1,178.58	High Zone	2005	6.14	0	0	0	1	0	225	J-100	Open	223	J-104	0.04	150
473	P-71	6	Steel		85	36.68	0	36.68	Low Zone	0	8.83	0	0	2019	1	0	231	J-68	Open	286	J-29	0.1	149
475	P-80	12	Ductile Iron		115	84.45	0	84.45	Low Zone	1980	5.02	0	0	0	1	0	286	J-29	Open	241	J-70	0.01	149
476	P-38	8	Ductile Iron		130	43.08	0	43.08	High Zone	2008	0.69	0	0	0	1	0	260	J-30	Open	287	J-31	0	150
477	P-36	2	HDPE		155	228.84	0	228.84	High Zone	2008	-0.2	0	0	0	1	0	259	J-32	Open	287	J-31	0.02	150
478	P-79	6	Asbestos Cement		115	84.1	0	84.1	High Zone	1975	1.72	0	0	2033	1	0	276	J-9	Open	260	J-30	0.02	150
479	P-81	8	Ductile Iron		130	34.69	0	34.69	High Zone	1990	-13.97	0	0	0	1	0	213	J-126	Open	288	J-35	0.09	150

3-E Waternetwork Pipes

ID	LABEL	DIA	MATERIAL	NOTES	CFACTOR	L__SCALED_	USER_L	L__USER_	ZONEL	INSTALL_YR	FLOW	CHECK_V	HEADLOSS	CIP_PROJ	IS_ACTIVE	MINORLOS	START_NODE	START_NLAB	STAT_INIT	STOP_NODE	STOP_NLAB	VELOCITY	ZONE
480	P-82	8	Ductile Iron		130	334.81	0	334.81	High Zone	1990	14.16	0	0	0	1	0	220	J-112	Open	288	J-35	0.09	150
481	P-83	6	Asbestos Cement		115	258.67	0	258.67	High Zone	0	0.2	0	0	2033	1	0	288	J-35	Open	289	J-37	0	150
482	P-86	6	Steel		85	832.77	0	832.77	Low Zone	0	0.56	0	0	2019	1	0	207	J-142	Open	290	J-39	0.01	149
483	P-91	8	Ductile Iron		130	466.48	0	466.48	High Zone	1990	0.49	0	0	0	1	0	212	J-130	Open	291	J-41	0	150
484	P-92	8	Ductile Iron		130	238.92	0	238.92	Low Zone	1990	0	0	0	0	1	0	291	J-41	Open	168	J-131	0	149
485	P-97	10	Steel		100	23.92	0	23.92	Low Zone	0	21.46	0	0	0	1	0	323	Lower Res	Open	292	J-43	0.09	149
486	P-98	12	Asbestos Cement		115	95.57	0	95.57	Low Zone	1967	21.46	1	0	2019	1	0	292	J-43	Open	228	J-96	0.06	149
487	P-101	6	PVC		150	127.78	0	127.78	Low Zone	0	0	0	0	0	1	0	292	J-43	Open	328	Transfer PMP	0	149
488	P-103	6	Steel		85	17.76	0	17.76		0	0	0	0	0	1	10	328	Transfer PMP-1	Open	229	J-94	0	0
489	P-105	14	HDPE		155	21.31	1	4		0	349.56	0	0	0	1	0	317	DW1	Open	329	DW1_PMP	0.73	0
490	P-106	5	Steel		100	72.64	1	232	Well Zone	0	349.56	0	0.042	0	1	0	329	DW1_PMP	Open	293	J-45	5.71	154
492	P-113	4	PVC		150	29.65	0	29.65		0	-1	0	-1	0	0	0	330	SW-Pump1	Open	294	J-47	-1	0
493	P-114	2	Ductile Iron		130	41.46	1	10		0	-1	1	-1	0	0	0	325	SW-Sump	Open	330	SW-Pump1	-1	0
494	P-119	14	HDPE		155	34.79	1	4		0	269.6	0	0	0	1	0	318	DW2	Open	331	DW2_PMP	0.56	0
495	P-121	5	Steel		100	43.91	1	221	Well Zone	0	269.6	0	0.026	0	1	0	331	DW2_PMP	Open	293	J-45	4.41	154
496	P-123	6	Asbestos Cement		115	333.23	0	333.23	High Zone	0	1.23	0	0	2033	1	0	295	J-51	Open	261	J-28	0.01	150
497	P-124	8	Ductile Iron		130	358.39	0	358.39	High Zone	1977	1.48	0	0	0	1	0	263	J-24	Open	295	J-51	0.01	150
498	P-125	8	Asbestos Cement		115	172.07	0	172.07	Well Zone	0	923.12	0	0.02	0	1	0	294	J-47	Open	296	J-53	5.89	154
499	P-127	8	Steel		70	44.03	0	44.03	Well Zone	0	923.12	0	0.05	0	1	0	296	J-53	Open	323	Lower Res	5.89	154
500	P-129	6	Cast iron		130	121.34	0	121.34	High Zone	0	0.49	0	0	2024	1	0	287	J-31	Open	297	J-55	0.01	150
501	P-131	1	Galvanized iron		120	234.65	0	234.65	High Zone	0	0.34	0	0	2024	1	0	297	J-55	Open	258	J-34	0.14	150
502	P-133	6	Ductile Iron		130	24.35	0	24.35		0	0	0	0	0	1	0	319	NUD Intertie Water	Open	338	NUD Intertie	0	0
503	P-135	6	Ductile Iron		130	71.09	0	71.09	High Zone	0	0	0	0	0	1	0	338	NUD Intertie Vault V	Closed	230	J-92	0	150
504	P-137	8	Ductile Iron		130	556.08	0	556.08	High Zone	1984	0.54	0	0	0	1	0	263	J-24	Open	298	J-59	0	150
505	P-139	8	Ductile Iron		130	353.1	0	353.1	High Zone	1984	0.25	0	0	0	1	0	298	J-59	Open	262	J-26	0	150
508	P-151	6	Steel		85	341.46	0	341.46	Low Zone	0	0.36	0	0	2021	1	0	290	J-39	Open	299	J-63	0	149
509	P-155	12	Ductile Iron		115	31.7	0	31.7	Low Zone	2011	14.23	0	0	0	1	0	299	J-63	Open	242	J-64	0.04	149
510	P-157	12	Ductile Iron		115	235.98	0	235.98	Low Zone	2001	0.1	0	0	0	1	0	242	J-64	Open	300	J-65	0	149
511	P-163	8	Ductile Iron		130	533.45	0	533.45	Intermediate Zone	2011	0	0	0	0	1	0	301	J-66	Open	197	J-162	0	151
513	P-167	8	Ductile Iron		130	30.1	0	30.1	Intermediate Zone	2011	0	0	0	0	1	0	340	PRV-3	Open	301	J-66	0	151
514	P-169	8	Ductile Iron		130	19.98	0	19.98	High Zone	0	0	0	0	0	1	0	302	J-67	Open	230	J-92	0	150
515	P-171	6	Steel		85	190.77	0	190.77	High Zone	0	0	0	0	0	1	0	229	J-94	Open	302	J-67	0	150
516	P-174	8	Ductile Iron		130	958.81	0	573.8	Horizon_View	2009	0	0	0	0	1	0	304	J-71	Open	303	J-69	0	156
517	P-175	8	Ductile Iron		130	1,198.19	0	1,582.79	Horizon_View	2009	1.3	0	0	0	1	0	305	J-73	Open	304	J-71	0.01	156
518	P-177	8	Ductile Iron		130	1,002.54	0	1,002.54	Horizon_View	2012	1.3	0	0	0	1	0	306	J-77	Open	305	J-73	0.01	156
519	P-179	8	HDPE		170	410.02	0	410.02	Horizon_View	2012	1.3	1	0	0	1	0	307	J-79	Open	306	J-77	0.01	156
520	P-181	10	Ductile Iron		140	57.72	0	57.72	Horizon_View	2012	0	0	0	0	1	0	341	PRV-4	Open	305	J-73	0	156
522	P-186	8	Ductile Iron		130	40.37	0	40.37	Horizon_View	2010	0	0	0	0	1	0	303	J-69	Open	342	PRV-5	0	156
523	P-187	10	Ductile Iron		140	57.57	1	10	SPU Tolt	0	0	0	0	0	1	0	320	R-4	Open	308	J-81	0	157
524	P-189	14	Ductile Iron		130	15.04	1	1		0	318.2	0	0	0	1	0	321	R-5	Open	332	HVDW2	0.66	0
525	P-192	8	Ductile Iron		130	15.62	0	15.62	Horizon_View	2012	1.3	0	0	0	1	0	327	Equalizing Tank	Open	307	J-79	0.01	156
526	P-193	6	Steel		85	159.52	1	370	Well Zone	2012	318.2	0	0.02	0	1	0	332	HVDW2	Open	309	J-82	3.61	154
528	P-197	8	Ductile Iron		130	120.69	0	120.69	High Zone	2005	0.34	0	0	0	1	0	265	J-20	Open	310	J-83	0	150
529	P-199	2	HDPE		155	263.28	0	263.28	High Zone	2005	0.34	0	0	0	1	0	310	J-83	Open	264	J-22	0.04	150
530	P-201	8	Ductile Iron		130	169.69	0	169.69	Low Zone	2008	0.2	0	0	0	1	0	253	J-44	Open	311	J-87	0	149
531	P-203	2	HDPE		155	228.08	0	228.08	Low Zone	2008	0.2	0	0	0	1	0	311	J-87	Open	251	J-48	0.02	149
532	P-205	12	Ductile Iron		115	235.29	0	235.29	Low Zone	2001	0.1	0	0	0	1	0	241	J-70	Open	312	J-89	0	149
533	P-207	8	Ductile Iron		130	54.41	0	54.41	Low Zone	0	4.92	0	0	0	1	0	241	J-70	Open	343	PRV-6	0.03	149
534	P-209	6	Ductile Iron		130	42.41	0	42.41	Towne Centre	0	4.92	0	0	0	1	0	343	PRV-6	Open	313	J-91	0.06	158
535	P-211	10	Ductile Iron		140	421.71	0	421.71	High Zone	2011	10.58	0	0	0	1	0	314	J-93	Open	173	J-123	0.04	150
537	P-215	2	PVC		150	22.7	1	5		0	-1	0	-1	0	0	0	333	FCV-1	Open	325	SW-Sump	-1	0
538	P-217	4	PVC		150	26.39	1	5		0	-1	0	-1	0	0	0	322	R-6	Open	333	FCV-1	-1	0
539	P-219	8	Ductile Iron		130	109.71	0	109.71	High Zone	2009	0.3	0	0	0	1	0	271	J-8	Open	315	J-95	0	150
540	P-221	2	HDPE		155	184.21	0	184.21	High Zone	2009	0.3	0	0	0	1	0	315	J-95	Open	270	J-10	0.03	150
541	P-223	8	Ductile Iron		130	12.7	0	12.7	High Zone	2010	0	0	0	0	1	0	342	PRV-5	Open	316	J-103	0	150
578	P-357	10	Ductile Iron		140	366.96	0	366.96	SPU Tolt	2009	0	0	0	0	1	0	308	J-81	Open	577	J-212	0	157
579	P-358	10	Ductile Iron		140	85.65	0	85.65	SPU Tolt	2012	0	0	0	0	1	0	577	J-212	Open	341	PRV-4	0	157
581	P-359	6	Ductile Iron		130	280.69	0	280.69	High Zone	1975	-0.15	0	0	2021	1	0	255	J-40	Open	580	J-213	0	150
582	P-360	6	Ductile Iron		130	512.43	0	512.43	High Zone	1975	-0.39	0	0	0	1	0	580	J-213	Open	257	J-36	0	150
584	P-361	6	Asbestos Cement	AC	115	393.51	0	393.51	High Zone	1975	0.68	0	0	2033	1	0	260	J-30	Open	583	J-214	0.01	150
585	P-362	6	Steel	Cast Iron/Steel	85	645.6	0	645.6	High Zone	0	0.05	0	0	2019	1	0	583	J-214	Open	261	J-28	0	150
591	P-363	8	Ductile Iron		130	21.77	0	21.77	Low Zone	2013	3.81	0	0	0	1	0	286	J-29	Open	590	PRV-155	0.02	149

3-E Waternetwork Pipes

ID	LABEL	DIA	MATERIAL	NOTES	CFACTOR	L__SCALED_	USER_L	L__USER_	ZONEL	INSTALL_YR	FLOW	CHECK_V	HEADLOSS	CIP_PROJ	IS_ACTIVE	MINORLOS	START_NODE	START_NLAB	STAT_INIT	STOP_NODE	STOP_NLAB	VELOCITY	ZONE
595	P-366	8	Ductile Iron		130	455.93	0	455.93	Beach Zone	1990	3.59	0	0	0	1	0	593	J-215	Open	239	J-74	0.02	152
598	P-368	6	Ductile Iron		130	16.06	0	16.06	Beach Zone	2013	3.81	0	0	0	1	0	590	PRV-155	Open	597	J-216	0.04	152
599	P-369	6	Steel		85	371.81	0	371.81	Beach Zone	0	3.81	0	0	2019	1	0	597	J-216	Open	593	J-215	0.04	152
608	P-374	8	HDPE	10"" DR9 HDPE	170	208.9	0	208.9	High Zone	2011	0.05	0	0	0	1	0	221	J-108	Open	607	J-218	0	150
609	P-375	8	Ductile Iron		130	9.05	0	9.05	High Zone	2011	0	0	0	0	1	0	607	J-218	Open	340	PRV-3	0	150
616	P-379	8	Ductile Iron	Asbestos Cement P	130	18.67	0	18.67	Intermediate Zone	1966	12.88	0	0	0	1	0	337	PRV-154	Open	615	J-219	0.08	151
617	P-380	8	Asbestos Cement	Asbestos Cement P	115	980.08	0	980.08	Intermediate Zone	1966	12.88	0	0	2033	1	0	615	J-219	Open	200	J-156	0.08	151
622	P-384	8	HDPE		170	74.95	0	74.95	Well Zone	2012	318.2	0	0.001	0	1	0	309	J-82	Open	327	Equalizing Ta	2.03	154
630	P-389	8	Ductile Iron		130	42.15	0	42.15	High Zone	2010	0	1	0	0	1	0	628	J-223	Open	302	J-67	0	150
632	P-390	10.3	HDPE		170	406.59	1	1	Horizon_View	2015	-1	0	-1	2019	0	0	628	J-223	Open	631	J-224	-1	156
634	P-391	8	Ductile Iron		130	7.39	1	1	High Zone	2015	-1	0	-1	2019	0	0	631	J-224	Open	633	PRV-160	-1	150
636	P-392	8	Ductile Iron		130	6.96	1	1	Low Zone	2015	-1	0	-1	2019	0	0	633	PRV-160	Open	635	J-225	-1	149
637	P-393	10.3	HDPE		170	159.97	1	1	Low Zone	2015	-1	0	-1	2019	0	0	635	J-225	Closed	323	Lower Res	-1	149
659	P-394	8	Ductile Iron		130	135.61	0	135.61	Well Zone	0	619.16	0	0.008	0	1	0	293	J-45	Open	658	J-226	3.95	154
660	P-395	8	Steel		70	155.87	0	155.87	Well Zone	0	923.12	0	0.05	0	1	0	658	J-226	Open	294	J-47	5.89	154
661	P-396	8	HDPE		170	548.06	1	1		2015	-1	1	-1	2019	0	0	658	J-226	Open	635	J-225	-1	0
663	P-397	8	Ductile Iron		130	32.23	0	32.23	High Zone	2011	10.63	0	0	0	1	0	172	J-3	Open	662	J-227	0.07	150
664	P-398	8.3	HDPE		170	481.28	0	481.28	High Zone	2011	10.63	0	0	0	1	0	662	J-227	Open	314	J-93	0.06	150
666	P-399	10.3	HDPE		170	147.01	1	1	High Zone	2015	-1	0	-1	2019	0	0	665	J-228	Open	662	J-227	-1	150
668	P-400	10	HDPE		170	130.55	1	1	Low Zone	2015	-1	0	-1	2019	0	0	292	J-43	Closed	667	J-229	-1	149
671	P-401	6	Ductile Iron		130	18.32	1	1		2015	-1	0	-1	2019	0	0	667	J-229	Open	670	Transfer PMP	-1	0
672	P-402	6	Ductile Iron		130	11.58	1	1		2015	-1	0	-1	2019	0	0	670	Transfer PMP-3	Open	665	J-228	-1	0
674	P-403	6	Ductile Iron		130	15.32	1	1		2015	-1	0	-1	2019	0	0	667	J-229	Open	673	Transfer PMP	-1	0
675	P-404	6	Ductile Iron		130	14.77	1	1		2015	-1	0	-1	2019	0	0	673	Transfer PMP-4	Open	665	J-228	-1	0
770	P-405	8	HDPE		170	502.78	0	502.78	High Zone	2010	8.99	0	0	0	1	0	230	J-92	Open	769	J-230	0.06	150
771	P-406	8	Ductile Iron		130	194.51	0	194.51	High Zone	2010	8.99	0	0	0	1	5	769	J-230	Open	165	J-97	0.06	150
773	P-407	8	Ductile Iron		130	141.36	0	141.36	High Zone	2010	0	0	0	0	1	0	316	J-103	Open	772	J-231	0	150
774	P-408	8	HDPE		170	370.44	0	370.44	High Zone	2010	0	0	0	0	1	0	772	J-231	Open	628	J-223	0	150
776	P-409	12	Ductile Iron		115	160.35	0	1	Low Zone	2014	0	0	0	0	1	0	300	J-65	Open	775	J-232	0	149
778	P-410	10	Ductile Iron		140	463.35	0	1	Low Zone	2014	0	0	0	0	1	0	775	J-232	Open	777	J-233	0	149
780	P-411	10	Ductile Iron		140	85.06	0	1	Low Zone	2013	0	0	0	0	1	0	777	J-233	Open	779	J-234	0	149
781	P-412	12	Ductile Iron		115	517.42	1	1	Low Zone	2014	0	0	0	2019	0	0	775	J-232	Closed	241	J-70	0	149
786	P-413	8	Ductile Iron	Steel PRV	130	9.87	0	9.87	Low Zone	2010	0	0	0	0	1	0	334	PRV-150	Open	785	J-235	0	149
787	P-414	8	Ductile Iron	Steel PRV	130	1,110.58	0	1,110.58	Low Zone	2010	-0.79	0	0	0	1	0	785	J-235	Open	208	J-140	0.01	149
789	P-415	4	Ductile Iron		130	19.36	1	2	Low Zone	0	0	0	0	0	1	0	785	J-235	Open	788	CV-1	0	149
790	P-416	4	Ductile Iron		130	18.96	1	2	Intermediate Zone	0	0	0	0	0	1	0	788	CV-1	Open	203	J-150	0	151
809	P-417	8	Ductile Iron	Steel	130	61.02	0	61.02	Intermediate Zone	2006	0.97	0	0	0	1	0	195	J-166	Open	808	J-236	0.01	151
810	P-418	8	Ductile Iron	Steel	130	215.95	0	215.95	Intermediate Zone	2006	0.44	0	0	0	1	0	808	J-236	Open	194	J-168	0	151
811	P-419	6	Steel		85	273.56	0	273.56	Intermediate Zone	0	0.53	0	0	2024	1	0	808	J-236	Open	281	J-19	0.01	151
813	P-420	6	Steel		85	50.22	0	50.22	Low Zone	1972	0	0	0	2019	1	0	335	PRV-40	Open	812	J-237	0	149
814	P-421	6	Steel		85	996.52	0	996.52	Low Zone	1972	-0.34	0	0	2019	1	0	812	J-237	Open	254	J-42	0	149
837	P-422	8	PVC	Polyvinyl Chloride	125	268.42	0	268.42	Intermediate Zone	1980	7.02	0	0	2033	1	0	200	J-156	Open	836	J-238	0.04	151
838	P-423	8	PVC	Polyvinyl Chloride	125	118.7	0	118.7	Intermediate Zone	1980	6.09	0	0	0	1	0	836	J-238	Open	196	J-164	0.04	151
840	P-424	6	PVC		125	440.43	0	440.43	Intermediate Zone	0	0.05	0	0	0	1	0	836	J-238	Open	839	J-239	0	151
842	P-425	8	Ductile Iron	Ductile Iron	130	846	0	846	High Zone	1990	4.91	0	0	0	1	0	223	J-104	Open	841	J-240	0.03	150
843	P-426	8	Ductile Iron	Ductile Iron	130	215.64	0	215.64	High Zone	1990	4.47	0	0	0	1	0	841	J-240	Open	222	J-106	0.03	150
845	P-427	6	Ductile Iron		130	91.7	0	91.7	High Zone	0	0	0	0	0	1	0	841	J-240	Open	844	J-241	0	150
851	P-428	2	HDPE		155	55.16	1	2	Horizon_View	2013	0	0	0	0	1	0	303	J-69	Open	850	FCV-2	0	156
852	P-429	2	HDPE		155	44.29	0	0	High Zone	2012	0	0	0	0	1	0	850	FCV-2	Open	316	J-103	0	150
866	P-431	8	Ductile Iron		130	1,941.29	1	1	Intermediate Zone	2033	-1	0	-1	2033	0	0	184	J-188	Closed	175	J-208	-1	151
867	P-432	8	Ductile Iron		130	993.54	1	1	Intermediate Zone	2033	-1	0	-1	2033	0	0	187	J-182	Closed	183	J-190	-1	151
885	P-442	8	Ductile Iron		130	1,208.33	1	1	Intermediate Zone	2033	-1	0	-1	2033	0	0	175	J-208	Closed	884	J-244	-1	151
887	P-443	6	Ductile Iron		130	15.78	1	1	Intermediate Zone	2033	-1	0	-1	2033	0	0	884	J-244	Open	886	PRV-163	-1	151
889	P-444	6	Ductile Iron		130	13.03	1	1	Low Zone	2033	-1	0	-1	2033	0	0	886	PRV-163	Open	888	J-245	-1	149
890	P-445	8	Ductile Iron		130	71.47	1	1	Low Zone	2033	-1	0	-1	2033	0	0	888	J-245	Closed	204	J-148	-1	149
907	P-446	14	HDPE		150	28.87	1	2		0	-1	0	-1	0	0	0	905	R-7	Open	906	DW4_PMP	-1	0
908	P-447	5	Steel		100	31.12	0	0		0	-1	0	-1	0	0	0	906	DW4_PMP	Open	296	J-53	-1	0
918	P-448	8	Ductile Iron		130	327.91	1	1	Intermediate Zone	2033	-1	0	-1	2033	0	0	167	J-198	Closed	884	J-244	-1	151
934	P-451	14	HDPE		155	34.29	1	4		0	303.96	0	0	0	1	0	932	DW3	Open	933	DW3_PMP	0.63	0
935	P-452	5	Steel		100	44.14	1	230	Well Zone	0	303.96	0	0.032	0	1	0	933	DW3_PMP	Open	658	J-226	4.97	154
947	P-453	8	Ductile Iron		130	28.43	1	5	Horizon_View	0	-1	0	-1	0	0	0	631	J-224	Open	946	PRV-164	-1	156
948	P-454	8	Ductile Iron		130	45.56	1	8	High Zone	0	-1	0	-1	0	0	0	946	PRV-164	Open	665	J-228	-1	150

3-E Waternetwork Pipes

ID	LABEL	DIA	MATERIAL	NOTES	CFACTOR	L__SCALED_	USER_L	L__USER_	ZONEL	INSTALL_YR	FLOW	CHECK_V	HEADLOSS	CIP_PROJ	IS_ACTIVE	MINORLOS	START_NODE	START_NLAB	STAT_INIT	STOP_NODE	STOP_NLAB	VELOCITY	ZONE
959	P-456	8	Ductile Iron		130	40	0	0		0	-1	0	-1	0	0	0	296	J-53	Open	958	FCV-3	-1	0
960	P-457	8	Ductile Iron		130	33.87	0	0		0	-1	0	-1	0	0	0	958	FCV-3	Open	292	J-43	-1	0
965	P-458	6	Ductile Iron		130	26.44	0	0		0	-1	1	-1	0	0	0	161	J-1	Open	324	Upper Res SS	-1	0
971	P-462	4	Steel	Steel	85	13.21	0	223.96	Low Zone	0	0	0	0	2024	1	0	196	J-164	Open	969	PRV-165	0	149
973	P-463	4	Steel	Steel	85	198.22	0	223.96	Low Zone	0	0	0	0	2024	1	0	202	J-152	Open	972	J-247	0	149
974	P-464	4	Steel	Steel	85	12.53	0	223.96	Low Zone	0	0	0	0	2024	1	0	969	PRV-165	Open	972	J-247	0	149
976	P-465	6	Ductile Iron		130	24.12	0	0		0	-1	0	-1	0	0	0	972	J-247	Open	975	CV-3	-1	0
977	P-466	6	Ductile Iron		130	24.86	0	0		0	-1	0	-1	0	0	0	975	CV-3	Open	196	J-164	-1	0
1003	P-473	8	Ductile Iron		130	784.47	0	0	Horizon_View	0	-1	0	-1	0	0	0	304	J-71	Open	1,002.00	J-249	-1	156
1005	P-474	12	Ductile Iron		130	588.96	0	0	Horizon_View	0	-1	0	-1	0	0	0	1,004.00	PRV-SPU2	Open	1,002.00	J-249	-1	156
1008	P-476	12	Ductile Iron		130	705.39	0	0	Horizon_View	0	-1	0	-1	0	0	0	1,002.00	J-249	Open	628	J-223	-1	156
1024	P-477	14	Ductile Iron		130	15.69	0	0		0	-1	1	-1	0	0	0	1,023.00	FCV-4	Open	1,004.00	PRV-SPU2	-1	0
1025	P-478	14	Ductile Iron		130	38.21	0	0		0	-1	0	-1	0	0	0	1,006.00	R-10	Open	1,023.00	FCV-4	-1	0

3-E Waternetwork Pipes

APPENDIX 3 - F NETWORK MODEL – UNIT DEMANDS

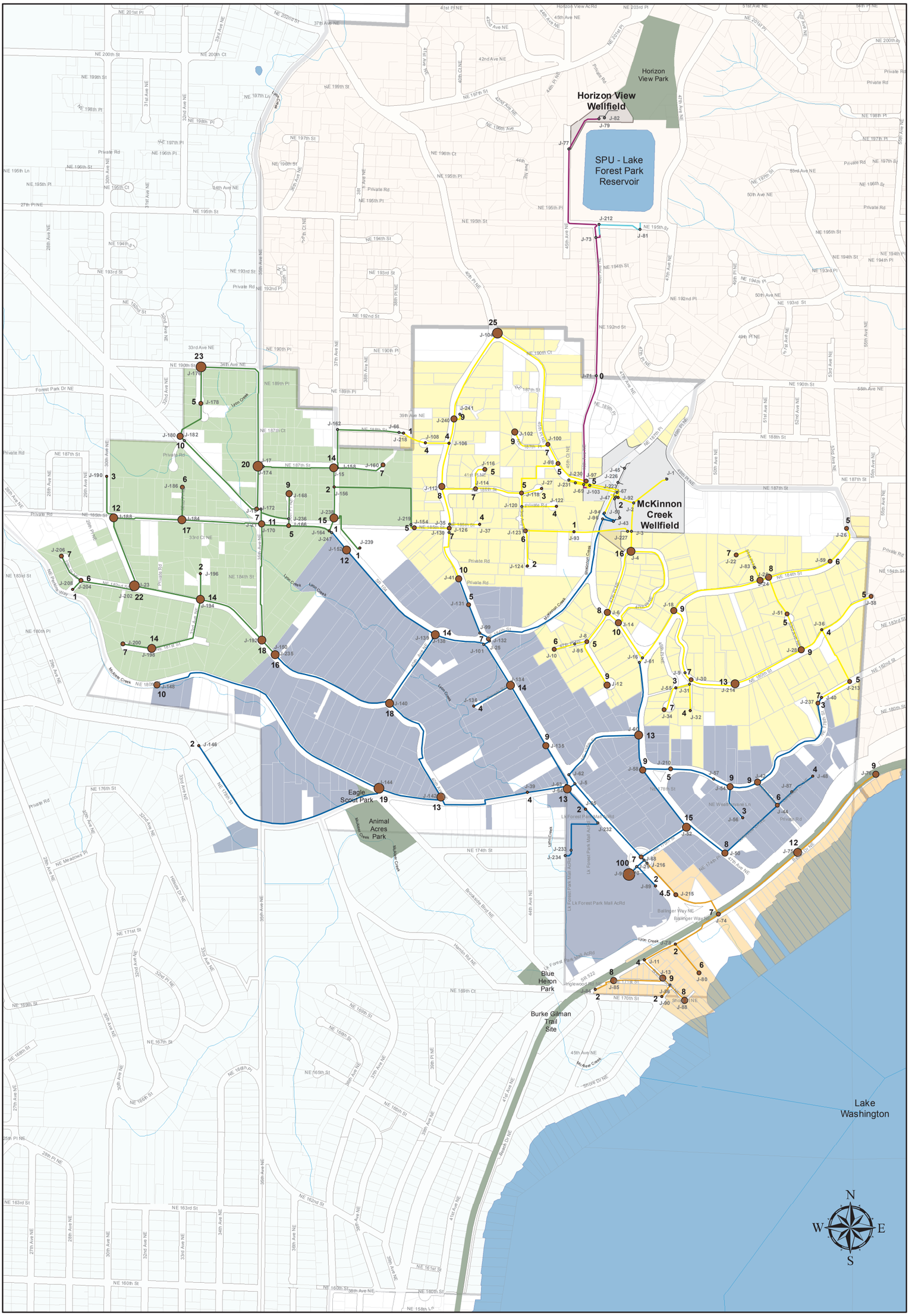
Appendix 3-F

Unit Demand Assignments and Scenario Parameters

ID	Label	Number of Unit Demands
165	J-97	5
166	J-85	8
167	J-198	14
168	J-131	5
169	J-135	9
170	J-75	12
173	J-123	6
174	J-210	5
175	J-208	1
176	J-206	7
177	J-204	6
179	J-200	7
180	J-196	2
181	J-194	14
182	J-192	18
183	J-190	3
184	J-188	12
185	J-186	6
186	J-184	17
188	J-180	10
189	J-178	5
190	J-176	23
191	J-174	20
192	J-172	7
193	J-170	11
194	J-168	9
195	J-166	5
196	J-164	1
198	J-160	7
200	J-156	2
201	J-154	5
202	J-152	12
204	J-148	10
205	J-146	2
206	J-144	19
207	J-142	13
208	J-140	18
209	J-138	14
210	J-136	4
211	J-134	14
213	J-126	7
214	J-124	2
215	J-122	4
217	J-118	5
218	J-116	5
219	J-114	7
220	J-112	8
221	J-108	4
222	J-106	4
223	J-104	25
224	J-102	9
225	J-100	7
226	J-98	5
227	J-132	7
230	J-92	2
231	J-68	7
232	J-90	2
233	J-88	8
235	J-84	2
236	J-80	6
237	J-78	2
238	J-76	9
239	J-74	7
239	J-74	4
242	J-64	13
245	J-60	13
246	J-58	9
247	J-56	3
248	J-54	9
249	J-52	15
250	J-50	8
251	J-48	4
253	J-44	6
254	J-42	9
255	J-40	3
256	J-38	5
257	J-36	4
258	J-34	7
259	J-32	4
260	J-30	7
261	J-28	9
262	J-26	5
263	J-24	8
264	J-22	7
265	J-20	8
266	J-18	9
268	J-14	10
269	J-12	9
270	J-10	6
271	J-8	5
272	J-6	8
273	J-4	16
277	J-11	4
278	J-13	9
280	J-15	14
283	J-23	22
285	J-27	3
289	J-37	4
290	J-39	4
291	J-41	10
295	J-51	5
297	J-55	3
298	J-59	6
300	J-65	2
304	J-71	27
312	J-89	2
313	J-91	100
314	J-93	1
580	J-213	5
583	J-214	13
593	J-215	4.5
607	J-218	1
785	J-235	16
812	J-237	7
836	J-238	15
836	J-238	3
839	J-239	1
841	J-240	9
Total ERUs		**1016.5**

2014		System Demand	GPM / ERU	Gal/Day
	MinDay	132.00 gpm	0.1299	190,080
	AvgDay	180.75 gpm	0.1778	260,274
	MaxDay	538.00 gpm	0.5293	774,720
	PkHour	717.00 gpm	0.7054	
2020				
	AvgDay	173.14 gpm	0.1703	249,315
	MaxDay	550.00 gpm	0.5411	792,000
	PkHour	784.00 gpm	0.7713	
2024				
	AvgDay	169.71 gpm	0.1670	244,384
	MaxDay	555.00 gpm	0.5460	799,200
	PkHour	813.00 gpm	0.7998	
2034				
	AvgDay	174.09 gpm	0.1713	250,685
	MaxDay	564.00 gpm	0.5548	812,160
	PkHour	816.00 gpm	0.8028	

3-F Network Model - Unit Demands



3-F Network Model - Unit Demands

LAKE FOREST PARK WATER DISTRICT

ERU ASSIGNMENT
EQUIVILANT RESIDENTIAL UNITS ON WATER NETWORK NODES

Legend
Number of ERUs
- 1-4
- 5-7
- 7-11
- 11-18
- 18-27
- 27-100

LAKE FOREST PARK WATER DISTRICT
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APPENDIX 3 - G NETWORK MODEL CALIBRATION

Appendix 3 – G NETWORK MODEL CALIBRATION

Field calibration study results, and basis for model calibration.

Initial Parameters			
Field Data Set	Element	Attribute	Value
Calibration A	Lower Res	Hydraulic Grade (ft)	293
Calibration B	Upper Res SSP	Hydraulic Grade (ft)	449
Calibration B	P-124	Pipe Status	Closed
Calibration C	P-134	Pipe Status	Closed
Calibration C	P-128	Pipe Status	Closed
Calibration C	P-180	Pipe Status	Closed
Calibration C	P-43	Pipe Status	Closed
Calibration C	Upper Res SSP	Hydraulic Grade (ft)	449.5
Calibration D	P-120	Pipe Status	Closed
Calibration D	PRV-3	Pressure Setting (psi)	47
Calibration D	P-43	Pipe Status	Closed
Calibration D	P-134	Pipe Status	Closed
Calibration D	Upper Res SSP	Hydraulic Grade (ft)	449
Calibration D	P-180	Pipe Status	Closed
Calibration E	P-86	Pipe Status	Closed
Calibration E	P-414	Pipe Status	Closed
Calibration E	Lower Res	Hydraulic Grade (ft)	293
Calibration F	P-405	Pipe Status	Open
Calibration F	Upper Res SSP	Hydraulic Grade (ft)	450
Calibration F	P-43	Pipe Status	Closed
Calibration F	P-180	Pipe Status	Closed
Calibration F	P-120	Pipe Status	Closed
Calibration F	PRV-3	Pressure Setting (psi)	47
Calibration F	P-134	Pipe Status	Closed
Calibration F 2	P-120	Pipe Status	Closed
Calibration F 2	PRV-3	Pressure Setting (psi)	47
Calibration F 2	P-405	Pipe Status	Open
Calibration F 2	P-134	Pipe Status	Closed
Calibration F 2	P-180	Pipe Status	Open
Calibration F 2	P-43	Pipe Status	Open
Calibration F 2	Upper Res SSP	Hydraulic Grade (ft)	446
Calibration F 3	PRV-3	Pressure Setting (psi)	47
Calibration F 3	P-43	Pipe Status	Open
Calibration F 3	P-180	Pipe Status	Open
Calibration F 3	P-120	Pipe Status	Open
Calibration F 3	P-134	Pipe Status	Open
Calibration F 3	Upper Res SSP	Hydraulic Grade (ft)	445
Calibration F 3	P-405	Pipe Status	Open

Observed Data During Flow			
Field Data Set	Element	Attribute	Value
Calibration A	J-25	HGL	273.66
Calibration A	J-96	HGL	292.81
Calibration A	J-63	HGL	259.64
Calibration B	J-20	HGL	371
Calibration B	J-18	HGL	398
Calibration B	J-4	HGL	440.7
Calibration C	J-67	HGL	438
Calibration C	J-97	HGL	414.3
Calibration C	J-154	HGL	288.4
Calibration D	J-194	HGL	303
Calibration D	J-174	HGL	309.4
Calibration D	J-218	HGL	440.2
Calibration D	J-124	HGL	442.7
Calibration E	J-138	HGL	281.2
Calibration E	J-140	HGL	261.5
Calibration F	J-218	HGL	382
Calibration F	J-174	HGL	267.84
Calibration F	J-227	HGL	443.65
Calibration F	J-124	HGL	430.7
Calibration F 2	J-124	HGL	415
Calibration F 2	J-218	HGL	350
Calibration F 2	J-174	HGL	284
Calibration F 2	J-227	HGL	440
Calibration F 3	J-227	HGL	440
Calibration F 3	J-124	HGL	427
Calibration F 3	J-218	HGL	399
Calibration F 3	J-174	HGL	285

Calibration Demands		
Field Data Set	Element	Demand (gpm)
Calibration A	J-65	2,500.00
Calibration B	J-83	1,400.00
Calibration C	J-156	1,400.00
Calibration D	J-198	540
Calibration E	J-142	900
Calibration F	J-178	1,800.00
Calibration F 2	J-178	2,040.00
Calibration F 3	J-178	2,060.00

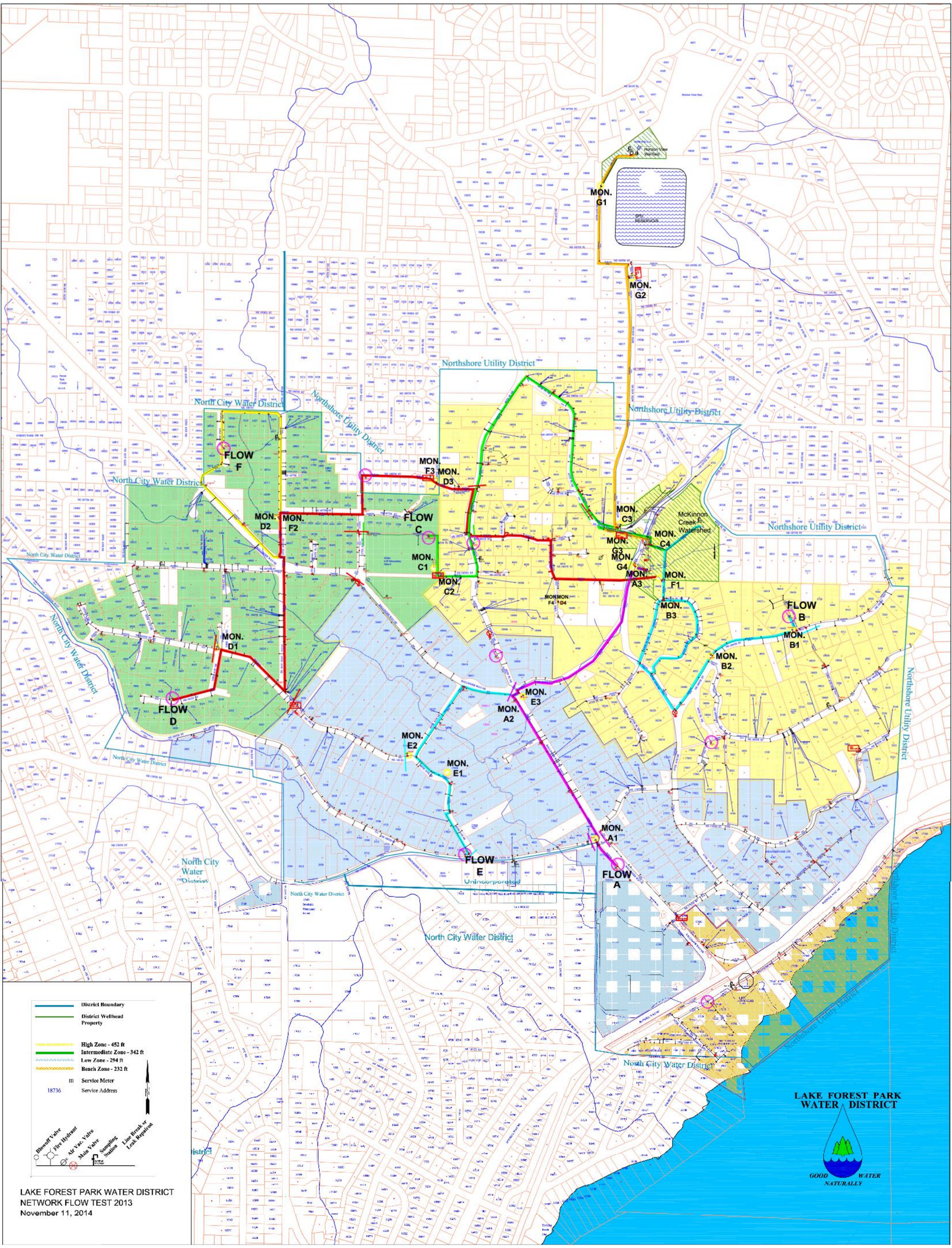
Model calibration study results.

Solution Simulated Results				
Field Data Snapshot	Junction	Observed HGL (ft)	Simulated HGL (ft)	Difference (ft)
Calibration A	J-63	259.64	260.51	0.87
Calibration A	J-25	273.66	277.02	3.36
Calibration A	J-96	292.81	291.13	-1.68
Calibration B	J-20	371	376.77	5.77
Calibration B	J-18	398	405.05	7.05
Calibration B	J-4	440.7	444.42	3.72
Calibration C	J-67	438	446.63	8.63
Calibration C	J-97	414.3	421.15	6.85
Calibration C	J-154	288.4	284.71	-3.69
Calibration D	J-194	303	294.24	-8.76
Calibration D	J-174	309.4	301.71	-7.69
Calibration D	J-218	440.2	433.12	-7.08
Calibration D	J-124	442.7	445.37	2.67
Calibration E	J-140	261.5	265.87	4.37
Calibration E	J-138	281.2	279.73	-1.47
Calibration F	J-124	430.7	435.06	4.36
Calibration F	J-218	382	387.6	5.6
Calibration F	J-174	267.84	270.17	2.33
Calibration F	J-227	443.65	446.45	2.8
Calibration F 2	J-124	415	414.85	-0.15
Calibration F 2	J-218	350	343.17	-6.83
Calibration F 2	J-174	284	286.82	2.82
Calibration F 2	J-227	440	439.21	-0.79
Calibration F 3	J-124	427	431.04	4.04
Calibration F 3	J-218	399	395.59	-3.41
Calibration F 3	J-174	285	287	2
Calibration F 3	J-227	440	441.03	1.03

Roughness Coefficient by Pipe Type	
Adjustment Group	Hazen-Williams C
12 Inch DI	115
8 Inch DI	130
6 Inch Steel	85
8 Inch PVC	125
8 Inch Steel	70
8 Inch HDPE	170
10 Inch HDPE	170
6 Inch AC	115
8 Inch AC	115
10 Inch DI	140

Model Fitness Statistics		
Snapshot	R Squared Pearson Coef.	Hydraulic Grade RMSE (ft)
Calibration A	0.9821	2.22
Calibration B	0.9988	5.68
Calibration C	1.0000	6.71
Calibration D	0.9977	6.95
Calibration E	1.0000	3.26
Calibration F	0.9997	3.99
Calibration F 2	0.9967	3.72
Calibration F 3	0.9980	2.87

3-G Network Model Calibration



3-G Network Model Calibration

APPENDIX 3 - H NETWORK MODEL – SIMULATED CAPACITIES

Current and Projected LFPWD Hydrant Capacity

Modeled November 11, 2014

							Current			*With Future Improvements*										
Hydrant Number	OLDID	Model Junction	Elevation (ft)	Zone	Hydraulic Grade (ft)	Pressure (psi)	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)		2020	change (gpm)	%	2025	change (gpm)	%	2033	change (gpm)	%		Total Change (gpm)
171ST4500	1	85	30	Beach Zone	195.46	71.6	1,082.40	20		1724.18	641.78	59.29	1723.92	-0.26	0.00	1723.51	-0.41	-0.02		641.11
175ST4640	10	52	74	Low Zone	284.08	90.9	2,277.30	53.3		3500	1,222.70	53.69	3500	0.00	0.00	3500	0	0.00		1,222.70
178ST3859	88	142	66	Low Zone	284.45	94.5	2,557.27	46.9		3044.1	486.83	19.04	3500	455.90	14.98	3500	0	0.00		942.73
178ST4400	89	39	63	Low Zone	284.44	95.8	2,668.19	20		3452.73	784.54	29.40	3500	47.27	1.37	3500	0	0.00		831.81
178ST4420		63	66	Low Zone	284.44	94.5	3,500.00	67.1		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
178ST4663	20	60	126	Low Zone	284.21	68.5	2,572.14	33.1		3500	927.86	36.07	3500	0.00	0.00	3500	0	0.00		927.86
178ST4748	14	57	146	Low Zone	284.09	59.7	1,515.67	20		1856.48	340.81	22.49	3304.18	1,447.70	77.98	3346.64	42.46	1.29		1,830.97
178ST5026	16	42	172	Low Zone	284.07	48.5	1,537.72	20		2183.65	645.93	42.01	3017.17	833.52	38.17	3051.61	34.44	1.14		1,513.89
178ST5050	17	237	185	Low Zone	284.06	42.9	1,309.96	20		1890.33	580.37	44.30	2197.51	307.18	16.25	2238.57	41.06	1.87		928.61
178ST5084	18	237	185	Low Zone	284.06	42.9	1,309.96	20		1890.33	580.37	44.30	2197.51	307.18	16.25	2238.57	41.06	1.87		928.61
180ST3023	84	148	118	Low Zone	284.4	72	850.57	20.1		1365.01	514.44	60.48	1408.03	43.02	3.15	3357.58	1949.55	138.46		2,507.01
180ST3531	85	148	118	Low Zone	284.4	72	850.57	20.1		1365.01	514.44	60.48	1408.03	43.02	3.15	3357.58	1949.55	138.46		2,507.01
180ST3570	86	144	78	Low Zone	284.41	89.3	968.13	41.7		2275.43	1,307.30	135.03	2564.49	289.06	12.70	3500	935.51	36.48		2,531.87
180ST3722	87	144	78	Low Zone	284.41	89.3	968.13	41.7		2275.43	1,307.30	135.03	2564.49	289.06	12.70	3500	935.51	36.48		2,531.87
180ST4910	30	18	224	High Zone	435.78	91.6	1,551.88	65.9		1550.81	-1.07	-0.07	1361.98	-188.83	-12.18	1361.85	-0.13	-0.01		-190.03
180ST4942	31	9	257	High Zone	435.74	77.3	1,451.05	30.9		1410.92	-40.13	-2.77	1242.01	-168.91	-11.97	1287.63	45.62	3.67		-163.42
180ST5011		31	264	High Zone	435.74	74.3	1,440.87	26		1396.57	-44.30	-3.07	1229.78	-166.79	-11.94	1280.04	50.26	4.09		-160.83
180ST5050	33	214	285	High Zone	435.74	65.2	1,322.26	20		1325.72	3.46	0.26	1173.76	-151.96	-11.46	1247.93	74.17	6.32		-74.33
180ST5306	37	28	305	High Zone	435.74	56.6	1,216.59	23		1286.38	69.79	5.74	1154.44	-131.94	-10.26	1199.26	44.82	3.88		-17.33
180ST5422	39	36	312	High Zone	435.73	53.5	883.71	20		1221.61	337.90	38.24	1114.56	-107.05	-8.76	1199.17	84.61	7.59		315.46
181ST3035	77	198	180	Intermediate	342.57	70.3	840.63	24.3		1864.3	1,023.67	121.77	1857.13	-7.17	-0.38	2530.42	673.29	36.25		1,689.79
182ST3007	74	204	148	Intermediate	342.59	84.2	1,724.23	38.2		1997.14	272.91	15.83	1974.19	-22.95	-1.15	2789.46	815.27	41.30		1,065.23
182ST3300	76	194	190	Intermediate	342.6	66	2,447.20	20		2784.44	337.24	13.78	2720.81	-63.63	-2.29	3030.8	309.99	11.39		583.60
182ST3356	78	192	151	Intermediate	342.61	82.9	3,222.32	35.4		3494	271.68	8.43	3431.76	-62.24	-1.78	3500	68.24	1.99		277.68
182ST3534		235	143	Low Zone	284.48	61.2	2,631.26	20		2765.38	134.12	5.10	2850.55	85.17	3.08	3060.23	209.68	7.36		428.97
182ST3574		140	109	Low Zone	284.48	75.9	3,500.00	28.4		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
182ST3816		140	109	Low Zone	284.48	75.9	3,500.00	28.4		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
184ST4932		18	224	High Zone	435.78	91.6	1,551.88	65.9		1550.81	-1.07	-0.07	1361.98	-188.83	-12.18	1361.85	-0.13	-0.01		-190.03
184ST5025		20	286	High Zone	435.75	64.8	1,285.44	38.8		1306.97	21.53	1.67	1153.83	-153.14	-11.72	1221.71	67.88	5.88		-63.73
184ST5222	39	59	306	High Zone	435.75	56.1	1,269.59	23.3		1292.44	22.85	1.80	1141.36	-151.08	-11.69	1212.59	71.23	6.24		-57.00
185ST18500	56	219	168	Intermediate	343.34	75.9	3,317.89	20		3382.94	65.05	1.96	3337.95	-44.99	-1.33	3471.98	134.03	4.02		154.09
185ST3007	72	188	182	Intermediate	342.62	69.5	2,257.86	20.9		2713.75	455.89	20.19	2652.77	-60.98	-2.25	3243.77	591	22.28		985.91
185ST3211	71	184	148	Intermediate	342.63	84.2	2,640.77	34		3035.34	394.57	14.94	2972.34	-63.00	-2.08	3462.86	490.52	16.50		822.09
185ST3313	70	184	148	Intermediate	342.63	84.2	2,640.77	34		3035.34	394.57	14.94	2972.34	-63.00	-2.08	3462.86	490.52	16.50		822.09
185ST3844		154	168	High Zone	435.27	115.6	2,889.85	30.8		2889.88	0.03	0.00	2717.06	-172.82	-5.98	2693.28	-23.78	-0.88		-196.57
185ST4024	42	37	212	High Zone	435.44	96.7	2,053.84	20		2052.81	-1.03	-0.05	1967.24	-85.57	-4.17	2693.36	726.12	36.91		639.52
186ST18604	44	114	231	High Zone	435.72	88.6	3,068.03	42.5		3068.26	0.23	0.01	2974.44	-93.82	-3.06	2567.89	-406.55	-13.67		-500.14
186ST4001	43	112	208	High Zone	435.64	98.5	2,889.94	51.7		2889.88	-0.06	0.00	2717.17	-172.71	-5.98	2693.42	-23.75	-0.87		-196.52
186ST4308	46	118	260	High Zone	435.83	76.1	3,422.76	33.8		3417.4	-5.36	-0.16	3498.3	80.90	2.37	3437.56	-60.74	-1.74		14.80
186ST4500		93	256	High Zone	435.88	77.8	3,500.00	44.6		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
187PL18727	52	100	289	High Zone	436.04	63.6	3,061.47	23.3		3061.89	0.42	0.01	2959.46	-102.43	-3.35	3006.26	46.8	1.58		-55.21
187PL4427	53	102	272	High Zone	436.04	71	2,752.99	20		2753.29	0.30	0.01	2607.19	-146.10	-5.31	2673.39	66.2	2.54		-79.60
187ST18704	54	97	312	High Zone	436.25	53.8	3,177.80	20		3179.12	1.32	0.04	3106.8	-72.32	-2.27	3270.33	163.53	5.26		92.53
187ST3704	60	158	159	Intermediate	342.71	79.5	3,500.00	33.8		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
187ST3730	58	160	180	Intermediate	342.71	70.4	2,715.59	20		2795.22	79.63	2.93	2736.96	-58.26	-2.08	2766.86	29.9	1.09		51.27
188ST3705		162	173	Intermediate	342.71	73.4	3,493.09	23.8		3500	6.91	0.20	3500	0.00	0.00	3500	0	0.00		6.91
188ST3753		218	210	High Zone	435.68	97.6	2,733.40	34.8		2733.35	-0.05	0.00	2501.18	-232.17	-8.49	2490.57	-10.61	-0.42		-242.83
29PL18233	75	206	190	Intermediate	342.59	66	1,608.33	20		1801.65	193.32	12.02	1801.08	-0.57	-0.03	2328.28	527.2	29.27		719.95
30AV18204	75	23	173	Intermediate	342.59	73.4	2,139.46	27.4		2625.81	486.35	22.73	2563.84	-61.97	-2.36	3085.15	521.31	20.33		945.69
30AV3001		202	175	Intermediate	342.59	72.5	2,091.35	26.5		2563.94	472.59	22.60	2503.5	-60.44	-2.36	3057.67	554.17	22.14		966.32
33AV18902	63	178	148	Intermediate	342.66	84.2	3,277.23	20.5		3361.46	84.23	2.57	3333.81	-27.65	-0.82	3500	166.19	4.98		222.77
35AV18250	79	192	151	Intermediate	342.61	82.9	3,222.32	35.4		3494	271.68	8.43	3431.76	-62.24	-1.78	3500	68.24	1.99		277.68
35AV18450	67	170	124	Intermediate	342.65	94.6	3,500.00	47		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
35AV18535	61	174	141	Intermediate	342.66	87.3	3,500.00	34.1		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
35AV18727	62	176	158	Intermediate	342.66	79.9	3,094.20	20		3169.9	75.70	2.45	3138.3	-31.60	-1.00	3273.99	135.69	4.32		179.79
36PL18521		168	139	Intermediate	342.66	88.1	3,472.77	20		3500	27.23	0.78	3500	0.00	0.00	3500	0	0.00		27.23
37AV18500	58	238	143	Intermediate	342.69	86.4	3,500.00	36.8		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
37AV3705	57	156	155	Intermediate	342.73	81.2	3,500.00	36		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
40AV17846		142	66	Low Zone	284.45	94.5	2,557.27	46.9		3044.1	486.83	19.04	3500	455.90	14.98	3500	0	0.00		942.73
40AV18236		138	92	Low Zone	284.54	83.3	3,500.00	50.3		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
40AV18250	64	138	92	Low Zone	284.54	83.3	3,500.00	50.3		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
40AV7868		140	109	Low Zone	284.48	75.9	3,500.00	28.4		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
40PL18411	40	131	137	Low Zone	284.61	63.9	3,473.87	20		3500	26.13	0.75	3500	0.00	0.00	3500	0	0.00		26.13
40PL18476	41	130	182	High Zone	435.42	109.6	2,889.56	39.7		2889.59	0.03	0.00	2482.95	-406.64	-14.07	2693.42	210.47	8.48		-196.14
40PL18622	48	112	208	High Zone	435.64	98.5	2,889.94	51.7		2889.88	-0.06	0.00	2717.17	-172.71	-5.98	2693.42	-23.75	-0.87		-196.52
40PL18729	55	108	223	High Zone	435.68	92	2,733.20	35.7		2733.25	0.05	0.00	2501.3	-231.95	-8.49	2490.51	-10.79	-0.43		-242.69
40PL18906		241	253	High Zone	435.71	79	2,566.91	20		2565.54	-1.37	-0.05	2399.08	-166.46	-6.49	2393.15	-5.93	-0.25		-173.76
40PL18908	49	240	245	High Zone	435.71	82.5	2,644.04	38.1		2641.88	-2.16	-0.08	2399.08	-242.80	-9.19	2393.17	-5.91	-0.25		-250.87
40PL18952	50	104	308	High Zone	435.82	55.3	2,329.62	20		2327.89	-1.73	-0.07	2091.49	-236.40	-10.16	2090.75	-0.74	-0.04		-238.87
43AV18492	47	124	250	High Zone	435.86	80.4	3,464.66	20		3465.5	0.84	0.02	3500	34.50	1.00	3500	0	0.00		35.34
43AV18532	45	122	268	High Zone	435.84	72.6	2,289.44	20		2288.59	-0.85	-0.04	2150.49	-138.10	-6.03	2181.72	31.23	1.45		-107.72
45PL18922	51	104	308	High Zone	435.82	55.3	2,329.62	20		2327.89	-1.73	-0.07	2091.49	-236.40	-10.16	2090.75	-0.74	-0.04		-238.87
45PL4510		104	308	High Zone	435.82	55.3	2,329.62	20		2327.89	-1.73	-0.07	2091.49	-236.40	-10.16	2090.75	-0.74	-0.04		-238.87
47AV17114	2	11	31	Beach Zone	195.46	71.2	1,124.12	20		1922.56	798.44	71.03	1929.95	7.39	0.38	1927.27	-2.68	-0.14		803.15
47AV17440	11	50	67	Low Zone	284.07	93.9	1,653.14	59.6		2412.3	759.16	45.92	3500	1,087.70	45.09	3500	0	0.00		1,846.86
47AV17547	13	58	104	Low Zone	284.15	77.9	2,369.54	44.2		3500	1,130.46	47.71	3500	0.00	0.00	3500	0	0.00		1,130.46
47AV18360	27	6	228	High Zone	435.87	89.9	2,865.83	62.9		2866.91	1.08	0.04	2664.95	-201.96	-7.04	2666.69	1.74	0.07		-199.14
47AV18400	24	16	180	High Zone	435.83	110.7	1,999.35	84.9		1998.03	-1.32	-0.07	1746.32	-251.71	-12.60	1745.35	-0.97	-0.06		-254.00
47PL18225	29	12	212	High Zone	435.87	96.9	2,865.43	28.1		2867.09	1.66	0.06	2664.56	-202.53	-7.06	2666.29	1.73	0.06		-199.14
47PL18340	28	95	220	High Zone	435.87	93.4	2,865.83	42.8		2866.92	1.09	0.04	2664.95	-201.97	-7.04	2666.69	1.74	0.07		-199.14
47PL18417	25	6	228	High Zone	435.87	89.9	2,865.83	62.9		2866.91	1.08	0.04	2664.95	-201.96	-7.04	2666.69	1.74	0.07		-199.14
47PL18453	26	4	279	High Zone	435.9	67.9	3,500.00	46.7		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
49PL5011	32	55	240	High Zone	435.74	84.7	1,440.87	28.6		1396.58	-44.29	-3.07	1229.71	-166.87	-11.95	1279.33	49.62	4.04		-161.54
51PL18407		83	306	High Zone	435.75	56.1	1,285.47	28.6		1307.01	21.54	1.68	1153.4	-153.61	-11.75	1221.27	67.87	5.88		-64.20
53AV18035	38	51	330	High Zone	435.75	45.8	1,205.53	20		1233.14	27.61	2.29	1091.09	-142.05	-11.52	1173.01	81.92	7.51		-32.52
BALLWY17851		135	74	Low Zone	284.48	91.1	3,500.00	66.5		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
BALWY17425		89	50	Low Zone	283.73	101.1	2,062.75	20.9		3500	1,437.25	69.68	3500	0.00	0.00	3500	0	0.00		1,437.25
BALWY17510	9	68	58	Low Zone	283.81	97.7	2,234.37	20		3500	1,265.63	56.64	3500	0.00	0.00	3500	0	0.00		1,265.63
BALWY17576	19	5	70	Low Zone	284.43	92.8	3,500.00	64.3		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
BALWY17711	94	65	65	Low Zone	284.44	94.9	3,500.00	64		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
BALWY18211		134	98	Low Zone	284.54	80.7	3,500.00	61.1		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
BALWY18242	25	25	117	Low Zone	284.6	72.5	3,500.00	57.2		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
BALWY18251		101	114	Low Zone	284.59	73.8	3,500.00	58.1		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
BALWY18455	65	152	135	Low Zone	284.53	64.7	711.44	20		3500	2,788.56	391.96	3500	0.00	0.00	3500	0	0.00		2,788.56
BALWY18487	66	164	138	Intermediate	342.67	88.6	3,500.00	39.3		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
BALWY18500NE	92	156	155	Intermediate	342.73	81.2	3,500.00	36		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
BALWY18500S	90	239	140	Intermediate	342.69	87.7	1,978.01	20		1977.54	-0.47	-0.02	1927.44	-50.10	-2.53	1938.47	11.03	0.57		-39.54
BALWY18535	68	172	126	Intermediate	342.66	93.7	3,500.00	43.7		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
BALWY18709	69	182	150	Intermediate	342.66	83.4	3,500.00	21.7		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
BALWY4616	8	215	45	Beach Zone	195.49	65.1	1,176.87	20.1		2384.17	1,207.30	102.59	2402.53	18.36	0.77	2400.14	-2.39	-0.10		1,223.27
BEADR17220	3	78	28	Beach Zone	195.46	72.5	1,146.74	21.3		2026.54	879.80	76.72	2035.72	9.18	0.45	2033.24	-2.48	-0.12		886.50
BEADR17301	4	74	30	Beach Zone	195.47	71.6	1,177.62	21.3		2220.9	1,043.28	88.59	2233.99	13.09	0.59	2231.78	-2.21	-0.10		1,054.16
BEADR17360	5	74	30	Beach Zone	195.47	71.6	1,177.62	21.3		2220.9	1,043.28	88.59	2233.99	13.09	0.59	2231.78	-2.21	-0.10		1,054.16
BEADR17500	6	75	26	Beach Zone	195.47	73.3	1,132.76	20		1916.84	784.08	69.22	1923.96	7.12	0.37	1921.37	-2.59	-0.13		788.61
BEADR17753	93	76	26	Beach Zone	195.47	73.3	1,068.08	20		1612.97	544.89	51.02	1612.77	-0.20	-0.01	1612.46	-0.31	-0.02		544.38
BOTWY4626	7	74	30	Beach Zone	195.47	71.6	1,177.62	21.3		2220.9	1,043.28	88.59	2233.99	13.09	0.59	2231.78	-2.21	-0.10		1,054.16
BREAV4700	0	88	23	Beach Zone	195.46	74.6	1,111.24	20.4		1819.06	707.82	63.70	1824.61	5.55	0.31	1821.83	-2.78	-0.15		710.59
FERLN4777	12	44	130	Low Zone	284.07	66.7	1,571.54	36.3		2252.51	680.97	43.33	3186.44	933.93	41.46	3225.84	39.4	1.24		1,654.30
FERLN5017		87	125	Low Zone	284.07	68.8	1571.55	35.4		2252.51	680.96	43.33	3186.72	934.21	41.47	3225.83	39.11	1.23		1,654.28
TWNCNTR17535		234	47	Low Zone	284.44	102.7	3500	56.5		3500	0.00	0.00	3500	0.00	0.00	3500	0	0.00		0.00
WEALN4767	15	56	122	Low Zone	284.08	70.1	1115.66	20		1224.11	108.45	9.72	3036.45	1,812.34	148.05	3056.17	19.72	0.65		1,940.51

3-H Network Model Simulated Capacities

APPENDIX 3 - I NETWORK MODEL – PUMP CURVES

McKINNON CRK WELLS 1,2

2/7

DEEP WELL SUBMERSIBLE TURBINE

CURVE No. ST2375A

LIQUID END WEIGHTS

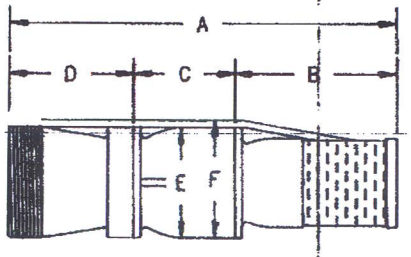
DESCRIPTION	WEIGHT LBS.	HP RATING	MOTOR FLANGE
ONE STAGE L.E.	55.8	5-20	6"
ONE STAGE L.E.			
ONE STAGE L.E.			
EACH ADDED STAGE	19.4	ALL	ALL

IMPELLER DATA

TYPE: ENCLOSED EYE AREA 5.76 Sq. In.
THRUST CONSTANT K 1.83 Lbs./Ft of HEAD.

HP	IMPELLER No.	STAGES	IMPELLER Dia.
20	S39551	5	3.75"
15	S39550	4	3.69"
10	S39549	3	3.50"
7.5	S39550	2	3.69"
5.0	S39548	2	3.19"

OUTLINE DIMENSIONS



A- ONE STAGE LIQUID END LENGTH
B- SUCTION CONNECTION LENGTH
C- STAGE LENGTH
D- DISCHARGE CONNECTION LENGTH
E- BOWL DIAMETER
F- DIAMETER ACROSS LEAD GUARD

BOWL DATA

BOWL No. M04461 PUMP SHAFT Dia. 1"
TYPE: THREADED DISCHARGE SIZE 4"NPT

NOTE: For each additional stage add 'C'

A	B	C	D	E	F	HP RATING	MOTOR FLANGE
19.63	11.00	5.00	3.63	5.38	5.81	5-20	6"

4/7

BERKELEY PUMPS

Submersible Turbine Components Program

6T Series Pump Staging

	HP	Pump Model	Catalog Number	Total Stage(s)	Primary Trim			Secondary Trim		
					Qty.	Impeller #	Diameter	Qty.	Impeller #	Diameter
					Trim angle all dia = 32°					
	5	6T5-275	B76718	1	1	M11668*	4.526x3.88			
	7.5	6T7.5-275	B76719	2	2	M11893	4.25x3.56			
	10	6T10-275	B76720	3	3	M11895	4.16x3.46			
	15	6T15-275	B76721	4	1	M11668*	4.526x3.88	3	M11893	4.25x3.56
275 GPM	20	6T20-275	B76722	5	4	M11668*	4.526x3.88	1	M11895	4.16x3.46
	25	6T25-275	B76723	6	6	M11668*	4.526x3.88			
	30	6T30-275	B76724	7	7	M11668*	4.526x3.88			
	40	6T40-275	B76725	9	9	M11668*	4.526x3.88			
	50	6T50-275	B76726	12	12	M11668*	4.526x3.88			
	60	6T60-275	B76727	14	14	M11668*	4.526x3.88			
					Trim angle all dia = 26°					
	7.5	6T7.5-325	B76728	2	2	L07733	4.25x3.63			
	10	6T10-325	B76729	3	3	P5-32DG	4.156x3.53			
	15	6T15-325	B76730	4	2	P5-32DL*	4.438x3.84	2	L07733	4.25x3.63
325 GPM	20	6T20-325	B76731	6	2	P5-32DL*	4.438x3.84	4	P5-32DG	4.156x3.53
	25	6T25-325	B76732	7	4	P5-32DL*	4.438x3.84	3	P5-32DG	4.156x3.53
	30	6T30-325	B76733	8	8	P5-32DL*	4.438x3.84			
	40	6T40-325	B76734	10	10	P5-32DL*	4.438x3.84			
	50	6T50-325	B76735	13	13	P5-32DL*	4.438x3.84			
	60	6T60-325	B76736	15	15	P5-32DL*	4.438x3.84			

*Full diameter impeller

(NEWEST VERSION) IMPELLER TRIMS
6T 20-275 5 STG
BOTTOM 4 STGS @
4.526 x 3.88
TOP STG @
4.16 x 3.46

5/7

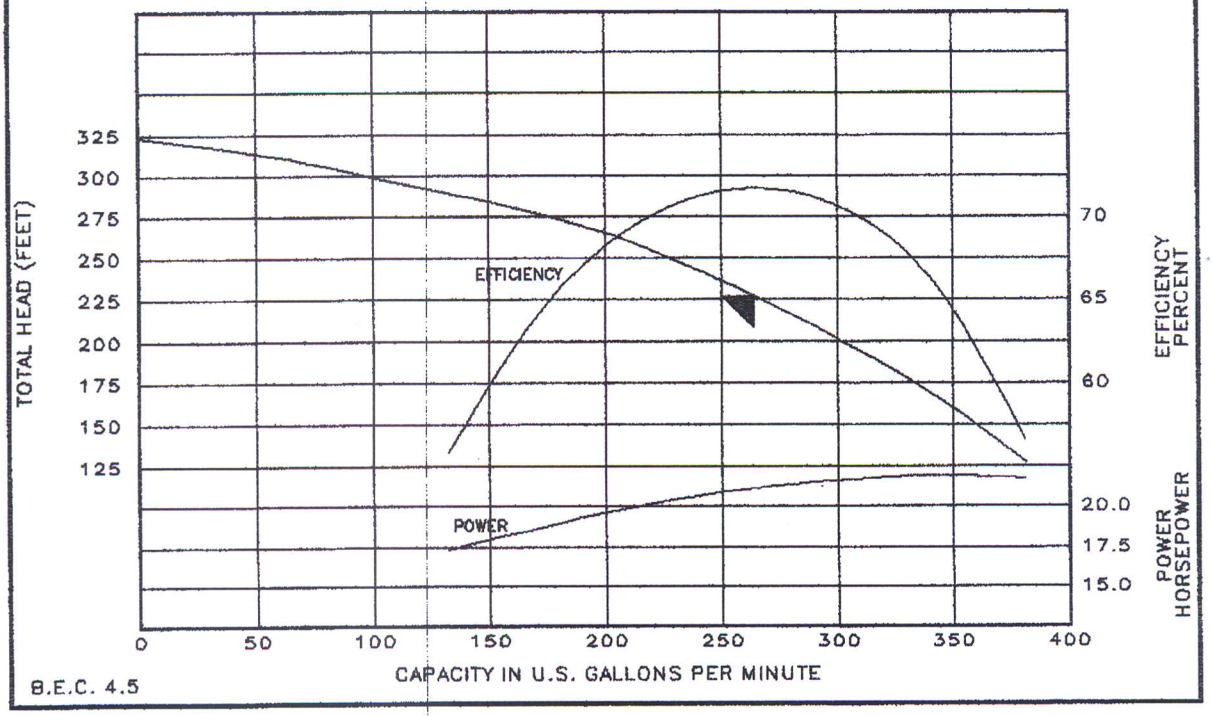
BERKELEY®

SUBMERSIBLE TURBINE

6T20-275

Hp: 20.0
Nominal RPM 3500

Based on Fresh Water @ 68 deg. F



B.E.C. 4.5

SELECTION CONDITIONS

Flow:	264.6 GPM	Total Dynamic Head:	227.1 feet

PUMP DESCRIPTION

Pump Model:	6T20-275	Discharge:	4"NPT
Stages:	5		
Materials:	Stainless Steel Impellers, Cast Iron Bowls		

PUMP PERFORMANCE

Flow:	264.6 GPM	Power:	21.1 BHP
Total Dynamic Head:	227.1 feet	Efficiency:	71.7%
Speed:	3500 RPM	Best Eff:	71.7 @ 264.6 GPM
Shut-Off Head:	323.4 feet	Max Power:	21.9 BHP

MOTOR

Size:	20 HP	Motor Diameter:	6"

PRICE/ORDER INFORMATION

Catalog No.:	B76722
Weight:	133 lbs.

QUOTED BY:

MARK BJORKLUND
MITCHELL LEWIS AND STAVER CO.
IRRIGATION DIVSION
29117 SW KINSMAN,WILSONVILLE
OR.97070.FAX#5036826113

QUOTED TO:

BEST EFF CURVE

09/25/2003 09:06 5036820529 MITCHELL LEWIS STAVE PAGE 05

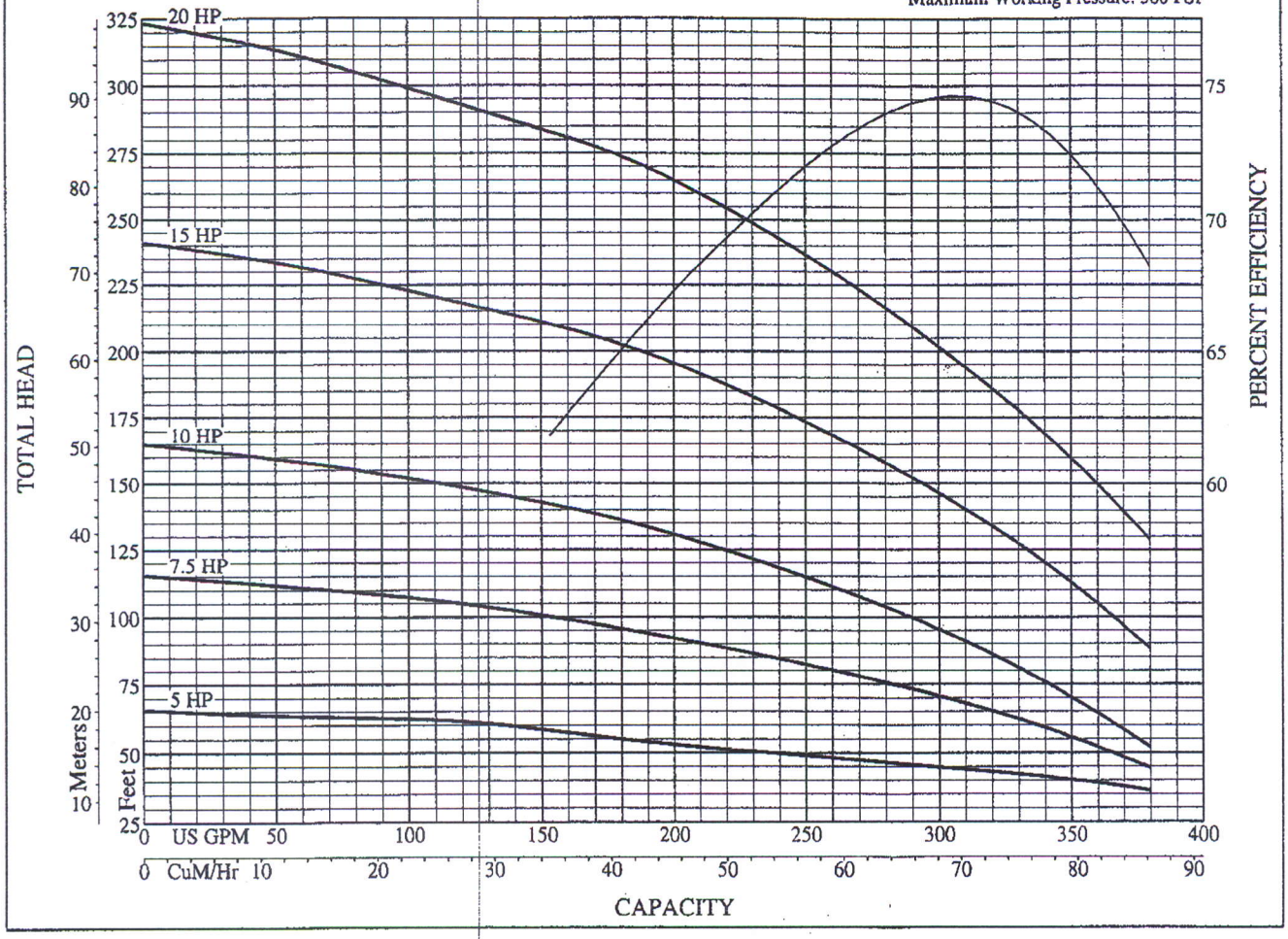
BERKELEY®

SUBMERSIBLE TURBINE

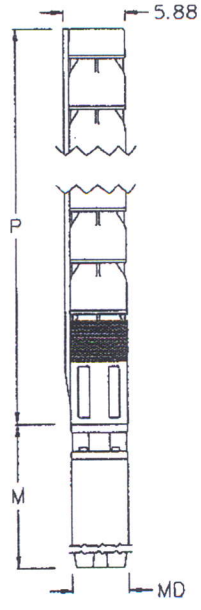
6T-275 6/7

NEWEST PUBLISHED CURVE

Nominal RPM: 3450
Based on Fresh Water @ 68° F.
Maximum Working Pressure: 580 PSI



OUTLINE DIMENSIONS / WEIGHTS



HP	stages	Motor size	P length	M* length	MD* dia.	Mtr. wt.	Pump wt.
5	1	6"	18.98	25.44	5.38	105	56
7.5	2	6"	23.98	28.00	5.38	120	75
10	3	6"	28.98	30.56	5.38	135	95
15	4	6"	33.98	33.13	5.38	146	114
20	5	6"	38.98	30.56	5.38	135	133

Note: dimensions = inches; weight = U.S. lbs.

M* Maximum length (Franklin Electric Motor)
MD* Motor diameter (Franklin Electric Motor)

SPECIFICATIONS

Minimum Well I.D.	6.0 Inches
Minimum Submergence @ BEP (above inlet)	10.0 Feet
Capacity Range	125 – 380 GPM
Discharge	4" F NPT
See manufacturer's data for motor cooling requirements	

SUPERSEDES
All Previous

Date 04/15/96
Section ST
Page 15.01

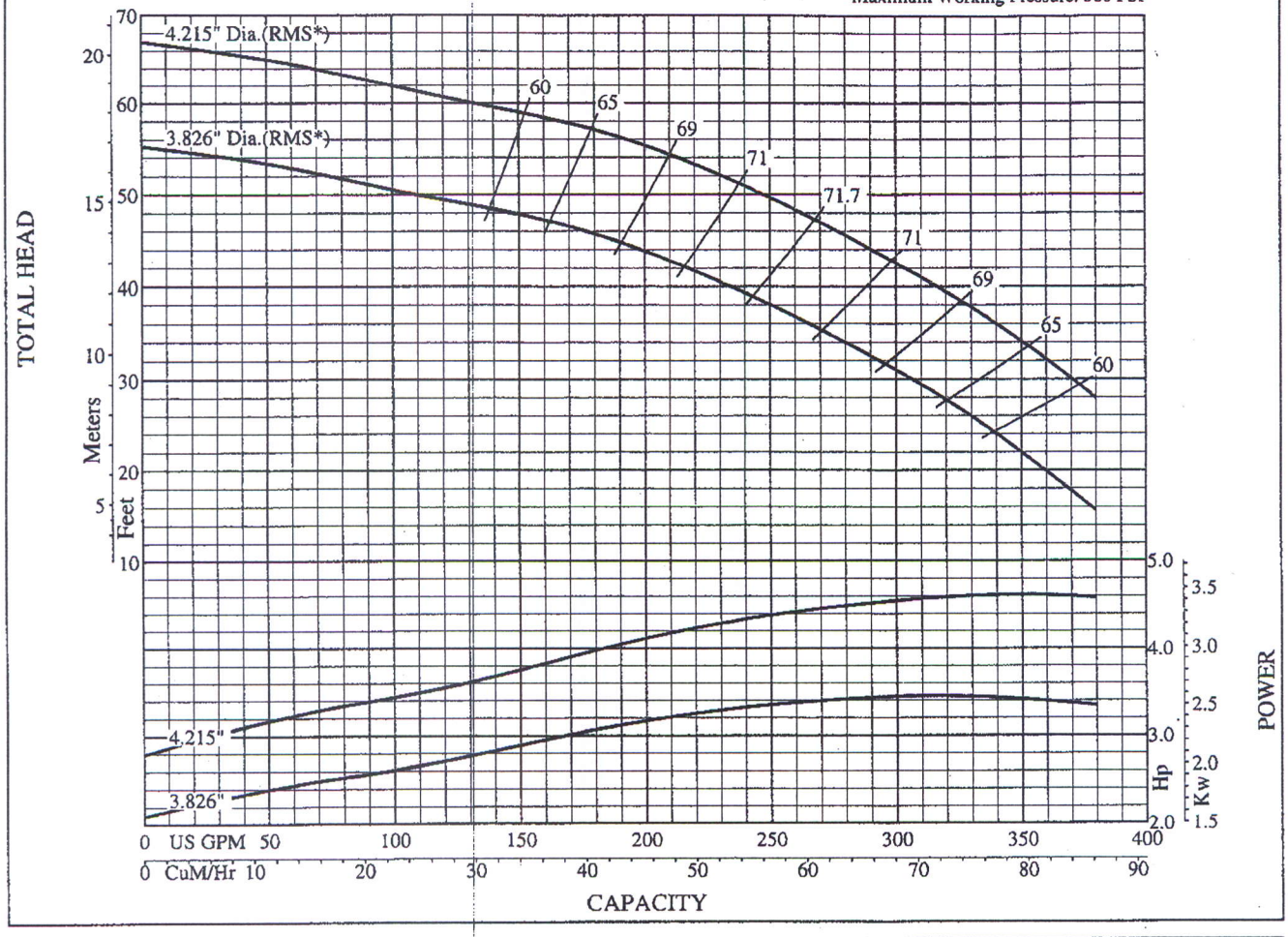
09/25/2003 09:06 5036820529 MITCHELL LEWIS STAVE PAGE 06

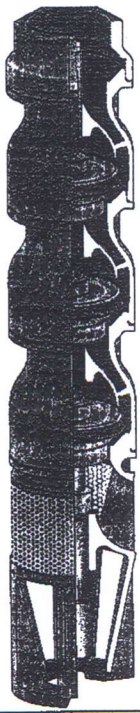
BERKELEY®

SUBMERSIBLE TURBINE
SINGLE STAGE PERFORMANCE

6T-275

Nominal RPM: 3450
Based on Fresh Water @ 68° F.
Maximum Working Pressure: 580 PSI

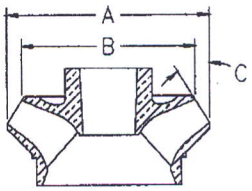




IMPELLER DIMENSIONS

RMS* Diameter	A Diameter	B Diameter	C Angle
4.215	4.526	3.880	32°
3.826	4.160	3.460	32°

* Root–Mean–Square



MATERIALS OF CONSTRUCTION

Part Name	Common Material Name	Material Spec Number
Discharge Adapter	Cast Iron	ASTM A48 Class 30
Top Bowl	Cast Iron	ASTM A48 Class 30
Intermediate Bowl	Cast Iron	ASTM A48 Class 30
Bearings, Top and Suction Case	Bronze	ASTM B144–3B (SAE 660)
Impeller	Silicon Bronze	ASTM B584 UNS C87500
Pump Shaft	Stainless Steel	AISI 416
Impeller Collets	Steel	1226
Suction Bracket	Cast Iron	ASTM A48 Class 30
Bowl Bearing	Rubber	Neoprene
Sand Cap	Bronze	ASTM B144–3B (SAE 660)
Strainer	Stainless Steel	AISI 302 UNS S30200
Cable Guard	Stainless Steel	AISI 302 UNS S30200
Shaft Coupling	Stainless Steel	AISI 416 UNS S41600

Note: Efficiency based on average staging

SUPERSEDES
All Previous

Date 04/15/96
Section ST
Page 15.02

09/25/2003 09:06 5036820529 MITCHELL LEWIS STAVE PAGE 07

Pump Performance Datasheet

Customer	: Lake Forest Park Water District	Quote number	:
Customer reference	: Brightwater Backup Wells	Size	: 7T40-350
Item number	: 1	Stages	: 6
Service	:	Based on curve number	: 7T40-350(6@5.39x4.75)
Quantity	: 2	Date last saved	: 07 Mar 2012 3:50 PM

Operating Conditions

Flow, rated	: 300.0 USgpm
Differential head / pressure, rated (requested)	: 391.8 ft
Differential head / pressure, rated (actual)	: 391.9 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Frequency	: 60 Hz

Performance

Speed, rated	: 3,450 rpm
Impeller diameter, rated	: 5.07 in
Impeller diameter, maximum	: 5.07 in
Impeller diameter, minimum	: 5.07 in
Efficiency	: 73.28 %
NPSH required / margin required	: - / 0.00 ft
nq (imp. eye flow) / S (imp. eye flow)	: N/A Metric units
MCSF	: 130.0 USgpm
Head, maximum, rated diameter	: 589.7 ft
Head rise to shutoff	: N/A %
Flow, best eff. point (BEP)	: 343.5 USgpm
Flow ratio (rated / BEP)	: 87.35 %
Diameter ratio (rated / max)	: 100.00 %
Head ratio (rated dia / max dia)	: 100.00 %
Cq/Ch/Ce [ANSI/HI 9.6.7-2004]	: 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Liquid

Liquid type	: --Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids concentration, by volume	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.00 psi.a

Material

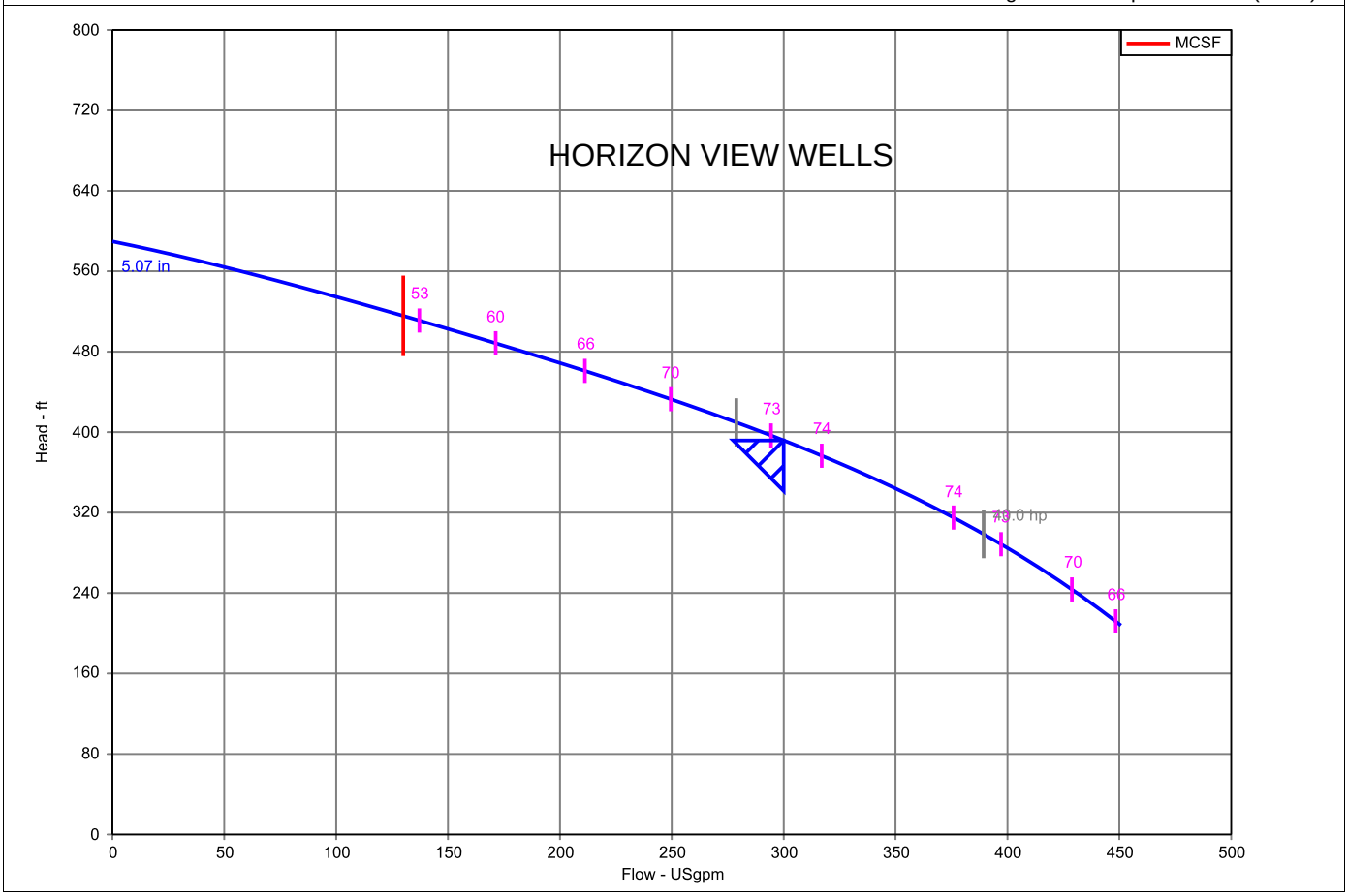
Material selected	: Not specified

Pressure Data

Maximum working pressure	: 255.3 psi.g
Maximum allowable working pressure	: 550.0 psi.g
Maximum allowable suction pressure	: N/A
Hydrostatic test pressure	: N/A

Driver & Power Data

Driver sizing specification	: Rated power
Margin over specification	: 0.00 %
Service factor	: 1.15 (used)
Power, hydraulic	: 29.69 hp
Power, rated	: 40.51 hp
Power, maximum, rated diameter	: 40.78 hp
Minimum recommended motor rating	: 40.00 hp / 29.83 kW (Fixed)



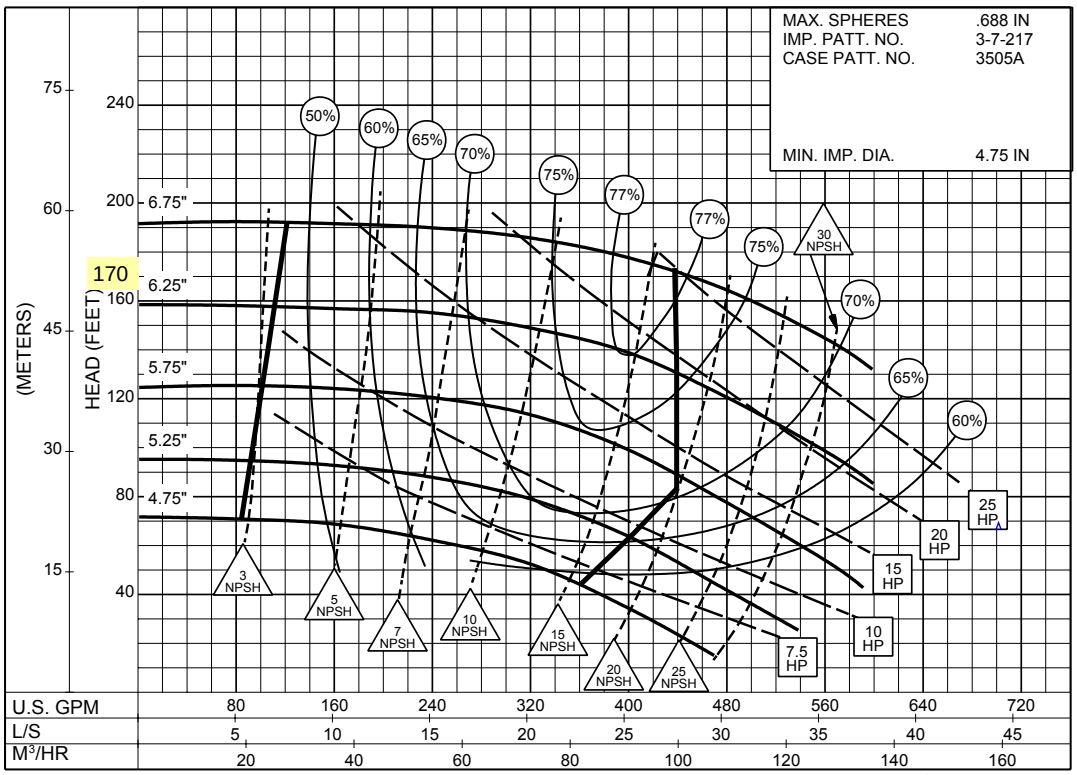
2-1/2 x 3 x 7B
SERIES 340 OR 360

TRANSFER PUMPS

ENCLOSED IMPELLER

Supersedes Section 340/360 Page 415
Dated January 1986

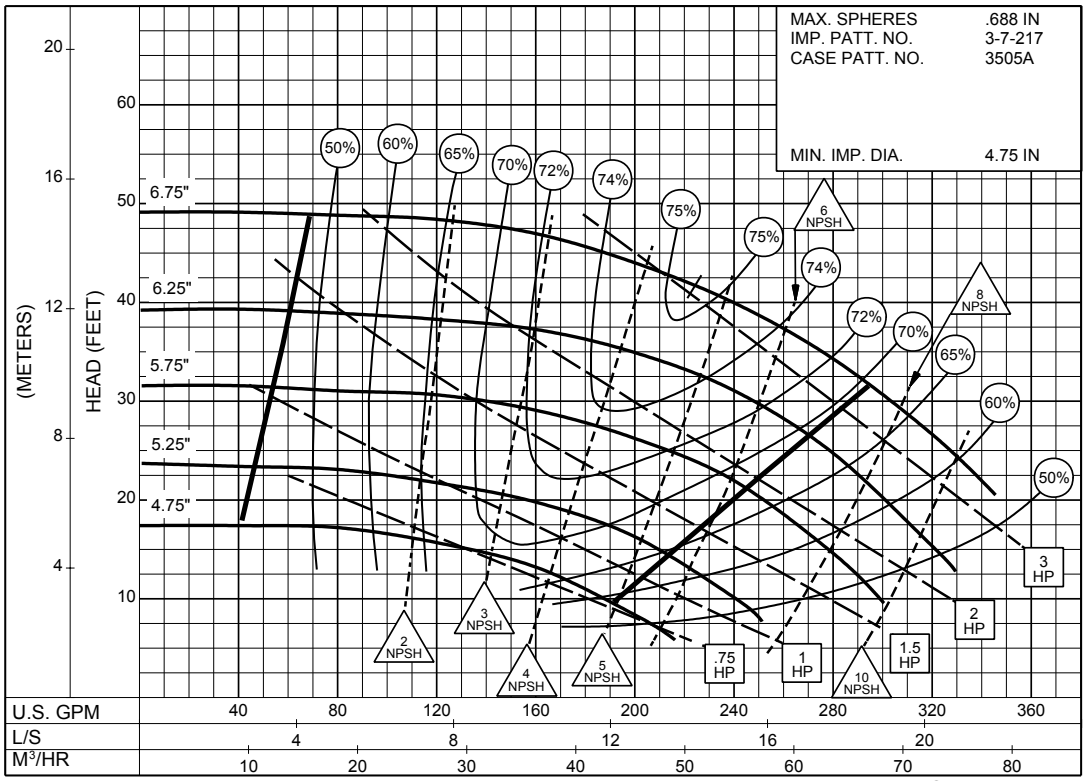
SIZE : 2-1/2x3x7B **TYPE : 340/360** **IMPELLER : Enclosed** **R. P. M. : 3500**



3PC-116292

3500 RPM

SIZE : 2-1/2x3x7B **TYPE : 340/360** **IMPELLER : Enclosed** **R. P. M. : 1750**



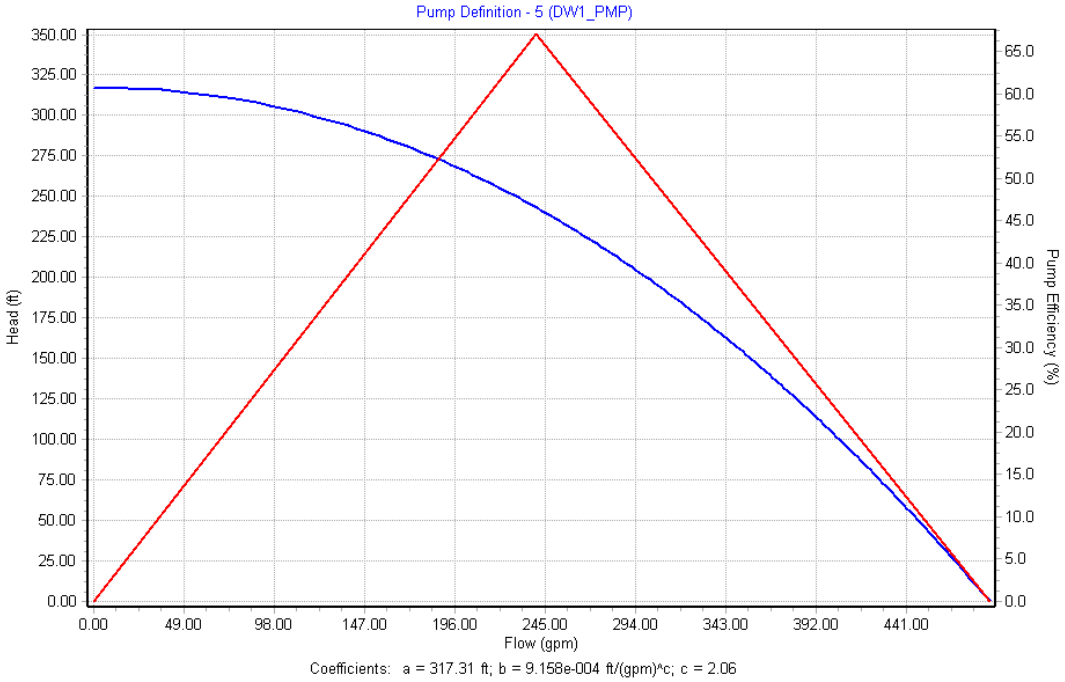
3PC-116293

1750 RPM

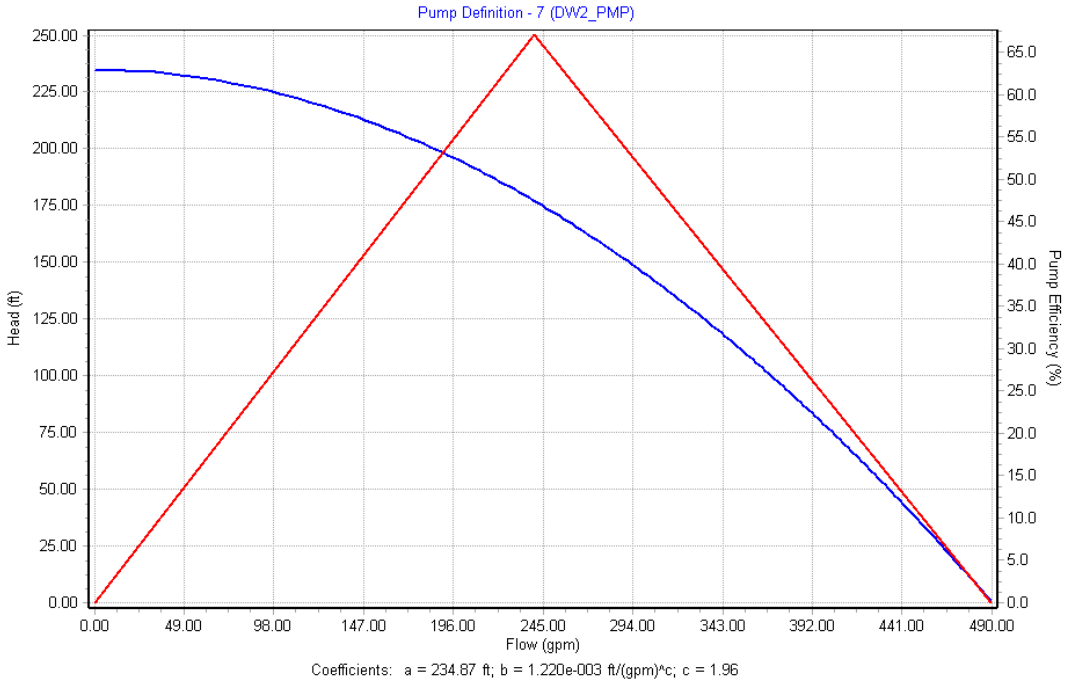
AURORA®
Pentair Pump Group

Network Model Pump Curves – 2014 (efficiency in red where available)

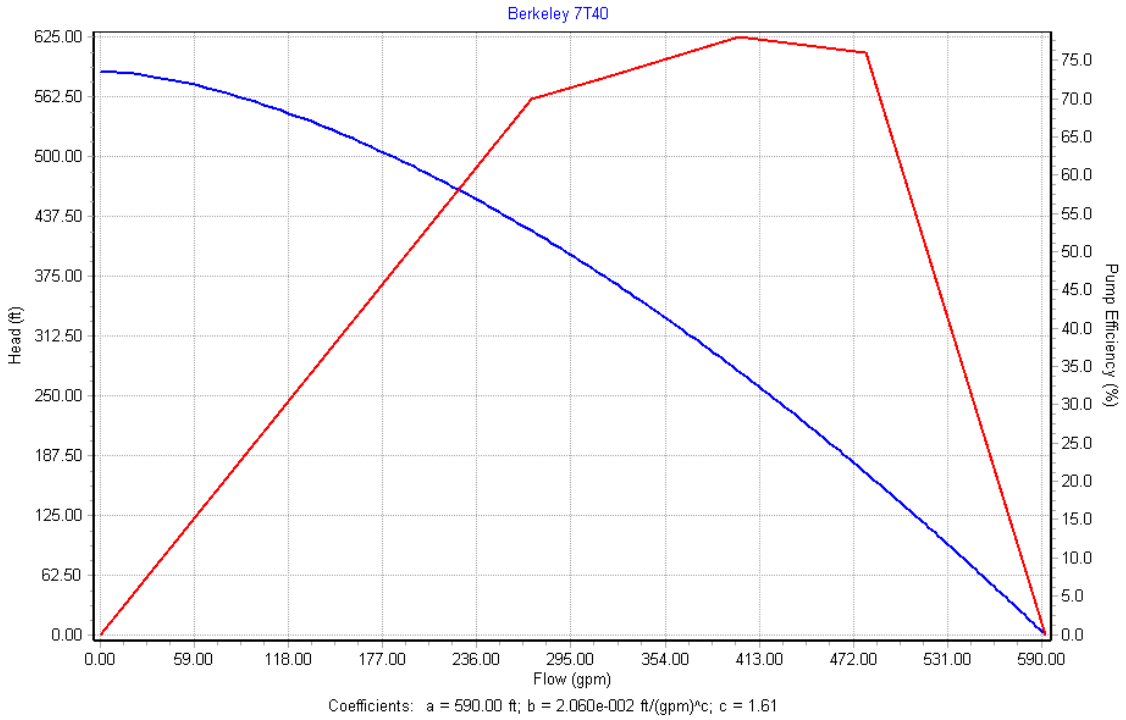
Deep Well #1 Pump



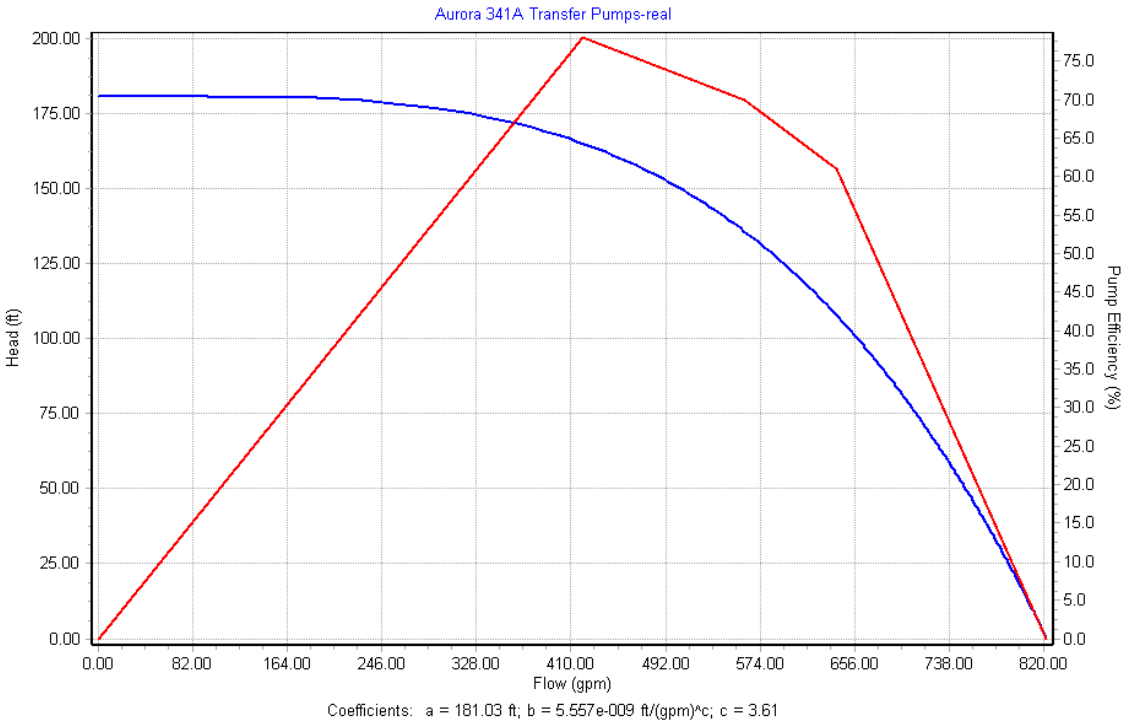
Deep Well #2 Pump



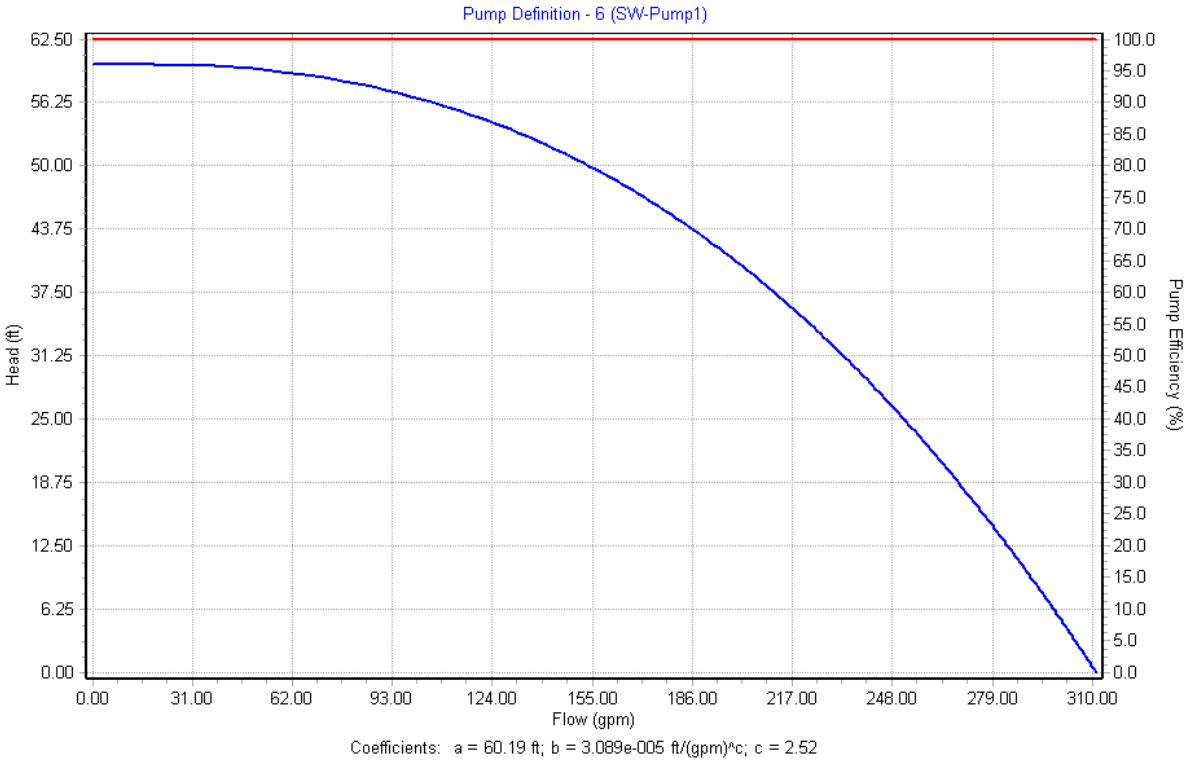
Horizon View Deep Wells



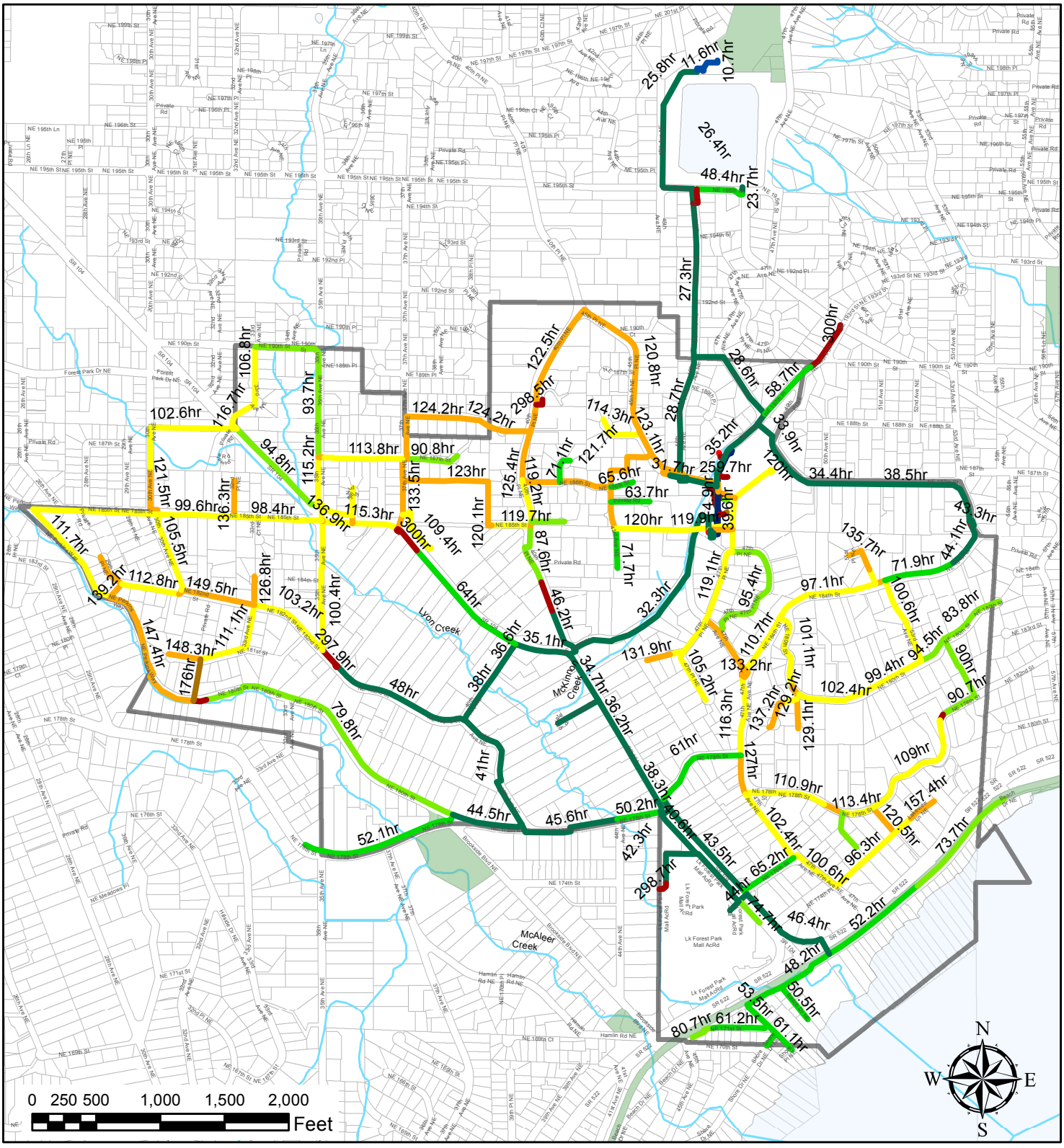
High Zone Transfer Pumps



Artesian Wells Sump Pump



APPENDIX 3 - J NETWORK MODEL – WATER AGE WITH PROPOSED IMPROVEMENTS



Water Age in 2033 System
LFPWD calculated water age, waternetwork after 2033 improvements with 300hr trial.

Updated Nov. 2015

LAKE FOREST PARK WATER DISTRICT

GOOD WATER, NATURALLY!

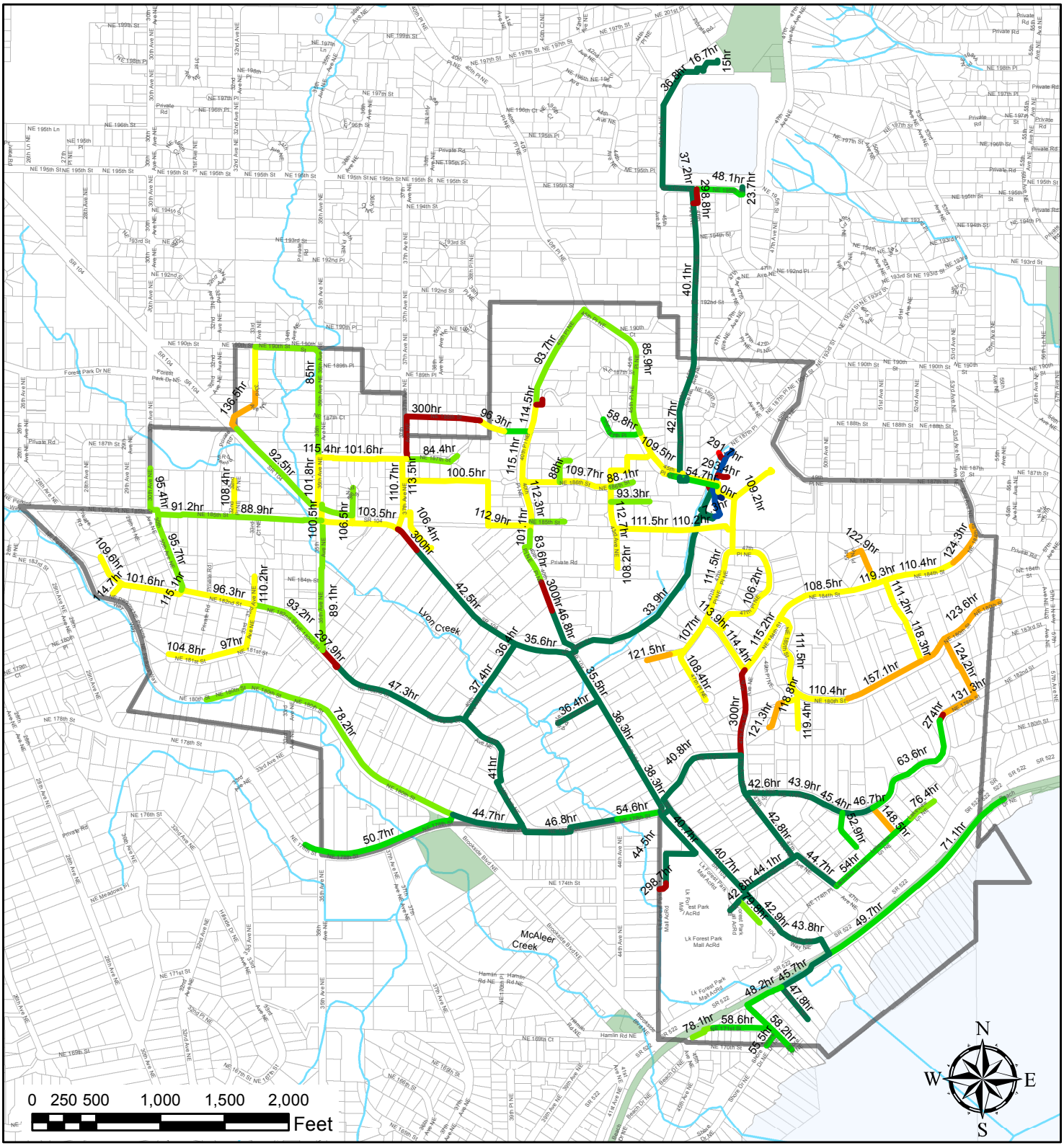
Legend

Max Age 300hr Trial

- 0-5hr
- 5-12hr
- 12-48hr
- 48-72hr
- 72-96hr
- 96-120hr
- 120-168hr
- 168-196hr
- 196-250hr
- 250-300hr

Boundary

- LFPWD
- Park



Water Age in Existing System
LFPWD calculated water age, existing waternetwork with 300hr trial.

Updated Nov. 2015

LAKE FOREST PARK WATER DISTRICT

GOOD WATER, NATURALLY!

Legend

Max Age 300hr Trial

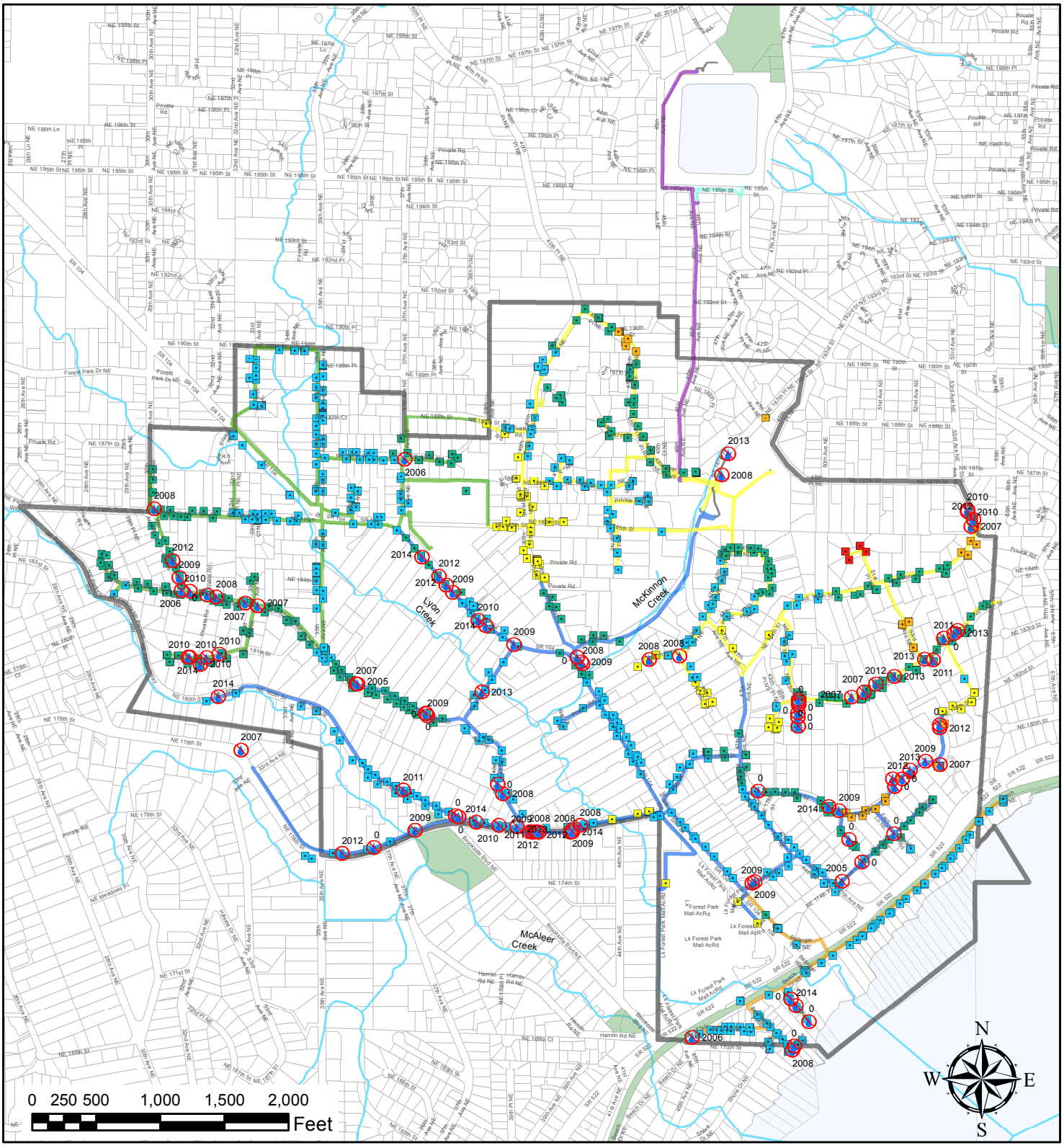
- 0-5hr
- 5-12hr
- 12-48hr
- 48-72hr
- 72-96hr
- 96-120hr
- 120-168hr
- 168-196hr
- 196-250hr
- 250-300hr

Boundary

- LFPWD
- Park

APPENDIX 3 - K MAP OF SERVICE PRESSURES AND MAIN REPAIRS

3-K Service Pressures and Main Repairs



Map of Service Pressures and Main Repairs
LFPWD calculated service pressure at meters, and ten year record of main repairs.

Updated Nov. 2015

LAKE FOREST PARK WATER DISTRICT

GOOD WATER, NATURALLY!

Legend

Meters-PSI
- 40 - 50 psi
- 50 - 60 psi
- 60 - 80 psi
- 80 - 100 psi
- 100 - 130 psi

Boundary
- LFPWD
- Park
- Leak

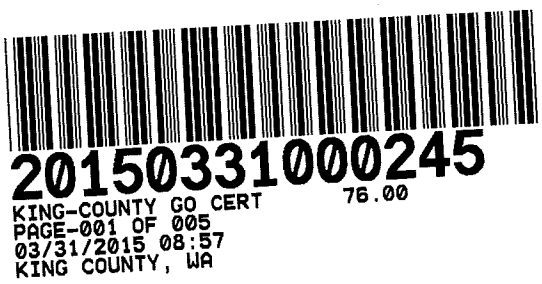
Network Pressure Zone
- Beach Zone
- ExemptPress
- High Zone
- Horizon_View
- Intermediate Zone
- Low Zone
- SPU Tolt
- Well Zone

APPENDIX 4 - WATER RIGHTS, CONSERVATION, RELIABILITY

APPENDIX 4 - A WATER RIGHTS DOCUMENTS INCLUDING TABLE 4

4-A Water Rights

LAKE FOREST PARK WATER DIST
4029 NE 178TH STREET
LAKE FOREST PARK, WA 98155



DOCUMENT TITLE: SUPERSEDING CERTIFICATE OF WATER RIGHT

REFERENCE NUMBER:

GRANTOR
STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
ECOLOGY NORTHWEST REGIONAL OFFICE (ECY NWRO)
3190 - 160TH AVE SE
BELLEVUE, WASHINGTON 98008-5452
(425) 649-7000

GRANTEE
LAKE FOREST PARK WATER DIST
4029 NE 178TH STREET
LAKE FOREST PARK, WA 98155

LEGAL DESCRIPTION

Source Name	Parcel	Township	Range	Sec	QQ Q
WELLS		26 N	04 E	3	SW SE SW NE

AUTHORIZED PLACE OF USE
The place of use (POU) of this water right is the service area described in the most recent Water System Plan/Small Water System Management Program approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

PARCELS: 4022906570, 4027700071

ADDITIONAL LEGAL IS ON PAGE 2 OF ATTACHED DOCUMENT

4-A Water Rights

File NR CG1-*00835S
WR Doc ID 5281789

State of Washington
Department of Ecology

SUPERSEDING CERTIFICATE OF WATER RIGHT

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, but is limited to an amount actually beneficially used.

This certificate supersedes Water Right Certificate 767 issued on October 22, 1948, and is subject to the following provisions.

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
April 1, 1940	835		767-D

MAILING ADDRESS
LAKE FOREST PARK WATER DIST
4029 NE 178TH STREET
LAKE FOREST PARK WA 98155

SITE ADDRESS (IF DIFFERENT)

Legal Description Continues on Page 2

Quantity Authorized for Withdrawal or Diversion

WITHDRAWAL OR DIVERSION RATE	UNITS	ANNUAL QUANTITY (AF/YR)
100	GPM	162

Purpose

PURPOSE	WITHDRAWAL OR DIVERSION RATE			ANNUAL QUANTITY (AF/YR)		PERIOD OF USE (mm/dd)
	ADDITIVE	NON-ADDITIVE	UNITS	ADDITIVE	NON-ADDITIVE	
Municipal Supply	100		GPM	162		01/01 - 12/31

IRRIGATED ACRES		PUBLIC WATER SYSTEM INFORMATION	
ADDITIVE	NON-ADDITIVE	WATER SYSTEM ID	CONNECTIONS
		40950	867

Source Location

COUNTY	WATERBODY	TRIBUTARY TO	WATER RESOURCE INVENTORY AREA
KING	GROUNDWATER		8-CEDAR-SAMMAMISH

SOURCE	PARCEL	WELL TAG(s)	TWP	RNG	SEC	QQ Q	LATITUDE	LONGITUDE
Well 1	4022906570	AFJ001	26N	4E	3	SWSE	47°45'51.49"N	122°16'44.05"W
Well 2	4022906570	AFJ002	26N	4E	3	SWSE	47°45'51.43"N	122°16'45"W
Well 3	4022906570	AFJ003	26N	4E	3	SWSE	47°45'47.87"N	122°16'46.27"W
Well 4	4022906570	AFJ004	26N	4E	3	SWSE	47°45'46.96"N	122°16'43.68"W
Well 5	4027700071	BAM 416	26N	4E	3	SWNE	47°46'20.84"N	122°16'48.72"W
Well 6	4027700071	BAM 417	26N	4E	3	SWNE	47°46'20.76"N	122°16'49.89"W

Datum: NAD83/WGS84

Place of Use

PARCELS (NOT LISTED FOR SERVICE AREAS)

LEGAL DESCRIPTION OF AUTHORIZED PLACE OF USE

The place of use (POU) of this water right is the service area described in the most recent Water System Plan/Small Water System Management Program approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

Measurement of Water Use

How often must water use be measured?	Weekly
How often must water use data be reported to Ecology?	Annually (Jan 31)
What volume should be reported?	Total Monthly and Annual Volume
What rate should be reported?	Monthly Peak Rate of Withdrawal (gpm)

Provisions

Wells, Well Logs and Well Construction Standards

All wells constructed in the state must meet the construction requirements of WAC 173-160 titled "Minimum Standards for the Construction and Maintenance of Wells" and RCW 18.104 titled "Water Well Construction". Any well which is unusable, abandoned, or whose use has been permanently discontinued, or which is in such disrepair that its continued use is impractical or is an environmental, safety or public health hazard must be decommissioned.

All wells must be tagged with a Department of Ecology unique well identification number. If you have an existing well and it does not have a tag, please contact the well-drilling coordinator at the

regional Department of Ecology office issuing this decision. This tag must remain attached to the well. If you are required to submit water measuring reports, reference this tag number.

Installation and maintenance of an access port as described in WAC 173-160- 291(3) is required.

Wellfield Limitations
The six well sources listed above shall be operated as a wellfield. The three groundwater rights, G1-*00835S (Certificate 767-D), G1-*05680C (Certificate 4019-A), and G1-*08167C (Certificate 5839-A) may be supplied by any one or combination of wells 1 through 6 so long as the well or wells is/are capable of sustainable operating at the rate required to provide the quantity at which it is operating.

The source limitation summarized below are based on the 2005 Water System Plan source capacity reporting by the districts and the 2009 well completion report on Wells 5 and 6 by Max Wells of Robinson Noble. Please note that in the case of wells 5 and 6, the maximum rates of withdrawal when both wells are operating is 250 gpm and 150 gpm for wells 5 and 6 respectively.

Wellfield Source Limitations				
SOURCE	A|S	WITHDRAWAL RATE	ANNUAL QUANTITY (AF/YR)	PERIOD OF USE (mm/dd)
Well 1		300	484	01/01 - 12/31
Well 2		300	484	01/01 - 12/31
Well 3		350	565	01/01 - 12/31
Well 4	S	340	548	01/01 - 12/31
Well 5		300	484	01/01 - 12/31
Well 6		250	403	01/01 - 12/31

A|S: A=Alternate; S=Standby/Reserve

Measurements, Monitoring, Metering and Reporting
An approved measuring device must be installed and maintained for each of the sources identified by this water right in accordance with WAC 173-173 "Requirements for Measuring and Reporting Water Use", which describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition the Department of Ecology for modifications to some of the requirements.

Water use for each source shall be recorded at a minimum frequency of once per week, the maximum rate of withdrawal for each source shall also be recorded for each month, and they both shall be submitted annually to Ecology via the Internet no later than January 30th of each year.

Department of Ecology personnel, upon presentation of proper credentials, will have access at reasonable times, to the project location, and to inspect at reasonable times, records of water use, wells, diversions, measuring devices and associated distribution systems for compliance with water law.

Given under my hand and the seal of this office at Bellevue, Washington, this 24th day of March, 2015.

Maia Bellon, Director
Department of Ecology

DATA REVIEW
OK DB

Tom Buroker, Section Manager
Northwest Regional Office
Water Resources Program

To request ADA accommodation including materials in a format for the visually impaired, call Ecology Water Resources Program at 360-407-6872. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341

4-A Water Rights

LAKE FOREST PARK WATER DIST
4029 NE 178TH STREET
LAKE FOREST PARK, WA 98155



DOCUMENT TITLE: SUPERSEDING CERTIFICATE OF WATER RIGHT

REFERENCE NUMBER:

GRANTOR
STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
ECOLOGY NORTHWEST REGIONAL OFFICE (ECY NWRO)
3190 - 160TH AVE SE
BELLEVUE, WASHINGTON 98008-5452
(425) 649-7000

GRANTEE
LAKE FOREST PARK WATER DIST
4029 NE 178TH STREET
LAKE FOREST PARK, WA 98155

LEGAL DESCRIPTION

Source Name	Parcel	Township	Range	Sec	QQ Q
WELLS		26 N	04 E	3	SW SE SW NE

AUTHORIZED PLACE OF USE
The place of use (POU) of this water right is the service area described in the most recent Water System Plan/Small Water System Management Program approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

PARCELS: 4022906570, 4027700071

ADDITIONAL LEGAL IS ON PAGE 2 OF ATTACHED DOCUMENT

4-A Water Rights

File NR CG1-*05680C
WR Doc ID 5281779

State of Washington
Department of Ecology

SUPERSEDING CERTIFICATE OF WATER RIGHT

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, but is limited to an amount actually beneficially used.

This certificate supersedes Water Right Certificate 4019 issued on September 21, 1961, and is subject to the following provisions.

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
July 26, 1960	5680	5388	4019-A

MAILING ADDRESS
LAKE FOREST PARK WATER DIST
4029 NE 178TH STREET
LAKE FOREST PARK WA 98155

SITE ADDRESS (IF DIFFERENT)

Legal Description Continues on Page 2

Quantity Authorized for Withdrawal or Diversion

WITHDRAWAL OR DIVERSION RATE	UNITS	ANNUAL QUANTITY (AF/YR)
440	GPM	704

Purpose

PURPOSE	WITHDRAWAL OR DIVERSION RATE			ANNUAL QUANTITY (AF/YR)		PERIOD OF USE (mm/dd)
	ADDITIVE	NON-ADDITIVE	UNITS	ADDITIVE	NON-ADDITIVE	
Municipal Supply	440		GPM	704		01/01 - 12/31

IRRIGATED ACRES		PUBLIC WATER SYSTEM INFORMATION	
ADDITIVE	NON-ADDITIVE	WATER SYSTEM ID	CONNECTIONS
		40950	876

Source Location

COUNTY	WATERBODY	TRIBUTARY TO	WATER RESOURCE INVENTORY AREA
KING	GROUNDWATER		8-CEDAR-SAMMAMISH

SOURCE	PARCEL	WELL TAG(s)	TWP	RNG	SEC	QQ Q	LATITUDE	LONGITUDE
Well 1	4022906570	AFJ001	26N	4E	3	SWSE	47°45'51.49"N	122°16'44.05"W
Well 2	4022906570	AFJ002	26N	4E	3	SWSE	47°45'51.43"N	122°16'45"W
Well 3	4022906570	AFJ003	26N	4E	3	SWSE	47°45'47.87"N	122°16'46.27"W
Well 4	4022906570	AFJ004	26N	4E	3	SWSE	47°45'46.96"N	122°16'43.68"W
Well 5	4027700071	BAM 416	26N	4E	3	SWNE	47°46'20.84"N	122°16'48.72"W
Well 6	4027700071	BAM 417	26N	4E	3	SWNE	47°46'20.76"N	122°16'49.89"W

Datum: NAD83/WGS84

Place of Use

PARCELS (NOT LISTED FOR SERVICE AREAS)

LEGAL DESCRIPTION OF AUTHORIZED PLACE OF USE

The place of use (POU) of this water right is the service area described in the most recent Water System Plan/Small Water System Management Program approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

Measurement of Water Use

How often must water use be measured?	Weekly
How often must water use data be reported to Ecology?	Annually (Jan 31)
What volume should be reported?	Total Monthly and Annual Volume
What rate should be reported?	Monthly Peak Rate of Withdrawal (gpm)

Provisions

Wells, Well Logs and Well Construction Standards

All wells constructed in the state must meet the construction requirements of WAC 173-160 titled "Minimum Standards for the Construction and Maintenance of Wells" and RCW 18.104 titled "Water Well Construction". Any well which is unusable, abandoned, or whose use has been permanently discontinued, or which is in such disrepair that its continued use is impractical or is an environmental, safety or public health hazard must be decommissioned.

All wells must be tagged with a Department of Ecology unique well identification number. If you have an existing well and it does not have a tag, please contact the well-drilling coordinator at the

regional Department of Ecology office issuing this decision. This tag must remain attached to the well. If you are required to submit water measuring reports, reference this tag number.

Installation and maintenance of an access port as described in WAC 173-160- 291(3) is required.

Wellfield Limitations

The six well sources listed above shall be operated as a wellfield. The three groundwater rights, G1-*00835S (Certificate 767-D), G1-*05680C (Certificate 4019-A), and G1-*08167C (Certificate 5839-A) may be supplied by any one or combination of wells 1 through 6 so long as the well or wells is/are capable of sustainable operating at the rate required to provide the quantity at which it is operating.

The source limitation summarized below are based on the 2005 Water System Plan source capacity reporting by the districts and the 2009 well completion report on Wells 5 and 6 by Max Wells of Robinson Noble. Please note that in the case of wells 5 and 6, the maximum rates of withdrawal when both wells are operating is 250 gpm and 150 gpm for wells 5 and 6 respectively.

Wellfield Source Limitations

SOURCE	A|S	WITHDRAWAL RATE	ANNUAL QUANTITY (AF/YR)	PERIOD OF USE (mm/dd)
Well 1		300	484	01/01 - 12/31
Well 2		300	484	01/01 - 12/31
Well 3		350	565	01/01 - 12/31
Well 4	S	340	548	01/01 - 12/31
Well 5		300	484	01/01 - 12/31
Well 6		250	403	01/01 - 12/31

A|S: A=Alternate; S=Standby/Reserve

Measurements, Monitoring, Metering and Reporting

An approved measuring device must be installed and maintained for each of the sources identified by this water right in accordance with WAC 173-173 "Requirements for Measuring and Reporting Water Use", which describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition the Department of Ecology for modifications to some of the requirements.

Water use for each source shall be recorded at a minimum frequency of once per week, the maximum rate of withdrawal for each source shall also be recorded for each month, and they both shall be submitted annually to Ecology via the Internet no later than January 30th of each year.

Department of Ecology personnel, upon presentation of proper credentials, will have access at reasonable times, to the project location, and to inspect at reasonable times, records of water use, wells, diversions, measuring devices and associated distribution systems for compliance with water law.

Given under my hand and the seal of this office at Bellevue, Washington, this 24th day of March, 2015.

Maia Bellon, Director
Department of Ecology

DATA REVIEW
OK DB

Tom Buroker, Section Manager
Northwest Regional Office
Water Resources Program

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4-A Water Rights

LAKE FOREST PARK WATER DIST
4029 NE 178TH STREET
LAKE FOREST PARK, WA 98155



DOCUMENT TITLE: SUPERSEDING CERTIFICATE OF WATER RIGHT

REFERENCE NUMBER:

GRANTOR
STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
ECOLOGY NORTHWEST REGIONAL OFFICE (ECY NWRO)
3190 - 160TH AVE SE
BELLEVUE, WASHINGTON 98008-5452
(425) 649-7000

GRANTEE
LAKE FOREST PARK WATER DIST
4029 NE 178TH STREET
LAKE FOREST PARK, WA 98155

LEGAL DESCRIPTION

Source Name	Parcel	Township	Range	Sec	QQ Q
WELLS		26 N	04 E	3	SW SE SW NE

AUTHORIZED PLACE OF USE
The place of use (POU) of this water right is the service area described in the most recent Water System Plan/Small Water System Management Program approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

PARCELS: 4022906570, 4027700071

ADDITIONAL LEGAL IS ON PAGE 2 OF ATTACHED DOCUMENT

4-A Water Rights

File NR CG1-*08167C
WR Doc ID 5281769

State of Washington
Department of Ecology

SUPERSEDING CERTIFICATE OF WATER RIGHT

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, but is limited to an amount actually beneficially used.

This certificate supersedes Water Right Certificate 5839 issued on October 23, 1967, and is subject to the following provisions.

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
June 27, 1966	8167	8124	5839-A

MAILING ADDRESS
LAKE FOREST PARK WATER DIST
4029 NE 178TH STREET
LAKE FOREST PARK WA 98155

SITE ADDRESS (IF DIFFERENT)

Legal Description Continues on Page 2

Quantity Authorized for Withdrawal or Diversion

WITHDRAWAL OR DIVERSION RATE	UNITS	ANNUAL QUANTITY (AF/YR)
225	GPM	360*

*Qa non-additive, derived from additive Qa previously issued for Certificates 498-A, 767-D, and 4019-A

Purpose

PURPOSE	WITHDRAWAL OR DIVERSION RATE			ANNUAL QUANTITY (AF/YR)		PERIOD OF USE (mm/dd)
	ADDITIVE	NON-ADDITIVE	UNITS	ADDITIVE	NON-ADDITIVE	
Municipal Supply	225		GPM		360	01/01 - 12/31

IRRIGATED ACRES		PUBLIC WATER SYSTEM INFORMATION	
ADDITIVE	NON-ADDITIVE	WATER SYSTEM ID	CONNECTIONS
		40950	876

Source Location

COUNTY	WATERBODY	TRIBUTARY TO	WATER RESOURCE INVENTORY AREA
KING	GROUNDWATER		8-CEDAR-SAMMAMISH

SOURCE	PARCEL	WELL TAG(s)	TWP	RNG	SEC	QQ Q	LATITUDE	LONGITUDE
Well 1	4022906570	AFJ001	26N	4E	3	SWSE	47°45'51.49"N	122°16'44.05"W
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Well 5	4027700071	BAM 416	26N	4E	3	SWNE	47°46'20.84"N	122°16'48.72"W
Well 6	4027700071	BAM 417	26N	4E	3	SWNE	47°46'20.76"N	122°16'49.89"W

Datum: NAD83/WGS84

Place of Use

PARCELS (NOT LISTED FOR SERVICE AREAS)

LEGAL DESCRIPTION OF AUTHORIZED PLACE OF USE

The place of use (POU) of this water right is the service area described in the most recent Water System Plan/Small Water System Management Program approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

Measurement of Water Use

How often must water use be measured?	Weekly
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Provisions

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regional Department of Ecology office issuing this decision. This tag must remain attached to the well. If you are required to submit water measuring reports, reference this tag number.

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Wellfield Source Limitations

SOURCE	A|S	WITHDRAWAL RATE	ANNUAL QUANTITY (AF/YR)	PERIOD OF USE (mm/dd)
Well 1		300	484	01/01 - 12/31
Well 2		300	484	01/01 - 12/31
Well 3		350	565	01/01 - 12/31
Well 4	S	340	548	01/01 - 12/31
Well 5		300	484	01/01 - 12/31
Well 6		250	403	01/01 - 12/31

A|S: A=Alternate; S=Standby/Reserve

Measurements, Monitoring, Metering and Reporting

An approved measuring device must be installed and maintained for each of the sources identified by this water right in accordance with WAC 173-173 "Requirements for Measuring and Reporting Water Use", which describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition the Department of Ecology for modifications to some of the requirements.

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Department of Ecology personnel, upon presentation of proper credentials, will have access at reasonable times, to the project location, and to inspect at reasonable times, records of water use, wells, diversions, measuring devices and associated distribution systems for compliance with water law.

Given under my hand and the seal of this office at Bellevue, Washington, this 24th day of March, 2015.

Maia Bellon, Director
Department of Ecology

DATA REVIEW
OK

Tom Buroker, Section Manager
Northwest Regional Office
Water Resources Program

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4-A Water Rights

LAKE FOREST PARK WATER DIST
4029 NE 178TH STREET
LAKE FOREST PARK, WA 98155



DOCUMENT TITLE: SUPERSEDING CERTIFICATE OF WATER RIGHT

REFERENCE NUMBER:

GRANTOR
STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
ECOLOGY NORTHWEST REGIONAL OFFICE (ECY NWRO)
3190 - 160TH AVE SE
BELLEVUE, WASHINGTON 98008-5452
(425) 649-7000

GRANTEE
LAKE FOREST PARK WATER DIST
4029 NE 178TH STREET
LAKE FOREST PARK, WA 98155

LEGAL DESCRIPTION

Source Name	Parcel	Township	Range	Sec	QQ Q
SPRINGS/WELLS		26 N	04 E	3	SW SE SW NE

AUTHORIZED PLACE OF USE
The place of use (POU) of this water right is the service area described in the most recent Water System Plan/Small Water System Management Program approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

PARCELS: 4022906570, 4027700071

ADDITIONAL LEGAL IS ON PAGE 2 OF ATTACHED DOCUMENT

4-A Water Rights

File NR CS1-*01894C
WR Doc ID 5281798

State of Washington
Department of Ecology

SUPERSEDING CERTIFICATE OF WATER RIGHT

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, but is limited to an amount actually beneficially used.

This certificate supersedes Water Right Certificate 498 issued on May 4, 1931, and is subject to the following provisions.

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
October 1, 1926	1894	810	498

MAILING ADDRESS
LAKE FOREST PARK WATER DIST
4029 NE 178TH STREET
LAKE FOREST PARK WA 98155

SITE ADDRESS (IF DIFFERENT)

Legal Description Continues on Page 2

Quantity Authorized for Withdrawal or Diversion

WITHDRAWAL OR DIVERSION RATE	UNITS	ANNUAL QUANTITY (AF/YR)
0.464	CFS	336

Purpose

PURPOSE	WITHDRAWAL OR DIVERSION RATE			ANNUAL QUANTITY (AF/YR)		PERIOD OF USE (mm/dd)
	ADDITIVE	NON-ADDITIVE	UNITS	ADDITIVE	NON-ADDITIVE	
Municipal Supply	0.464		CFS	336		01/01 - 12/31

IRRIGATED ACRES		PUBLIC WATER SYSTEM INFORMATION	
ADDITIVE	NON-ADDITIVE	WATER SYSTEM ID	CONNECTIONS
		40950	867

4-A Water Rights

Source Location

COUNTY	WATERBODY	TRIBUTARY TO	WATER RESOURCE INVENTORY AREA
KING	Springs/Wells	Lake Washington	8-CEDAR-SAMMAMISH

SOURCE	PARCEL	WELL TAG(s)	TWP	RNG	SEC	QQ Q	LATITUDE	LONGITUDE
Siphon Wells 1 to 8	4022906570	AFJ005 to AFJ012	26N	4E	3	SWSE	47°45'51.15"N	122°16'45.91"W
Well 1	4022906570	AFJ001	26N	4E	3	SWSE	47°45'51.49"N	122°16'44.05"W
Well 2	4022906570	AFJ002	26N	4E	3	SWSE	47°45'51.43"N	122°16'45"W
Well 3	4022906570	AFJ003	26N	4E	3	SWSE	47°45'47.87"N	122°16'46.27"W
Well 4	4027700071	BAM416	26N	4E	3	SWNE	47°46'20.84"N	122°16'48.72"W
Well 5	4027700071	BAM 417	26N	4E	3	SWNE	47°46'20.76"N	122°16'49.89"W
Well 6								

Datum: NAD83/WGS84

Place of Use

PARCELS (NOT LISTED FOR SERVICE AREAS)

LEGAL DESCRIPTION OF AUTHORIZED PLACE OF USE

The place of use (POU) of this water right is the service area described in the most recent Water System Plan/Small Water System Management Program approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

Measurement of Water Use

How often must water use be measured?	Weekly
How often must water use data be reported to Ecology?	Annually (Jan 31)
What volume should be reported?	Total Monthly and Annual Volume
What rate should be reported?	Monthly Peak Rate of Withdrawal (gpm)

Provisions

Wells, Well Logs and Well Construction Standards

All wells constructed in the state must meet the construction requirements of WAC 173-160 titled "Minimum Standards for the Construction and Maintenance of Wells" and RCW 18.104 titled "Water Well Construction". Any well which is unusable, abandoned, or whose use has been permanently discontinued, or which is in such disrepair that its continued use is impractical or is an environmental, safety or public health hazard must be decommissioned.

All wells must be tagged with a Department of Ecology unique well identification number. If you have an existing well and it does not have a tag, please contact the well-drilling coordinator at the

regional Department of Ecology office issuing this decision. This tag must remain attached to the well. If you are required to submit water measuring reports, reference this tag number.

Installation and maintenance of an access port as described in WAC 173-160- 291(3) is required.

Wellfield Limitations

The six well sources and eight spring sources listed above shall be operated as a wellfield. The three groundwater rights, G1-*00835S (Certificate 767-D), G1-*05680C (Certificate 4019-A), and G1-*08167C (Certificate 5839-A) may be supplied by any one or combination of wells 1 through 6 so long as the well or wells is/are capable of sustainable operating at the rate required to provide the quantity at which it is operating. This water right, S1-*01894C (Certificate 498) may be utilized in whole or part through the six wells or through the eight spring sources.

The source limitation summarized below are based on the 2005 Water System Plan source capacity reporting by the districts and the 2009 well completion report on Wells 5 and 6 by Max Wells of Robinson Noble. Please note that in the case of wells 5 and 6, the maximum rates of withdrawal when both wells are operating is 250 gpm and 150 gpm for wells 5 and 6 respectively.

Wellfield Source Limitations

SOURCE	A|S	WITHDRAWAL RATE	ANNUAL QUANTITY (AF/YR)	PERIOD OF USE (mm/dd)
Siphon Wells 1 to 8		208 (0.464 CFS)	336	01/01 -12/31
Well 1		300	484	01/01 - 12/31
Well 2		300	484	01/01 - 12/31
Well 3		350	565	01/01 - 12/31
Well 4	S	340	548	01/01 - 12/31
Well 5		300	484	01/01 - 12/31
Well 6		250	403	01/01 - 12/31

A|S: A=Alternate; S=Standby/Reserve

The total quantities produced from all sources may not exceed the total quantity of Qi or Qa authorized by the four water rights currently issued to the LFPWD, namely 973 gallons per minute and 1,202 acre-feet per year.

Measurements, Monitoring, Metering and Reporting

An approved measuring device must be installed and maintained for each of the sources identified by this water right in accordance with WAC 173-173 "Requirements for Measuring and Reporting Water Use", which describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition the Department of Ecology for modifications to some of the requirements.

Water use for each source shall be recorded at a minimum frequency of once per week, the maximum rate of withdrawal for each source shall also be recorded for each month, and they both shall be submitted annually to Ecology via the Internet no later than January 30th of each year.

Department of Ecology personnel, upon presentation of proper credentials, will have access at reasonable times, to the project location, and to inspect at reasonable times, records of water use, wells, diversions, measuring devices and associated distribution systems for compliance with water law.

Given under my hand and the seal of this office at Bellevue, Washington, this 24th *day of* March, *2015.*

DEPARTMENT OF ECOLOGY STATE OF WASHINGTON

Maia Bellon, Director
Department of Ecology

DATA REVIEW
OK

Tom Buroker, Section Manager
Northwest Regional Office
Water Resources Program

To request ADA accommodation including materials in a format for the visually impaired, call Ecology Water Resources Program at 360-407-6872. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341

APPENDIX 5 SOURCE PROTECTION PROGRAM

APPENDIX 5 - A WELLFIELD ANALYSIS - CONVERSE CONS., 1980

5-A Wellfield Analysis Converse Cons. 1980

Converse Consultants NW

Geotechnical Engineering and Applied Earth Sciences

GEOHYDROLOGIC ANALYSIS OF MUNICIPAL WELL FIELD Lake Forest Park, Washington

Conducted for:

King County Water District No. 83

80-5140-02

July 1, 1980

Converse Consultants NW
3131 Elliott Avenue
Suite 550
Seattle, Washington 98121
Telephone 206 285-5200

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Converse Consultants NW

Geotechnical Engineering
and Applied Earth Sciences

July 1, 1980 80-5140-02

King County Water District No. 83
17711 Ballinger Way NE
Seattle, Washington 98155

Attention: Mr. Ken Chalmers, Superintendent

Subject: Report on Geohydrologic Analysis of District Well Field

Gentlemen:

We have completed our analysis of a pump test on your municipal well field, located in Lake Forest Park. The accompanying report presents our interpretation of aquifer characteristics, well performance, and potential for additional groundwater supply. .

In our opinion, well rehabilitation or modifications are unnecessary at this time and would not appreciably improve overall system capacity. This study did not address conditions of the pumps or distribution system; any questions regarding those components can be taken up with your engineer. However, we noted no specific problems in any segment of the system.

The test and analysis indicate aquifer capacity is insufficient to support another well efficiently in your present watershed. Favorable locations for additional wells of 300 to 500 gpm capacity do exist wfthin the district boundaries, however. Such a well should be located for the simplest possible tie-in with your existing distribution system, as well as for geologic suitability.': Evaluation of specific sites can be made on the basis of data we have already compiled and should not require additional field work other than assessment of access for a drilling rig. We would be happy to discuss specific sites at your convenience.

We appreciate the opportunity to have served you. If we can supply additional information or assist you further in the future, please do not hesitate to call.

Respectfully,

CONVERSE WARD DAVIS DIXON, INC.

Mark E. Shaffer

Mark E. Shaffer
Senior Geologist/Engineer

Converse Consultants NW
3131 Elliott Avenue
Suite 550
Seattle. Washington 98121
Telephone 206 2855200

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Professional Certification

GEOHYDROLDGIC ANALYSIS OF
MUNICIPAL WELL FIELD

Lake Forest Park, Washington



Mark E. Shaffer
Senior Geologist/Engineer

This report has been prepared by the staff of Converse Ward Davis Dixon, Inc. under the professional supervision of the Engineer whose seal and signature appear hereon.

The findings, recommendations, specifications or professional opinions are presented, within the limits prescribed by the client, after being prepared in accordance with generally accepted professional engineering and geologic. practice. There is no other- warranty, either express or implied.

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DRAWINGS

1. Well Locations
2. Driller's Logs of Existing Wells

APPENDIX A Hydraulic Analyses

CONCLUSIONS AND RECOMMENDATIONS

1. The present well field operated by King County Water District No. 83 is judged to have a safe sustained yield of 600 to 750 gallons per minute (gpm), assuming a reduced pumping rate over at least half the year, Because present pumping capability is 800 to 900 gpm, an additional well within the District watershed would serve only to increase short-term (1 day or less) capacity.

2. Properly constructed wells drilled in certain areas elsewhere in the District, generally northwest and east of the present watershed, could be reasonably expected to yield 300 to 500 gpm on a sustained basis. Prospective sites that would conveniently tie in to the existing distribution system should be individually evaluated prior to test drilling.

3. Well No. 2 shows no evidence of corrosion or incrustation. Comparable yields suggest Wells 1 and 3 are also in good condition. Well rehabilitation or other than normal well and pump maintenance thus do not appear necessary.

4. Iron content of water pumped from Well No. 3 appears most likely due to surface seepage. This problem can probably not be eliminated without significant expense, but is minimized by your present procedures of maintaining good surface drainage in the well vicinity and diluting with water from Wells 1 and 2. Regular or sustained pumping of Well 3 would probably reduce iron content to acceptable levels. Regular checks for bacterial contamination of Well No. 3 should be continued, and specific action taken to seal casing leaks if tests begin to show such contamination.

5. Hydraulic constants computed for the confined aquifer presently utilized by District wells are as follows:

   Transmissivity: 6,000 gallons per day per foot
   Storage Coefficient: 6.9×10^{-5}

Hydraulic analyses must account for two non-uniform conditions:

a) a relatively steep natural gradient exists in the pietometric surface, limiting southward migration of the cone of depression to about 10 times the well drawdown; and

b) a source of recharge is indicated about 1 mile from the well field, probably attributable to lateral expansion of the aquifer northward.

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INTRODUCTION

This report presents results of an aquifer pump test- conducted on the King County Water District No. 83 municipal well field. The test was performed primarily to evaluate prospects for drilling a new well to supplement existing water suply. An earlier letter report dated April 17, 1980, assessed groundwater and geologic conditions in the general vicinity.

The District well field consists of 3 wells located approximately as depicted on Drawing 1. The wells vary from 161 to 216.5 feet deep, and the top of the aquifer is reportedly between 140 and 130 feet below ground surface. Driller's logs for Wells 1 and 2 are included in the District's Comprehensive Water Plan (Unpublished report by Hammond, Collier and Wade-Livingstone Associates, Seattle, August, 1973) and the log for Well No. 3 was obtained from the State Department of Ecology. These logs and other well data are shown graphically on Drawing 2. The wells reportedly produce from a sand and gravel aquifer confined by silty or clayey beds. Screen length is unknown on Well No. 1 but is record as 21 and 15 feet respectively on Wells No. 2 and 3. Results of the pump test indicate the true aquifer thickness is probably between 40 and 50 feet;* thus none of the 3 wells are believed to be fully penetrating and/or fully screened.

PRESENT WELL CONDITIONS

A constant discharge-drawdown relationship indicates casing losses are insignificant for Well No. 2. Corrosion or incrustation thus does not appear to be a problem. The rapid, characteristic response of Wells No.

*Partial penetration has the effect of increasing the computed storage coefficient at distances closer to the pumped well than about 1.5 times aquifer thickness. Aquifer thickness was estimated by comparing actual drawdown with that computed for a fully penetrating well using aquifer constants derived from the most distant observation well (see McWhorter and Sunada, 1977, p. 134, for specific method).

1 and 3 to pumping in Well No. 2 indicates all three wells utilize the same aquifer. Appearance of excessive iron in Well No. 3 after idle periods is therefore probably caused by infiltration of surface water, rather than by a separate underground source. To find and repair a leak in the casing or surface seal would be expensive, with little guarantee of success. We recommend that you continue to divert surface water away from Well No. 3 to the greatest extent possible, monitor water quality carefully for signs of bacterial contamination, and mix water from other wells with Well No. 3 water to meet State water quality standards. More continuous pumping of Well No. 3 would probably keep iron at a lower level.

AQUIFER TEST

The aquifer test was conducted on May 28-29, 1980. Well No. 2 was pumped continuously for slightly under 30 hours while water levels were monitored in all 3 wells. Pump discharge was increased and decreased in steps at the beginning and end of the test to evaluate casing losses in the pumped well. Graphs of the well drawdown versus time for the main, constant-discharge portion of the test, mathematically adjusted to compensate for initial variable pumping rate, are shown in Appendix A. The pumping rate over the 24-hour, main test period averaged about 360 gallons per minute (gpm).

Interpretation of the test indicates only a moderately productive aquifer in comparison to others in the Puget Sound region. The aquifer is confined, with a static level between 30 and 40 feet below ground surface. This corresponds to an elevation of about 257 feet (msl) in Wells No. I and 2 and 214 feet in Well No. 3. Available drawdown is about 100 feet in Well No. 3 and 150 feet in Wells No. 1 and 2.

The piezometric surface (level to which water rises in wells) of the aquifer slopes southward at about the same gradient as the land surface between wells. Using this gradient (about 11:1), the transmissivity calculated from the pump test, and an assumed porosity of 0.2, the velocity of groundwater flow is computed at about 1/2 mile per year toward

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Lake Washington. Hydrogeologic maps of the well field vicinity (Smith, 1975; Liesch and others, 1963; Newcomb, 1952) suggest recharge of the aquifer occurs in an area extending 3 miles or more to the north. District wells are thus not likely to run dry even during two or three consecutive drought years, although some reduction in capacity might occur at such times.

Apparent aquifer transmissivity computed for the well field is about 6,000 gallons per day per foot, and the storage coefficient computed from drawdown in Well No. 3, the most distant from the pumped well, is about 7×10^{-5}. Relevant calculations are shown on Figure A-3, Appendix A.

The drawdown curve for all three wells shows a slight flattening approximately 10 hours into full-capacity pumping, indicating either an increase in transmissivity or a zone of aquifer recharge. The apparent transmissivity computed for this late-time portion of the drawdown curves is about 9,800 gallons per day per foot. Analysis using the method of Jenkins (1970) indicates this effect becomes significant at a distance on the order of 1 mile from the well field. This may reflect a change in aquifer thickness and/or permeability but is more likely an effect of lateral expansion of the aquifer to the north. Because of the high natural gradient of the piezometric surface, the cone of depression can never extend further south than about 10 times the well drawdown. This interpretation is corroborated by extrapolation of data from Wells 1 and 2 to about the same drawdown at long time periods in spite of their lateral separation.

WELL FIELD CAPACITY

The rather steeply sloping natural piezometric surface and the non-uniform aquifer geometry make prediction of long-term well capacities uncertain by conventional mathematical methods. The approach followed here is simply to extrapolate the drawdown curves, corrected for partial penetration, to long time periods. Six months is considered a reasonable period of analysis in view of probable seasonal peaks in the water consumption. Well levels could be expected to recover during the winter

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slack pumping perfod. This extrapolation indicates the safe yield for the well field is between 600 and 750 gallons per minute. Constant year-round pumping would probably reduce this yield by IO percent or less: Intermittent pumping at hfgher rates is permfssible provided the average combined pumping rate for all periods does not exceed the safe yield. If intermittent pumping at high rates is anticipated, extreme care should be taken to ensure pumps will be automatically shut down before water falls below the intake.

It is apparent from this analysis that the overall capacity of the well field would not be increased by drilling another well, since the combined pumping capacity is already hfgher than the long-term safe yield. The only advantage gained from an additional well would be slightly higher short-term capacity; However, this might be more easily accomplished by enlarging storage capacity.

PROSPECTS FOR ADDITIONAL WELLS

Geologic conditions and the pump test results indicate that the aquifer supplying the District wells is continuous beneath the upland area lyfng generally northeast of Batlinger Way. Drilling sites northwest or east of the present watershed and within the District boundaries appear favorable for sustained single-well yields of 300 to 500 gpm. These or other locations in the District that tie in easily to your present distribution system should be individually evaluated before a final decision is made to test-drill such sites. This evaluation would not, in general, involve any additional field work except to evaluate drilling access.

It is possible that other, deeper aquifers underlie the District watershed. Test drilling these would be very expensive and risk of failure high. Therefore, we do not recommend such exploration.

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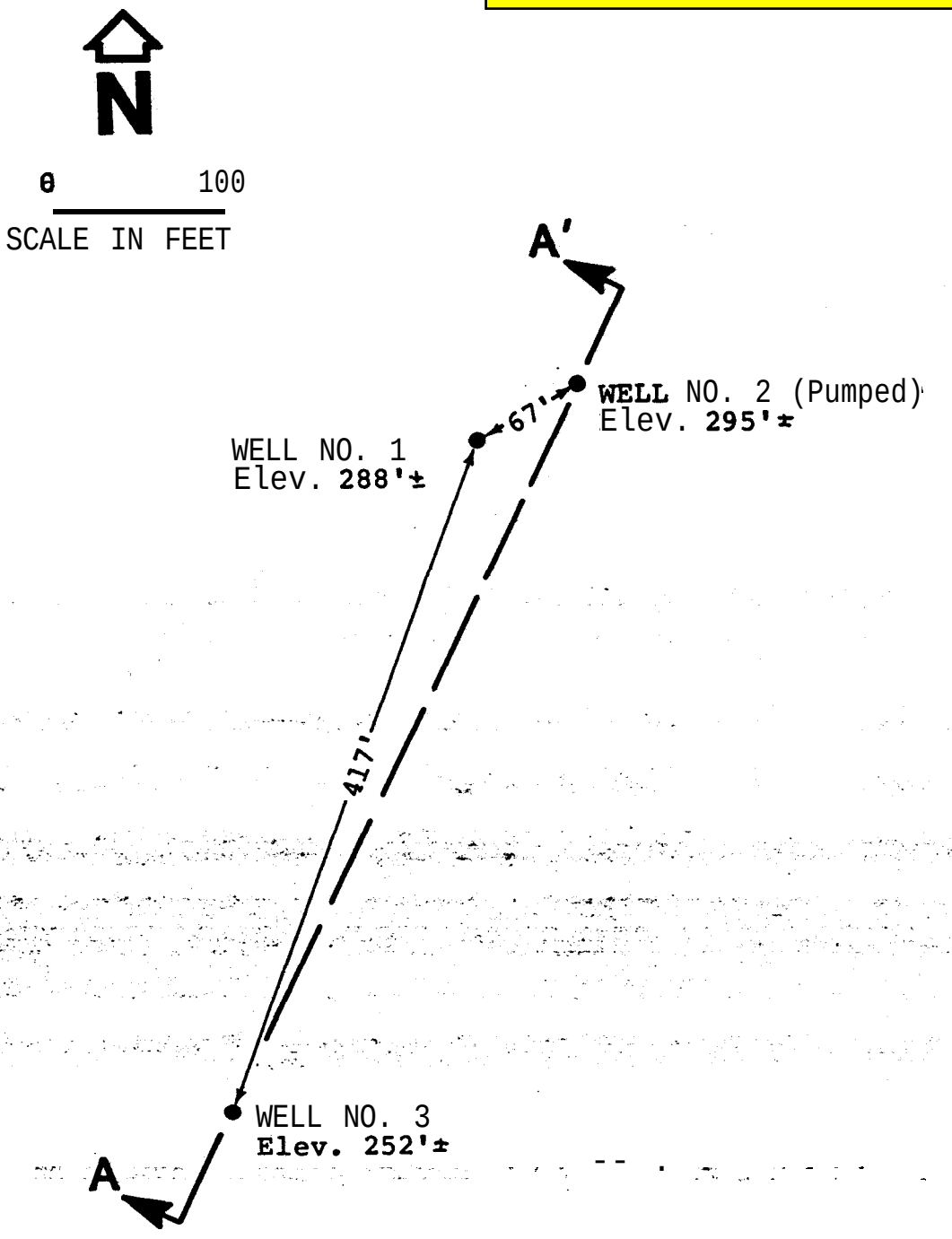
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LOCATIONS OF WELLS

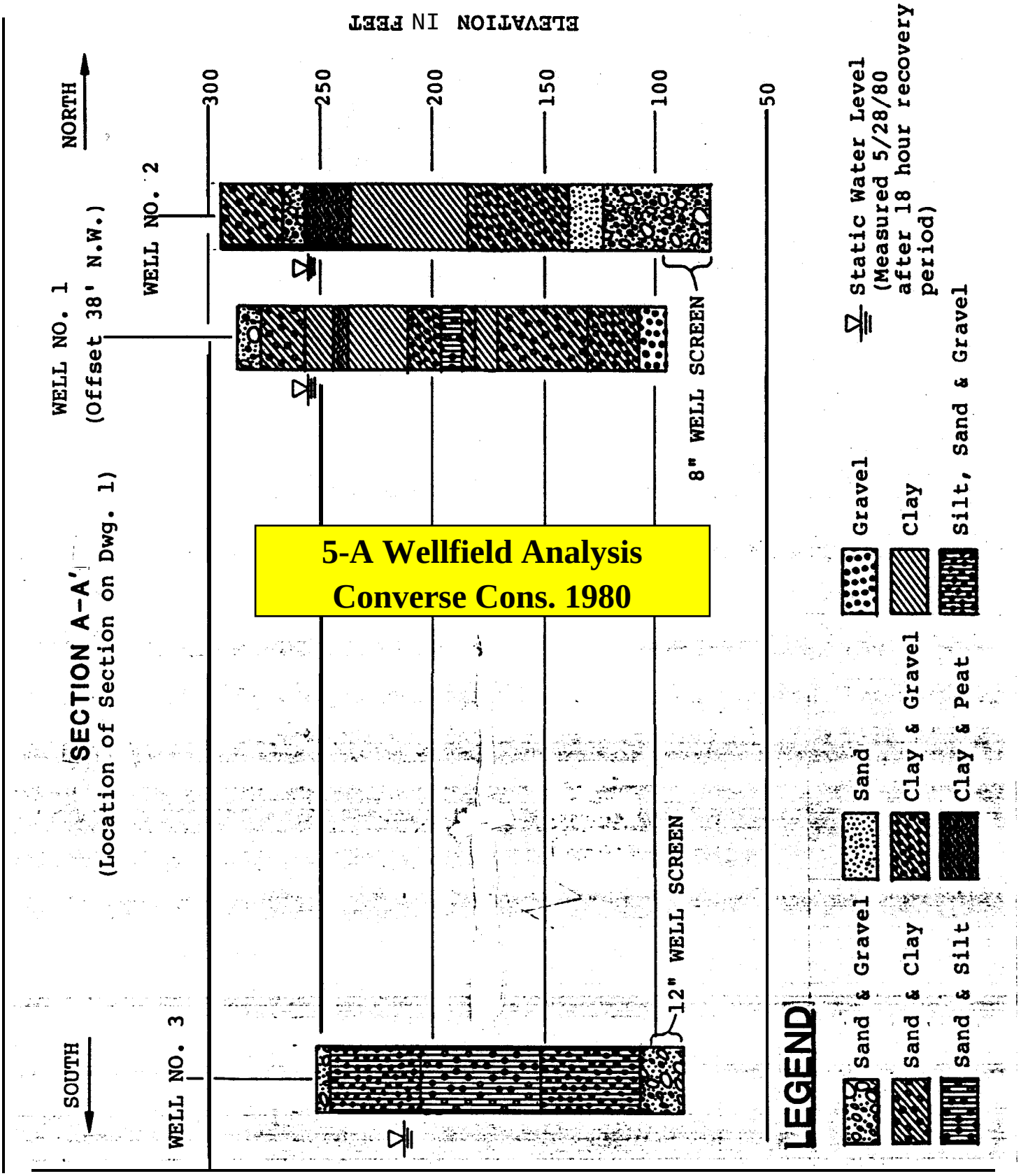
MUNICIPAL WELL FIELD
Lake Forest Park, Washington
for King County Water District X83

Project No.
80-5140-02

Drawing No.
1

ConverseWardDavisDixon Geotechnical Consultants

FORM NO. D55/78 Approved by



DRILLERS LOGS' OF WELLS

MUNICIPAL WELL FIELD
Lake Forest Park, Washington
for King County Water District #83

Project No. 80-5140-02

Drawing No. 2

ConverseWardDavisDixon Geotechnical Consultants

FORM NO. D38/78 Approved for publication ____ by ____

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APPENDIX A

HYDRAULIC ANALYSES

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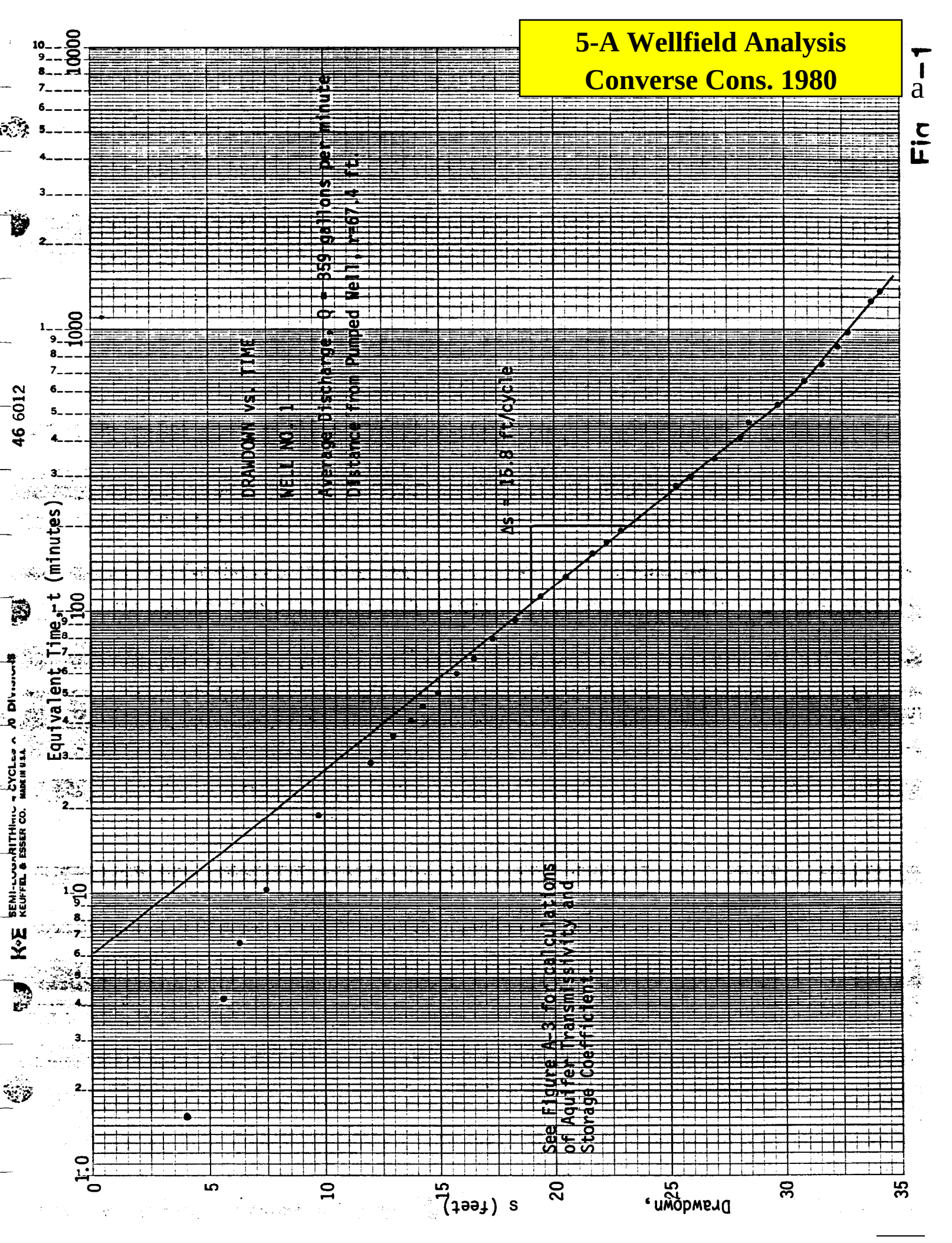
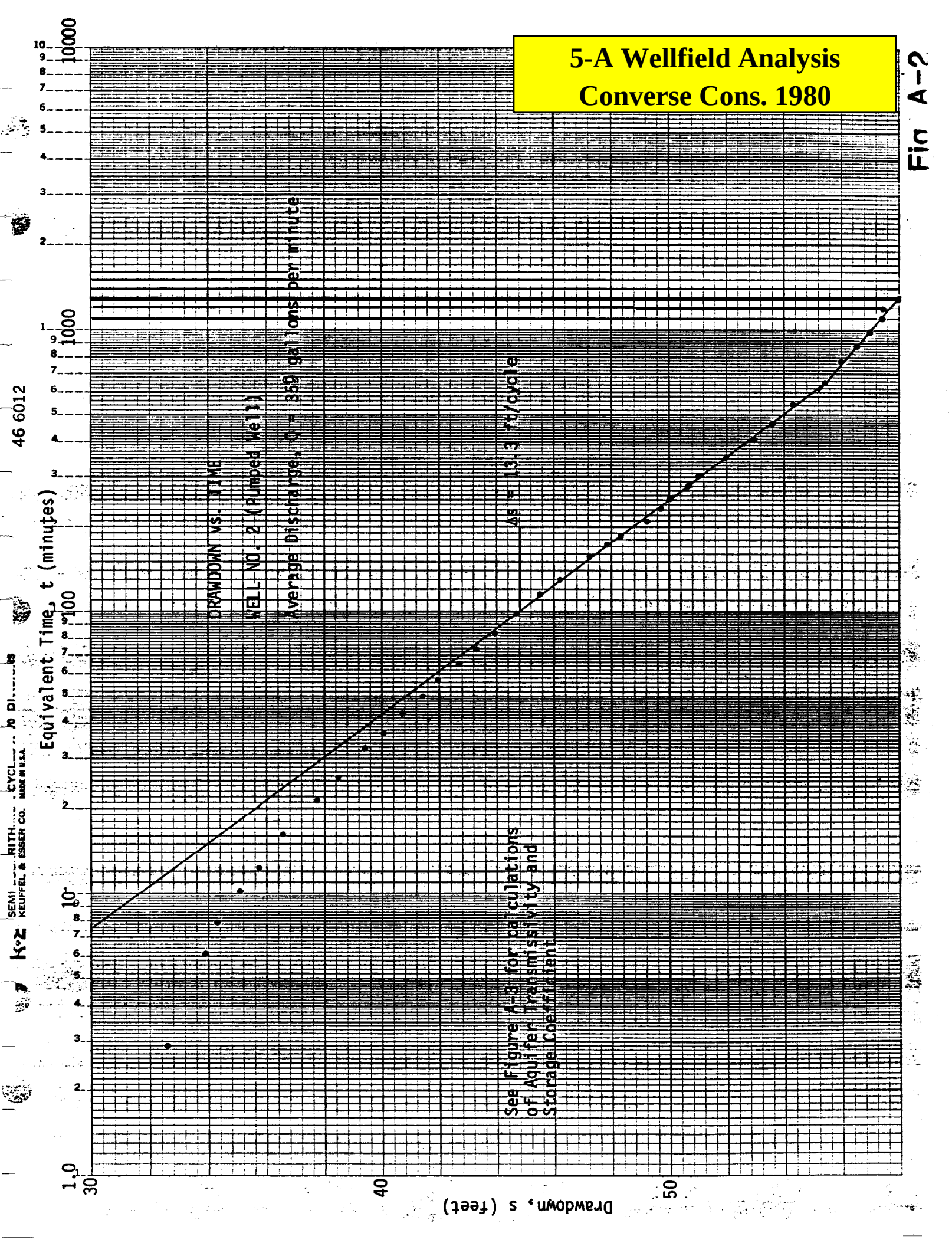


Fig a-1

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Fin A-2



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Fig A-2

DRAWDOWN Vs. TIME
WELL NO. 3

Average Discharge, Q=359 gallons per minute
Distance From Pumped Well, r=417 ft.

Equivalent Time, t (minutes)

Drawdown, s (feet)

t_o = 9.6 min.

Δs = 15.8 ft/cycle

CALCULATIONS:

a) For Transmissivity, T

$T = \frac{2.3Q}{4\pi(\Delta s)} = \frac{2.3(359)}{4\pi(15.8)} = 4.16$ gpm/ft. = 536 ft.^{2}/min.

$T = 4.16 \times 1440 = 6000$ gallons/day/foot

b) For Storage coefficient, S

$S = \frac{2.25\,T(t_o)}{r^2} = \frac{2.25(536)(9.6)}{(417)^2} = 6.9 \times 10^{-3}$

Note: Lower segment of drawdown curve has not been considered to represent aquifer transmissivity because of change in aquifer characteristics (see text, page 5).

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APPENDIX 5 - B HYDROGEOLOGIC INVESTIGATIONS – BRIGHTWATER 2005

King County
Brightwater
TREATMENT SYSTEM

Technical Memorandum

To: *Leon Maday (WTD), Bob Peterson (WTD)*
Dan Mundall (LFPWD/Mundall Engineering)
Mike Krautkramer (Robinson & Noble)

From: *Doug Hillman, LHG (Aspect Consulting) and John Newby (CDM)*

Date: *June 20, 2005*

Subject: *Summary of Lake Forest Park Hydrogeologic Investigations*
Geotechnical Services for the Brightwater Conveyance System
Contract No. E23007E, Task 162

Introduction

This memorandum summarizes two years of cooperative investigations between the Lake Forest Park Water District and the CDM Brightwater Conveyance team. This report is prepared in accordance with the King County/Lake Forest Park Water District agreement that mandates further investigation and interpretation of the hydrogeology of Lake Forest Park, specifically on the relationship between the soils proposed for tunneling and the Lake Forest Park Aquifer. The Brightwater Conveyance effluent tunnel is currently planned to penetrate fine-grained silts and clays and no less than twenty feet below the Lake Forest Park Aquifer. At its closest, the tunnel is planned to pass 1,900 feet to the north of the Lake Forest Park Water District wellfield.

Extensive drilling in the area provides detailed subsurface information used to delineate the general nature and extent of the LFP Aquifer. Multiple forms of testing produced reliable and reproducible hydraulic property estimates for both the aquifer system and the silts and clays proposed for tunneling beneath the aquifer. We are able to conclude from this information that the tunnel zone is hydraulically insulated from the overlying aquifer system and that minimal groundwater flow is induced through the clays and silts as a result of wellfield pumping. Planned tunneling methods, such as pressure balance at the face and liner grouting as the boring machine advances, afford additional protection.

The results of our investigations and current understanding of Lake Forest Park hydrogeology are presented in the following sections.

Surface and Subsurface Overview

Lake Forest Park Water District and Wellfield

The Lake Forest Park Water District (LFPWD) wellfield provides water to the approximately 855 customers in the District service area. The District operates shallow and deep water producing systems, both located in a single wellfield just south of the intersection of 47th Avenue NE and NE 187th Place. Locations of the District boundaries and the wellfield are both shown on Figure 1.

The shallow system is fed by artesian flow from a water-bearing zone at about Elevation 350 to 375 feet (Metro Conveyance project datum [1]). The water right assigned to the shallow system is 450 gpm/720 acre ft/yr. The District also operates a deep well network with a permitted capacity of 765 gpm/1,226 acre ft/yr. The District operates three deep wells and maintains a fourth as a backup supply source. The deep wells vary in depth between 161 and 210 feet and are screened between Elevation 181 and 216 feet.

The 10-year wellhead protection area (WHPA) is approximately rectangular, with straight edges to the east, south, and west, and with an arc to the north (Figure 1). The southern edge runs due east west approximately 1,000 feet south of the center of the wellfield. The east and west WHPA boundaries run due north south approximately 1,750 feet from the center of the wellfield. The northern limit is an arc with an approximate radius of 2,500 feet from the center of the wellfield. The conveyance alignment crosses the northern portion of the WHPA.

Boring and Well Data Sources

Subsurface data was gathered from a number of different wells and borings to characterize the extent and properties of the LFP Aquifer and the surrounding hydrogeologic system. These data sources are located on Figure 1 and logs are copies in Attachment A. These data sources include:

- Brightwater borings of the E-### series. These borings drilled by CDM along NE 195th Street are spaced approximately 500 feet apart along the Brightwater effluent tunnel alignment. Their bottom elevations range from 18 to 123 feet. Each of the borings in the vicinity of LFP was installed with at least one observation well and/or vibrating wire piezometer (pressure transducer);
- Brightwater borings of the N-### series. Two borings, N-151 and N-152, were drilled by CDM in the LFP and Kenmore areas, near the shore of Lake Washington;
- Brightwater borings of the TW-20# series. Four borings, TW-201, TW-202, TW-202A, and TW-203, were drilled by CDM on the LFP upland area for the explicit purpose of better understanding the LFP Aquifer and the underlying fine-grained soils targeted for the Brightwater effluent tunnel. The borings of TW-201, TW-202, and TW-202A fully penetrated the LFP Aquifer and were installed with standpipe observation wells (OWs) screened in the

[1] All elevations in this report are referenced to METRO datum. Metro datum = NAVD88 datum + 96.28 feet.

silts and clays below the LFP Aquifer. TW-203 was drilled approximately 60 feet into the LFP Aquifer, where an observation well was installed;

- Brightwater EIS borings of the MW-## series. Four borings, MW-8, MW-9, MW-10, and MW-11, were drilled during the initial conceptual planning phases of the Brightwater project. These borings are generally along the margins of the LFP Aquifer, particularly along the lake shore;
- LFPWD Wells. The LFPWD Wellfield includes LFPWD #1, LFPWD #2, LFPWD #3, and LFPWD #4. These four wells are on the south side of the LFP hill and are installed with screens at various elevations within the LFP Aquifer. The District also completed a test well (name on map?) about 1000 feet west-northwest of the wellfield, but did not encounter aquifer material and was abandoned; and
- Wells and Borings of the Department of Ecology Database. The Washington State Department of Ecology maintains an online, searchable database of the well logs that are submitted in compliance with drilling regulations. These records were searched in the LFP vicinity and two wells, identified in this report as 10A1 and 3B1, were located. The location of 3B1 is not given precisely; however, we locate it just north of Horizon View Park, north of the City of Seattle reservoir on LFP hill. The boring log for 3B1 does not indicate where the well is screened but the well penetrates 25 feet into the LFP Aquifer. The given water level is interpreted to represent that of the LFP Aquifer. The status of this well is uncertain. Well 10A1 is a private water well in Lake Forest Park, approximately halfway between the LFPWD wellfield and Lake Washington. It penetrates 20 feet into the LFP Aquifer, where it is screened. Communications with LFPWD indicate that this well is likely in service.

Geologic Units and Hydrostratigraphy

The LFP wellfield occupies the southern slope of a glaciated upland that has been heavily incised by post-glacial streams. Erosional incision and exploration borings for the Brightwater tunnel reveal a complex geologic history and information on the nature of the LFP aquifer. Geologic units range from thin ribbons of recent alluvium present only in modern drainage bottoms to glacial and non-glacial sequences that are several hundred feet thick and up to 125,000 years old. Cross sections drawn parallel (Figure 2) and perpendicular (Figure 3) to the conveyance alignment depict the subsurface distribution of these units. Figure 4 is an interpretive cross section used to identify LFP Aquifer occurrence in the vicinity of the conveyance alignment.

The hydrostratigraphic units are described below from youngest to oldest (stratigraphic top to bottom):

- Recent Alluvium (Qal) is composed of sand and gravel with silt and organic matter. Recent alluvium is present in the bottoms of modern stream and ravine bottoms. In general, these drainages are actively incising and the recent alluvium is typically thin. These bodies of recent alluvium form thin, localized shallow aquifers except in the vicinity of Lyon Creek and Lake Washington where thicker deposits are encountered;

- Recessional Outwash (Qvrf) is composed primarily of silty to clean sand and gravel. It occurs as thin and discontinuous patches on the uplands and in broad drainage bottoms of MacAleer and Lyon Creek. Recessional outwash may form small, discontinuous aquifers where present above glacial till in the uplands. The outwash may be up to several tens of feet thick in the MacAleer and Lyon Creek drainages and may form a shallow unconfined aquifer of local extent;
- Vashon Glacial Till (Qvt) is a non-sorted to poorly sorted mixture of clay, silt, sand, and gravel with cobbles and boulders that was deposited at the base of the Puget Lobe ice sheet during the last glaciation. It is very dense, generally behaves as an aquitard and may perch shallow groundwater or confine deeper aquifers where present across valley bottoms. It is present as a discontinuous veneer near the surface of much of the uplands of the Lake Forest Park area. It is generally about 10 to 15 feet thick, but may be locally exceed 30 feet and is generally absent where post-glacial stream incision and landslides have removed the till layer and exposed the older units;
- Vashon Advance Outwash (Qva) is present below the Vashon till in much of the upland area. It consists primarily of fine- to medium-grained sand and gravelly sand. Vashon Advance Outwash is an important regional aquifer, although it is limited in thickness in the vicinity of the LFPWD wellfield;
- Lawton Clay (Qvlc) was deposited in a lacustrine environment in front of the advancing Puget Lobe during the last glaciation. It is the earliest Vashon-age deposit mapped along the Brightwater Conveyance alignment and is present in isolated pockets where it overlies older glacial and non-glacial deposits. Lawton Clay behaves as an aquitard and consists mostly of silt, with clay and occasional sand and gravel dropstones;
- Pre-Fraser Non-Glacial Deposits (Qpfn) lie below the Vashon deposits in much of the LFP area. These deposits consist of non-glacial (deposited during a relatively warm period between Pleistocene glaciations) sands and silty sands (Qpfnf), silts and clays (Qpfnl), and thin beds of peat and organic silt (Qpfnw). This non-glacial sequence is texturally highly variable in both vertical and lateral dimensions, which reflects the shifting depositional environments of meandering streams and rivers, floodplains and lakes, and wetlands. This non-glacial sequence is generally considered a leaky aquitard, although the coarse-grained bodies within it may yield limited groundwater. Correlation with age dated deposits to the east and west suggests that this sequence is the Olympia Beds, which are about 16,000 to 60,000 years old; and
- Pre-Fraser Glacial Deposits (Qpog) compose the LFPWD aquifer. Age dating of adjacent deposits that correlate with this sequence suggests that the LFPWD aquifer is part of the Possession Drift, a glacial sequence that is about 60,000 to 80,000 years old. Regionally the Possession Drift glacial deposits are composed of about 60% fine-grained glaciolacustrine or glaciomarine (deposited in glacial lakes or restricted marine bodies) with about 20% glacial tills and diamictons (unsorted to poorly sorted deposits with a range of particle sizes) and 20% glaciofluvial deposits (glacial outwash).

In the Lake Forest Park area, the proportion of glaciofluvial deposits (chiefly silty to clean sand and sand-gravel mixtures) is considerably higher than the regional average. These interconnected sand and gravel bodies form the LFPWD aquifer. The glaciofluvial deposits are believed to have been deposited primarily in sub-glacial channels (tunnel-like conduits that carried glacial meltwater and sediment at the base of the melting ice sheet). Outwash in the aquifer occurs as elongate ribbons and lenses that appear to be interconnected where they are tightly clustered. The glacial depositional model suggests that the aquifer should be elongate in the north to south direction, and the limited borehole data north and south of the Brightwater Conveyance alignment suggest that this is the case – the main aquifer body trends generally south-southeast. The high degree of interconnectedness of the sand and gravel channels above about elevation 200 feet results in the high yields that are characteristic of the LFPWD aquifer.

The aquifer underlies much of the City of Lake Forest Park (LFP) and part of Kenmore, from north of the King-Snohomish County line to south of the Lake Washington shoreline. Its east-west extent is more limited, approximately bounded by Lyon Creek to the west and following a north-northwest trending line from 62nd Avenue NE at the shore of Lake Washington to 55th Avenue NE at NE 195th Street (Figure 1).

The aquifer is wedge-shaped, becoming thicker to the north, away from Lake Washington, and thinning to the east and west. Along the thickest north-south centerline, the aquifer is approximately 80 feet thick at the location of the LFPWD wellfield, and is over 130 feet thick beneath NE 195th Street. Borings north of NE 195th Street have intersected the aquifer, but its full thickness is unknown in that area. Beneath the LFP uplands, the aquifer is present at elevations between 150 and 300 feet (Figures 2 and 3). Along the Lake Washington shoreline, the aquifer is interpreted to be between 65 and 125 feet in elevation.

Glaciolacustrine, glaciomarine, and glacial diamicton deposits composed of hard silts and clays limit downward migration of groundwater from the aquifer and form the regional aquitard below the LFPWD aquifer. Within this regional aquitard, a slightly silty sand body was encountered in E-306 between elevations 147 and 161. This sandy body may be encountered during tunneling, however it is overlain by 23 feet of hard silt and clay and it appears to be laterally and vertically isolated from the aquifer.

Older Pre-Fraser Non-Glacial Deposits (Qpfn) are present below the Possession Drift aquifer and basal aquitard. A sample of the older pre-Fraser non-glacial deposits from E-309 at the 469 foot depth has been age dated at about 110,000 years before present. This age date suggests that these non-glacial deposits are the Whidbey Formation, which is regionally about 80,000 to 125,000 years old.

Groundwater Elevations

Groundwater in the LFP area generally flows from the upland areas in the north toward Lake Washington, a regional discharge feature that bounds the area to the south. These patterns are shown with the generalized groundwater elevation contours depicted on Figure 5. In the area near the conveyance alignment, the static water level of observation wells and vibrating wire piezometers in the LFP Aquifer is between 345 and 370 feet in elevation. In the wellfield, a groundwater elevation of about 260 feet is typical. South of the wellfield, the gradient becomes steeper until the static water level is approximately 150 feet elevation at the shore of Lake Washington.

Hydrogeologic Testing

Multiple testing methods were used to evaluate hydrogeologic conditions in the LFP Aquifer area. These methods included long-term water level monitoring, slug tests, and pumping tests using piezometers installed in conjunction with the Brightwater project in addition to pre-existing wells owned by the District. The collective monitoring system enabled evaluation of conditions at multiple depths within and beneath the LFP Aquifer. The wells consist of either a standpipe observation well (OW) and/or vibrating wire piezometers (VWPs) that are grouted in place. The wells are summarized in Table 1, along with monitoring position relative to the LFP Aquifer occurrence at each location.

Slug Tests

Slug tests have been used to estimate the horizontal hydraulic conductivity of a number of the soils screened in a number of different wells. The results are summarized in Table 2.

Pumping Tests in TW-201, TW-202 and TW-202A

Three pumping tests were conducted to evaluate the hydraulic properties of the silts and clays proposed for tunneling beneath the LFP Aquifer. These pumping tests were conducted in TW-201, TW-202, and TW-202A. The following discussion provides an overview of the test results; a complete discussion of the testing methods and subsequent analyses is available in a separate report (CDM, February 11, 2005). Based on the testing in TW-202 and TW-202A, the horizontal hydraulic conductivity of the fine-grained soils underlying the LFP Aquifer is estimated at 8×10^{-7} cm/sec. No response to the LFPWD pumping cycles was observed in any of the TW series wells, an indicator that the tunnel zone silts and clays are not hydraulically connected to the LFP Aquifer.

Based on these hydraulic properties, groundwater inflow from a 14-foot-diameter tunnel face is estimated at 0.02 to 0.03 gpm (28 to 43 gal/day) when the face is exposed during a TBM maintenance stop. The estimated range accounts for either atmospheric or 3 bars of pressure within the TBM during the maintenance period.

Testing in the tunnel zone silts and clays consisted of the following:

- **TW-201**—A bailer was used to remove all the water from the casing of TW-201 over 75 minutes. Negligible amounts of water flowed into the casing during bailing and the well was drawn down 192 feet. After four days, the well had recovered 15 feet. This recovery was too slow to analyze. No response to this pump test was observed in any of the surrounding observation points;
- **TW-202**—A bladder pump operated with compressed nitrogen induced 133 feet of drawdown after 3 hours of pumping. An average pumping rate of 0.14 gpm was maintained and approximately 2.5 feet of drawdown was observed in TW-202A (located about 10 feet from TW-202). After, 24 hours, the pumped well recovered 93 feet; and
- **TW-202A**—A bladder pump operated with compressed nitrogen induced 46 feet of drawdown after 3 hours of pumping. An average pumping rate of 0.12 gpm was maintained and approximately 1.7 feet of drawdown was observed in the adjacent well, TW-202. After, 24 hours, the pumped well recovered 43 feet.

Due to the low transmissivity of the tested silts and clays, no equilibrium drawdown was reached during any of these tests. When pumping or bailing was terminated, recovery was monitored through a combination of hand and pressure transducer measurements. The recovery data was then analyzed to determine the hydrogeologic properties of the glaciolacustrine sediments underlying the LFP Aquifer.

LFPWD Wellfield Pump Tests

Timeline

Two pumping tests were conducted in cooperation with the Lake Forest Park Water District to evaluate the LFP Aquifer and assess hydrogeologic conditions in the general vicinity of the conveyance alignment. Two 24-hour constant rate tests took place on March 3 and 4, 2004 and on March 23 and 24, 2005. The setup and timing of both tests were similar and ran as follows:

- In the days to weeks preceding the pump test—Deploy dataloggers to area wells, including LFPWD wells, wells along the alignment, and, in 2005, the LFP-targeted test wells (TW-201, TW-202, TW-202A and TW-203);
- Roughly 48 hours in advance of the pump test—The District begins filling their storage to maximize supply capacity during the subsequent shutdown period;
- Twenty-four hours in advance of the pump test—Shut off the wellfield wells to allow the aquifer to recover to static water levels. Prepare for pumping test discharge via a fire hydrant at 17753 Beach Drive NE. Water pumped in excess of the District's water storage capacity is conveyed from the hydrant via lay-flat hose to a storm drain system that discharges directly to Lake Washington with prior Ecology and City of Lake Forest Park approvals;

- Beginning of test—Reset data logger interval to higher frequency to collect more detailed data during the first hour of the test. Begin pumping. As quickly as possible (within five minutes), bring the pumping wells up to a stable, combined rate of about 650 gallons per minute. After approximately two hours, open hydrant at discharge point to maintain desired storage levels. Monitor water levels in the wellfield as possible;
- Twenty-four hours after the beginning of the test—Reset data logger interval to higher frequencies to collect more detailed data during the first hour of recovery. Shut off the pumps. Close the hydrant discharge;
- Forty-eight hours after the beginning of the test—Resume normal wellfield operations; and
- Several days after the test—Download data from dataloggers.

Results

Observation wells and vibrating wire piezometers instrumented with dataloggers for the 2004 and 2005 tests are listed with the observed drawdowns below in Table 3. Hydrographs of the test period are presented as Figures 6 and 7 (include hydrographs for both 2004 and 2005).

Vibrating wire piezometers grouted in the deep fine-grained soils beneath the LFP Aquifer showed responses to pumping that were similar to installations in the coarse-grained soils of the aquifer. However, the standpipes installed in these lower silts and clays (TW-201, TW-202, and TW-202A), did not respond to aquifer pumping. While pumping cycles in the aquifer do induce a pressure effect on the lower silts and clays, this does not necessitate the movement of appreciable volumes of water. The lack of response in the silt and clay standpipes indicates that these tunnel-zone soils are hydraulically insulated from the aquifer.

Horizontal hydraulic conductivity of the LFP Aquifer is estimated at 20 ft/day or 7×10^{-3} cm/sec by using an equivalent aquifer thickness of 80 feet, which is the approximate thickness of the aquifer at the LFPWD wellfield.

Transmissivity

Transmissivity of the LFP Aquifer is estimated at approximately 7,000 gal/day/ft based, on collective interpretation of the available pumping test data.

- **2005 Test**—Hydraulic parameters of the LFP Aquifer were estimated from the drawdown and recovery curves at a number of different measurement points and from a distance drawdown analysis of wells and piezometers screened in the LFP Aquifer. Measurements from TW-203 OW, E-115A OW, E-115A shallow VWP, E-305 OW, and E-309 OW were plotted and analyzed using the AQTESOLV program (HydroSOLVE, Inc.) and copies of the model outputs are included in Attachment B. The data fit the type curves of several different analyses quite well; therefore, an average value from the multiple analyses is considered representative of aquifer conditions. Transmissivity is estimated to be between 6,957 gallons per day per foot (gal/day/ft) and 13,218 gal/day/ft.

The distance drawdown analysis also yielded a good fit to observed data. A straight line on the semi-log plot of distance from the pumping wells versus drawdown was drawn through the LFPWD Wellfield, E-308 OW, E-115A OW, E-214 OW and E-305 OW. Transmissivity was estimated at 10895 gal/day/ft. This analysis is included in Attachment C. All hydraulic parameter values apply to the Qpogf unit that comprises the LFP Aquifer.

- **2004 Test**—Water level data from five observation wells (LFP Well #4, E-306, E-307, E-308, and E-214) in the vicinity of the LFP Aquifer were used to estimate hydraulic parameters including Transmissivity. Three main methods were used to calculate the Transmissivity including the Hantush Jacob method (1955), distance-drawdown method (Cooper and Jacob, 1946), and the Theis recovery method (1935). Transmissivity estimates varied from 2,000 to 16,000 gal/day/ft, with an average value of 7,000 gal/day/ft. The Theis recovery method generally yielded larger Transmissivity values. Data from most of the wells indicated minimal leakage from the overlying confining unit based on Hantush Jacob leaky aquifer type curves. Hydrographs for observation well pumping wells are presented in Figure 8.
- **1980 Test**—Converse Consultants conducted a pumping test on behalf of LFPWD using wellfield Well No. 2. The test was conducted at a rate of 360 gpm and they estimated a transmissivity of 6,000 gal/day/ft. The report also noted the presence of lateral bounds to the aquifer, an observation that is consistent with the stratigraphic patterns noted earlier in this report.

Storage Coefficient

The storage coefficient of the LFP Aquifer is estimated at 1×10^{-4}, which is consistent with the confined nature of the water-bearing system.

- **2005 Test**—The aquifer storage coefficient was determined based on Theis analysis of data from the shallow vibrating wire piezometer at E-115A and the observation wells at E-305. The computed value was 1×10^{-4}. This value should be considered an average value for the entire LFP Aquifer; differences in well construction or local variations in aquifer composition yield higher and lower values.
- **2004 Test**—Based on analyses of five monitoring wells including LFPWD Well #4, E-306, E-307, E-308, and E-214, an average aquifer storage coefficient of 6×10^{-5} was estimated. Both the Hantush Jacob and distance-drawdown methods were used to calculate storage coefficients at these monitoring wells. Results varied by an order of magnitude depending on the location of the well and the analysis method used.
- **1980 Test**—Converse Consultants estimated the storage coefficient at 6.9×10^{-5}.

Hydraulic Continuity between Aquifer and Tunnel Zone

Several lines of evidence indicate that the proposed tunnel zone is hydraulically insulated from the overlying aquifer system:

- **First**, the tunnel alignment is designed to penetrate fine-grained, cohesive silts and clays that are uniformly present throughout the area and at depth beneath the aquifer. These soils are composed predominantly of hard (occasionally very stiff) glaciolacustrine or glaciomarine clay and silt with variable amounts of sand, and gravel. The sand and gravel is typically tightly suspended as dropstones within a hard clay or silt matrix, or is present as lenses of very dense or hard till or diamicton within the glaciolacustrine or glaciomarine sequences. Boreholes throughout the alignment show that the till and diamicton lenses are nearly as impermeable (the hydraulic conductivity is essentially too low to measure in the field) as the hard clays and silts.
- **Second**, by direct measure, it was determined that the silts and clays transmit very limited quantities of groundwater; standpipes completed in these deposits do not exhibit signs of water movement related to wellfield pumping in the aquifer. No drawdown in response to wellfield pumping was observed in the standpipe observation wells screened within the glaciolacustrine sediments targeted for tunneling.
- **Third**, groundwater seepage calculations made using the hydraulic property estimates for the silts and clays quantify the low potential inflow rates. Inflow rates at the 14-foot-diameter tunnel face during maintenance stops are estimated at 28 to 43 gal/day, based on reduced pressures within the TBM during maintenance. Groundwater seepage into an unlined tunnel (a very conservative case, given liner-grouting plans) is also relatively low. The cumulative inflow estimates over a 5,000-foot-long alignment range from 0.1 to 11 gpm, based on the measured horizontal hydraulic conductivity of the silts/clays (8×10^{-7} cm/sec) and an assumed reduction in vertical hydraulic conductivity (typically 100 times lower for fine-grained soils).

It is recognized that the localized stratigraphic variability occurs within the hydrogeologic system. For example, a 14-foot-thick sandy zone was encountered in boring E-306 within the silts and clays between the tunnel zone and overlying aquifer system. While sandy in nature, laboratory grain size analyses indicate that the material consists of 23% silt/clay. Horizontal hydraulic conductivity estimates for soil of this nature are typically 1×10^{-4} cm/sec or lower. Vertical hydraulic conductivity is typically 100 times lower, resulting in an estimated vertical hydraulic conductivity value of 1×10^{-6} cm/sec, or less. The potential vertical seepage from an isolated feature of this nature is estimated at 3 gpm. This calculation is based on Goodman's formula, a length of 1,000 ft, and a net gradient of 100 feet.

Attachments

Table 1—Wells and Piezometers Intersecting the LFP Aquifer

Table 2—Slug Test Hydraulic Conductivity Estimates

Table 3—Summary of Piezometer Response during Pumping Tests

Figure 1—Site and Well Location Plan

Figure 2—East-West Hydrogeologic Profile

Figure 3—North-South Hydrogeologic Profile

Figure 4—Conceptual model of Aquifer

Figure 5—Groundwater Potentiometric Surface

Figure 6—LFPWD Pump Test 2005 Hydrograph of Installations in the LFP Aquifer

Figure 7—LFPWD Pump Test 2005 Hydrograph of Installations Below the LFP Aquifer

Figure 8—LFPWD Pump Test 2004 Hydrograph of Observation and Pump Wells

Appendix A—Boring Logs and Well Construction Diagrams

Appendix B—Pumping Test Analysis Plots

Appendix C—Distance Drawdown Analysis

References

CDM, February 11, 2005, Memorandum, Lake Forest Park Pumping Test Results for Test Wells TW-201, 202, and 202A.

Converse Consultants NW, July 1, 1980, Geohydrologic Analysis of Municipal Well Field, Lake Forest Park, Washington. Prepared for King County Water District No. 83.

Tables

Table 1—Wells and Piezometers Intersecting the LFP Aquifer

Well Name	Elevations and Thicknesses in Feet				
	Ground Surface	Bottom of boring	LFP Aquifer Bounds	LFP Aquifer Thickness	Instrumentation
E-304	339.0	44.0	210.0 to 212.0	2	VWP at 211
E-114	392.5	18.5	203.5 to 227.5	24	VWP at 60, OW from 202.5 to 212.5
E-305	443.4	123.4	198.4 to 226.4	28	VWP at 153.4, OW from 206.4 to 216.4
E-214	418.0	97.0	195.5 to 206.0	10.5	VWP at 108 OW from 198 to 208
E-306	497.6	117.6	183.6 to 203.0 and 222.9 to 236.6	33.1	VWP at 126.6 OW from 196.6 to 206.6
E-307	607.0	106.0	176.5 to 187.5 and 222.0 to 240.5	29.5	VWP at 125 OW from 195 to 205
TW-201	617.5	139.5	183.5 to 187.5 and 211.5 to 252	44.5	OW from 144.5 to 159.5
E-308	613.2	113.2	172.7 to 176.7 and 258.2 to 295.2	41	VWP at 126.2 OW from 232.2 to 243.2
TW-202	604.0	125.0	159.0 to 182.0, 204.0 to 244.0 and 264.0 to 284.0	87	OW from 129 to 139
TW-202A	605.4	126.4	Top of Aquifer not identified in boring. From 157.9 to at least 175.4	At least 17.5	OW from 123.6 to 133.6
E-115/A	622.1	100.3	205.0 to 310.8	105.8	VWP at 146.3 OW from 205.3 to 215.3 VWP at 295.3
E-309	589.1	109.1	241.6 to 293.6	52	VWP at 155.1 VWP at 220.6 OW from 269.1 to 279.1
E-416	435.6	45.6	256.6 to 313.6	57	VWP at 78.6 VWP at 202.6
E-215	403.4	42.4	278.4 to 296.4	18	VWP at 55.4 VWP at 157.4
TW-203	509.4	177.4	Bottom of Aquifer not identified in boring. From below 177.4 to 231.9	At least 54.5	OW from 179.4 to 189.4

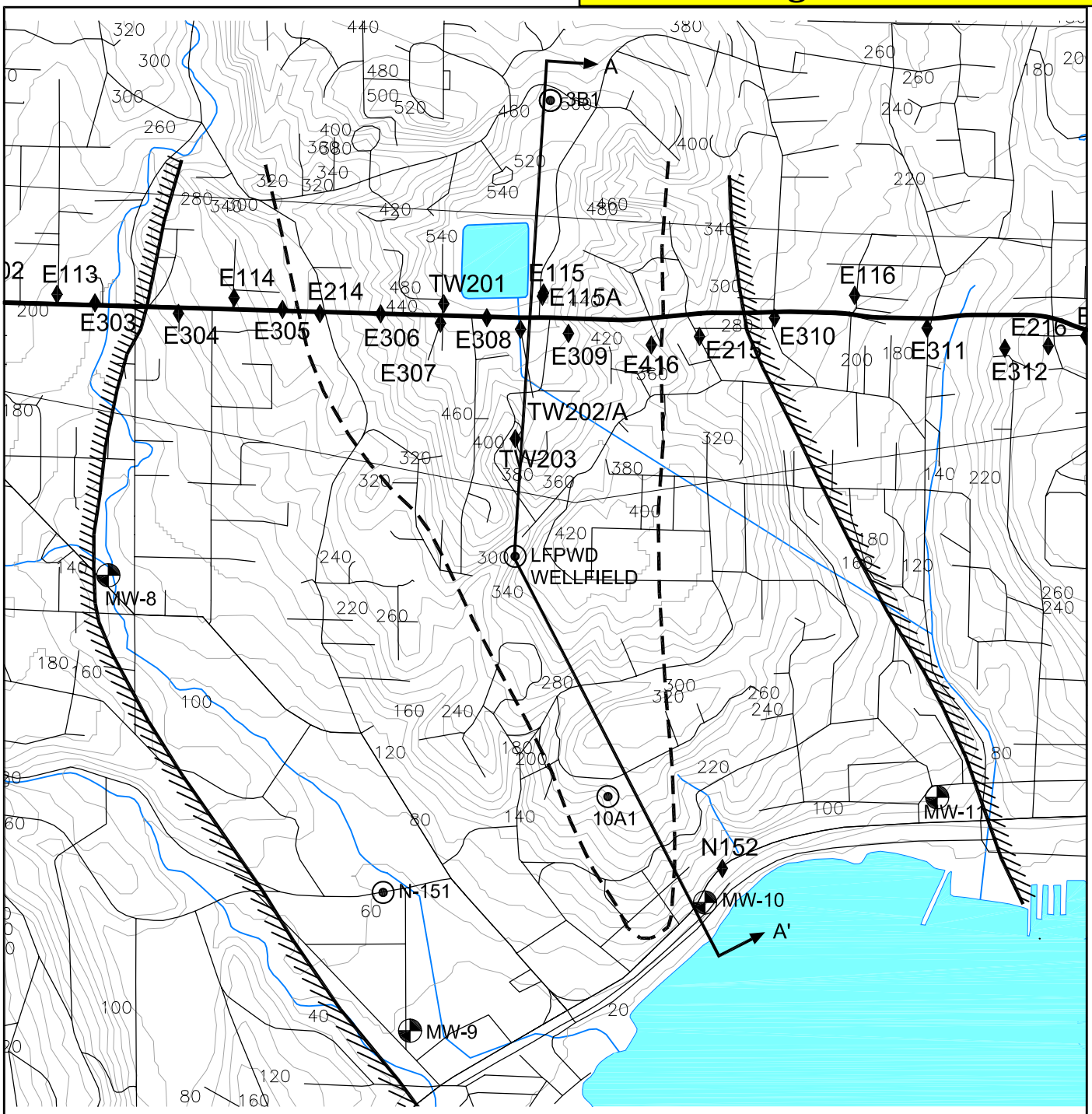
Table 2—Slug Test Hydraulic Conductivity Estimates

Well Name	Soil Type	Hydrostratigraphic position relative to LFP Aquifer	Best Estimate of Hydraulic Conductivity (cm/sec)	Comments
E-306	SP	Within LFP Aquifer	4×10^{-4}	Minimum conductivity value; skin effect indicated by non-recovery to pre-test static water level.
E-308	SM, CL	Within LFP Aquifer	7×10^{-5}	Minimum conductivity value; skin effect indicated by non-recovery to pre-test static water level.
E-309	SP-SM	Within LFP Aquifer	2×10^{-5}	Well was partially responsive and may be plugged.
TW-201	ML	Below LFP Aquifer	< 9 x 10-6	Response too slow to analyze. 9×10^{-6} is a maximum value, although the true value is likely to be at least one order of magnitude lower.
TW-202	ML	Below LFP Aquifer	< 5 x 10-7	Response too slow to analyze. Limited recovery data indicates a conductivity of roughly 5×10^{-7}.
TW-202A	ML	Below LFP Aquifer	< 5 x 10-6	Response too slow to analyze. Limited recovery data indicates a conductivity between 3×10^{-9} and 5×10^{-6}.
TW-203	SW	Within LFP Aquifer	2×10^{-3}	Questionable value, LFPWD pumping cycle overprints data

Table 3—Summary of Piezometer Response during Pumping Tests

Well Name	Installation	Soil Type	Geologic Unit	Vertical distance from top of screen or piezometer to LFP Aquifer	2004 Test Drawdown	2005 Test Drawdown
LFPWD #2	OW	GP	Qpogf	in aquifer	pumping	68.0’
LFPWD #4	OW	SW	Qpogf	in aquifer	66.5’	68.9’
E-114	VWP	ML	Qpogl	137’	no data	-0.17
E-116	VWP	ML	Qpogl	adjacent to aquifer	0.3’	
E-305	OW	SM	Qpogf	in aquifer	0.0’	10.5’
E-214	OW	SP	Qpogf	in aquifer	13.2’	12.7’
	VWP	CL	Qpogl	87’	0.2’	-0.1’
E-306	OW	SP	Qpogf	in aquifer	14.7’	no data
	VWP	CL	Qpogf	20’	6.6’	4.2’
E-307	OW	CL	Qpogl	interbed in aquifer	18.5’	17.7’
	VWP	CH	Qpogd	51’	9.1’	10.0’
TW-201	OW	ML	Qpogl	23’	no data	0.0’
E-308	OW	SM	Qpogf	in aquifer	19.0’	16.9’
	VWP	GC, CL	Qpogd and Qpogl	41’	no data	8.0’
TW-202	OW	ML	Qpogm	20’	no data	-0.20
TW-202A	OW	ML	Qpogm	25’	no data	-1.34’
E-115A	sh VWP	SP	Qpogf	in aquifer	no data	11.1’
	OW	GW-GM	Qpogf	in aquifer	no data	15.4’
	dp VWP	CH	Qpogd	4’	no data	13.6’
E-309	OW	SP-SM	Qpogf	in aquifer	no data	5.5’
	sh VWP	ML	Qpogl	20’	no data	8.8’
	dp VWP	ML	Qpogl	86’	no data	0.1’
E-215	sh VWP	ML	Qpogm	120’	0.6’	0.2’
	dp VWP	CL	Qpogl	222’	0.3’	0.0’
TW-203	OW	SW	Qpogf	in aquifer	no data	40.6’

Figures



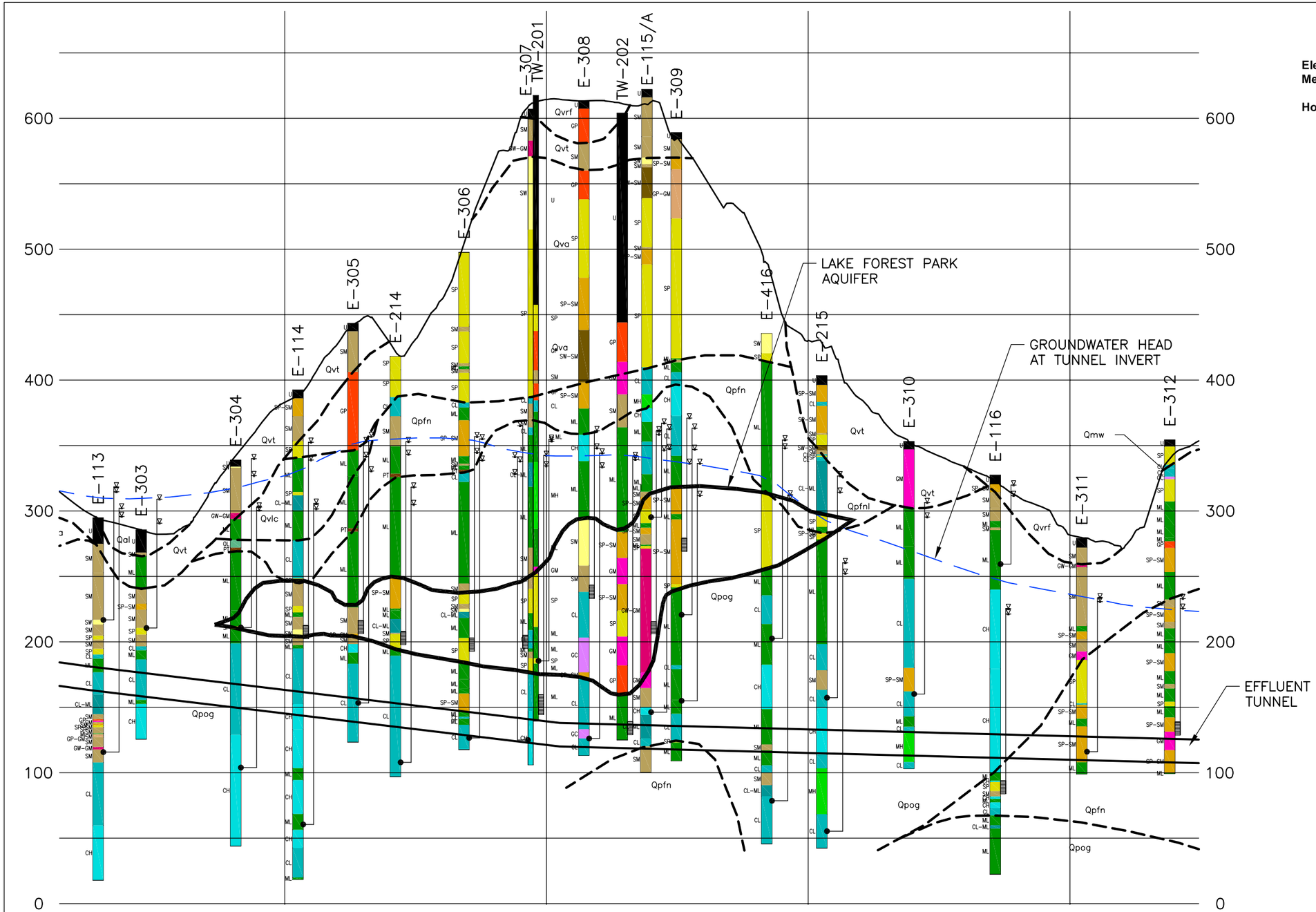
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Department of Natural Resources and Parks
Wastewater Treatment Division

CDM

Figure 1
Site and Well Location Plan
BRIGHTWATER REGIONAL WASTEWATER TREATMENT SYSTEM

Elevation Datum is Metro and in Feet.
Metro = NAVD88 +96.28 Feet

Horizontal Scale: 1 Inch = 800 Feet



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Data Sources: x

File Name: Figure 4.dwg

Figure 2
East-West Hydrogeologic Profile
BRIGHTWATER REGIONAL WASTEWATER TREATMENT SYSTEM

A
NORTH

A'
SOUTH

ELEVATION – FEET (NAVD88)

600
500
400
300
200
100
0
–100

3B1
CLAY
CEMENTED GRAVEL
BLUE CLAY
GRAVEL
SAND AND CLAY
CLAY W/GRAVEL
SAND AND GRAVEL

E–115/A
GRAVELLY SILTY SAND
SAND
SILT AND CLAY
SAND & SILTY GRAVEL
GRAVEL
SILTY SAND
CLAY
SILTY SAND

TW–202/A
SAND AND GRAVEL
SILTY SAND
SILT
SAND AND GRAVEL WITH SILT
SILT

TW–203
SILTY SAND
SILT SAND AND GRAVEL
CLAY
SILT
SILTY SAND
SILT
SILTY SAND GRADES CLEAN SAND

LFPWD
Qvr
Qvt
Qpogl
Qpogt
Qpogf
Qpogl

10A1
SILT SAND CLAY WOOD
SILT SAND
CLAY
SILT CLAY SAND
SAND AND GRAVEL
FINE SAND
MED SANDY GRAVEL

MW–10
TILL
SILTY SAND AND GRAVEL
CLAY

WATER LEVEL IN LFP AQUIFER

GROUND SURFACE

LFP AQUIFER

0 600 1200 Feet

June 2005
HORIZONTAL SCALE

P:\19897\43507\Lake Forest Park\Figure 3.dwg

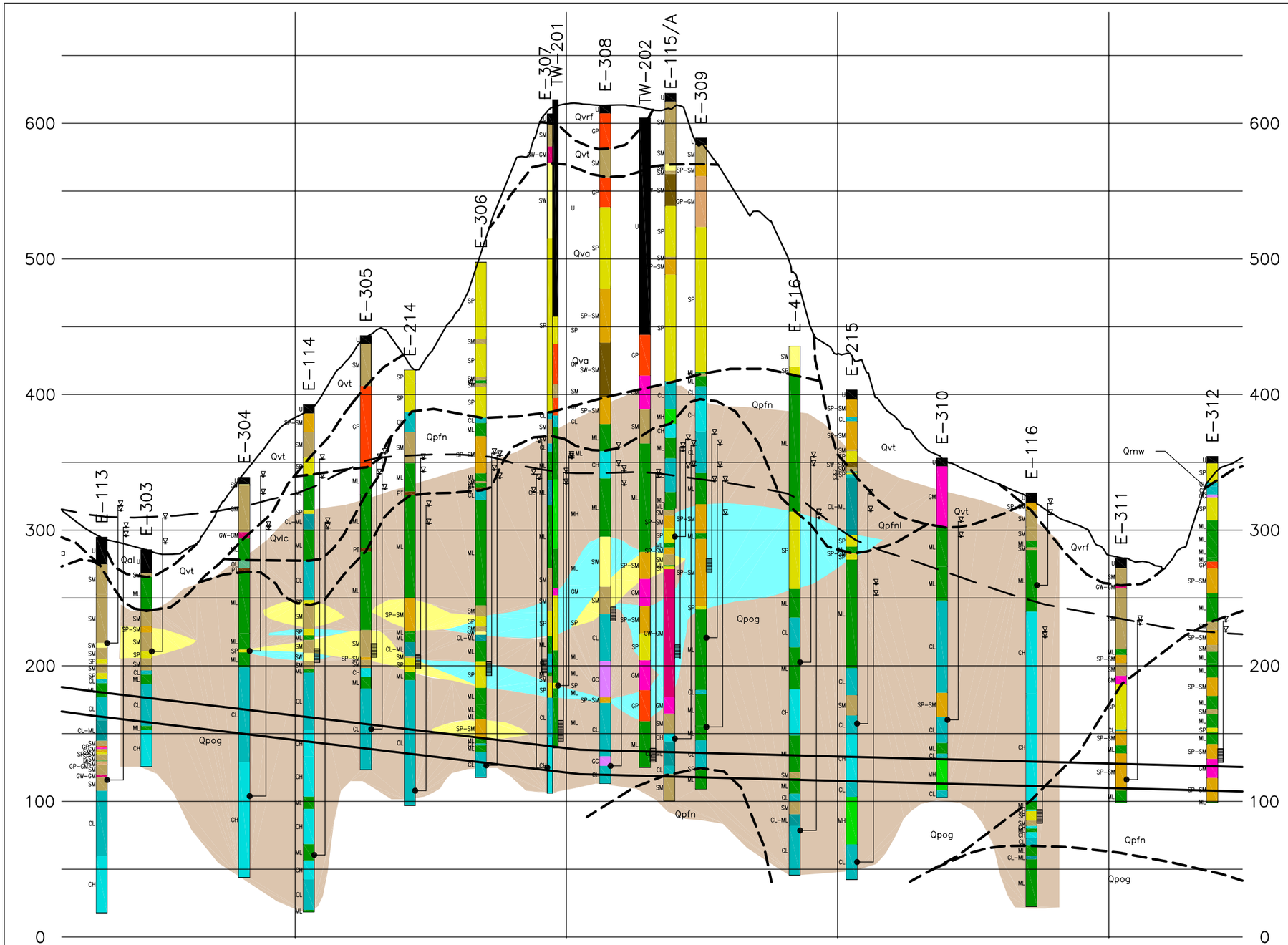
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Data Sources:

File Name:

Figure 3
North-South Hydrogeologic Profile
BRIGHTWATER REGIONAL WASTEWATER TREATMENT SYSTEM



Generalized Hydrogeologic Units in Profile

Blue units are those that are saturated and interpreted to be of higher permeability. These generally include clean gravels and sands, typically GP, GW, SW, and some SP (all except fine sands). K range 10^{-1} to 10^{-3} cm/sec.

Yellow units are those that are saturated and interpreted to be of moderate permeability, and may yield groundwater in moderate amounts. These include SP (if sand is predominantly fine), all slightly silty units generally including SM-SP, GM-GP, GM-GW, SM-SW, and units that appear to be interbedded higher and lower permeability soils. K range 10^{-3} to 10^{-5} cm/sec.

Brown units are those that are not interpreted to behave as an aquifer, and likely possess low permeability. These include clay and silt (CH, CL, ML and MH) mixtures, silt and sand mixtures (SM), silt and gravel mixtures (GM), and tills and diamictons that may have a dominantly fine-grained matrix (typically ML or SM or GM). K range 10^{-5} to 10^{-7} cm/sec.

(There is some crossover between these units, and classification as blue, yellow, or brown is based on logged descriptions of grain sizes present, not just the unified soil classification designations referenced above.)

Elevation Datum is Metro and in Feet.
Metro = NAVD88 +96.28 Feet

Horizontal Scale: 1 Inch = 800 Feet

5-B Hydrogeologic Investigations
Brightwater 2005

King County
Department of
Natural Resources and Parks
Wastewater Treatment
Division

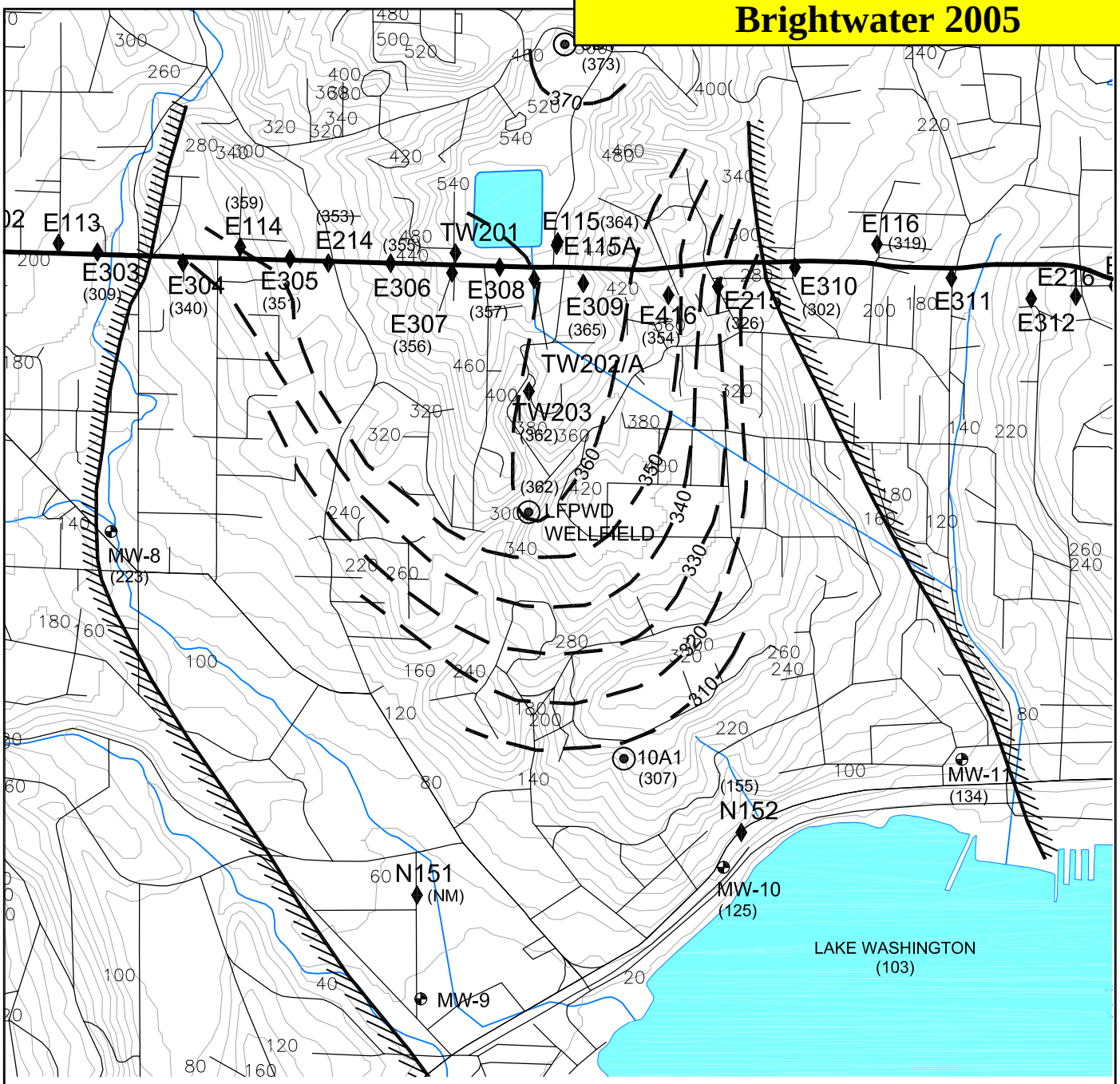
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Data Sources:

File Name: Figure 4.dwg

Figure 4
Conceptual Model of Aquifer
BRIGHTWATER REGIONAL
WASTEWATER TREATMENT SYSTEM

5-B Hydrogeologic Investigations
Brightwater 2005



310 GROUNDWATER CONTOUR AND ELEVATION IN FEET (METRO DATUM)

LAKE FOREST PARK AQUIFER BOUNDARY

10A1 WATER SUPPLY WELL LOCATION AND DESIGNATION

N152 BRIGHTWATER EXPLORATION BORING LOCATION AND DESIGNATION

MW-10 EIS BORING LOCATION AND DESIGNATION

(307) GROUND WATER ELEVATION IN FEET (METRO DATUM)

N

0 600 1200 Feet

June 2005

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

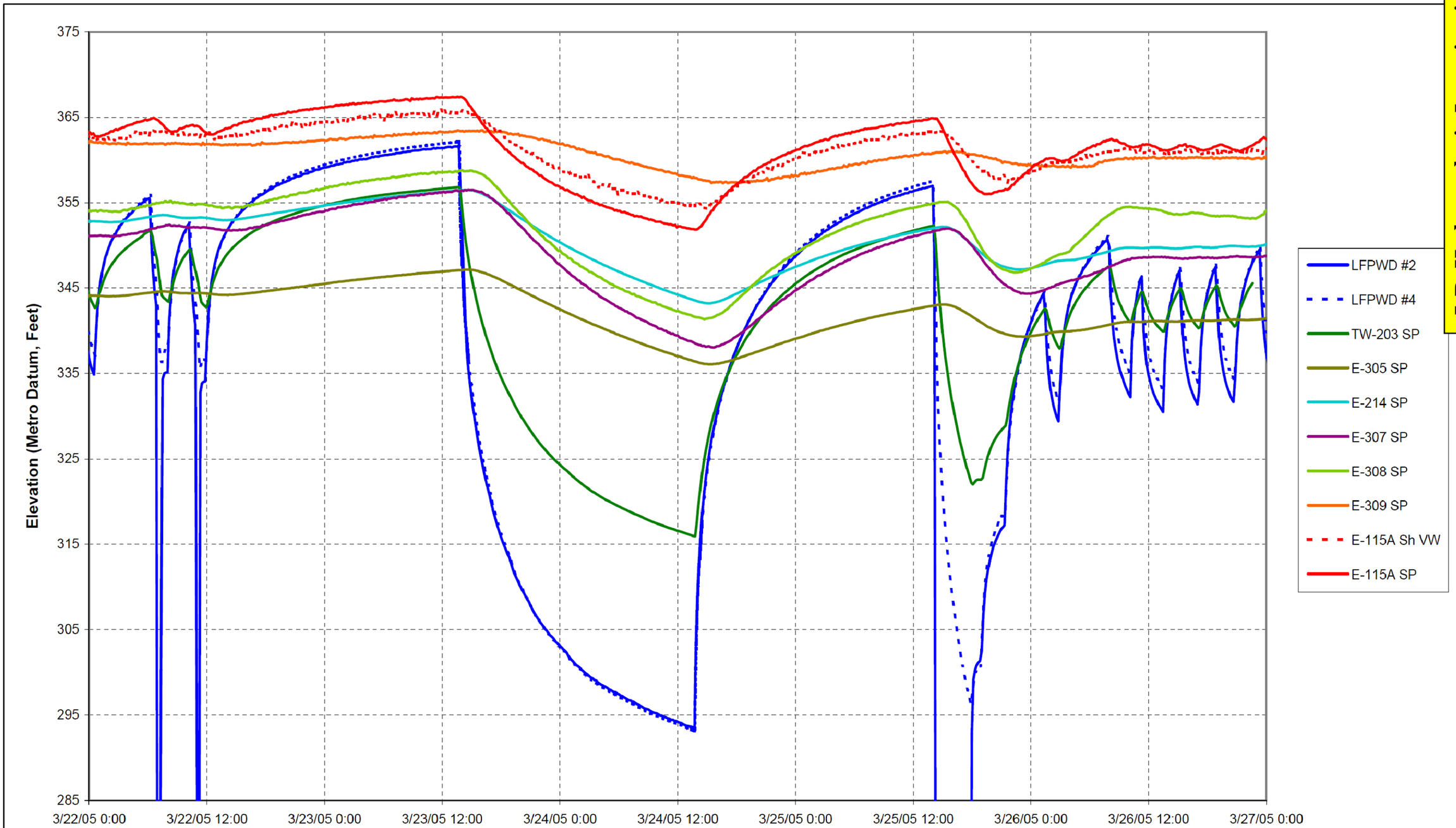
CDM

Figure 5

Groundwater Potentiometric Surface

BRIGHTWATER REGIONAL WASTEWATER TREATMENT SYSTEM

5-B Hydrogeologic Investigations
Brightwater 2005



P:\19897\43507\Lake Forest Park\Figure 6.dwg

King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

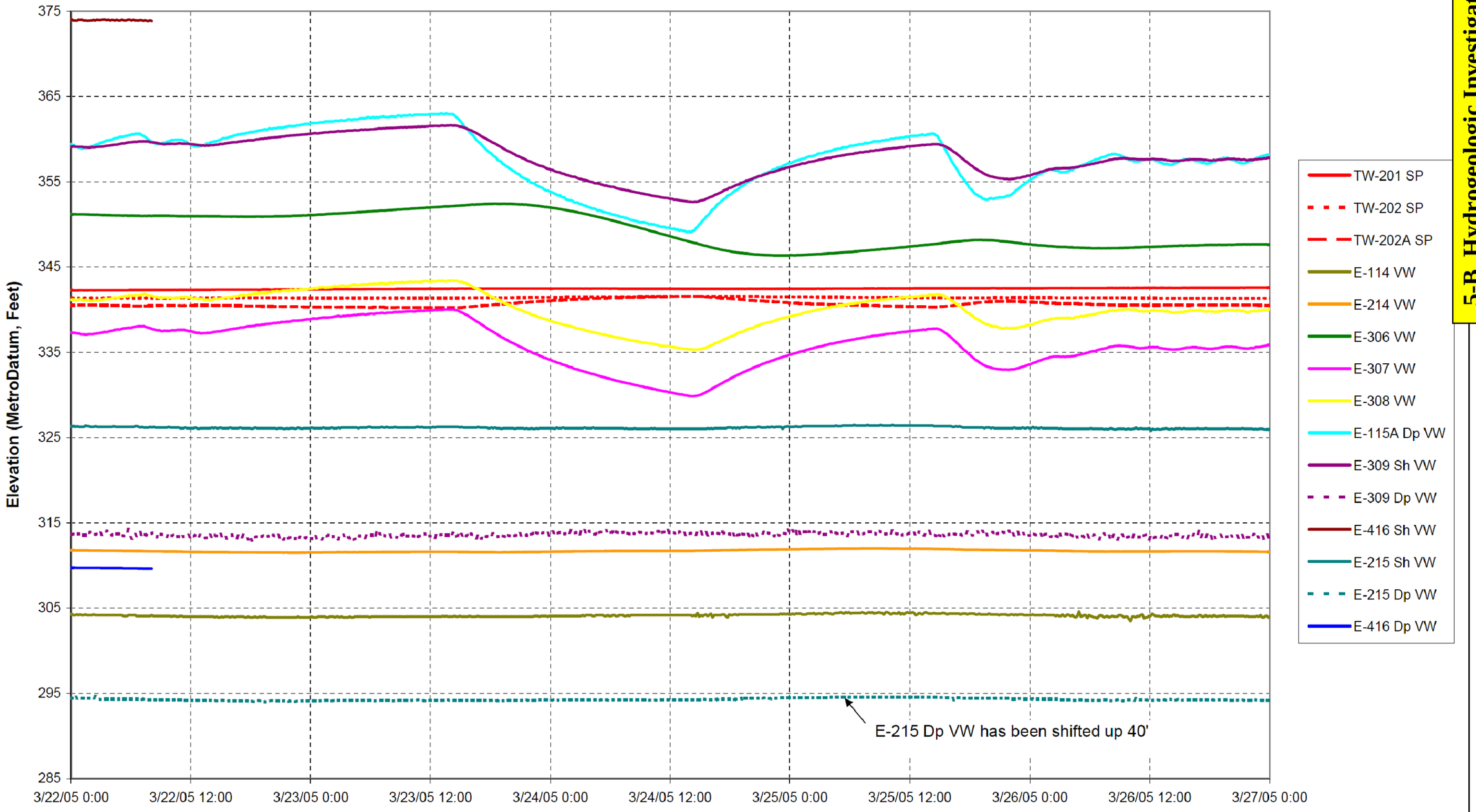
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Data Sources:

File Name:

Figure 6
LFPWD Pump Test 2005 Hydrograph of Installations in the LFP Aquifer
BRIGHTWATER REGIONAL
WASTEWATER TREATMENT SYSTEM

5-B Hydrogeologic Investigations
Brightwater 2005



P:\19897\43507\Lake Forest Park\Figure 7.dwg

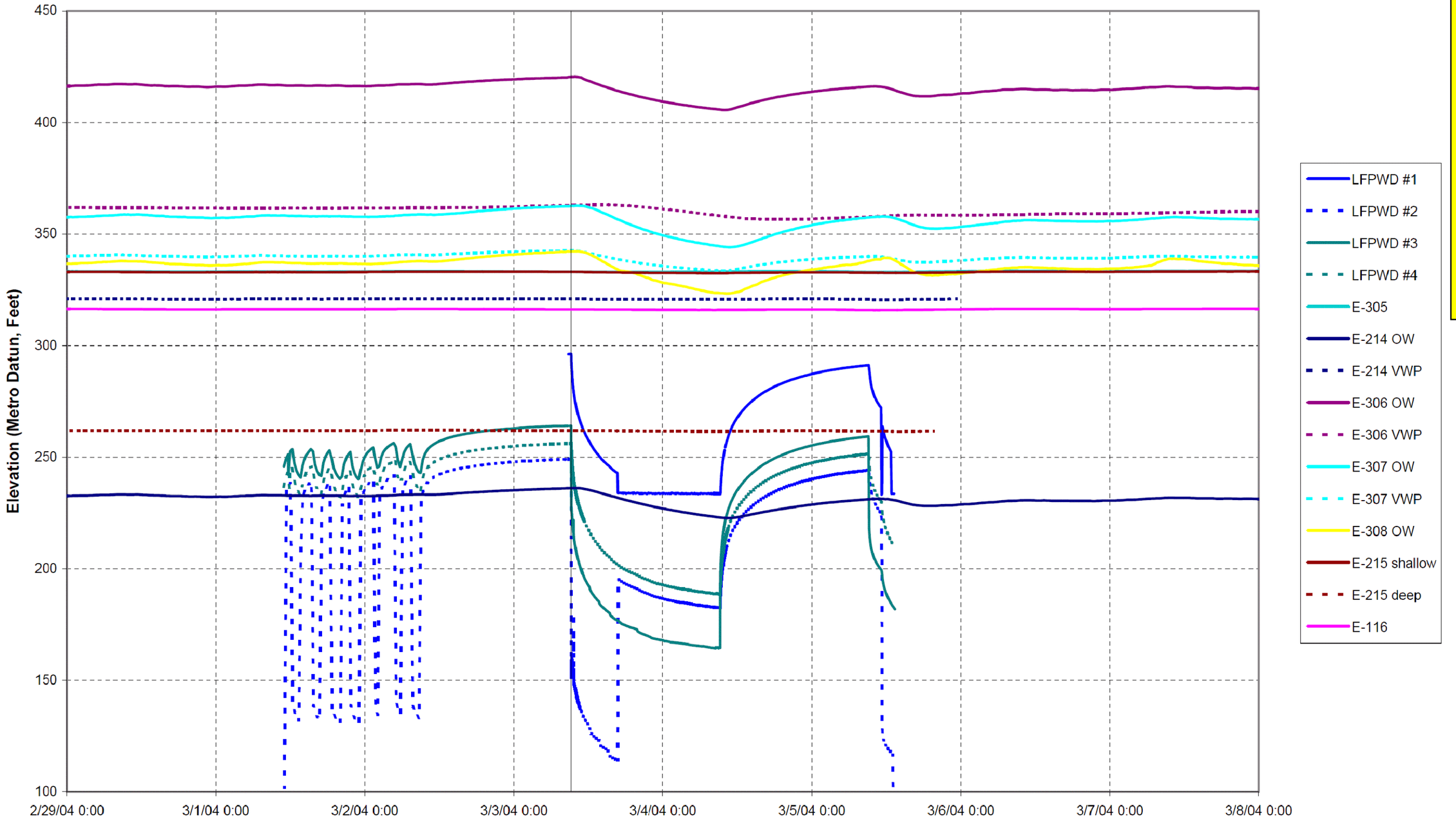
King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

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Data Sources:

File Name:

Figure 7
LFPWD Pump Test 2005 Hydrograph of Installations Below the LFP Aquifer
BRIGHTWATER REGIONAL WASTEWATER TREATMENT SYSTEM



P:\19897\43507\Lake Forest Park\Figure 7.dwg

King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

The information included on this map has been compiled from a variety of sources and is subject to change without notice. King County makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. King county shall not be liable for any general, special, indirect, incidental, or consequential damages including, but not limited to, lost revenues or lost profits resulting from the use or misuse of the information contained on this map. any sale of this map or information on this map is prohibited except by written permission of King County.

Data Sources:

File Name:

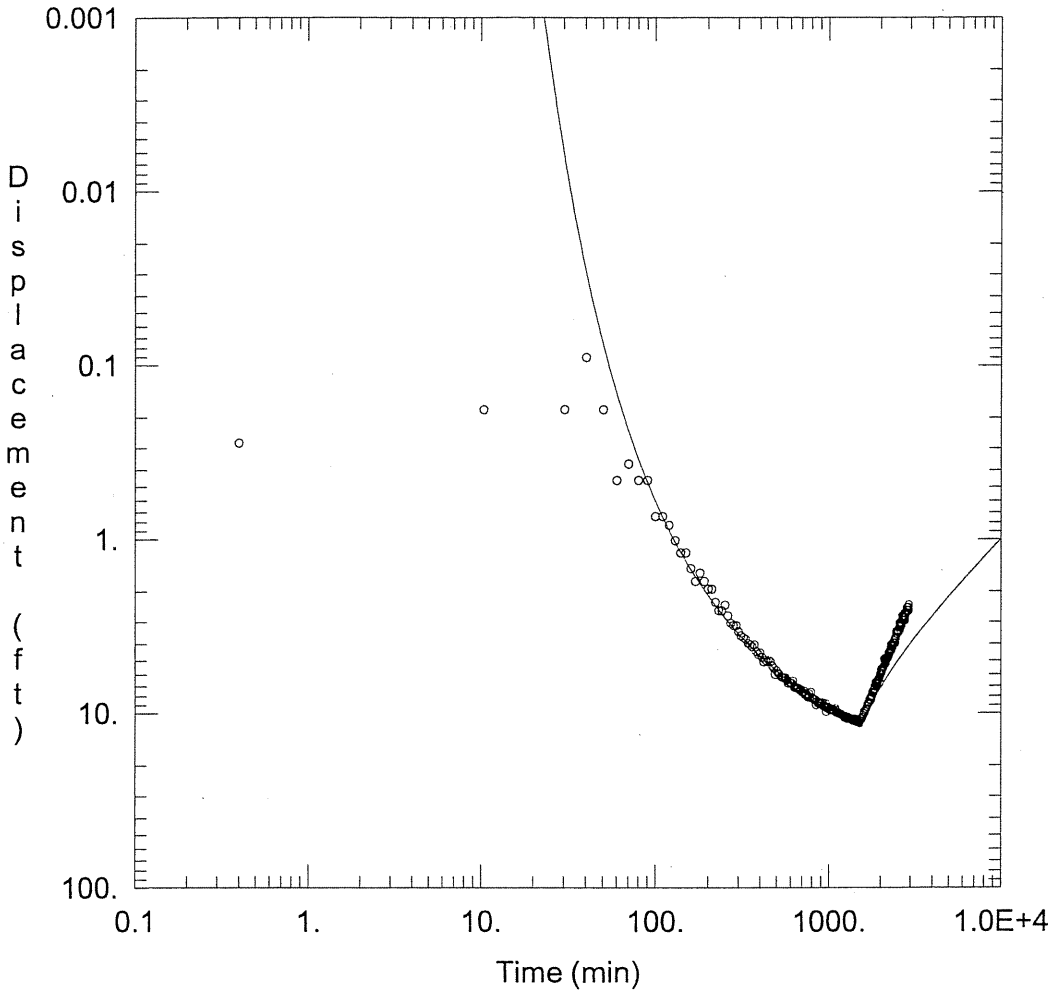
Figure 8
LFPWD Pump Test 2004 Hydrograph of Observation and Pump Wells
BRIGHTWATER REGIONAL
WASTEWATER TREATMENT SYSTEM

Appendix A

Boring Logs and Well Construction Diagrams

Appendix B

Pumping Test Analysis Plots



LFPWD TEST 2005

Data Set: U:\LFPWD\E115ASH_T.aqt
Date: 04/15/05 Time: 10:53:38

PROJECT INFORMATION

Company: Aspect Consulting
Client: Brightwater/CDM/King County
Project: 020102-100-160.4d
Location: Lake Forest Park
Test Well: LFP Wellfield
Test Date: 3/23/05

5-B Hydrogeologic Investigations
Brightwater 2005

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Wellfield	0	0

Observation Wells

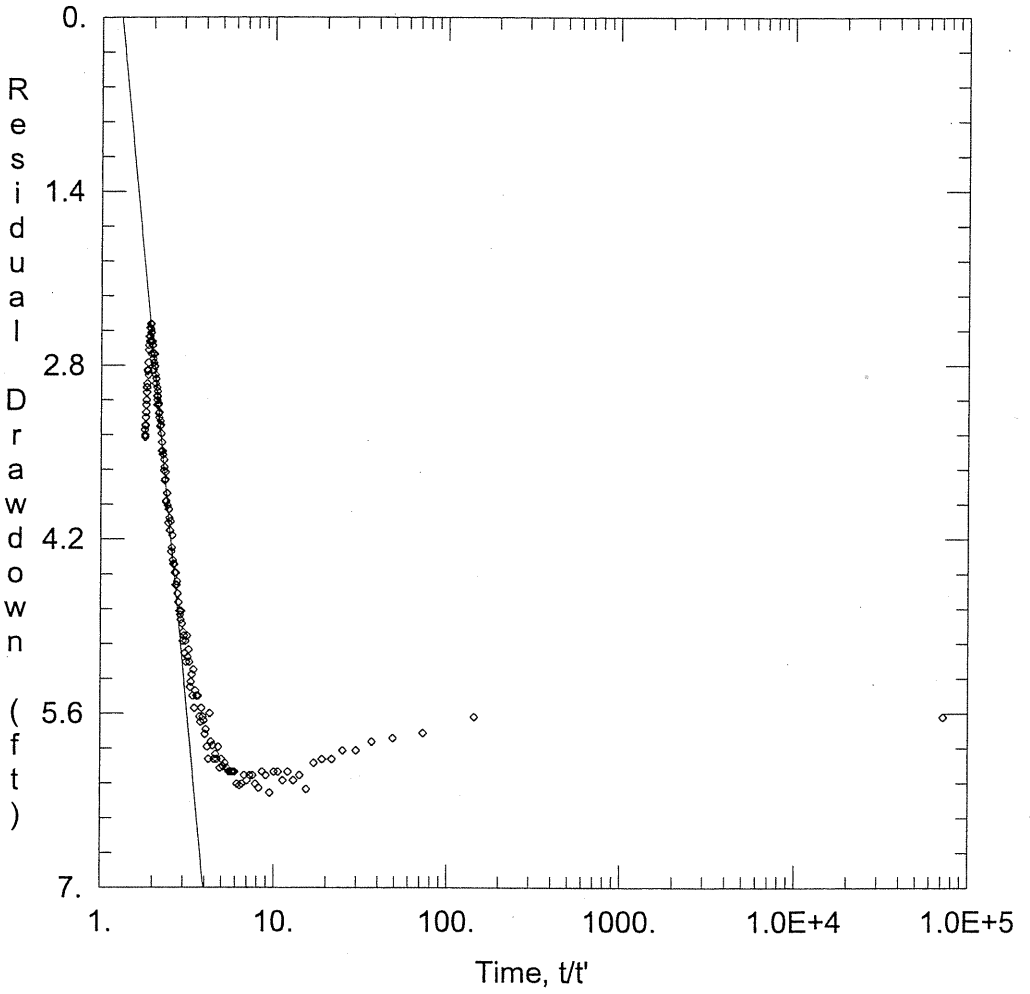
Well Name	X (ft)	Y (ft)
○ E115A sh VWP	2300	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 16.46 cm^2/sec
S = 0.0001249
Kz/Kr = 0.1
b = 80. ft

Attachment B



LFPWD TEST 2005

Data Set: U:\LFPWD\E309SP_Tr.aqt
Date: 04/19/05 Time: 17:49:23

PROJECT INFORMATION

Company: Aspect Consulting
Client: Brightwater/CDM/King County
Project: 020102-100-160.4d
Location: Lake Forest Park
Test Well: LFP Wellfield
Test Date: 3/23/05

5-B Hydrogeologic Investigations
Brightwater 2005

AQUIFER DATA

Saturated Thickness: 80. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Wellfield	0	0

Observation Wells

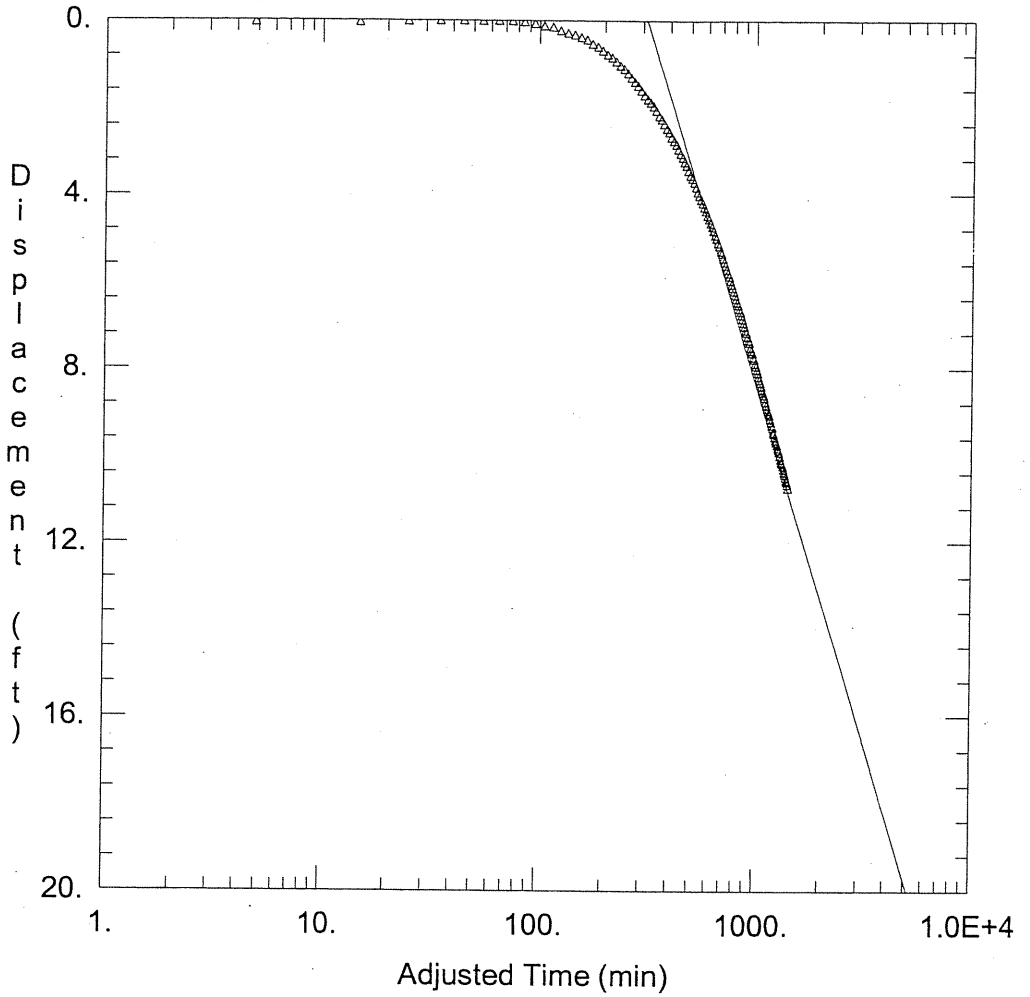
Well Name	X (ft)	Y (ft)
◇ E-309 SP	2000	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 16.97 cm^2/sec S/S' = 1.297

Attachment B



LFPWD TEST 2005

Data Set: U:\LFPWD\E305SP_T.aqt
Date: 04/15/05 Time: 10:25:44

PROJECT INFORMATION

Company: Aspect Consulting
Client: Brightwater/CDM/King County
Project: 020102-100-160.4d
Location: Lake Forest Park
Test Well: LFP Wellfield
Test Date: 3/23/05

5-B Hydrogeologic Investigations
Brightwater 2005

AQUIFER DATA

Saturated Thickness: 80. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Wellfield	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
▵ E-305 SP	2880	0

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 15.07 cm^2/sec S = 8.217E-5

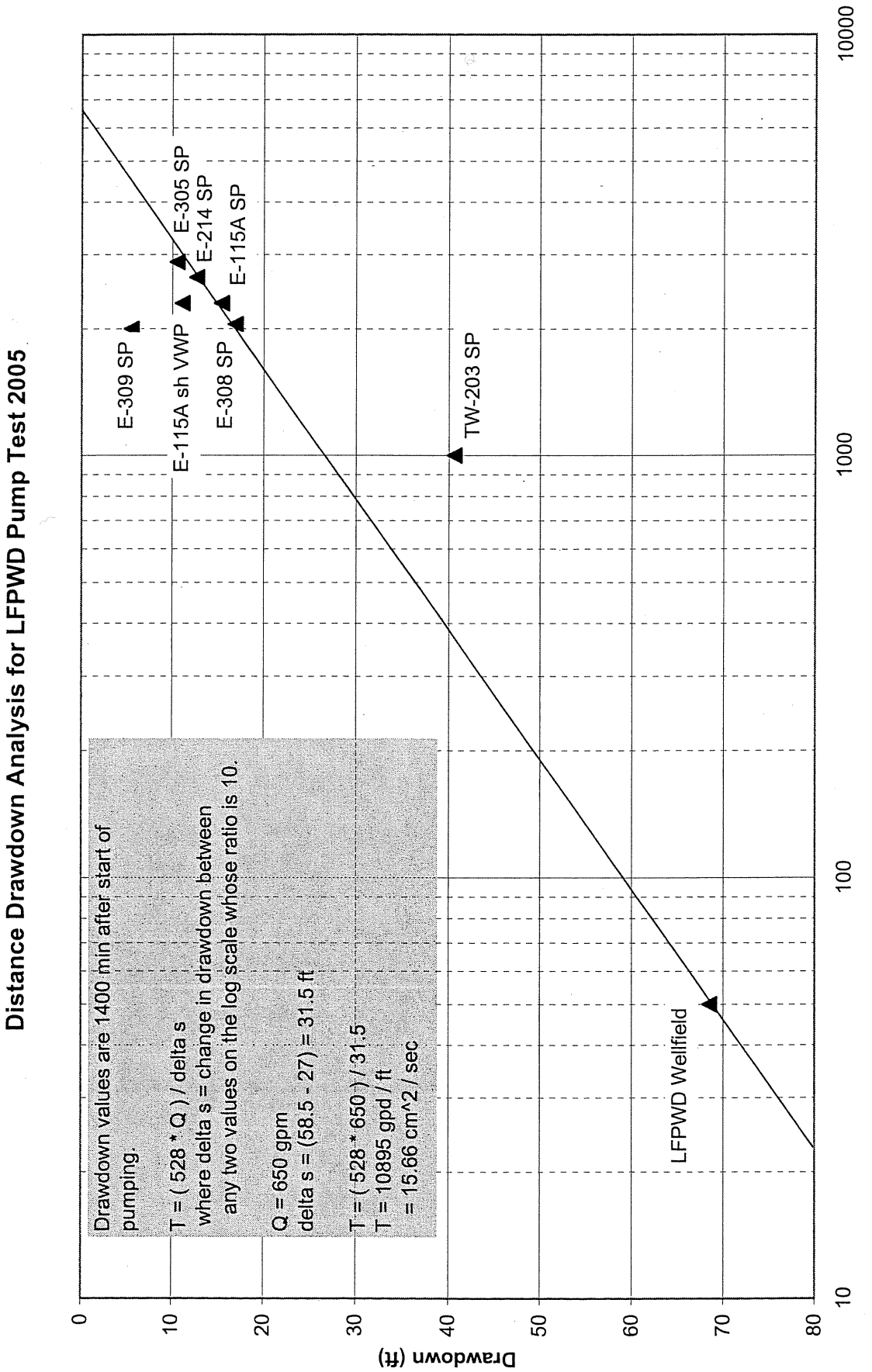
Attachment B

5-B Hydrogeologic Investigations
Brightwater 2005

Appendix C

Distance Drawdown Analysis

5-B Hydrogeologic Investigations
Brightwater 2005



Attachment C

APPENDIX 5 - C WELL CONSTRUCTION REPORTS MCKINNON CR.

WELL #1

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
AND DEVELOPMENT

WELL LOG

No. Decla/ 835
Cert. #767-D

Date 1940, 19
Record by J. W. Hueter
Source G. W. Decla. Claim

Location: State of WASHINGTON
County King
~~xxx~~ Firtst Add. to Lake Forest
~~xxx~~ Lot 15, Block 13
¼ ¼ sec. 3 T. 26 N., R. 4 E. W.

DIAGRAM OF SECTION

Drilling Co.
Address
Method of Drilling drilled Date 19
Owner Lake Forest Park Water Co., a Corp.
Address Seattle, Wash.
Land surface, datum ft. above / below

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	no record		
Pump	Test:		
	Dim: 172'		
	Dd: 70'		
	Pump: Turbine, 100 g.p.m.		
	Motor: 3 hp		
	Yield: 100 g.p.m. (Claim)		
	Perfor: Screen from 6' to 10' perfo		

(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)

Turn up

Sheet of sheets

5-C Well Const. Reports McKinnon

WELL LOG.—Continued No. 26/4-3Q

Correlation	Material	Thickness (feet)	Depth (feet)
	Depth forward	———	
	PUMP TEST:		
	Dim. 8"x216'		
	SWL: 60 ft.		
	DD: 40 ft.		
	Yield: 440 g.p.m.		
	Water Temp. 50°		
	Test pump - gas driven turbine		
	CASING:		
	12" diam. from 0 to 12 ft.		
	8" " from 0 to 195 ft.		
	Shoe is now at 195 ft.		
	PERFORATIONS:		
	Cook well screen #40 slot from		195
	to 216 ft.		

S. F. No. 7[illegible]—12-54—3M. 40108.

WELL #2

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION AND DEVELOPMENT

WELL LOG No. Appli. 5680

Date 12-16, 1960

Record by well driller

Source driller's record

Location: State of WASHINGTON

County King

Area

Map Lot 15, Blk.13, Lk.F. Park 1st Add.

¼ ¼ sec. 3 T. 26 N., R. 4 E.

Diagram of Section

Drilling Co. H.O. Meyers Drilling Co.

Address 6424 L.W.Blvd.N.E., Kirkland, Wash

Method of Drilling Date 11-26, 1960

Owner King Co. Water Dist. #83

Address Box 1627, Seattle, Wash.

Land surface, datum ft. above / below

Correlation	Material	Thickness (feet)	Depth (feet)
	Sand & some clay	6	6
	" " " " -some water	21	27
	Sand, gravel & water	9	36
	Clay & peat	22	58
	Blue clay	28	90
	Tough blue clay	20	110
	Gravel & clay	5	115
	" " " very hard @ 112	5	120
	Small gravel in clay	20	140
	Gravel	14	154
	Hardpan & fine sand	15	169
	Gravel sand & water	13	182
	Some wood & fine sand	2	184
	Coarse sand	18	202
	Gravel & coarse sand	14	216

(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)

(over)

Turn up Sheet ... of ... sheets

5-C Well Const. Reports McKinnon

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

WELL #3

Application No. 26/04-09C
Permit No. ....

(1) OWNER: Name City of Lake Forest Park Address .....

(2) LOCATION OF WELL: County King — ne ¼ nw ¼ Sec 9 T 26 N., R 4e W.M.

Bearing and distance from section or subdivision corner .....

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) .... NEW 3 4
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 12 inches.
Drilled 161 ft. Depth of completed well 161 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 12 " Diam. from 0 ft. to 161 ft.
Threaded ☐ ..... " 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 Johnson
Type stainless Model No. .....
Diam. 12 Slot size .060 from 144 ft. to 159 ft.
Diam. ..... Slot size ..... from ..... ft. to ..... 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 cement
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ..... Depth of strata .....
Method of sealing strata off .....

(7) PUMP: Manufacturer's Name Fairbanks Morse
Type: line shaft turbine H.P. 15

(8) WATER LEVELS: Land-surface elevation above mean sea level .... ft.
Static level 18 ft. 1 in. ft. below top of well Date 7-5-74
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? city
Yield: 350 gal./min. with 20 ft. drawdown after 8 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

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 ☐

(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
sand and gravel	0	5
brn silty sand and gravel	5	11
blue silty sand and gravel	11	24
brn silty sand and gravel	24	29
blue silty sand and gravel	29	46
blue silty sand	46	98
blue silty sand and gravel	98	142
water bearing sand and gravel	142	159
blue silty sand	159	161

Work started 6-20-74, 19.... Completed 7-9-74, 19....

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 Northwest Pump & Drilling Co.
(Person, firm, or corporation) (Type or print)

Address 5245 auburn Way So. Auburn, Wn.

[Signed] Richard B. DeCamp
(Well Driller)

License No. 0097 Date 8-29-74, 19....

(USE ADDITIONAL SHEETS IF NECESSARY)

G. F. No. 7356—OS—(Rev. 4-71).

5-C Well Const. Reports McKinnon

DEPT ECOLOGY WD SO
002

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. 004586
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name King County Water Dist 83 Address 17705 Ballinger Way NE

(2) LOCATION OF WELL: County King NW¼ SE¼ Sec. 10 T. 26 N., R. 5E W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) 47th Ave NE NE 187th Place

(3) PROPOSED USE: ☐ Domestic ☐ Industrial ☐ Municipal ☒ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one) #4
Abandoned ☐ New well ☐ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 8" inches.
Drilled 235 feet. Depth of completed well 210 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 8" Diam. from +2 ft. to 190 ft.
Welded ☒ Liner installed ☐ Threaded ☐ " Diam. from ft. to ft.
" 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 Johnson
Type 304 Stainless Model No.
Diam. 6" Slot size 40 from 190 ft. to 200 ft.
Diam. 8" Slot size 20 from 200 ft. to 205 ft.

Gravel packed: Yes ☐ No ☒ Size of gravel 16 205 - 210
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 20' ft.
Material used in seal Cement
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 57' ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? Driller
Yield: 350 gal./min. with 19 ft. drawdown after 3 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

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.

5-C Well Const. Reports McKinnon

(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 Sand	0	6
Brown Sand + gravel	6	16
Gray Sand + gravel	16	20
Gray Silty gravel	20	33
Brown + gray silt + clay some gravel	33	136
Sand + gravel water	136	151
Sand	151	158
Sand + gravel	158	174
Sand	174	189
Sand + gravel	189	205
Sand some gravel	205	210
Sand	210	218
Sand some gravel	218	225
Gray Clay	227	235

Work started 4-4-88, 19. Completed 4-20-88, 19

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 Rd E
(Signed) (WELL DRILLER) License No. 1099
Contractor's Registration No. HOLTDI*136B6 Date 7-8, 1994

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

ORIGINAL

Start Card No. 004586

Water Right Permit No. _____

(1) OWNER: Name King County Water Dist 83 Address 17705 Ballinger Way NE

(2) LOCATION OF WELL: County King ¼ ¼ Sec. T. N., R. W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) _____

(3) PROPOSED USE: ☐ Domestic ☐ Industrial ☐ Municipal ☒
☐ Irrigation ☐ Test Well ☐ Other ☐
☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one) #4
Abandoned ☐ New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 8" inches.
Drilled 235 feet. Depth of completed well 210 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 8" Diam. from 0 ft. to 191 ft.
Welded ☒ _____" Diam. from _____ ft. to _____ ft.
Liner installed ☐
Threaded ☐ _____" 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 Johnson
Type 304 Model No. _____
Diam. 8 Slot size 40 from 210 ft. to 200 ft.
Diam. 8" Slot size 20 from 200 ft. to 190 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 Cement
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 57 ft. below top of well Date _____

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 57 ft. below top of well Date _____
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? Driller
Yield: 350 gal./min. with 19 ft. drawdown after 3 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

Date of test _____

5-C Well Const. Reports McKinnon

Temperature of water _____ 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 Sand	0	6
Brown silty sand + gravel	6	16
Gray sand + gravel	16	20
Gray silty sand	20	33
Gray silt	33	43
Brown silt organics	43	47
Gray silt	47	111
Gray silty sand - gravel	111	136
Sand + gravel (water)	136	151
Sand (water)	151	158
Sand, some cobbles (water)	158	161
Sand + gravel (water)	161	174
Sand	174	184
Sand + gravel (water)	184	205
Sand, some gravel	205	210
Sand	210	214
Sand + gravel	214	218
Sand + gravel silt + clay	218	227
Gray clay, some sand gravel	227	232
Gray clay	232	235

Work started 4-7-84 19 Completed 4-20-84 19

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 Rd E

(Signed) _____ (WELL DRILLER) License No. 1044

Contractor's Registration No. _____ Date 4-21 19 84

WELL LOG.—Continued No. 26/4-30

Correlation	Material	Thickness (feet)	Depth (feet)
	Depth forward	———	
	Yield: 200 gpm with 130' DD after 1 hr.		
	250 gpm with 152' DD after 3 hrs.		
	300 gpm with 168' DD after 15 min.		

S. F. No. —6-61—2M.

5-C Well Const. Reports McKinnon

ABANDONED #3

Appl.# 8167

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION AND DEVELOPMENT

WELL LOG No. 26/4E-30Q

Date May 15, 1967

Record by Driller

Source Driller's record

Location: State of WASHINGTON

County King

Area

Map

SW¼ SE¼ sec. 3 T. 26 N., R. 4 E. W.

Diagram of Section

Drilling Co. Richardson Well Drilling Company

Address 219 So. 115th St., Tacoma, Washington

Method of Drilling Cable Date September 3, 1966

Owner King County Water Dist. #83

Address 3712 N.E. 180th St. Seattle, Wash.

Land surface, datum ft. above / below

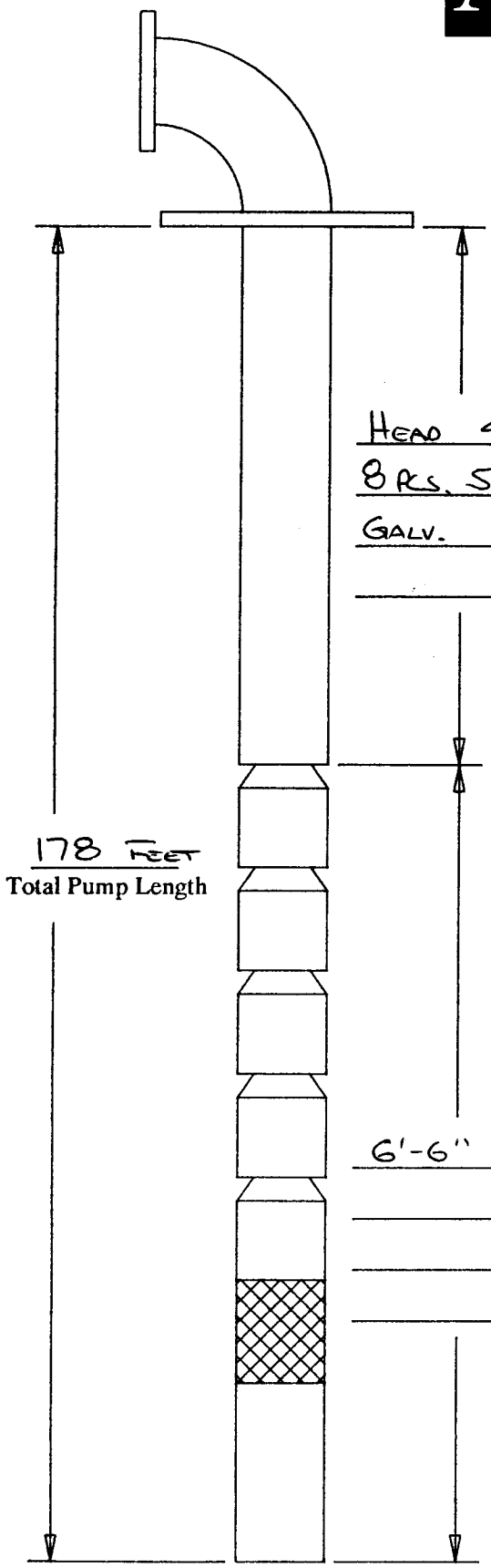
SWL: 24' August 29, 1966 Dims: 12" x 172'

Correlation	Material	Thickness (feet)	Depth (feet)
	(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)		
	Municipal		
	Clay, brown	0	5
	Sand & gravel with water	5	16
	Clay, blue	16	23
	Sand, gray, some water	23	28
	Clay, gray	28	107
	Hardpan	107	120
	Sand, fine, heaving	120	141
	Sand, cemented	141	147
	Clay, gray	147	152
	Sand, & gravel, water	152	172
	Clay, gray	172	182
	Casing: 12" from 0-154'		
	Screened from 147-152' and 152-172'		
	Surface sealed with concrete to 10'		

Turn up

Sheet ... of ... sheets

AQUA FLO INC.



Customer LAKE FOREST PARK

P.O.# Well# 2

Pump Model GT20-275

Serial No G311-090

No. of Stages 4

GPM _____ TDH _____

Liquid WATER

HEAD 42" *

8 RS. 5" SCH 40 x 21'

GALV.

Motor Mfgr FRANKLIN

H.P. 20 RPM 3600

P.H. 3 Volts 460

Wire 10/4 FLAT JACKET

Date Installed 11-2-94

Pump OD over Guard 6"

Motor OD 6"

Shroud OD N/A

Shroud ID N/A

Notes – ADD 18" WELL CASING (8" PIPE)

– SET PUMP 24" DEEPER

– S.S. BANDS HOLD DROP TUBE AND WIRE

– 1" SCH 80 PVC TUBE TO 171'-6" WITH END CAP

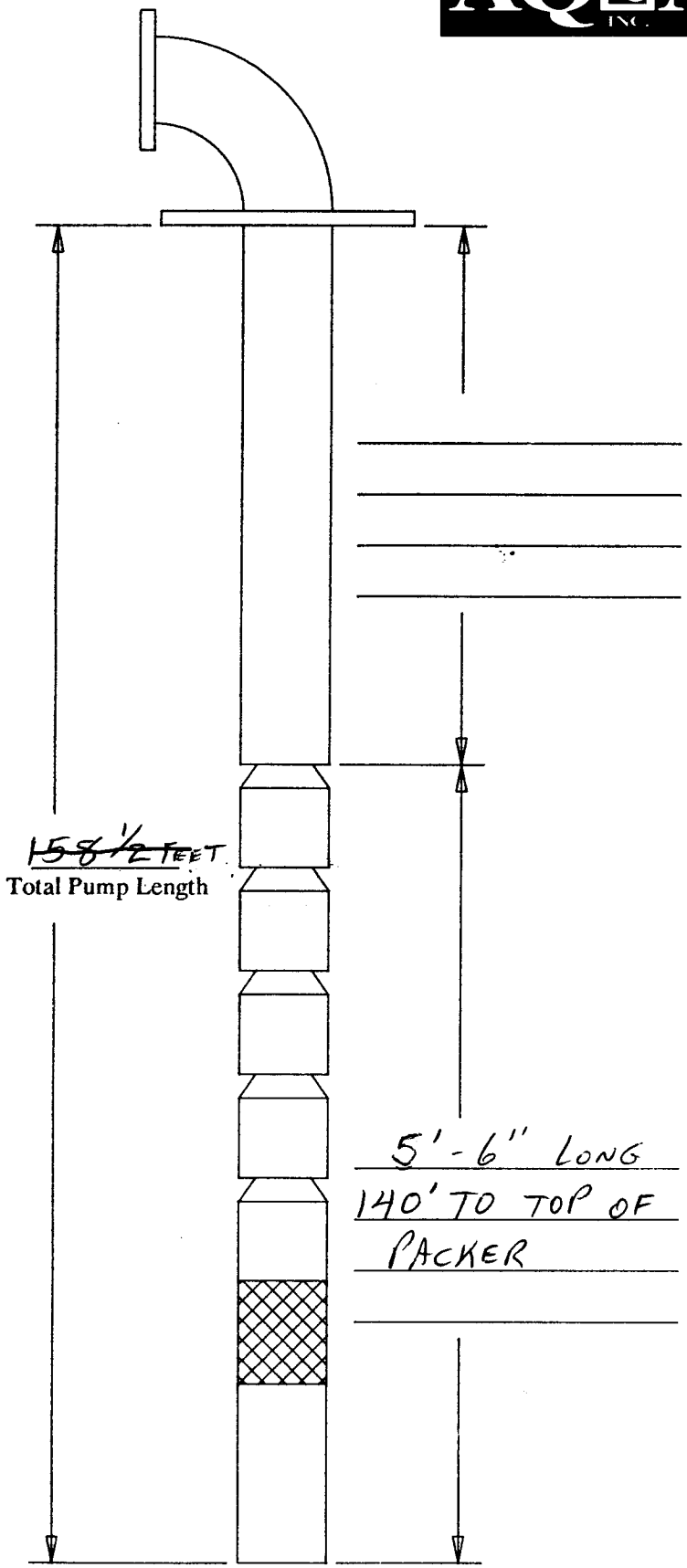
– MOTOR MEG. - Z ON ALL 3 LEGS, POOR CONDITION

5-C Well Const. Reports McKinnon

★ HEAD IS FROM WELL HEAD BASE TO TOP OF FIRST LENGTH OF WELL PIPE.

1413 Meridian East • Puyallup. WA 98371-1399 • Telephone (206) 952-9363 • FAX (206) 952-9368

AQUA FLO INC.



Customer KING COUNTY WATER DIST. #83

P.O.# Well# 3

Pump Model GT 20-275

Serial No

No. of Stages 4

GPM TDH

Liquid WATER

Motor Mfgr FRANKLIN

H.P. 20 RPM 3600

P.H. 3 Volts 460

Wire 10/4 FLAT JACKET

Date Installed 9/93?

Pump OD over Guard 6"

Motor OD 6"

Shroud OD N/A

Shroud ID N/A

Notes 12" CASING

143' TO TOP OF 1ST SCREEN

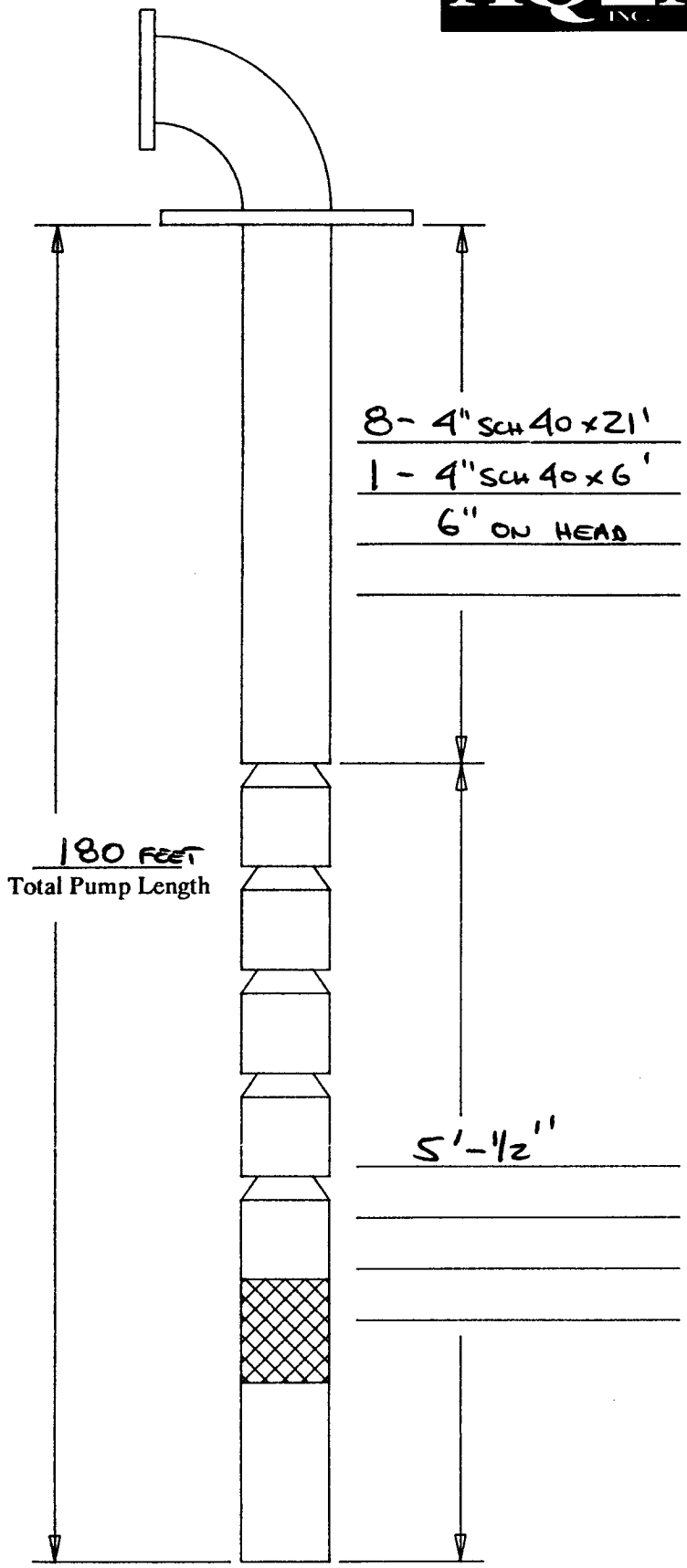
149' TO TOP OF 2ND SCREEN

155½ TO BOTTOM OF WELL

5-C Well Const. Reports McKinnon

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AQUA FLO INC.



Customer LAKE FOREST PARK #83

P.O.# Well# #4

Pump Model GOULDS 6DHLC

Serial No FP358659

No. of Stages 3

GPM 340 TDH 130

Liquid WATER

Motor Mfgr FRANKLIN

H.P. 20 RPM 3600

P.H. 3 Volts 460

Wire 1°/4 FLAT JACKET

Date Installed 7/94

Pump OD over Guard 6.28

Motor OD 5.38

Shroud OD N/A

Shroud ID N/A

Notes -4" D.I. CHECK VALVE ABOVE PUMP.

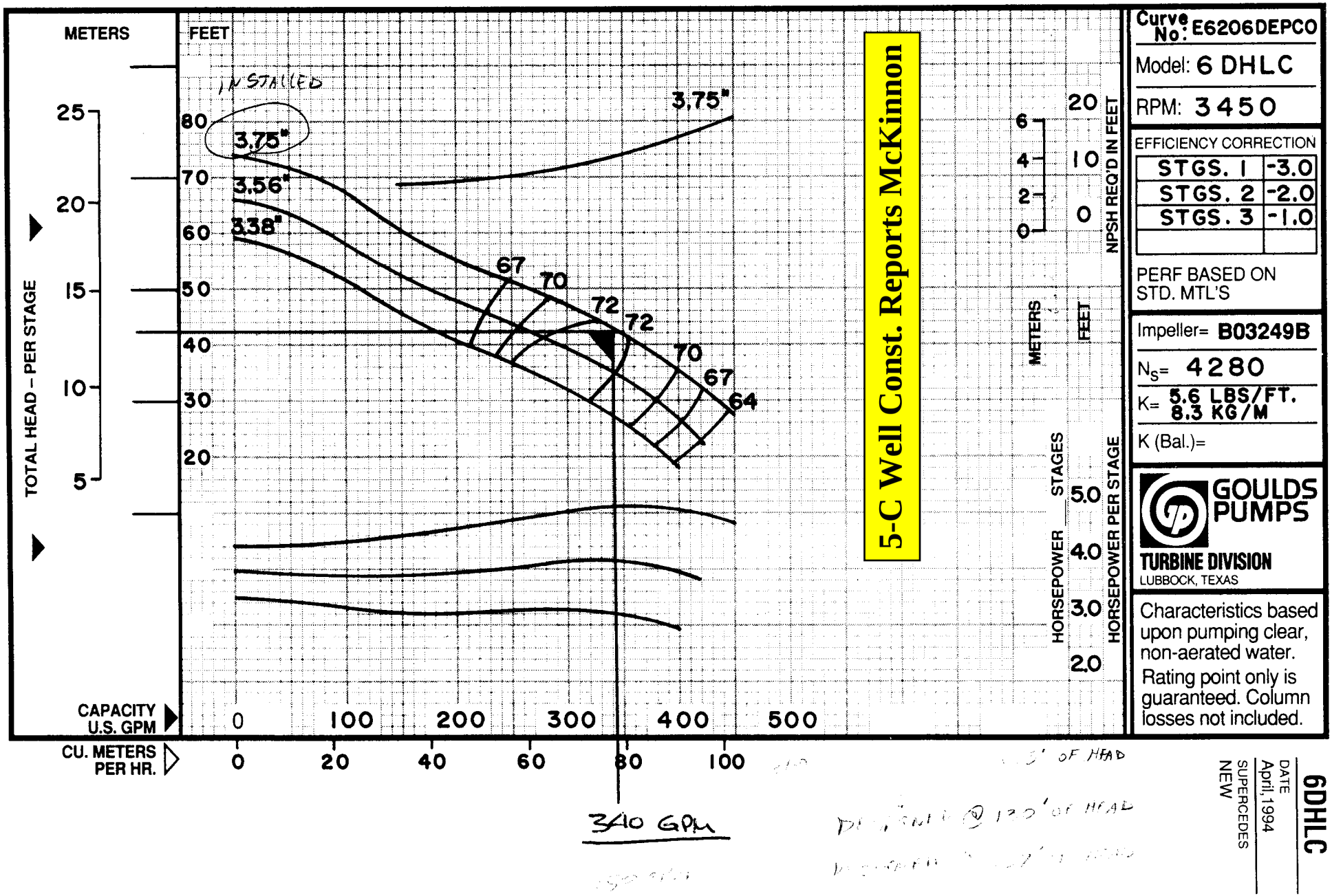
- 1" SCH 80 PVC INSTALLED TO TOP OF PUMP.

- STAINLESS BANDING HOLDS WIRE + 1" TUBE TO COLUMN

5-C Well Const. Reports McKinnon

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GOULDS PROPOSAL NO.	GOULDS S.O. NO.	INQUIRY NO.	CUSTOMER P.O. NO.	P.O. DATE	ITEM NO.	CUSTOMER			
						Lake Forest Park #83			
PROJECT		SERVICE		GPM CAPACITY	F.T. TDH	% EFFICIENCY	RPM		
Well #4		Water		340	130	71	3600		



Curve No: E6206DEPCO

Model: 6 DHLC

RPM: 3450

EFFICIENCY CORRECTION

STGS. 1	-3.0
STGS. 2	-2.0
STGS. 3	-1.0

PERF BASED ON STD. MTL'S

Impeller= B03249B

N_S= 4280

K= 5.6 LBS/FT. 8.3 KG/M

K (Bal.)=

GOULDS PUMPS

TURBINE DIVISION

LUBBOCK, TEXAS

Characteristics based upon pumping clear, non-aerated water.

Rating point only is guaranteed. Column losses not included.

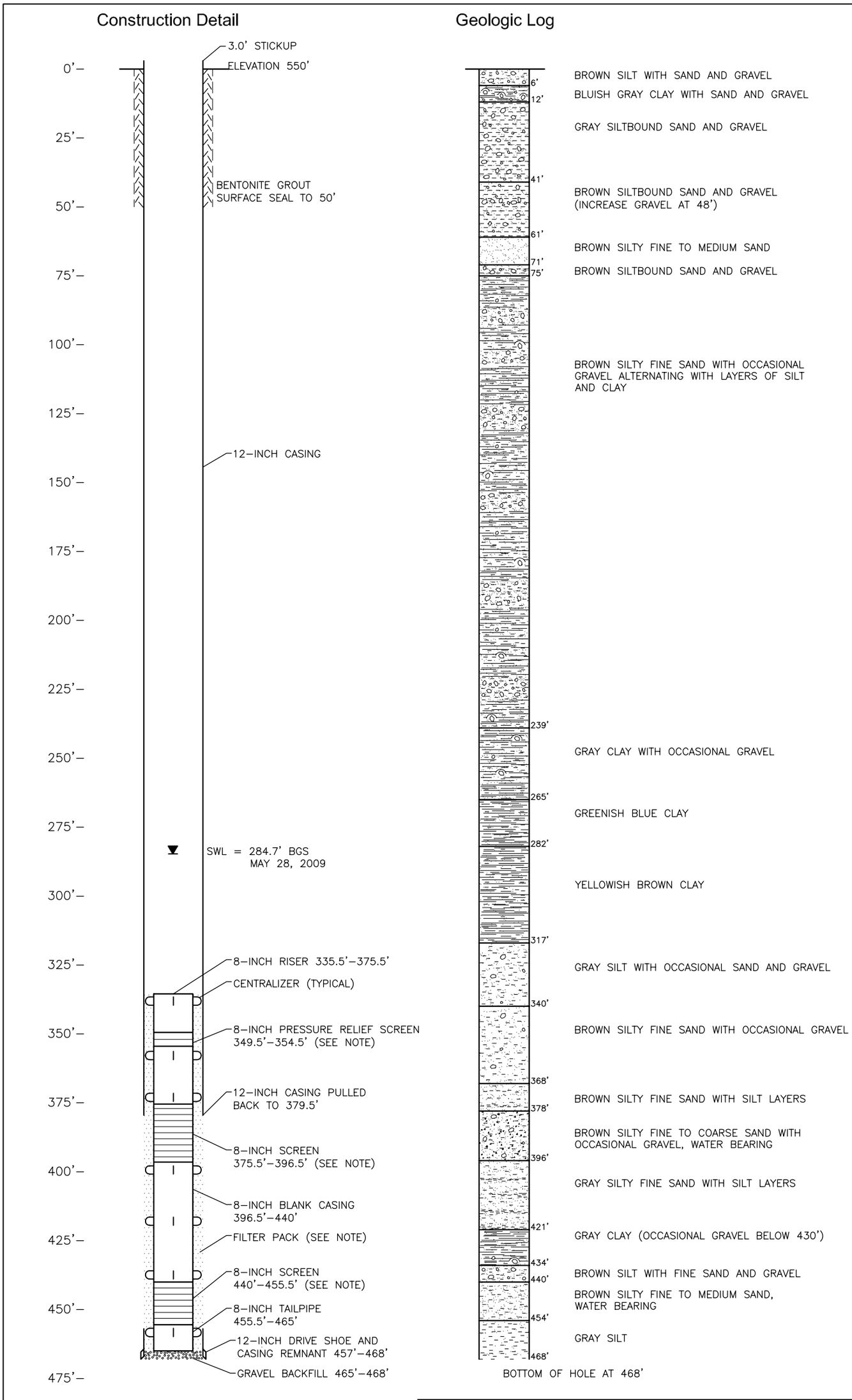
MODEL 6DHLC

DATE April, 1994

SUPERCEDES NEW

6DHLC

APPENDIX 5 - D WELL CONSTRUCTION REPORTS HORIZON VIEW



NOTES:
ALL WELL SCREENS ARE 40-SLOT (0.040-INCH OPENING) STAINLESS S
V-WIRE WRAP. FILTER PACK IS 8x12 COLORADO SILICA SAND PRODUCT.

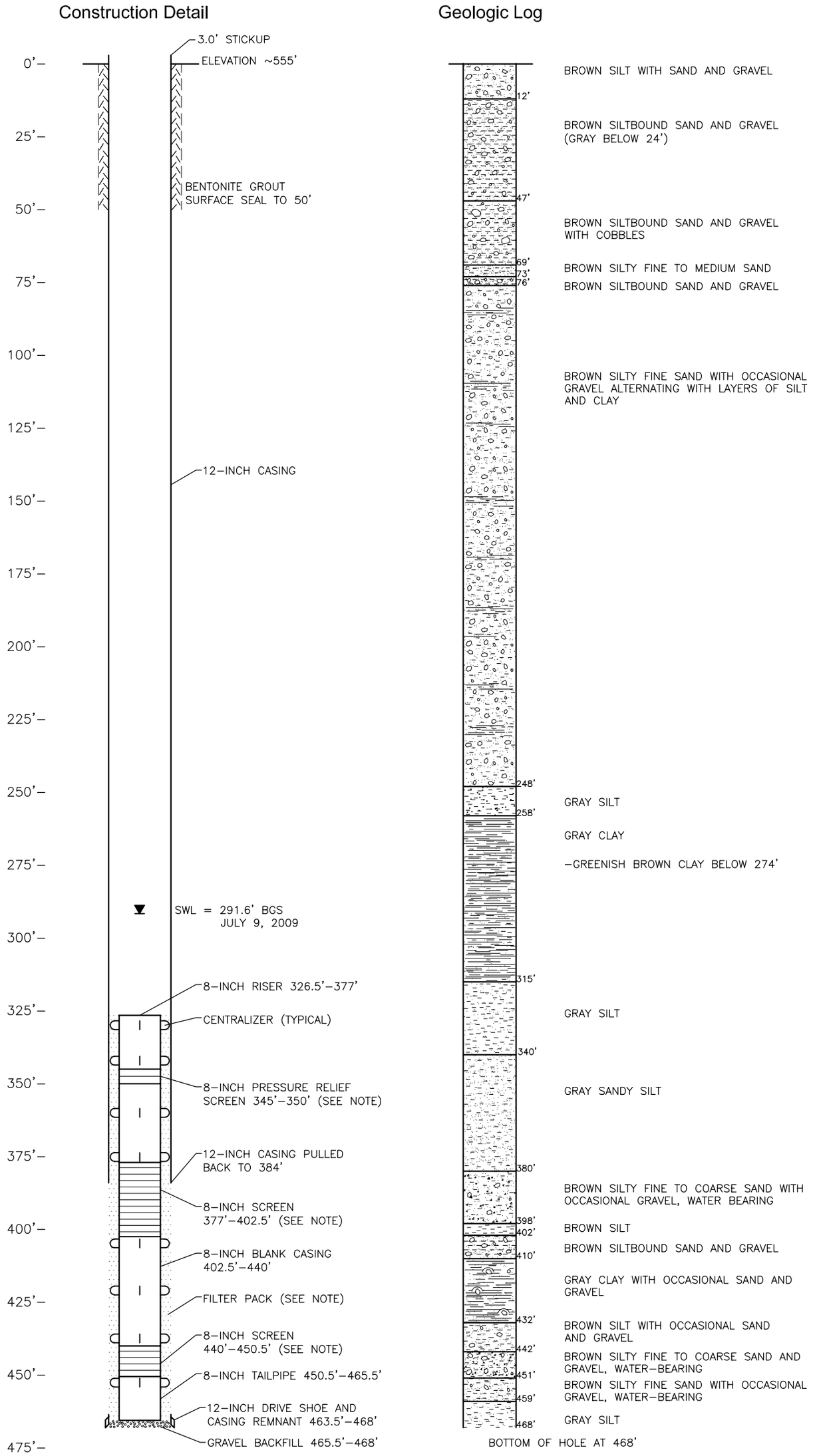
5-D Well Const. Reports Horizon View

Figure 3

ROBINSON NOBLE SALTBUSH INC.
GROUNDWATER & ENVIRONMENTAL SCIENTISTS

PM: MTW	King County	
August 2009	T 26 N/R 04 E - 03	
2093-002A		

Figure 3
Construction Detail and Geologic Log for Well 1
Lake Forest Park Water District: SPU-AS Wells 1 & 2



NOTES:
ALL WELL SCREENS ARE 40-SLOT (0.040-INCH OPENING) STAINLESS S
V-WIRE WRAP. FILTER PACK IS 8x12 COLORADO SILICA SAND PRODUCT

5-D Well Const. Reports Horizon View

ROBINSON NOBLE SALTBUSH INC. GROUNDWATER & ENVIRONMENTAL SCIENTISTS	PM: MTW	King County	Figure 12
	August 2009	T 26 N/R 04 E - 03	Construction Detail and Geologic Log for Well 2
	2093-002A		Lake Forest Park Water District: SPU-AS Wells 1 & 2

Figure 12

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

Construction/Decommission *("x" in circle)*

○ Construction

○ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

CURRENT
Notice of Intent No. WE09749

Unique Ecology Well ID Tag No. BAM 416

Water Right Permit No. _____

Property Owner Name Lake Forest Park Water Dis

Well Street Address 4510 195th St NE

City Lake Forest Park County King

Location SE 1/4-1/4 NE 1/4 Sec 3 Twn 26 R 4 (EWM or WWM) circle one

Lat/Long (s, t, r Still **REQUIRED**) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. _____

PROPOSED USE: ☐ Domestic ☐ Industrial ☒ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other _____

TYPE OF WORK: Owner's number of well (if more than one) 1

☒ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☒ Cable ☐ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 12 inches, drilled 468 ft. Depth of completed well 465 ft.

CONSTRUCTION DETAILS

Casing Installed: ☒ Welded 12" Diam. from +2 ft. to 379 ft.
☐ Liner installed _____" Diam. from _____ ft. to _____ ft.
☐ Threaded _____" Diam. from _____ ft. to _____ ft.

Perforations: ☐ Yes ☒ No

Type of perforator used _____

SIZE of perfs _____ in. by _____ in. and no. of perfs _____ from _____ ft. to _____ ft.

Screens: ☒ Yes ☐ No ☐ K-Pac Location _____

Manufacturer's Name _____

Type _____ Model No. _____

Diam. 8 Slot size 40 from 466 ft. to 440 ft.

Diam. 8 Slot size 40 from 396 ft. to 379 ft.

Gravel/Filter packed: ☒ Yes ☒ No ☐ Size of gravel/sand 6x12

Materials placed from 465 ft. to 335 ft.

Surface Seal: ☒ Yes ☐ No To what depth? 50 ft.

Material used in seal Quick Grout

Did any strata contain unusable water? ☐ Yes ☐ No

Type of water? _____ Depth of strata _____

Method of sealing strata off Trim pumped

PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.

Static level _____ ft. below top of well Date _____

Artesian 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

Was a pump test made? ☐ Yes ☐ No If yes, by whom? _____

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ 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

Date of test _____

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water _____ Was a chemical analysis made? ☐ Yes ☐ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Brown Silt + Cobbles	0	10
Gray Green Silt, Gravels	10	24
Silt bound Sand & Gravel	24	60
Brown Silty Sand, Gravels	60	71
Silt Brown Sand, Gravels	71	78
Silty Sand, some Gravels	78	100
Sand, Gravels	100	227
Sand, some Gravels w/ Silt Layers	227	239
Gray Silty Clays	239	265
Green Blue Yellow & Tan Clay	265	308
Gray Silt	308	340
Sandy Silt & Clay Gravels	340	345
Fine Silty Sand wB	345	378
med some Coarse Sand w/ some Gravels	378	396
Fine Tan Sand	396	401
Fine Sand Silt Layers	401	420
Gray Clay	420	434
Brown Clay	434	440
med Sand Brown	440	452
Fine Silty Sand	452	454
Gray Clay	454	468

Start Date 4-8-09 Completed Date 5-22-09

5-D Well Const. Reports Horizon View

WELL CONSTRUCTION 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.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Wade Iversen

Driller/Engineer/Trainee Signature Wade Iversen

Driller or trainee License No. 0597

Drilling Company Boart Longyear

Address Po Box 1890

City, State, Zip Milton WA 98354

Contractor's Registration No. BOARTLC941RA Date 8/12/09

If TRAINEE,
Driller's Licensed No. _____
Driller's Signature _____

Ecology is an Equal Opportunity Employer.

ECY 050-1-20 (Rev 3/05) **The Department of Ecology does NOT warranty the Data and/or Information on this Well Report.**

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

Construction/Decommission *("x" in circle)*

○ Construction

○ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

CURRENT

Notice of Intent No. WE09989

Unique Ecology Well ID Tag No. BAM 417

Water Right Permit No. _____

Property Owner Name Lake Forest Water Dist.

Well Street Address 4510 195th St NE

City Lake Forest Park County King

Location SE 1/4-1/4 NE 1/4 Sec 3 Twn 26 R 4 (EWM or WWM) circle one

Lat/Long (s, t, r Still **REQUIRED**) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. _____

PROPOSED USE: ☐ Domestic ☐ Industrial ☒ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other _____

TYPE OF WORK: Owner's number of well (if more than one) 2

☒ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☒ Cable ☐ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 12 inches, drilled 468 ft. Depth of completed well 465 ft.

CONSTRUCTION DETAILS

Casing Installed: ☒ Welded 12 " Diam. from +2 ft. to 354 ft.; ☐ Liner installed _____ " Diam. from _____ ft. to _____ ft.; ☐ Threaded _____ " Diam. from _____ ft. to _____ ft.

Perforations: ☐ Yes ☒ No

Type of perforator used _____

SIZE of perfs _____ in. by _____ in. and no. of perfs _____ from _____ ft. to _____ ft.

Screens: ☒ Yes ☐ No ☐ K-Pac Location _____

Manufacturer's Name _____

Type _____ Model No. _____

Diam. 8 Slot size 40 from 450 ft. to 440 ft.

Diam. 8 Slot size 40 from 402 ft. to 384 ft.

Gravel/Filter packed: ☒ Yes ☐ No ☐ Size of gravel/sand 8 x 2

Materials placed from 465 ft. to 326 ft.

Surface Seal: ☒ Yes ☐ No To what depth? 53 ft.

Material used in seal Quick Grout

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 _____ ft.

Static level 294 ft. below top of well Date 7-8-09

Artesian 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

Was a pump test made? ☐ Yes ☐ No If yes, by whom? _____

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ 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

Date of test _____

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water _____ Was a chemical analysis made? ☐ Yes ☐ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Brown Silty Sub Soil	0	10
Green & Gray Clay	10	12
Brown Silt bound Sand & Gravels	12	22
Gray Silt bound Sand & Gravels	22	47
Brown Silt bound Sand & Gravels	47	73
Sand some Gravels	73	217
Sand & Silt Layers	217	230
Sand Brown	230	248
Gray Clay	248	274
Green Clay	274	287
Brown, Green & Gray Clays	287	315
Gray Clay & Silt	315	340
Silty Sand & Gravels	340	355
Brown fine Sand w/ Silt Layers	355	363
Gray Silty fine Sand	363	378
med Brown Sand	378	402
Brown Silt Bound Sand & Gravels	402	410
Brown Silty fine Sand	410	418
Gray Clay	418	432
Brown Silt	432	443
med Sand	443	459
Gray Clay	459	468

5-D Well Const. Reports Horizon View

Start Date 6-1-09 Completed Date 7-13-09

WELL CONSTRUCTION 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.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Wade Iversen

Driller/Engineer/Trainee Signature Wade Iversen

Driller or trainee License No. 0597

Drilling Company Boart Longyear

Address Po Box 1890

City, State, Zip Milton WA 98354

Contractor's Registration No. BOARTLC941RA Date 8-12-09

If TRAINEE,

Driller's Licensed No. _____

Driller's Signature _____

Ecology is an Equal Opportunity Employer.

The Department of Ecology does NOT warranty the Data and/or Information on this Well Report.

APPENDIX 5 - E GROUND WATER CONTAMINATION SUSCEPTIBILITY ASSESSMENT SURVEY FORM MCKINNON CREEK WELLFIELD

Water District No. 83, King County, Wn.

~~17705 Ballinger Way N.E.~~ / Seattle, Washington 98155
4029 NE 178TH ST

Commissioners
WILLIAM CURRIE
TIMOTHY M. DAVIS
GORDON HUNGAR

PHILLIP B. LAY, Manager
~~364-7711~~
365-3211

Department of Health
Northwest Regional Drinking Water Office
C/O Steve Hulsman
1511 3rd Ave., Suite 719
Seattle, Wa 98101

March 7, 1995

Dear Steve:

Enclosed you will find susceptibility forms for our S06 well field which include: Well #1, Well #2, and Well #3, and our S05 shallow well field. I have completed the entire form for S05 and Well #3 for S06. Well #3 is the best representative of the S06 well field. I have also included Calculated Fixed Radius maps, drillers reports, a summary of the drillers reports, inorganic chemical reports and V. O. C.s.
I apologize for the delay, this has been a long fact gathering exercise. If you have any questions please call.

Phillip Lay

Phillip Lay, manager

5-E Contamination Susceptibility McKinnon

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 : King County Water District No. 83

Water system name : None

County: King

Water system number: 40950K Source number: S05

Well depth: 25 (ft.) (*From WFI form*)

Source name: S05

WA well identification tag number:___ ___ ___-___ ___ ___

__x__ well not tagged

Number of connections: 850 Population served: 2600

Township: 26N Range: 4 EWM

Section: 03 1/4 1/4 Section: SW¼

Latitude/longitude (if available): 47°45'51.67"N / 122°16'45.24"W
Average position of multiple wells

How was lat./long. determined?

_____ global positioning device __x__ 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: ___ / ___ /__30__ month/day/year

last reconstruction: ___ / ___ /__88__ month/day/year

_____ information unavailable

5-E Contamination Susceptibility McKinnon

2) Well driller: _____

_____

_____

x well driller unknown

3) Type of well:

___Drilled: ___ rotary ___ bored ___ cable (percussion) __ Dug

___ Other: x spring(s) ___ lateral collector (Ranney)

___ driven x jetted ___ other: _____

Additional comments: _____

_____

4) Well report available? ___ YES (attach copy to form) x 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: 50 (gallons/min)

Source of information: Master Meter

If not documented, how was pumping rate determined? _____

_____

__ Pumping rate unknown

6) Is this source treated?

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.*)

5-E Contamination Susceptibility McKinnon

PART III: Hydrogeologic Information

1) Depth to top of open interval: [check one]

___ < 20 ft _x_ 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):

_x_ < 20 ft ___ 20-50 ft ___ 50-100 ft ___ > 100 ft

___ flowing well/spring (artesian)

How was water level determined?

___ well log _x_ other: engineering report

__ depth to ground water unknown

3) If source is a flowing well or spring, what is the confining pressure:

_____ psi (pounds per square inch)(free flow rate = 49 gpm)
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 _x_ NO

5) Wellhead elevation (height above mean sea level): 265 (ft)

How was elevation determined? ___ topographic map ___ Drilling/Well Log ___ altimeter

_x_ other: survey data

___ 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

_x_ information unavailable

5-E Contamination Susceptibility McKinnon

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

X controlled access (describe): Road to well - must travel through locked drive gate

___ other uses for wellhouse (describe): _____

___ 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*)

X depth of seal unknown

___ no surface seal

10) Annual rainfall (inches per year):

___ < 10 in/yr ___ 10-25 in/yr X > 25 in/yr

5-E Contamination Susceptibility McKinnon

PART IV: **Mapping Your Ground Water Resource**

1) Annual volume of water pumped: 7,557,000 (gallons)

How was this determined?

X meter

___ estimated: ___ pumping rate (_____)

___ pump capacity (_____)

___ other: _____

2) "Calculated Fixed Radius" estimate of ground water movement:
(see Instruction Packet)

6 month ground water travel time : 700 (ft)

1 year ground water travel time : 980 (ft)

5 year ground water travel time: 2200 (ft)

10 year ground water travel time: 3110 (ft)

Information available on length of screened/open interval?

___ YES ___ NO

Length of screened/open interval: _____(ft)

3) Is there a river, lake, pond, stream, or other obvious surface water body within the 6 month time of travel boundary? ___ YES X 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 X NO (mark and identify on map).

Comments: _____

_____

_____

_____

_____

5-E Contamination Susceptibility McKinnon

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				x
landfills, dumps, disposal areas				
known hazardous materials clean-up site				
water system(s) with known quality problems				
population density > 1 house/acre suburban resid.x	x	x		
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:

No other possible sources of contamination have been identified. The recharge area to the 10-year limit is almost totally residential in nature and all commercial activities are at an elevation well below the screen levels of all wells.

5-E Contamination Susceptibility McKinnon

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
< 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	NO
Results greater than MCL or SAL	___	X
VOCs detected at least once	___	___
VOCs never detected	X	___

___ 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

X EDB/DBCP tests not required

D. Other SOCs (Pesticides):	YES	NO
Other SOCs detected	___	X
(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: _____

_____

_____

_____

5-E Contamination Susceptibility McKinnon

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.	___	X

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:
Wells are located in 265-foot elevation of a canyon area which rises to about 450-foot elevation and then falls away to about 50-foot to 100-foot elevation to the east and west within the five and ten-year limits.

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?

X YES ___ NO

5-E Contamination Susceptibility McKinnon

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.

As can be seen from the attached topographic map our aquifer recharge area is constrained by the natural ridge area lying to the north of the well area for about one mile where the land surface rises to 500-foot elevation. To the south the land slopes down to the level of Lake Washington at about one mile distance.

5-E Contamination Susceptibility McKinnon

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 : Phillip Lay, Manager

Water system name : King County Water District No. 83

County: King

Water system number: 40950K Source number: S06

Well depth: _____ (ft.) (*From WFI form*)

Source name: Well 3

WA well identification tag number: ___ ___ ___-___ ___ ___

__x__ well not tagged

Number of connections: 850 Population served: 2600

Township: 26N Range: 4 EWM

Section: 03 1/4 1/4 Section: SW¼, SE¼

Latitude/longitude (if available): 47 45 45.85"N / 122 16'46.13"W

How was lat./long. determined?

_____ global positioning device __x__ 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: 8 /29 /74 month/day/year

last reconstruction: __ / __ /__ month/day/year

_____ information unavailable

5-E Contamination Susceptibility McKinnon

2) Well driller: Northwest Pump & Drilling Company

3245 Auburn Way South

Auburn, WA

___ 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: 350 (gallons/min)

Source of information: Master Meter Logs

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.*)

5-E Contamination Susceptibility McKinnon

PART III: Hydrogeologic Information

1) Depth to top of open interval: [check one]

___ < 20 ft ___ 20-50 ft ___ 50-100 ft x 100-200 ft ___ >200 ft

___ information unavailable ('< ' *means less than;* '> ' *means greater than*)

2) Depth to ground water (static water level):

x < 20 ft ___ 20-50 ft ___ 50-100 ft ___ > 100 ft

___ flowing well/spring (artesian)

How was water level determined?

___ well log x other: Sounding Tape

___ 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): 240 (ft)

How was elevation determined? ___ topographic map ___ Drilling/Well Log ___ altimeter

x other: survey

___ 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.)

x 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?~~ bottom of the lowest confining layer?

x YES ___ NO

___ information unavailable

5-E Contamination Susceptibility McKinnon

7) Sanitary setback:

___ < 100 ft* ___ 100-120 ft ___ 120-200 ft X > 200 ft
* if less than 100 ft describe the site conditions:

8) Wellhead construction:

X wellhead enclosed in a wellhouse

X controlled access (describe): Road to Well - Must Travel through locked drive gate

___ other uses for wellhouse (describe): None

___ 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

5-E Contamination Susceptibility McKinnon

PART IV: Mapping Your Ground Water Resource

1) Annual volume of water pumped: 68,237,000 (gallons)

How was this determined?

X meter

___ estimated: ___ pumping rate (_____)

___ pump capacity (_____)

___ other: _____

2) "Calculated Fixed Radius" estimate of ground water movement:
(see Instruction Packet)

6 month ground water travel time : 980 (ft)

1 year ground water travel time : 1390 (ft)

5 year ground water travel time: 3110 (ft)

10 year ground water travel time: 4400 (ft)

Information available on length of screened/open interval?

X YES ___ NO

Length of screened/open interval: 15 (ft)

3) Is there a river, lake, pond, stream, or other obvious surface water body within the 6 month time of travel boundary? ___ YES X 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 X NO (mark and identify on map).

Comments: _____

_____

_____

_____

_____

5-E Contamination Susceptibility McKinnon

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				x
landfills, dumps, disposal areas				
known hazardous materials clean-up site				
water system(s) with known quality problems				
population density > 1 house/acre surburan resid.	x			
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:

No other possible sources of contamination have been identified. The recharge area to the 10-year limit is almost totally residential in nature and all commercial activities are at an elevation well below the screen levels of all wells

5-E Contamination Susceptibility McKinnon

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
< 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	NO
Results greater than MCL or SAL	___	X
VOCs detected at least once	___	___
VOCs never detected	X	___
___ 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		
X EDB/DBCP tests not required		

D. Other SOCs (Pesticides):	YES	NO
Other SOCs detected	___	X
(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: _____

_____

_____

_____

5-E Contamination Susceptibility McKinnon

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.	___	x

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:

Wells are located in the 250-foot elevation region of a canyon area which rises to about 450-foot elevation and then falls away to about 50-foot to 100-foot elevation to the east and west within the five and ten year travel limits.

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?

x YES ___ NO

5-E Contamination Susceptibility McKinnon

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.

As can be seen from the attached topographic map our aquifer recharge area is constrained by the natural ridge area lying to the north of the well area for about one mile where the land surface rises to 500-foot elevation. To the south the land slopes down to the level of Lake Washington at about one mile distance.

APPENDIX 5 - F GROUND WATER CONTAMINATION SUSCEPTIBILITY ASSESSMENT SURVEY FORM HORIZON VIEW WELLFIELD

Appendix 5-F
BAM-416
Horizon View Well #1

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

Ground Water Contamination
Susceptibility Assessment Survey Form

Complete **one** form for **eac**h ground water source (well, well of a wellfield, spring, spring of a springfield) used in your water system (photocopy as necessary). Contact your regional WA DOH office if you need a copy of the Instruction Packet.

PART I: System Information

Well owner/manager: Alan Kerley (General Manager)

Water system name: Lake Forest Park Water District

County: King

Water system ID number: 40950K Source number: _____

Well depth: 465 feet

Source name: _____

WA well tag identification number: _____ _____ BAM - 416 _____ _____

☐ Well not tagged

Number of connections: _____ Population served: _____

Township: 26 Range: 04

Section: 03 ¼ ¼ Section: _____

Latitude/longitude (if available): 47°46'21.6"N / 122°16'46.3"W

How was latitude/longitude determined?

☐ Global positioning device ☐ survey ☐ topographical map
☑ other: Google Earth

*Please see Instruction 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: 4 /8 /09 month/day/year

Date well last reconstructed: ___/___/___month/day/year

☐ Information unavailable

2) Well driller: Boart Longyear Inc.

☐ Well driller unknown

3) Type of well: ___ Drilled: ☐ rotary ☐ bored ☑ cable (percussion) ☐ Dug

___ other: ☐ spring(s) ☐ lateral collector (Ranney)

☐ driven ☐ jetted ☐ other:

4) Well report available ☑ Yes (attach copy to form) ☐ No

5) Average pumping rate: 300 (gallons/min)

Source of information Design pumping rate based on pump test report.

If not documented, how was pumping rate determined? See attached hydrogeological report.

☐ 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.)

Appendix 5-F
BAM-416
Horizon View Well #1

PART III: Hydrogeologic Information

1) Depth to top of open interval: [check one]

☐ less than 20 ft ☐ 20-49ft ☐ 50-99ft ☐ 100-200ft ☑ greater than 200ft

☐ information unavailable

2) Depth to ground water (static water level):

☐ less than 20ft ☐ 20-49ft ☐ 50-100ft ☑ greater than 100ft

☐ flowing well/spring (artesian)

How was water level determined?

☐ well log ☑ other Water Level Probe

☐ 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): 550 feet

How was elevation determined? ☐ topographic map ☐ Drilling/Well Log ☐ altimeter

☑ other: Topographic survey. Control elevation established by wsdot gps.

☐ 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 Instruction Packet for example.)

Yes evidence of confining layer(s) in well log

_____ no evidence of confining layer(s) 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

☐ information unavailable

Appendix 5-F
BAM-416
Horizon View Well #1

7) Sanitary setback:

☑ less than 100ft* ☐ 100-120ft ☐ 120-200 ft ☐ greater than 200ft

* If less than 100ft, describe the site conditions:

Property boundaries constrain control radius to 75 ft. Well casing sealed with bentonite to a depth of 50ft bgs to mitigate risk of contamination

8) Wellhead construction:

☐ wellhead enclosed in a wellhouse

☑ controlled access (describe): Wellhead enclosed under polyethylene fake boulder secured to concrete pad.

☐ other uses for wellhouse (describe): _____

☐ no wellhead control

9) Surface seal:

☐ 18 ft

☑ greater than 18 ft

☐ less than 18 ft (no Department of Ecology approval)

☐ less than 18 ft (approved by Department of Ecology, include documentation)

☐ depth of seal unknown

☐ no surface seal

10) Annual rainfall (inches per year):

☐ less than 10 in/yr ☐ 10-25 in/yr ☑ greater than 25 in/yr

Appendix 5-F
BAM-416
Horizon View Well #1

PART IV: Mapping Your Ground Water Resource

1) Annual volume of water pumped: 80.3 Mill (2011 (gallons)

How was this determined?
☑ meter
☐ estimated: ☐ pumping rate (_____)
☐ pump capacity (_____)
☐ pumping rate and capacity (_____)
☐ other (describe):_____

2) Determined time of travel using:

☑ "Calculated Fixed Radius" estimate of ground water movement:
(see Instruction Packet)
☐ Alternate Numerical Model

6-month ground water travel time: 620 feet

1-year ground water travel time: 880 feet

5-year ground water travel time: 1920 feet

10-year ground water travel time: 2780 feet

Information available on length of screened/open interval?
☑ Yes ☐ No

Length of screened/open interval: 35 feet

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: A small lake exists north of the simple 10 yr radius
that is generally considered to be within the recharge area.

Appendix 5-F
BAM-416
Horizon View Well #1

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. If you do not know if one of the following is present, mark the "unknown" space.

	6-month	1-year	5-year	unknown
• likely pesticide application				X
• stormwater injection wells				
• other injection wells				
• abandoned ground water well				X
• landfills, dumps, disposal areas				
• known hazardous materials clean-up site				X
• known water quality problems				X
• population density less than 1 house/acre				
• residences commonly have septic tanks				X
• Wastewater treatment lagoons				
• sites used for land application of waste				

Please include a map of the wellhead and time of travel areas with this form. Mark and identify on the map any of the risks listed above.

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:

Abbey View Memorial Park cemetary exists within 10 yr simple radius boundary.
Aquifer is known to flow from the North which is predominantly residential housing. The city of Brier has formally recognized that substantial recharge of the aquifer occurs within their boundaries and encourage responsible activity.
Residential septic systems are likely to exist, locations unknown.

2) **Source-specific water quality records**: For each type of test below, **mark the row that applies to the sample results for this source**. Consider all the sample results from the past 12 years. Maximum Contaminant Levels (MCLs) and State Advisory Levels (SALs) are noted next to the specific test and are listed in the Instruction Packet.

Appendix 5-F
BAM-416
Horizon View Well #1

A. **Nitrate:** (Nitrate MCL = 10 mg/liter)

- ☐ Results greater than MCL
- ☑ less than 2 mg/liter nitrate
- ☐ 2-5 mg/liter nitrate
- ☐ greater than 5 mg/liter nitrate

B. **VOCs:** (VOC detection level is 0.5 ug/liter or 0.0005 mg/liter)

- ☐ 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.)

- ☐ 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, Herbicides, or SOCs other than EDB/DBCP):**

- ☐ Other SOCs detected
  (pesticides, herbicides or 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:_____

Appendix 5-F
BAM-416
Horizon View Well #1

E. **Bacterial contamination:**

Any bacterial detection(s) in the past 3 years in samples taken from the source (not distribution sampling records)? ☐ Yes ☑ No

Any bacterial detection(s) in the past 3 years in the distribution system that have been attributed to the source? ☐ Yes ☑ No

Source sampling records for bacteria unavailable ☐ Yes ☑ No

PART VI: Geographic or Hydrologic Factors Contributing to a Non-Circular Zone of Contribution

The following questions will help identify those ground water sources 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 these 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:

Wellhead is situated on a prominance with drainage naturally occuring away from well. Small lake exists to the north, inside recharge area.

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

Appendix 5-F
BAM-416
Horizon View Well #1

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
Less than 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
Less than 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.

A geohydrological study of the wellfield and aquifer zone in 1980 by Converse Consultants NW indicated north to south flow of the aquifer into the area of Lake Washington, correlating with typical surface geology. The recharge area is believed to broaden and extend to the North roughly 3 miles. Typical flow rates were estimated to be 1/2 mile per year.

FORM COMPLETED BY:

MUNDALL ENGINEERING — May 9, 2012

Print Name — Date

Signature

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

Project Report Form
Water Rights Self Assessment

Permit Certificate or Claim #	Name of rightholder or claimant	Priority Date	Source Name/Number	Primary or supplemental	Existing System Capacity - based on water right limits		Projects Production/withdrawal with New Project On-line		Projected System Capacity Status (excess or deficiency of water rights)	
					Maximum Instantaneous Flow rate (Qi)	Maximum Annual Volume (Qi)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/ Certificates 1. 835	Lake Forest Park Water Co.	April, 1940	Well #1	Primary	100 GPM	162 Ac Ft/Yr				
2. 5388	KCWD 83	July 1960	Well #2	Primary	440 GPM	704 Ac Ft/Yr				
3. 8124	KCWD 83	June 1966	Well #3	Supplemental	225 GPM	360 Ac Ft/Yr				
4. 1- 498	Lake Forest Park Water Co.	Oct. 1926	Artesian	Primary	450 GPM					
Claims 1.										
2.										
3.										
4.										
Total	**********	******	**********	**********	990 GPM					

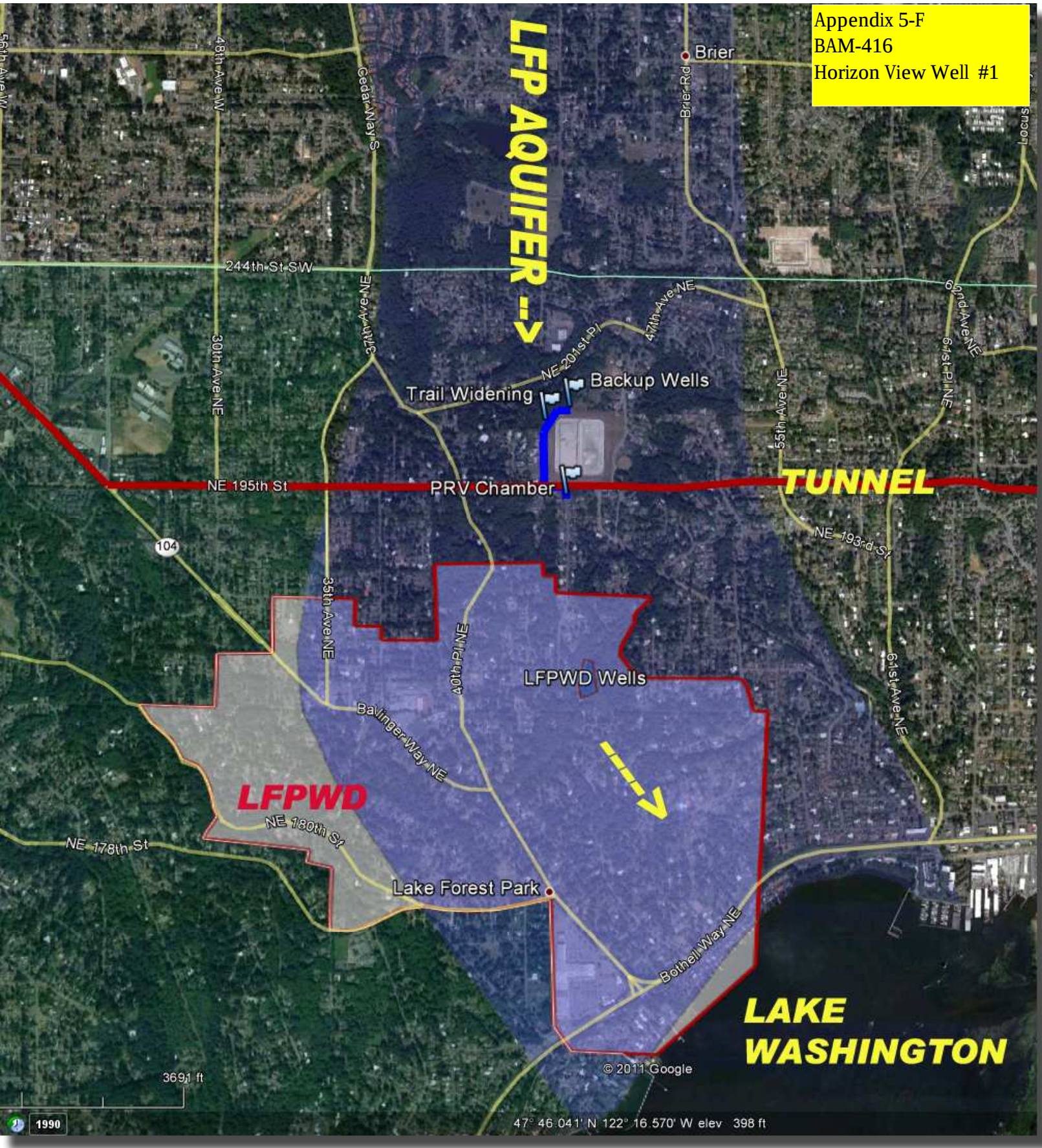
Appendix 5-F
BAM-416
Horizon View Well #1

Intertie Name/Identifier	Name of Purveyor Providing Water	Existing Limits on Intertie Water Use		Projected Production/Withdrawal with New Project On-line		Current Intertie Supply Status (Excess/Deficiency)	
		Maximum Instantaneous Flow rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (qi)	Maximum Annual Volume (Qa)
1.							
2.							
3.							
4.							
TOTAL **********	****** ********** **********						

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD call (800) 833-6388.

DOH Form 331-370 (Updated 08/10)

To return form, please see reverse side.



Map showing Aquifer, Brightwater Tunnel, Water District and project extents.

Appendix 5-F
BAM-416
Horizon View Well #1

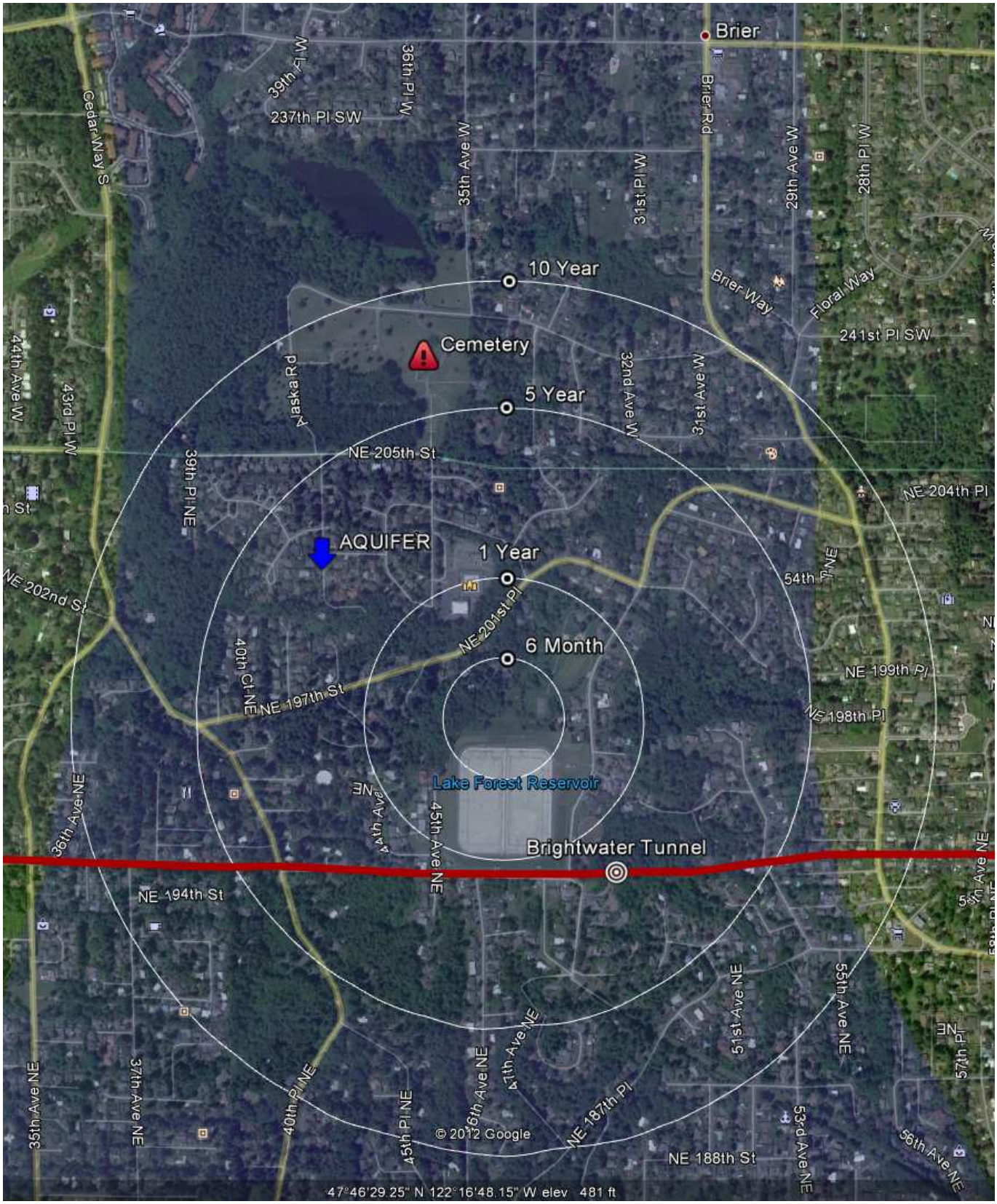


Figure 1. Map showing time travel to well using CFR method and projected extents of aquifer

Appendix 5-F
BAM-416
Horizon View Well #1

A
NORTH

A'
SOUTH

HORIZON VIEW WELLFIELD

SPU RESERVOIR

McKINNON CREEK WELLFIELD S05,S06

GROUND SURFACE

ELEVATION – FEET (NAVD88)

600
500
400
300
200
100
0
–100

3B1
CLAY
CEMENTED GRAVEL
BLUE CLAY
GRAVEL
SAND AND CLAY
CLAY W/GRAVEL
SAND AND GRAVEL

WATER LEVEL IN LFP AQUIFER

E–115/A
GRAVELLY SILTY SAND
SAND
SILT AND CLAY
SAND & SILTY GRAVEL
GRAVEL
SILTY SAND
CLAY

TW–202/A
SAND AND GRAVEL
SILTY SAND
SILT
SAND AND GRAVEL WITH SILT
SILT

TW–203
SILTY SAND
SILT SAND AND GRAVEL
CLAY
SILT
SILTY SAND
SILT
SILTY SAND GRADES CLEAN SAND

LFPWD
Qvr
Qvt
Qpogl
Qpogt
Qpogf
Qpogl

10A1
SILT SAND CLAY WOOD
SILT SAND
CLAY
SILT CLAY SAND
SAND AND GRAVEL
FINE SAND
MED SANDY GRAVEL

MW–10
TILL
SILTY SAND AND GRAVEL
CLAY

LFP AQUIFER

BRIGHTWATER TUNNEL

Lake Washington

0 600 1200 Feet

APRIL 2012
HORIZONTAL SCALE

Adapted with information from: ***Summary of Lake Forest Park Hydrogeologic Investigations Geotechnical Services for the Brightwater Conveyance System Contract No. E23007E, Task 162, June 2005***

AQUIFER PROFILE NORTH-SOUTH

P:\19897\43507\Lake Forest Park\Figure 3.dwg

APPENDIX 5 - G POTENTIAL SOURCES OF CONTAMINATION

Business Name	Alderwood Water and Waste Water
Contact Information/ County	(425) 787-0250
Address	15204 35th Ave. W Lynnwood, WA. 98087-2306
Contamination Description(s)	
Possible leakage into LFPWD aquifer and recharge area.	

5-G Potential Sources of Contamination

Business Name	Richard Smith
Contact Information/ County	
Address	3732 235th PLSW Brier, WA. 98036-8241

Contamination Description(s)

Auto repair operations onsite with possible fluid contaminants as runoff into ground water.

Also piles of deteriorating material that could be contaminating soil beneath.
Possible fluids stored onsite with contaminating effect.

5-G Potential Sources of Contamination

Business Name	City of Lake Forest Park wastewater system
Contact Information/ County	Aaron Halverson (Environmental Programs manager) (206) 368-5440 Email: ahalverson@ci.lake-forest-park.wa.us
Address	17425 Ballinger Way NE Lake Forest Park, WA. 98155
Contamination Description(s)	
Possible leaks in sewer system that could contaminate groundwater.	

5-G Potential Sources of Contamination

Business Name	Ronald Wastewater District
Contact Information/ County	(206) 546-2494
Address	17505 Linden Ave N Seattle, WA. 98133

Contamination Description(s)

Possible leaks in sewer system that could reach groundwater.

5-G Potential Sources of Contamination

Business Name	Parmly Property/James, Parmly
Contact Information/ County	King County
Address	20137 47th Ave. NE Lake Forest Park, WA. 98155

Contamination Description(s)

A description of possible contaminants can be found in a report in this file by the EPA.

Possible contaminants from on site automotive repair shop.

The property is the location of a toxic cleanup site.

5-G Potential Sources of Contamination

EPA United States Environmental Protection Agency

Envirofacts

FRS Facility Detail Report

FRS



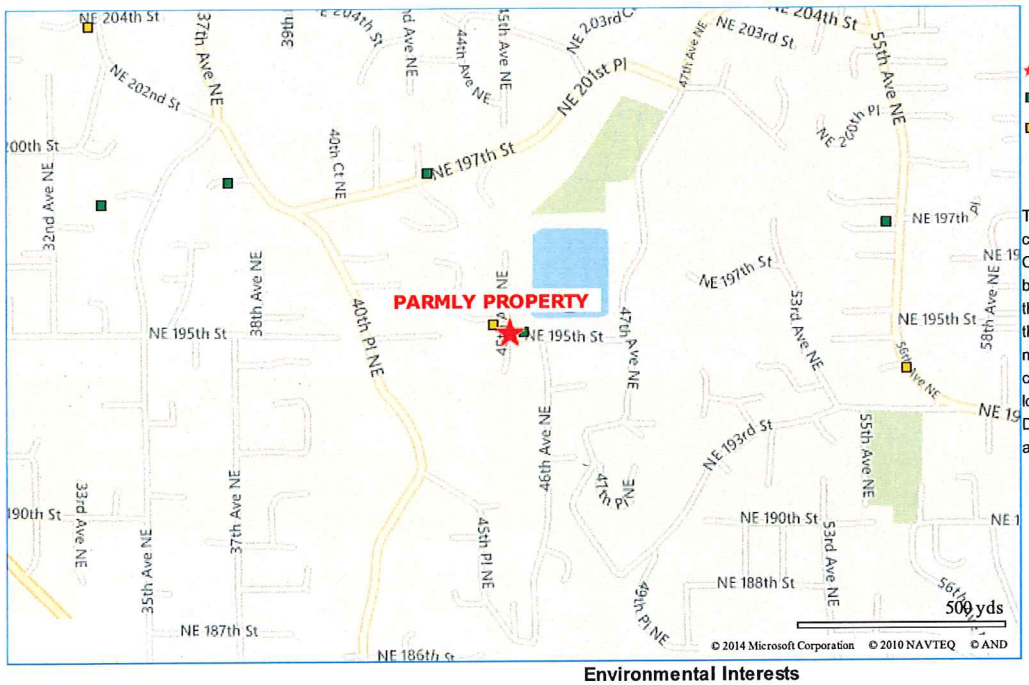
PARMLY PROPERTY

20137 47TH AVE NE
LAKE FOREST PARK, WA 98155
EPA Registry Id: 110015571308

Facility Registry Service Links

- Search
  - FRS Facility Query
  - FRS EZ Search
  - Organization Search
- FRS Physical Data Model
- FRS Geospatial Model
- Contact Us
- Facility Registry Service (FRS) Home

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Legend

- Selected Facility
- EPA Facility of Interest
- State/Tribe Facility of Interest

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Environmental Interests

Information System	Information System ID	Environmental Interest Type	Data Source	Last Updated Date	Supplemental Environmental Interests:
WASHINGTON - FACILITY / SITE IDENTIFICATION SYSTEM	2525 EXIT Disclaimer	STATE MASTER	WA-FSIS		TOXICS-GROUNDWATER PROGRAM TOXICS-STATE CLEANUP SITE

Additional EPA Reports: MyEnvironment Site Demographics Facility Coordinates Viewer Environmental Justice Map Viewer Watershed Report

Standard Industrial Classification Codes (SIC)

Data Source	SIC Code	Description	Primary
WA-FSIS	7539	AUTOMOTIVE REPAIR SHOPS, NOT ELSEWHERE CLASSIFIED	

National Industry Classification System Codes (NAICS)

No NAICS Codes returned.

Facility Codes and Flags

EPA Region:	10
Duns Number:	
Congressional District Number:	07
Legislative District Number:	46
HUC Code/Watershed:	17110012 / LAKE WASHINGTON
US Mexico Border Indicator:	
Federal Facility:	NO
Tribal Land:	NO

Facility Mailing Addresses

Affiliation Type	Delivery Point	City Name	State	Postal Code	Information Syste
MAILING ADDRESS	20137 47TH AVE NE	LAKE FOREST PARK	WA	98155	WA-FSIS
MAILING ADDRESS	20137 47TH AV NE	SEATTLE	WA	98155	WA-FSIS

Alternative Names

No Alternative Names returned.

Contacts

No Contacts returned.

Organizations

No Organizations returned.

5-G Potential Sources of Contamination

Query executed on: AUG-20-2014

Business Name	Sewer Pump stations/NUD
Contact Information/ County	(425) 398-4400 King County
Address	6830 NE 185th St. Kenmore, WA. 98028-0489

Contamination Description(s)

Possible sewer pipe or pump leakage that could contaminate LFPWD Wellhead system.

8" concrete sewer main with lining installed along 187th ave inside Mckinnon Creek wellhead area has contamination potential.

5-G Potential Sources of Contamination

Business Name	LAKE FOREST PARK WATER DIST.
Contact Information/ County	ALAN KARLAY, MGR.
Address	

Contamination Description(s)

ABANDONED WELLS ~~IN NEAR~~ MCKINNON RD. WALLFIELD.

#1 – ABOUT 5-8 FT SOUTH OF EXISTING DW #1. CONCRETE CAP AND DIRT COVER PLACED C. 2005 BY CHARLES LARKINS

#2 – ABOUT ~~30~~ FT NW OF SHALLOW WELL #1 } SEE MAP

ABOUT 77 FT W OF D.W. #2 }

CONCRETE FDN. AND PIPING STILL INTACT BUT DETERIORATING CONDITION. (9/2014) DM.

5-G Potential Sources of Contamination

Business Name	Don Mac Gilvra
Contact Information/ County	King County
Address	4909 NE 187th St. Lake Forest Park, WA. 98155

Contamination Description(s)

Possible soil and groundwater contamination due to use of fertilizer and pesticide.

5-G Potential Sources of Contamination

Business Name	CITY OF LAKE FOREST PARK
Contact Information/ County	
Address	HORIZON VIEW PARK - ABANDONED WELL

Contamination Description(s)

8"/6" WATER WELL LOCATED NEAR PLAYGROUND/BALLFIELD. WELLHEAD IS BROKEN AND WITH 2' OF COVER.

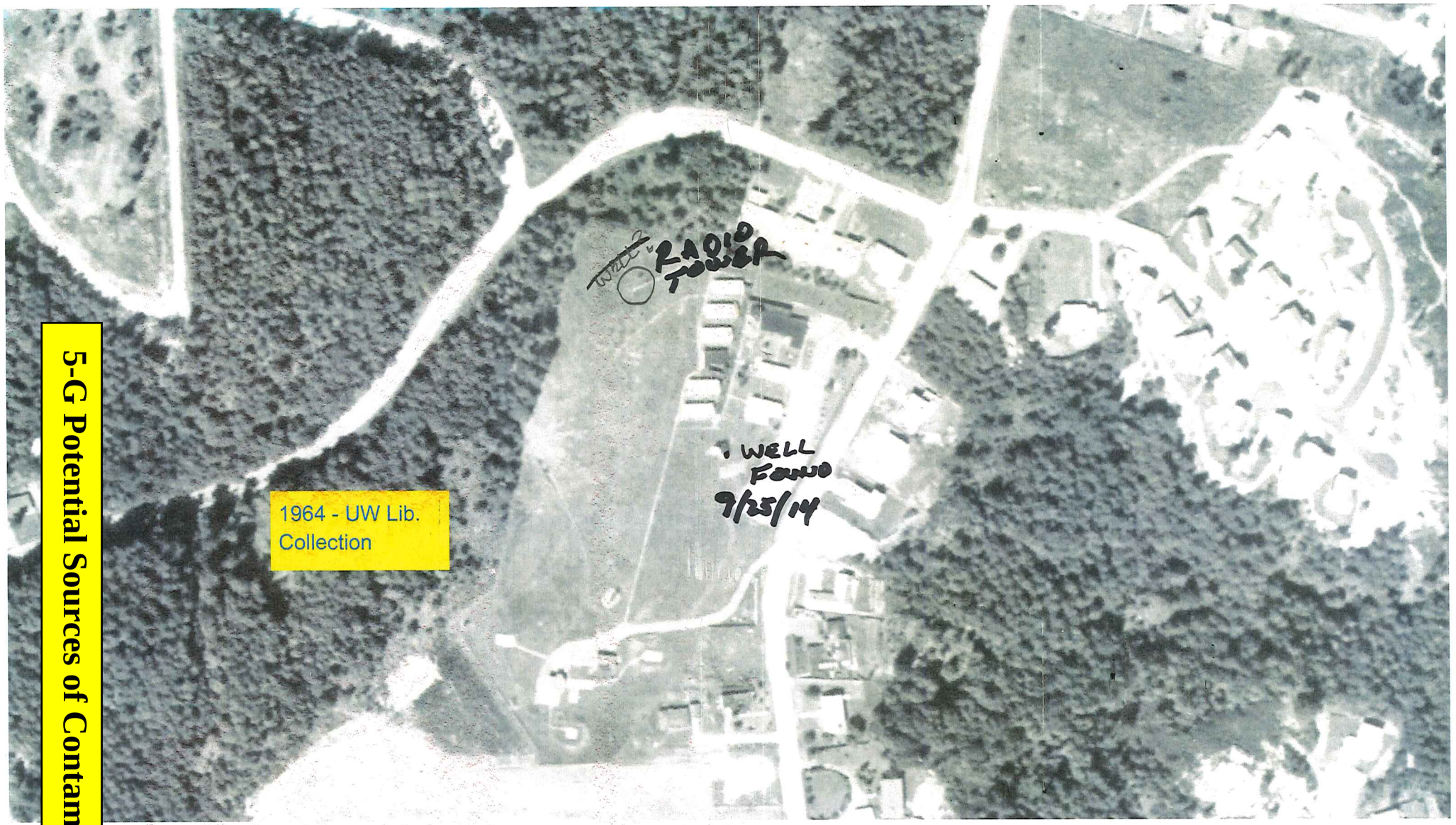
EXPOSED ON 9/25/2014 AND PHOTOS TAKEN. WELL DRILLED IN 1954 BY ARMY FOR THE NIKE BASE. ≈ 340 FT DEEP. → SEE DOCUMENTS

DISTRICT MAY BE ABLE TO RETROFIT THIS WELL AND TURN IT INTO A MONITORING/SENTINAL WELL. IDEAL LOCATION - SEVERAL HUNDRED (640 FT) FEET NORTH OF HORIZON VIEW WELLS #1, 2 (BAM46 419)

5-G Potential Sources of Contamination

5-G Potential Sources of Contamination

5-G Potential Sources of Contamination



1964 - UW Lib. Collection

Business Name	City of Brier Wastewater system
Contact Information/ County	Public works (425) 775-5440 Email: bpworks@ci.brier.wa.us
Address	2901 228th St. SW Brier, WA. 98036

Contamination Description(s)

Possible sewer system leakage into groundwater.

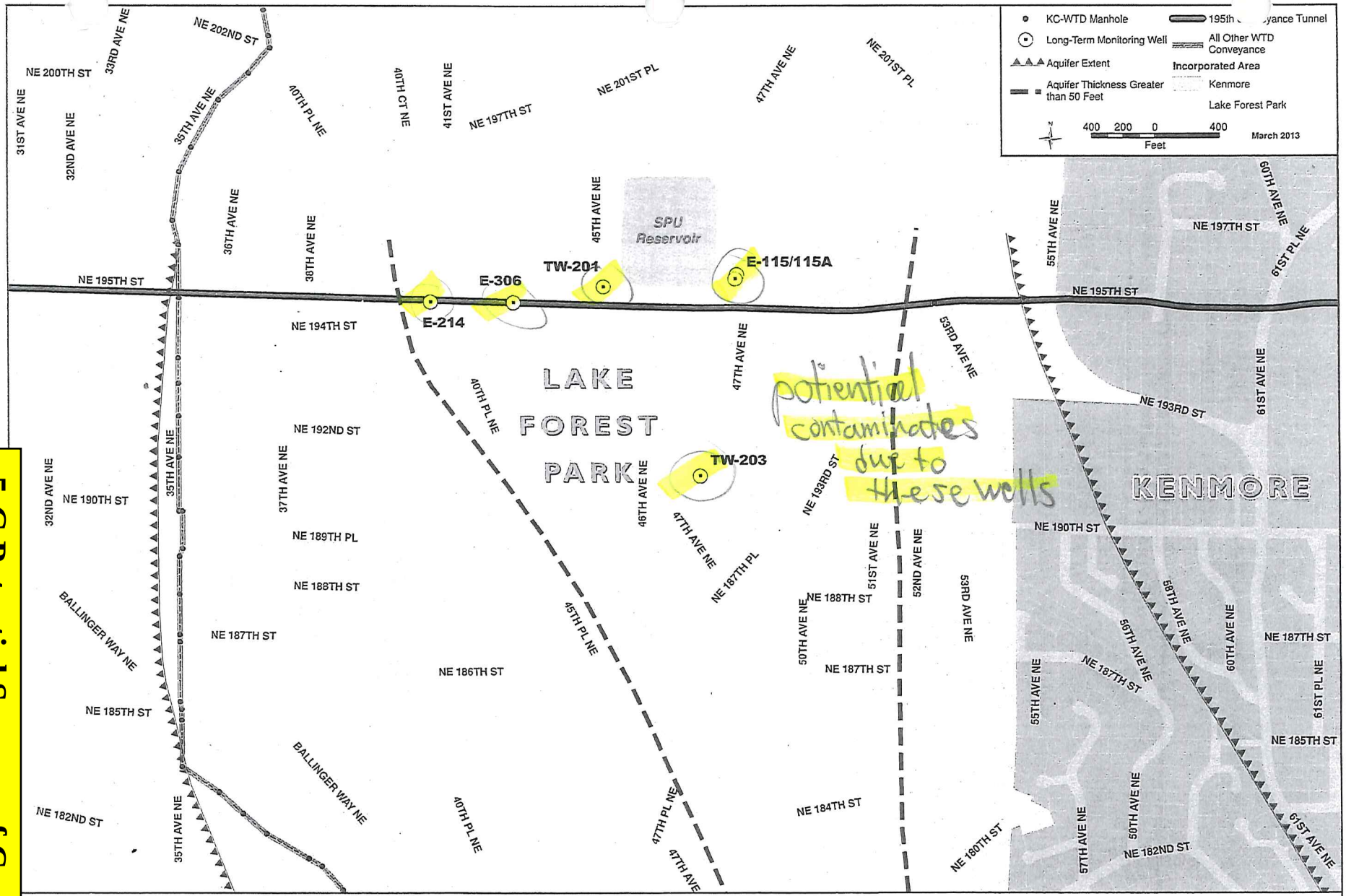
5-G Potential Sources of Contamination

Business Name	Wells along Bright water tunnel
Contact Information/ County	Wells of concern: E-214, E-306, TW-201, TW-203, E-115, E-115A
Address	Locations specified on map of aquifer

Contamination Description(s)

The wells have possible contamination risk due to human activity near and around each well and due to the nature of well itself. Contaminants from surface could travel down the well. Also build up of bateria or minerals inside well itself.

5-G Potential Sources of Contamination



King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

The information included on this map has been compiled from a variety of sources and is subject to change without notice. King County makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a survey product. King County shall not be liable for any general, special, indirect, incidental, or consequential damages including, but not limited to, lost revenues or lost profits resulting from the use or misuse of the information contained on this map. Any sale of this map or information on this map is prohibited except by written permission of King County.

File Name: Q:\\WTD\Projects\BW_Design\Projects\final_well.mxd - Shari Cross

Long-Term Monitoring Well Locations for Lake Forest Park Aquifer

Figure 1

Business Name	Borth Corp
Contact Information/ County	
Address	3716 235th PL SW Brier, WA. 98036-8241

Contamination Description(s)

Specialized freight due to onsite trucking could be a source of contamination.

For more information look at EPA report included in this WHP Plan.

5-G Potential Sources of Contamination

5-G Potential Sources of Contamination

EPA United States Environmental Protection Agency

Envirofacts

FRS Facility Detail Report

FRS

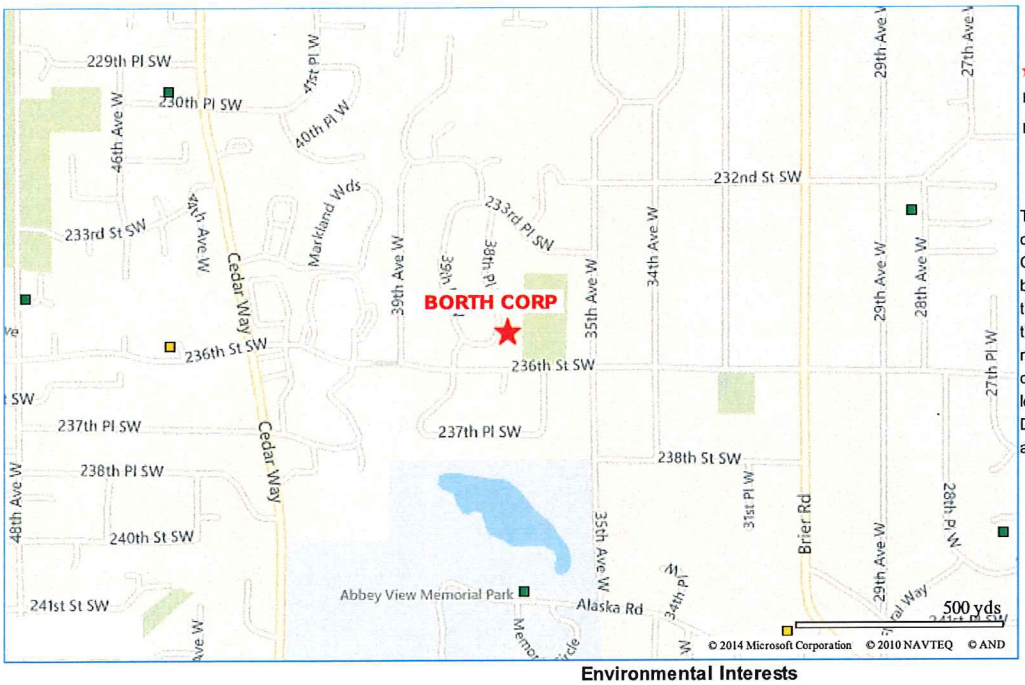


BORTH CORP
3716 235TH PL SW
BRIER, WA 98036-8241
EPA Registry Id: 110005321188

Facilty Registry Service Links

- Search
  - FRS Facility Query
  - FRS EZ Search
  - Organization Search
- FRS Physical Data Model
- FRS Geospatial Model
- Contact Us
- Facility Registry Service (FRS) Home

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Legend

- Selected Facility
- EPA Facility of Interest
- State/Tribe Facility of Interest

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Environmental Interests

Information System	Information System ID	Environmental Interest Type	Data Source	Last Updated Date	Supplemental Environmental Interests
RESOURCE CONSERVATION AND RECOVERY ACT INFORMATION SYSTEM	WAD048673800	UNSPECIFIED UNIVERSE (N)	RCRAINFO	02/16/2012	

Additional EPA Reports: MyEnvironment | Enforcement and Compliance | Site Demographics | Facility Coordinates Viewer | Environmental Justice Map Viewer | Watershed Report

Standard Industrial Classification Codes (SIC)

No SIC Codes returned.

National Industry Classification System Codes (NAICS)

Data Source	NAICS Code	Description	Prim
RCRAINFO	48422	SPECIALIZED FREIGHT (EXCEPT USED GOODS) TRUCKING, LOCAL	

Facility Codes and Flags

EPA Region:	10
Duns Number:	
Congressional District Number:	02
Legislative District Number:	WA
HUC Code/Watershed:	17110012 / LAKE WASHINGTON
US Mexico Border Indicator:	
Federal Facility:	NO
Tribal Land:	NO

Facility Mailing Addresses

Affiliation Type	Delivery Point	City Name	State	Postal Code	Information Syste
OWNER	3716 235TH PL SW	BRIER	WA	98036-8241	RCRAINFO
REGULATORY CONTACT	3716 235TH PL SW	BRIER	WA	98036-8241	RCRAINFO

Alternative Names

Alternative Name	Source of Data
BORTH CORP	RCRAINFO

Contacts

Affiliation Type	Full Name	Office Phone	Information System	Mailing Addr
REGULATORY CONTACT	BORTH CORP BORTH CORP	(000)000-0000	RCRAINFO	View

Organizations

Affiliation Type	Name	DUNS Number	Information System	Mailing Address
OWNER	BORTH CORP B		RCRAINFO	View

Query executed on: AUG-21-2014

Business Name	Abbey View Memorial Park Cemetery and lake
Contact Information/ County	(425) 483-0555
Address	3601 Alaska Rd. Brier, WA. 98036

Contamination Description(s)

Abbey View Lake (as named by cemetery staff) could hold and allow gradual seepage of contaminants from outside the lake area to the aquifer beneath.

There are several fuel tanks onsite: one above ground diesel tank, one subsurface gas tank, one subsurface diesel tank, one oil tank above ground, and one septic tank. These tanks have the possibility of being a ground water contaminant source if a leak or misuse occurs.

There is a vehicle repair building onsite that could be a source of contamination.

The decomposing human remains, FORMALDEHYDE could be a source of ground contamination and therefore aquifer contamination.

5-G Potential Sources of Contamination

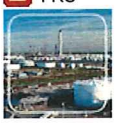
EPA United States Environmental Protection Agency

Envirofacts

FRS Facility Detail Report

5-G Potential Sources of Contamination

FRS



ABBEY VIEW CEMETARY

3600 ALASKA RD
BRIER, WA 98036
EPA Registry Id: 110005375398

Facility Registry Service Links

- Search
  - FRS Facility Query
  - FRS EZ Search
  - Organization Search
- FRS Physical Data Model
- FRS Geospatial Model
- Contact Us
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Legend

- Selected Facility
- EPA Facility of Interest
- State/Tribe Facility of Interest

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Environmental Interests

Information System	Information System ID	Environmental Interest Type	Data Source	Last Updated Date	Supplemental Environmental Interests:
RESOURCE CONSERVATION AND RECOVERY ACT INFORMATION SYSTEM	WAD988506333	UNSPECIFIED UNIVERSE (N)	RCRAINFO	02/16/2012	
WASHINGTON - FACILITY / SITE IDENTIFICATION SYSTEM	47727286 EXIT Disclaimer	STATE MASTER	WA-FSIS		TOXICS-2344 LEAKING STORAGE TANK TOXICS-2344 UNDERGROUND STORAGE TANK PROGRA

Additional EPA Reports: MyEnvironment | Enforcement and Compliance | Site Demographics | Facility Coordinates Viewer | Environmental Justice Map Viewer | Watershed Report

Standard Industrial Classification Codes (SIC)

Data Source	SIC Code	Description	Primary
WA-FSIS	9999	NONCLASSIFIABLE ESTABLISHMENTS	

National Industry Classification System Codes (NAICS)

Data Source	NAICS Code	Description	Primary
RCRAINFO	81222	CEMETERIES AND CREMATORIES	

Facility Codes and Flags

EPA Region:	10
Duns Number:	
Congressional District Number:	02
Legislative District Number:	WA
HUC Code/Watershed:	17110012 / LAKE WASHINGTON
US Mexico Border Indicator:	
Federal Facility:	NO
Tribal Land:	NO

Facility Mailing Addresses

Affiliation Type	Delivery Point	City Name	State	Postal Code	Information Sys
OWNER	3600 ALASKA RD	BRIER	WA	98036-8437	RCRAINFO
HAZARDOUS WASTE LEGAL OWNER	3600 ALASKA RD	BRIER	WA	98036-8437	WA-FSIS
HAZARDOUS WASTE MAIL ADDRESS	3600 ALASKA RD	BRIER	WA	98036-8437	WA-FSIS
MAILING ADDRESS	3600 ALASKA RD	BRIER	WA	98036	WA-FSIS
REGULATORY CONTACT	3600 ALASKA RD	BRIER	WA	98036-8437	RCRAINFO
MAILING ADDRESS	3600 ALASKA RD	BRIER	WA	98036	WA-FSIS

Alternative Names

Alternative Name	Source of Data
ABBEY VIEW MEMORIAL PARK	WA-FSIS

Organizations

Contacts

APPENDIX 5 - H AGREEMENT WITH NUD RE. MCKINNON CR. SEWER

Northshore Utility District

ADDRESS

6830 NE 185th Street
Kenmore, WA 98028-2701

P.O. Box 82489
Kenmore, WA 98028-0489

TELEPHONES		FAX NUMBERS	
Engineering:	(425)398-4401	Engineering:	(425)398-4435
Administration:	(425)398-4402	Administration:	(425)398-4430
Operations:	(425)398-4403	Operations:	(425)398-4432
Information:	(425)398-4400	Purchasing:	(425)398-4434

Website: Http://www.nud.net

February 23, 2004

Tony Sexton, Superintendent
Lake Forest Park Water District
4029 NE 178th St
Lake Forest Park, WA 98155

RE: **LFPWD Wellhead Protection and NUD Sewer at NE 187 PL and 47 AVE NE**

Dear Mr. Sexton:

This is in response to a letter that Philip Lay, the previous manager of LFPWD, had written on October 9, 2000 (please see attached). The letter was included in a packet of information that was forwarded to Northshore Utility District (NUD) by Dan Mundall, your engineering consultant. Mr. Lay and Mr. Mundall had met with NUD staff on October 4, 2000 to talk about your wellhead protection program. Out of the meeting, there were 5 mitigative and corrective measures outlined to protect the existing wells in your District from a possible sanitary sewer overflow (SSO).

Northshore Utility District has completed the following:

1. NUD has installed watertight manhole lids on all manholes within the critical section where a possible SSO may occur.
2. NUD currently performs routine CCTV inspections twice a year on the sewer main in the area to ensure that the pipe retains it's structural integrity.

In addition, we agree to pursue completion of the following mitigative measures:

1. NUD will install a simple float switch sensor in MH-31B-8 as a means of early detection of a possible SSO.
2. The current NUD Emergency Response Plan will be updated to reflect procedures to handle SSO incidents in high-risk areas.

Lastly, we commit to the following corrective measures:

1. In the event of a SSO that is a direct result of NUD activity (flushing, cleaning, etc.), NUD will be responsible for the cleanup in the wellhead area.
2. NUD will provide standby water, free of charge, to LFPWD in the event of a SSO in the wellhead area that is a direct result of NUD activity (flushing, cleaning, etc.).

5-H Agreement with NUD re. McKinnon Sewer

In regard to the sensor in MH-31B-8, I spoke with Mr. Mundall, on Friday (2/20/04) and he said that LFPWD has installed a 4x4 signpost with a battery powered amber beacon; and that LFPWD plans to install a solar panel connection to the battery in order to keep it fully charged at all times. NUD will install the float switch in MH-31B-8 and run a conduit and wire to the 4x4 signpost to allow LFPWD to make the final connection to the amber beacon. NUD agrees to maintain the float switch in the manhole, but will look to LFPWD to maintain the amber beacon, it's power supply and the information sign for the site.

Lastly, upon a field investigation, the 4x4 wood signpost did not appear to be securely installed to a sufficient depth nor encased in concrete at the base.

If you have any questions please give me a call at (425) 398-4400 ext. 121.

Sincerely,

George S. Matote
Engineer

Enclosure

Cc: Yee
Kaiser
Hawley
Williams
Bogdan

5-H Agreement with NUD re. McKinnon Sewer

LAKE FOREST PARK WATER DISTRICT

left msg 12 noon 12/29/00. Need to confirm receipt of letter.

Commissioners:
William Currie
Timothy M. Davis
Gordon Hungar

Phillip B. Lay, Manager

(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155

GOOD WATER, NATURALLY

October 9, 2000

1/2/2001 Matt returned call @ 8:42 Am. He did receive the letter & NUD plans to start working on manhole covers w/in next couple of months, 10/11/00

DRAFT

Dan Olson, General Manager
North Shore Utility District
6830 N.E. 185th Street
Kenmore, WA 98028-2701

RE: **N.U.D. Sewers in K.C.W.D. 83 Wellhead Protection Area near N.E. 187th Pl.**

Dear Dan:

TERRY HAWLEY 11/3/04

Further to our October 4 meeting with your staff (Matt Everett, Rick (Dennis) William, and Rob Musch) I have summarized below several mitigative and corrective measures that were agreed to in principle by N.U.D. and our District. It appears that these measures can be of mutual benefit in reducing both opportunities for a spill and chance of well contamination while also providing for proper means of action and liability control in the event that this did occur.

In summary 5 (five) mitigative and corrective measures were agreed on in principle by NUD and LFPWD in the meeting. These include:

DONE ✓ 1. NUD will install water tight manhole lids in critical section (6 – 7 total). These will reduce the opportunity for vandalism while also guarding against overspill in the event of a line backup.

DONE ✓ 2. NUD will carry out video inspection – annually to assure physical integrity and hydraulic capacity of the pipe.

3. NUD will install a sensor with alarm/indicator light that will indicate if level rises above normal. LFPWD will provide electrical power for this at their pumphouse adjacent to the sewer.

4. NUD will make operating plan changes/alterations to reflect high risk area requirements. These plan changes will detail emergency response proceedures and capabilities for handling flow in the event of a line obstruction or spill.

5. NUD is liable in any case for cleanup of it's own spill. In addition NUD will supply standby water free of charge to LFPWD during an interruption of their source(s) that is caused by NUD sewer failure.

SIZE TTG LIMITS MTGD 2/4/00 2002 NOTES MTM 2/20/04

5-H Agreement with NUD re. McKinnon Sewer

In our discussion it was agreed that a reasonable period for complete implementation would be 1 (one) year from the date of our meeting, with operational protocol changes and sensor/alarm installation proceeding manhole retrofits. However, in consideration of liability, you may wish to act sooner.

In the mean time we are awaiting the provision of N.U.D. manhole invert information and the remaining video inspection which was recently conducted. In our review of the video provided thus far we note what appears may be moderately serious pitting of the inside wall in several sections of the R.C. pipe. N.U.D. may wish to investigate this further and schedule future lining or replacements if necessary.

Thank you for your action on this mutually important issue. Please advise if you need further information or assistance in this regard.

Sincerely,

LAKE FOREST PARK WATER DISTRICT

Phillip Lay, Manager

Encl. Minutes of Meeting Oct. 4, 2000

cc. Matt Everett, NUD
Dan Mundall, Engineering & Cons.
David Jennings, Wa. DOH
Commissioners - LFPWD

5-H Agreement with NUD re. McKinnon Sewer

Minutes of Meeting

Wednesday October 4, 2000
11:00 AM

Present:

Matt Everett, Operations Manager, Northshore Utility District (NUD)
Rick (Dennis) William, Sewer Supervisor (NUD)
Rob Musch, Utility Worker III (NUD)
Phillip Lay, Manager, Lake Forest Park Water District (LFPWD)
Dan Mundall, P.E., Mundall Engineering & Cons.

RE: **NUD's sewer main which traverses LFPWD's (K.C.W.D.83) Wellhead Protection Area**

Background:

This meeting follows a meeting with NUD sewer staff (01-24-2000) and written correspondence to NUD regarding the issue of an 8" concrete sewer main which traverses the West side of LFPWD's wellhead property in Lake Forest Park on the closed N.E. 187th PL. Right-of-Way. In the previous meeting between NUD and LFPWD and in written correspondence LFPWD has asked for NUD to evaluate the risk of failure and implement mitigative measures.

- On opening the meeting Dan and Phillip explained that LFPWD sought resolution of the issue to protect the District's water sources and to free the District from liability in the event of a sewer spill. It was noted that the problem was discovered as the District was completing their Wellhead Protection Program as required by the State Department of Health and realized the potential for wellhead contamination from the NUD sewer.

- Those present agreed that records show the NUD easement predates LFPWD's ownership of the land through which the sewer traverses, and that LFPWD bought the land from a private owner in the late 1960's with the condition of a 10 ft wide utility easement traversing the property. It was mentioned that the sewer was likely considered a desirable alternative to septic drainfields for the residences adjacent to the wellheads at the time of construction, overshadowing any risk from sewer failure.

- Matt offered that NUD was willing only to make minor operational changes to mitigate risk and that a geotechnical slope stability study or replacement, upgrade or bypass of the sewer was out of the question from a standpoint of cost. Matt offered that NUD could at most "bolt down" manhole lids and implement routine video inspection of pipe between 6 manholes in the sewer in the section considered high risk. It was agreed that the zone considered highest risk was from NUD MH 28-8 through MH 31C-8 where the sewer is nearest to wellheads and in direct flow path to the wellheads. Both upstream and downstream appear to be less of a risk; upstream sections of the sewer would drain into a natural drainage course and downstream sections would also drain downslope of the wells. Rick noted that flows were low enough that NUD could respond to failure by bypass pumping or by evacuation and hauling in the event of failure. NUD staff discussed the manhole bolt down concept, which can help prevent vandalism of the sewer as well as stop leakage in the event of a sewer backup. A video inspection would show internal obstructions or cracking in the pipe. NUD staff presented a copy of a recent video inspection to LFPWD.

- Dan noted that LFPWD was not in a position to tell NUD how to run their sewer and could not outline specific operational steps to mitigate damage. He added that from a risk perspective awareness was

5-H Agreement with NUD re. McKinnon Sewer

the most critical element in risk reduction, since as it presently stands leakage could go on for days without being noticed by either District staff or residents, and that routine bacteriological sampling could not detect contamination for up to a week. It was agreed that cleanup & restoration are less of an issue than detection, although LFPWD would expect free water from NUD during "down time" caused by an NUD sewer failure. In addition, it would be expected that NUD would take responsibility for cleanup, although Dan noted that [domestic] sewer spill cleanup and restoration would typically be minor compared to industrial/chemical spills where the pollutants (such as metals, for example) are persistent in the environment.

- Phil noted that Quest Communications (US West) is interested in placing their overhead phone lines underground in the same area and may be contacting NUD in that regard. However, it was qualified that this was not a request or endorsement by LFPWD as they did not want to be liable for damage to the sewer or disturbing or undermining the stability of the slope supporting the sewer.

- There was considerable discussion on ways to improve awareness of a leakage or obstruction failure. In conclusion, NUD offered to install a sensor based audible & visible alarm with a call # sign that would be readily seen from the street on 47th Ave. N.E. & N.E. 187th Pl. by both LFPWD staff and residents. The alarm could sense major obstruction and backup in the sewer before a spill occurred. LFPWD would supply 120v AC to NUD for the alarm at their pump house. It was not clear where to place the sensor. Dan asked NUD to provide invert elevations for the sewer so it could be determined how best to place it to be effective in sensing a backup noting that if the section was very steep, more than one sensor may be needed.

- In summary a list of 5 (five) mitigative and corrective measures was agreed on in principle by NUD and LFPWD in the meeting. These include:

1. NUD will install water tight manhole lids in critical section (6 – 7 total)
2. NUD will carry out video inspection – annually
3. NUD will Install alarm/indicator light with power by LFPWD at their pumphouse
4. NUD will make operating plan changes/alterations to reflect high risk area requirements
5. NUD is liable in any case for cleanup of it's own spill. In addition NUD will supply standby water free of charge to LFPWD during an interruption of their source(s) that is caused by NUD sewer failure.

- Matt asked what schedule is expected for implementation of the mitigative measures. Phil and Dan expressed their desire to implement all measures "within a year". Video inspection was already completed for this year. The most demanding task was installation of the bolt down water tight lids which required new frames to be hauled [by hand or cart] to location. In priority, operational proceedures and alarm installation would proceed this.

Minutes recorded by Dan Mundall, P.E., Mundall Engineering & Cons. (10-5-2000)

5-H Agreement with NUD re. McKinnon Sewer

APPENDIX 5 - I HAZARDOUS SPILL RESPONSE NOTICE

Commissioners:
William F. Donahue
David A. Hammond
Eli B. Zehner

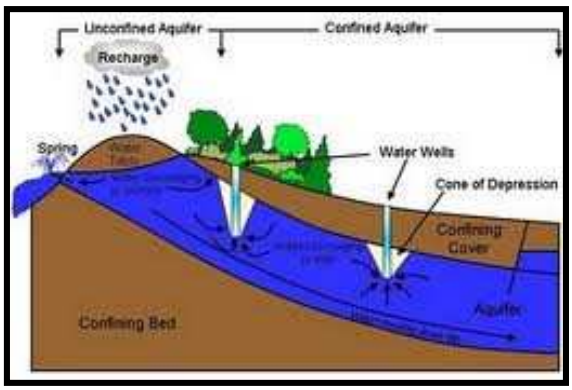
LAKE FOREST PARK WATER DISTRICT

GOOD WATER, NATURALLY

(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155
www.lfpwd.org

RE: EMERGENCY SPILL RESPONSE PLANS FOR COMMUNITY WATER SUPPLY

April 2, 2015



Dear Emergency Responder:

Lake Forest Park Water District supplies water to about 900 customers within the City of Lake Forest Park. Our District normally supplies water from two wellfields that are also located in the City boundaries.

Presently we are developing a water source protection plan as required by the State Department of Health (DOH). As part of this plan, we must provide wellhead protection contaminant risk and planned response information to agencies responsible for incident/spill response procedures. In particular, local emergency responders are asked to evaluate whether changes in incident/spill response procedures are needed to better protect these water supplies. As stated in the Wellhead Protection Program Guidance Document, "If a public water system's source water is determined to be vulnerable to surface activities, special procedures may need to be incorporated into local emergency response plans."

Washington Department of Health has given the District's wellfields the following ratings:

- McKinnon Creek (18460 47th Place NE) shallow artesian wells "**High**" susceptibility
- McKinnon Creek (18460 47th Place NE) deep wells "**Moderate**" susceptibility
- Horizon View (19568 45th Ave. NE) "**Low**" susceptibility

A map of each wellfield, along with a list of known potential contaminant sources, is enclosed for your review. An acknowledgement of receipt of this information or a response from your office is **not** required as part of the wellhead protection plan documentation.

5-I Hazardous Spill Response Notice

The District has scheduled a public hearing on:

Monday, April 13, at 7:00 pm
Shoreline Conf. Center – Ballinger Room
18560 1st Ave NE Shoreline WA 98155
Phone (206)-393-4122

The objectives of this planning meeting will be to describe the water source system, the potential contaminant risks we have identified, and discuss ways to mitigate these risks.

Thank you for your attention in this matter. If you have any questions about the plan, please feel free to contact us.

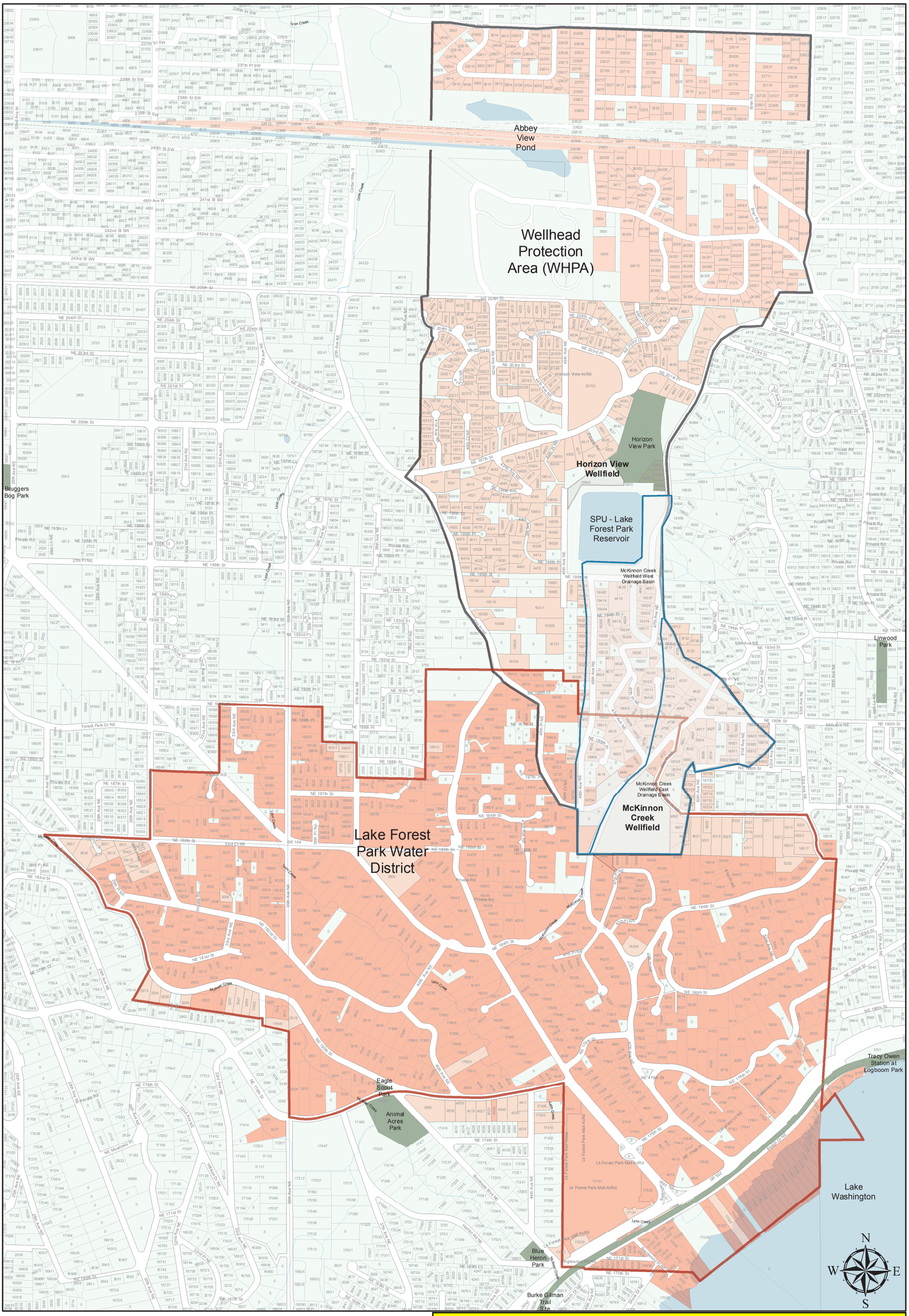
Sincerely,



Alan Kerley, General Manager

Enclosures: LFPWD Comprehensive Water System Plan 2015, Part Five - "Source Protection Program 2015" including maps of wellfields and table of contaminant risks.

APPENDIX 5 - J SOURCE PROTECTION RECORD OF NOTIFICATIONS



5-J Source Protection Record of Notifications

LAKE FOREST PARK WATER DISTRICT

WHPA MAILING
WHPA NOTIFICATION MAILING LIST

Legend

- Customer List
- WHPA Mailing List
- McKinnon Wellfield Watershed
- WHPA
- Wellfields
- Park

LAKE FOREST PARK WATER DISTRICT
GOOD WATER, NATURALLY!

MUNDALL ENGINEERING & CONSULTING
P.O. Box 799
Sumas, Washington 98295
P.O. Box 56 Toll Free
Lytton, B.C. V0K 1Z0 1-800-313-9705
Bus. (250)-455-0085 Cellular (360)-319-1285
FAX (250)-455-2276 E-Mail Dan@Mundall.com

5-J Source Protection Record of Notifications

Summary of Notification Letter Distribution
Lake Forest Park Water District - Source Protection Program 2015

Agencies/Local Government

4/3/15 - ☑ City of Lake Forest Park (note: abandoned well, street runoff) ✓

4/3/15 - ☑ City of Brier (street runoff) ✓

4/3/15 - ☑ Northshore Utility District (note: sanitary sewer in McKinnon wellfield) ✓

4/3/15 - ☑ King County (note: Brightwater tunnel for treated effluent, monitoring wells in aquifer) ✓

- ☒ Washington State Dept. of Ecology (note: abandoned wells) 4/3/15 CALLED NW REGION NORL PHILIP (425) 649-7044 — NOT NEEDED. — DM

Business Owners / Operators within WHPA

4/3/15 - ☑ Abbeyview Cemetery (note: formaldehyde, fuel storage, nitrates, pesticides, herbicides) ✓

- ☒ Parmley Auto Repair (note: VOC, petroleum products) } UNABLE TO LOCATE BUSINESS CURRENTLY O.N

- ☒ Borth Corp. Freight (note: technically outside of 10 year WHPA) UNABLE TO LOCATE

Residents

4/3/15 - ☑ 890 Customers of Lake Forest Park Water District

4/3/15 - ☑ 771 Residents inside 10 year WHPA

} COMBINED LIST QTY = ?

Emergency Response Organizations

4/3/15 - ☑ Northshore Fire District ✓

4/3/15 - ☑ City of Lake Forest Park Police ✓

Commissioners:
William F. Donahue
David A. Hammond
Eli B. Zehner

LAKE FOREST PARK WATER DISTRICT

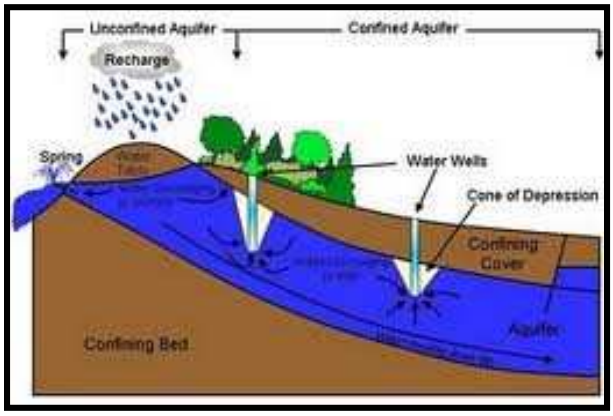
GOOD WATER, NATURALLY

(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155
www.lfpwd.org

April 2, 2015

RE: Notification for Agencies & Local Governments Re. Groundwater Source Protection

Dear Local Government / Agency Representative:



Lake Forest Park Water District supplies drinking water to about 900 customers within the City of Lake Forest Park. Our District normally supplies water from two wellfields that are also located in the City boundaries.

We are developing a Water Source Protection Plan as required by Washington State Department of Health (RCW 43.20.050). State law (RCW 70.119A.060) also requires us to protect the land area surrounding our wellfields in order to prevent contamination of our community drinking water supply.

In preparing our water source protection program we mapped the area we are required to protect and delineated the 10 year recharge zone of our drinking water supply wells. We are also required to identify and agencies and local governments of potential sources of contamination to our wells (within the 10 year recharge zone). Our water is obtained from two wellfields:

Wellfield	Address	Site Discription/landmarks

- McKinnon Creek (18460 47th Place NE → 12 acre wooded area north to 187th Street)
- Horizon View (19568 45th Ave. NE → 2 acres near SPU Reservoir/Horizon Park)

The purpose of this letter is to inform you of the possible impact of your agency/government to our wellfields and of the risks we have identified with your business activities. Please see Table 5-1 in the attached Source Protection Program document for potential contaminants we may have identified with your business.

5-J Source Protection Record of Notifications

We also want to remind you that any hazardous material spilled onto the ground or put into a septic system has the potential of contaminating our drinking water supply. Some typical contamination sources are:

- Spillage of paints, cleaners, or solvents onto the ground.
- Dumping of motor oil, gasoline, antifreeze or similar fluids onto the ground. These materials can be recycled, free of charge, at most major automotive shops and parts stores.
- Leaking fuel storage tanks and distribution lines.
- Seepage of wastewater from damaged conveyance systems.

The District has scheduled a public meeting to discuss these and other issues. Time and place for this meeting are:

Monday, April 13, at 7:00 pm
Shoreline Conf. Center – Ballinger Room
18560 1st Ave NE Shoreline WA 98155
Phone (206)-393-4122

Our engineer will present detailed information about the "Lake Forest Park" aquifer and we will open discussion to many practical ways that we each can help protect our pristine water supply from contamination. There will be light snacks provided and we also welcome your ideas.

We are very fortunate to have a very good supply of naturally pure water that has supplied our community for over 100 years! We would like to keep it that way as a lasting legacy for those that come along after us. Please plan to attend this important meeting to share your ideas and find out ways that you can assist in preserving this pristine water source for the Lake Forest Park community. **If you have any questions before that time, please feel free to contact District staff between the hours of 8:30 am and 4:30 pm daily at (206) 365-3211**.

Thank you for your careful consideration of these matters.

Sincerely,



Alan Kerley, General Manager

Enclosures: LFPWD Comprehensive Water System Plan 2015, Part Five - "Source Protection Program 2015" including maps of wellfields and table of contaminant risks.

Commissioners:
William F. Donahue
David A. Hammond
Eli B. Zehner

LAKE FOREST PARK WATER DISTRICT

GOOD WATER, NATURALLY

(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155
www.lfpwd.org

December 4, 2014

Dear Resident:

Letter of Notification - Wellhead Protection Plan



Our maps show that you reside in an area where water percolates through the soil to supply the aquifer for our community drinking-water wells. In our effort to provide the safest, purest water to our customers, the District is holding a public meeting to help develop a Wellhead Protection Area (WHPA) Plan in accordance with State law. Your residence is within the wellhead protection zone that supplies our wellfields, and we encourage you to participate in this important process.

A public meeting will be held on **Monday, December 15, at 1:00 pm at the Lake Forest Park Water District headquarters (4029 N.E. 178th St. – near the LFP Towne Center)**. Our engineer will present information about the aquifer and we will be discussing many practical ways that residents can help protect our water supply from contamination.

We are fortunate to have a very good supply of naturally pure water that has supplied our community for over 100 years! We would like to keep it that way as a lasting legacy for those that come along after us. Please plan to attend this important meeting to share your ideas and find out ways that you can assist in preserving this pristine water source for the Lake Forest Park community. If you have any questions before that time, please feel free to contact District staff between the hours of 8:30 am and 4:30 pm daily at (206) 365-3211.

Sincerely,

Alan Kerley, General Manager, Lake Forest Park Water District

Encl: Map of Wellhead protection area (over)

5-J Source Protection Record of Notifications

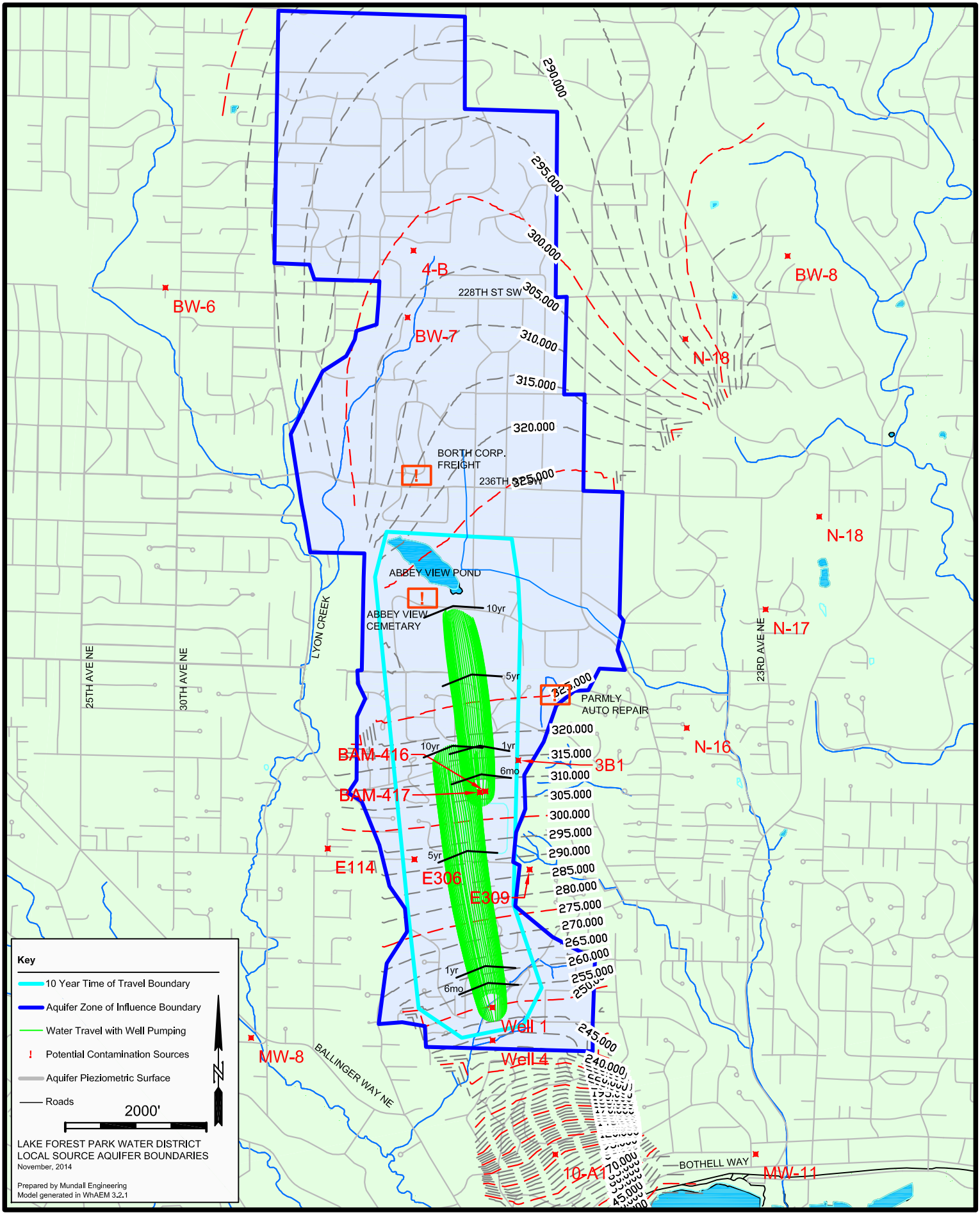


FIGURE 1 - LAKE FOREST PARK WATER DISTRICT AQUIFER BOUNDARIES

5-J Source Protection Record of Notifications

Commissioners:
William F. Donahue
David A. Hammond
Eli B. Zehner

LAKE FOREST PARK WATER DISTRICT

GOOD WATER, NATURALLY

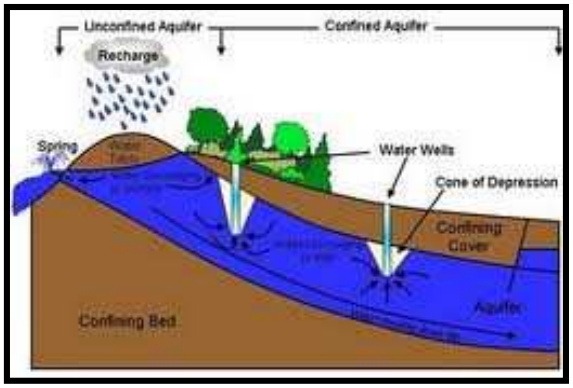
(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155
www.lfpwd.org

Letter of Notification – Water Source Protection Planning Meeting #2

April 2, 2015

Dear Resident:

In our effort to provide the safest, purest water to our customers, the District is holding another public meeting (this time in the evening) to help develop a Wellhead Protection Area (WHPA) Plan in accordance with State law. You are receiving this letter because our maps show that you reside in an area where water percolates through the soil to supply the aquifer for our community drinking-water wells or you may be a customer of the District. In either case we encourage you to participate in this important process.



Time and place for this meeting are:

Monday, April 13, at 7:00 pm
Shoreline Conf. Center – Ballinger Room
18560 1st Ave NE Shoreline WA 98155
Phone (206)-393-4122

Our engineer will present information about the aquifer and we will open discussion to many practical ways that we each can help protect our pristine water supply from contamination. There will be light snacks provided and we also welcome your ideas.

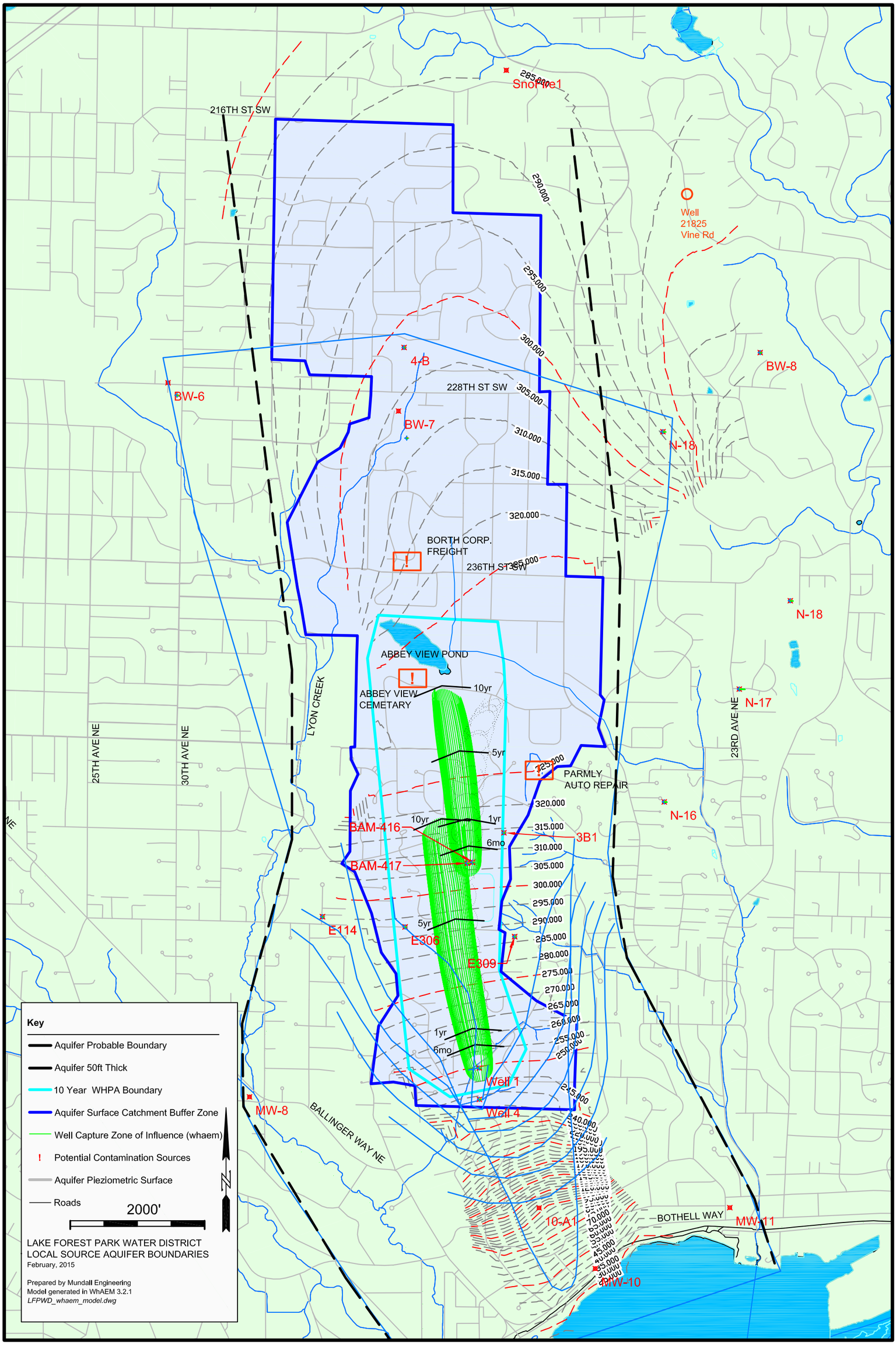
We are very fortunate to have a very good supply of naturally pure water that has supplied our community for over 100 years! We would like to keep it that way as a lasting legacy for those that come along after us. Please plan to attend this important meeting to share your ideas and find out ways that you can assist in preserving this pristine water source for the Lake Forest Park community. **If you have any questions before that time, please feel free to contact District staff between the hours of 8:30 am and 4:30 pm daily at (206) 365-3211**.

Sincerely,

Alan Kerley, General Manager, Lake Forest Park Water District

Encl: Map of Wellhead protection area (over)

5-J Source Protection Record of Notifications



LAKE FOREST PARK WATER DISTRICT
AQUIFER BOUNDARIES

5-J Source Protection Record of Notifications

APPENDIX 5 - K SOURCE PROTECTION RECORD OF MEETINGS

Commissioners:
William F. Donahue
David A. Hammond
Eli B. Zehner

LAKE FOREST PARK
WATER DISTRICT

GOOD WATER, NATURALLY

(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155
www.lfpwd.org

WELCOME! PLEASE SIGN IN
ENGINEERING MEETING 12/15/2014

NAME	ADDRESS	PHONE NUMBER
[illegible]	19205 46 ave NE	206 362 0742
[illegible]	18922 - 45th Pl NE	206 - 363 - 7357
[illegible]	23926 29th AVE W	425 - 329 - 5972
[illegible]	18717 50TH AVE. N.E.	206 - 362 - 5986
Paver Carol Pidoll	4404 NE 203 Pl	206 - 367 - 0858
Michele Luche	4028 NE 196th Court	206 - 440 - 9705
Tony Tomassi	4646 ne 187 Pl	206-367-9679
DeAnne & Felix Alvarez	19505 45th Ave. NE	206-861-6454
Alexander & Stephanie Alvarez	19837 47th Ave NE	206-660-8225
Ashton Alvarez	19839 47th Ave NE	206-271-0895
Robert-Tern Tyartinson	19555 - 45 Av NE	206-362-7073

5-K Source Protection Record of Meetings

Kay Welborn	18725 50th Ave NE	367-0898
James Benden	18620 41 st Pl NE	367-8185
Ernie Laubert	18922-45th Pl NE	363-7357
Nik Quesnell	4043 NE 196th St.	206-276 9101
Denny Criss	23865 35th Ave W	425 483 8446
Paul Burton	4619 NE 195th	206-363-8435
Elizabeth Osmond	4232 NE 203rd Pl	206-799-0692 cell

5-K Source Protection Record of Meetings

Commissioners:
Eli Zehner
David A. Hammond
William F. Donahue

LAKE FOREST PARK
WATER DISTRICT

GOOD WATER, NATURALLY

(206) 365-3211
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4029 N.E. 178th St.
Lake Forest Park
WA 98155
www.lfpwd.org

Advisory Committee Interest

WELCOME! PLEASE SIGN IN
~~SOURCE PROTECTION MEETING # 2~~ 4/13/2015

NAME	ADDRESS	PHONE NUMBER
Richards Micheline	15404 47th pl NE LFP	206-364-5505
JIM ADAMS	4616 NE 174TH PL	206 362 8957
Julie Hungar	18913 Bothell	206 365 5138
Sarah Zerkel	18452 47th PL NE	206 367-3265
Cheryl Brady	3320 NE 182nd ST.	206 365 3536
Tracy Funtani	4630 NE 178th St	206 940 1326
Nicole Gaudette	City of Brier 2901 228th St SW Brier 98036	425-775-5440
ERIC STROM	18411-51ST PL NE	206 364 1065
Sally Yamasaki	17868 40th Ave NE	206 362-3577
JEAN BRYANT	17045 HAMLIN RD NE	206 363-5055
Fred Becker	18210-47PL NE	206-953-0933

5-K Source Protection Record of Meetings

Commissioners:
Commissioners:
Eli Zehner
David A. Hammond
William F. Donahue

LAKE FOREST PARK
WATER DISTRICT

GOOD WATER, NATURALLY

(206) 365-3211
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4029 N.E. 178th St.
Lake Forest Park
WA 98155
www.lfpwd.org

APRIL 13, 2015
PUBLIC HEARING ON SOURCE WATER PROTECTION

NAME	ORGANIZATION/ADDRESS		SUSCRIBE TO LFPWD EMAIL?
Aaron Stadler	18468 47th PL NE, LFP, 98155		Yes
ARMAND michelide	18404 47th PL N.E LFP 98155		yes
Cheryl Brady	3320 NE 182nd ST		Yes
Jean Bryant	17045 Hamlin Rd NE		yes
Jim Adams	4616 NE 177TH PL		yes
Larry Gulberg	4508 NE 171st St	LFP	~~No~~ Y
Jose Vila	3017 NE 180th st	LFP	yes
Thaiya ½ M	18434 47th PL NE	LFP	Yes
Robert Graves	3333 N.E. 182nd St	LFP	yes
Tracy Furutani	4631 NE 178th	LFP	Yes
DAN BENSON	17868 40th NE	LFP	?
Sally Yamasaki	" " "	LFP	?
Sadie + Frank Yamasaki	" "	LFP	?
Lee Pelfe	18237 - 40th NE	" "	
Tony Angell	" "	" "	
Mike Wade	3017 NE 182nd	LFP	no
Walter TABOR	4631 NE 178	LFP	
Jen Rul LFPSF	18177 28th Ave NE	LFP	
Tom Kellock	17200 Brookside Bl NE	LFP	no
PETER UNDERWOOD	5008 NE 190TH ST, LFP		- STORM
DAN MUNDALL, MUNDALL ENGR., BOX 779 SUMAS, WA 98295			
Steve Mundall, Mundall Technical Box 792 Sumas WA 98295			

5-K Source Protection Record of Meetings

Commissioners:
Commissioners:
Eli Zehner
David A. Hammond
William F. Donahue

LAKE FOREST PARK
WATER DISTRICT

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Lake Forest Park
WA 98155
www.lfpwd.org

APRIL 13, 2015
PUBLIC HEARING ON SOURCE WATER PROTECTION

NAME	ORGANIZATION/ADDRESS	SUSCRIBE TO LFPWD EMAIL?
Fred Beeler	18210 47th Pl NE	No
Connie Keith Kerns	18433 47th PL NE	Y
CRAIG KERNS	18433 47TH PLACE NE	Y
Mollie & Mike Merkley	18236 35th Ave NE	not sure
SARAH ZERKEL	18452 47TH PL NE	"
John Carmody	18105 33rd Ave NE	Yes
Dianne Pottle	1519 NE 177th St	NO
Julie Hungar	18213 Ballinger Way NE	No
Bob + Sue Perigo	18414 51st Place NE	yes
Ken + Phillippa Kassover	18422 47th Pl NE	not sure.
John Nyhus	18417 47th Pl NE	Yes
Bill + Nikki Thomas	18456 47th Pl NE	
Mark Phillips	18533 26th Ave NE	
Sharon Paxson	LFP	No
Connie Barnes	18215 Ballinger Wy NE	No
	4247 NE 168th Ct LFP	
Emily Campbell	3530 NE 178th St	
RICHARD STROM	18441 51 PL NE	YES
William & Carol	18609 47th Pl NE	
BRETT MASSA + VANESSA SMALL	3577 NE 180th ST	No
Busso + Janette Lemmé		yes
Andy Keay-Ellers	35760 NE 180th	yes
Martin Joswick	18115 33rd Ave NE	yes
Lolly Smith	18418 47th Place NE	yes

5-K Source Protection Record of Meetings

Commissioners:
Eli Zehner
David A. Hammond
William F. Donahue

LAKE FOREST PARK
WATER DISTRICT

GOOD WATER, NATURALLY

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Advisory Committee Interest

WELCOME! PLEASE SIGN IN
~~SOURCE PROTECTION MEETING~~ # 2 4/13/2015

NAME	ADDRESS	PHONE NUMBER
Richard's Micheline	15404 47th PL N.E LFP	206-364-5505
JIM ADAMS	4616 NE 174TH PL	206 362 8957
Julie Hungar	18913 Ballinger	206 365 5138
Sarah Zerkel	18452 47th PL NE	206 367-3265
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JEAN BRYANT	17045 HAMLIN RD NE	206 363-5055
Fred Becker	18210-47PL NE	206-953-0933

5-K Source Protection Record of Meetings

APPENDIX 5 - L SOURCE PROTECTION: SECURITY VULNERABILITY SELF ASSESSMENT (EPA) – CERTIFICATE OF COMPLETION

5-L Security Vulnerability Self Assessment

Certification of Completion

A final step in completing the "Security Vulnerability Self-Assessment Guide for Small Drinking Water Systems" is to notify the state drinking water primacy agency that the assessment has been conducted. Please fill in the following information and send this page only to the appropriate state drinking water primacy agency contact so that this certification can be included in the records that the state maintains on your water system.

Public Water System (PWS) ID: 40950K

System Name: LAKE FOREST PARK WATER DISTRICT

Address: 4029 NE 178TH STREET

Town/City: LAKE FOREST PARK **State:** WA

ZIP Code: 98155

Phone: 206-365-3211 **Fax:** 206-365-3357

Email: office@lfpwd.org

Person Name: ALAN KERLEY

Title: GENERAL MANAGER

Address:

Town/City: **State:**

ZIP Code:

Phone: **Fax:**

Email: alan@lfpwd.org

I certify that the information in this vulnerability assessment has been completed to the best of my knowledge and that the appropriate parties have been notified of the assessment and recommended steps to be taken to enhance the security of the water system. Furthermore, a copy of the completed assessment will be retained at the public water system, in a secure location, for state review as requested.

Signed J. Kerley **Date** 10/12/15

Please send this page only to the attention of the State Drinking Water Primacy Agency.

APPENDIX 6 OPERATION AND MAINTENANCE PROGRAM

APPENDIX 6 - A SPECIFIC MAINTENANCE PROCEDURES

LAKE FOREST PARK
WATER DISTRICT

Commissioners:
Eli Zehner
David A. Hammond
William F. Donahue

GOOD WATER, NATURALLY

PHONE: (206) 365-3211
FAX: (206)365-3357
4029 N.E. 178th St. Lake
Forest Park, WA 98155

Water Quality Best Management Practices

Introduction

June 2016

Lake Forest Park Water District (LFPWD) like all public water systems is required to deliver safe and reliable drinking water to their customers 24 hours a day, 365 days a year. Ensuring the water that is consumed at the tap remains as naturally pure and sterile as when it was first extracted from the source aquifers is the best way to protect public health. It is also the most cost effective, as the source water is pristine and does not require any further treatment.

District personnel ensure this through continual evaluation, water quality testing and the implementation of Best Management Practices (BMP's).

As part of this process, the District recently contacted and visited with Mt. View-Edgewood Water Company, a larger non- chlorinated water system to see their BMP's in action, establish an open line of communication to share knowledge between our two systems and to update LFPWD system specific Best Management Practices.

Source

LFPWD has three source waters, McKinnon Creek Wellfield Deep Wells and Shallow Wells and Horizon View Deep Wells. These well sources are excellent in regard to consistent quantity and the quality produced and need no further treatment before consumption. Because this source water is effectively sterile and no treatment is needed, the District has no disinfection by-products or other concerns that would be related to a surface water system.

It is of the highest priority that the District preserves the quality of these sources. Sanitary Control Areas and the use of restrictive covenants are necessary regulatory actions to control activity and land use around these sources.

District operations staff has a responsibility to preserve the quality of these sources through regular inspection and maintenance of the wells and springs.

Wells and Well housings

Vent screen damage or improper screen mesh, openings in the well caps, standing water, improperly secured housings and damaged or absent overflow drain screens can be pathways for contamination.

LFPWD encloses all of its wells.

BMP's relating to wells and well housings:

- Daily inspection for tampering or damage
- Sites are kept clean and sanitary at all times
- Proper venting to prevent vacuum from occurring
- Sample ports for source sampling
- All instrumentation openings sealed properly
- Rotation of well pumps to ensure water circulation and to reduce wear

Reservoirs and Tanks

LFPWD maintains tank levels that balance consumption demand and fire flow storage. Maintaining circulation and keeping the water as cold as possible during warm or hot temperatures is important to public health.

BMP's relating to reservoirs and tanks:

- Reservoirs/Tanks are taken out of service at a minimum of once every five years for cleaning
- Roof vent and overflow screens inspected for damage periodically
- All other openings and access points sealed properly
- Skim or overflow tanks at strategic times to remove surface column of water during periods of high pollen count or consecutive dry hot days. This removes pollen and dust that may have come in contact with the surface layer and also has the benefit of reducing water temperature.
- Trees and vegetation are trimmed back or removed to reduce pollen that may enter roof vents.
- Access hatches and seals are inspected, replaced if needed and disinfected anytime they are accessed
- Take Reservoirs/Tanks out of service if Heterotrophic Plate Count (HPC) has marked increase. LFPWD policy is to drain, clean, inspect, disinfect, and to sample and receive results of water quality tests before returning tank to service rather than chlorinating the water in the tank and returning to service. The District and its customers have a very strong non-chlorinated preference.

Recent actions:

- Reduced flow from Horizon View into the High tank to ensure transfer pump mixing at the High tank during warm/ hot days
- Transfer pump from low tank set on a timer to fill high tank during heat of the afternoon, ensures mixing at the hottest time of day
- Repaired mixing riser at the high tank

- Horizon View and High zone tank roofs painted bright white, noticeable difference afterwards in temperature of exterior of tank and interior air temperature
- Purchased Clinefinder for measuring water temperature at 2' intervals and began gathering data to see if stratification exists in our tanks
- Access hatch seal switched from red rubber gasket material to adhesive foam strips

Planned work:

- Paint roof of low tank white
- Continue water temperature data gathering at tanks
- Consider completely painting tanks white or off-white

Sample Stations

LFPWD has sample stations throughout the District for taking water quality tests in the distribution system. These sample stations are placed well above ground level and are set at a constant flow.

BMP's relating to Sample Stations:

- Whenever possible, trees and vegetation are trimmed back or removed to reduce pollen and insects that may lead to false positive coliform samples
- Disinfection of sample stations prior to taking samples
- Periodic removal of sample station hoods and complete disinfection of station
- Flow rate constant for at least ten minutes prior to taking sample because the valves that set the flow rate may squeeze down over time, reducing or ceasing flow at the station. This practice ensures that water is properly circulated through the station prior to sampling
- Staff follows District coliform sampling procedure, detailed in the District's Operations and Maintenance Manual. Following these procedures reduces false positives due to sampling technique

Recent actions:

- Began using Bac-down, a hospital grade disinfectant that is non-corrosive to the components of our sample stations

Pump Stations

LFPWD has pump stations at our wellfields for the purpose of moving water. Keeping these stations cool during times of warm or hot weather should be considered by the District. Installing de-humidifiers should also be considered as it will prevent corrosion and ambient moisture at the stations.

BMP's relating to Pump Stations:

- Pump logs are inspected daily for increased usage. A marked increase could be indicative of a leak or fire event
- Weekly cycling of all pumps to ensure water circulation
- No storage of chemicals or liquids allowed; storage should be limited to first aid supplies, backup and emergency components and a reasonable amount of tools.

- Site is inspected daily
- Site is kept clean and sanitary at all times

Planned work:

- Installation of air conditioners/de-humidifiers

Distribution

The District should consider sizing water mains to minimum flow requirements rather than maximum flow requirements with an eye to the future when feasible. Oversized water mains can lead to water aging and water quality issues. Where flow conditions require a fire hydrant on a dead end run, metered automatic flushing stations could be installed to ensure water turn over.

BMP's relating to Distribution system (water main and appurtenances):

- Water mains are flushed annually to remove sediment deposits
- Whenever possible, repair of water mains is done under pressure. When not possible, positive flow is maintained. These practices prevent contaminants from entering the system
- Fire Hydrants are serviced annually and inspected often. This ensures proper operation and deactivation of hydrants
- Leak detection is employed to prevent water loss and possible cross connection
- Numerous system valves reduce areas that may be affected by service interruption and assist in uni-directional water main flushing
- During dry periods personnel survey the service area for out of place green vegetation patches that could indicate a leak
- Old service lines are abandoned at the corporation stop on the water main. This prevents stagnant dead end lines throughout the system
- Meter setters are equipped with check valves for protection against back siphonage
- Fully implemented cross connection control program

Planned work:

- Elimination or proper sizing of dead end water mains to ensure consumption and circulation
- Elimination of aging steel pipe to eliminate cross connection risk

APPENDIX 6 - B CROSS CONNECTION CONTROL

LAKE FOREST PARK
WATER DISTRICT

Commissioners:
William F. Donahue
David A. Hammond
Eli Zehner

(206) 365-3211
FAX: (206) 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155

GOOD WATER, NATURALLY

FIRST NOTICE OF PERIODIC TEST FOR BACKFLOW PREVENTION ASSEMBLY

November 10, 2014

Dear Water District Customer:

Our records show that you have a backflow prevention assembly or assemblies installed in your water plumbing system that is due for annual testing as required by Washington Administrative Code 246.290.490. Please have the test performed by a person holding a certificate of competency as a Backflow Assembly Tester, issued by the State Department of Health.

If an assembly fails the backflow test, please have the necessary repairs made or replace the assembly. Upon completion of a satisfactory test, have the tester fill out a test report form and return it to our office.

Often times test report forms are sent to the wrong water district by mistake. Please contact your Backflow Assembly Tester if this is the case.

More information on backflow and a list of backflow assembly testers is available on our website at www.lfpwd.org.

If you have any questions please feel free to contact the District office at (206) 365-3211, between 8:00 AM and 4:00 PM, Monday through Friday.

Sincerely,

F. Alan Kerley
General Manager

Appendix 6-B
Cross Connection Control

Commissioners:
William F. Donahue
David A. Hammond
Eli B. Zehner

LAKE FOREST PARK
WATER DISTRICT

GOOD WATER, NATURALLY

(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155

BACKFLOW PREVENTION ASSEMBLY TEST – SECOND NOTICE

First letter sent on November 10, 2014

Test due by: December 2, 2014

<FIRST NAME> <LAST NAME> Account No.: <ACCOUNT#>
<ADDRESS>
Lake Forest Park, WA 98155 Make: <MAKE/SERIAL NO.>

Device Location: <DESCRIPTION>

Action Date: December 9th, 2014

A reminder notice for the testing of your backflow assembly device(s) was sent to you on November 10, 2014. The annual testing of your assembly/assemblies is required by State Code (WAC 246-290-490). As of today, we have neither heard from you nor received your report.

If you feel you have received this notice in error, please check with your backflow tester to ensure that your test report was sent to the correct water provider.

Failure to comply with this request by the action date referenced above could result in the discontinuance of your water service.

If you have any questions please feel free to contact the District office at (206) 365-3211, between 8:00 am and 4:00 pm, Monday through Friday.

Sincerely,

F.Alan Kerley
General Manager

Appendix 6-B
Cross Connection Control

LAKE FOREST PARK WATER DISTRICT
4029 NE 178th Street
Lake Forest Park, WA 98155
(206) 365-3211

BACKFLOW PREVENTION ASSEMBLY TEST -- FINAL NOTICE

December 9, 2014

TERRANCE & CAROLYN BAGLEY
4701 NE SHORE PL
Lake Forest Park, WA 98155

Account No.: 531

Make: WATTS 909QT 461750

LAST TEST DATE: 10/21/13

Device Location: DCVA IRRIGATION DOWNSTAIRS IN MECHANICAL ROOM.

As of this date the District has not received a response to your Annual Backflow Prevention Assembly Test requests sent to you on November 10, and November 25nd 2014. The annual testing of your assembly/assemblies is required by State Code (WAC 246-290-490).

The water service to this property will be discontinued effective December 24, 2014 for failure to respond to our previous Test Due Notifications. Service will remain discontinued until proof of testing has been received. DISCONNECT DATE: DECEMBER 24, 2014

If you feel you have received this notice in error, please check with your backflow tester to ensure that your test report was sent to the correct water provider.

If you have any questions please feel free to contact the District office at (206) 365-3211, between 8:00 AM and 4:30 PM, Monday through Friday.

Sincerely,

Alan Kerley
District Manager

Appendix 6-B
Cross Connection Control

2012 CROSS-CONNECTION CONTROL SURVEY

Dear Customer,

The following form **must** be completed and returned to the District by all water service customers connected to our public water supply. This survey will help us prevent accidental contamination of our drinking water system. The purpose of this survey is to determine whether a cross-connection may exist at your home or business and to protect public safety.

The Washington State Department of Health requires that all water purveyors protect the public water supply from contamination by eliminating actual cross-connections and reducing the hazard of potential cross-connections. It also requires all purveyors to report annually the potential for cross-connection hazards to the water system. Your completion of this survey will assist the District in satisfying these requirements.

A cross-connection is an unprotected or improper connection to the system that may cause contamination or pollution to enter the system. It can be a direct or indirect connection with any other water source, sewer, drain, conduit, pool, storage tank, plumbing fixture or other device which contains, or may contain, contaminated water, sewage or other liquid or waste of unknown or unsafe quality. The system water pressure can suddenly drop because of heavy usage, a fire in the area or a broken water main. When that happens, contaminated water could be siphoned back into your plumbing system from unprotected cross-connections within your home. Even though the District has a very reliable water distribution system, these pressure drops can occur. All homes have potential cross-connections. The water pipes and plumbing fixtures that make up cross-connections can be the link for contamination to get back into the drinking water supply. They can be a serious health hazard. The reversing of the flow direction in the pipes is called backflow. The result of cross-connection contamination is that chemicals, poisons and bacteria might find their way into the water you drink.

Examples of cross-connections include:
1. Improperly installed irrigation systems which may allow backsiphonage of stagnant, bacteriologically unsafe water into the domestic piping system.
2. Improperly plumbed water-using devices such as hot-tubs, boilers or dishwashers, which may allow unsafe water back into the domestic piping system.
3. Irrigation systems served by an auxiliary source, such as a private well or creek. Such systems create a potential for major contamination of the public water system via inter-ties with the domestic piping system.
4. Interconnections between the potable system and a non-potable system.

Most modern plumbing systems have backflow devices built in (toilets, sinks, modern hose connections). For more information and detailed descriptions of cross connections, view the following link:
http://www.epa.gov/safewater/crossconnectioncontrol/pdfs/chapter04.pdf

Every customer served by this system must be surveyed. This survey includes identifying what plumbing fixtures are present in the home or business. After we receive this survey back, we will review the data and determine whether an inspection of your plumbing is needed. If this is the case, you will be notified by phone or mail. Help yourself, your family and your community by eliminating unprotected cross-connections. Help the District and your neighbors by filling out the attached Cross Connection Survey and returning it to the District.

Return this survey to 4029 NE 178th Street, Lake Forest Park, WA 98155. You may include it with your water bill or fax it to (206) 365-3357 by the date shown. If you have any questions, call (206) 365-3211 between 8 a.m.-4 p.m. Monday-Friday.

Thank you for your assistance.

Appendix 6-B
Cross Connection Control

2012 CROSS-CONNECTION CONTROL SURVEY
SECOND NOTICE

Dear Customer,

In June of this year we sent out a letter and survey to all of our customers. Our records show that the District has not yet received yours. The purpose of this survey is to determine whether a cross-connection may exist at your home or business and protect the public safety.

The Washington State Department of Health requires that all water purveyors protect the public water supply from contamination by eliminating actual cross-connections and reducing the hazard of potential cross-connections. It also requires all purveyors to report annually the potential for cross-connection hazards to the water system. Your completion of this survey will assist the District in satisfying these requirements.

Please take a few minutes to help the District and your community protect its pure drinking water by completing the survey. It can be returned to 4029 NE 178th Street, Lake Forest Park, WA 98155. Our fax number is (206) 365-3357.

The survey can now also be quickly completed and submitted on our website at www.lfpwd.org. Additional cross connection content has also been added.

If you have any questions, call (206) 365-3211 between 8 a.m.-4 p.m. Monday-Friday.

Thank you for your assistance.

F. Alan Kerley
General Manager
Lake Forest Park Water District

Appendix 6-B
Cross Connection Control

LAKE FOREST PARK WATER DISTRICT
2012 CROSS CONNECTION SURVEY

Account Number: _____ (As Shown on Bill)

Date: _____

Customer Name: _____

Address: _____

Contact Phone Number: _____E-Mail: _____

Please check the boxes that apply to your residence and/or business and return to Lake Forest Park Water District by September 1, 2012.

If we do not receive your completed survey by the date listed above you may be required to install a backflow prevention device within 90 days of the above date or water service will be disconnected.

Survey Questions

1. Is this service for a residence, business or both?	☐ Residence ☐ Business ☐ Both
2. Do you have a well or other water source?	☐ Yes ☐ No ☐ Don't Know
If so, is it connected to the house plumbing system?	☐ Yes ☐ No ☐ Don't Know
3. Do you have an underground lawn irrigation/sprinkler system?	☐ Yes ☐ No ☐ Don't Know
If yes, what is the source?	☐ LFPWD ☐ Lake ☐ Well ☐ Other
4. Do you have a fire sprinkler system?	☐ Yes ☐ No ☐ Don't Know
5. Do you have a frost-proof yard hydrant?	☐ Yes ☐ No ☐ Don't Know
6. Do you heat your home with a hot water heating system?	☐ Yes ☐ No ☐ Don't Know
If yes, what is the source?	☐ Solar ☐ Geo-thermal ☐ Other
7. Do you have a swimming pool, hot tub or Jacuzzi tub with a permanent submerged water fill pipe?	☐ Yes ☐ No ☐ Don't Know
8. Do your laundry tubs/sinks have an air gap below the faucet?	☐ Yes ☐ No ☐ Don't Know
9. Do you have Vacuum Breaker Devices on all of your hose bibs?	☐ Yes ☐ No ☐ Don't Know
10. Do you have an existing Backflow Prevention Assembly?	☐ Yes ☐ No ☐ Don't Know

Return this survey to 4029 NE 178th Street, Lake Forest Park, WA 98155. You may include it with your water bill, Email it to office@lfpwd.org or fax it to (206) 365-3257 by the date shown. If you have any questions, call (206) 365-3211 between 8 a.m.-4 p.m. Monday-Friday.

Appendix 6-B
Cross Connection Control

BACKFLOW TESTERS LIST 2012

This is a list of testers that have requested to be on Lake Forest Park Water District's preferred tester list. In order to be on this list, testers have had to provide proof of certification, dates of equipment calibration and proof of insurance. This list is for information only and many other testers are available. This list is in random order.

AACRA Backflow
PMB-11 SR 9 N.E.
Lake Stevens WA 98258
425 334 4507

Aquasense
16625 Redmond Way Suite M
Redmond WA 98052
425 881 8600

Pacific Landscaping Inc.
16337 34th Ave NE
Lake Forest Park WA 98155
206 522 1830

Redwood Backflow
16403 NE 135th St.
Redmond WA 98052
425 495 1939

Affordable Backflow Testers LLC
14436 183rd Ave S.E.
Renton WA 98059
206 369 6178

Advanced Irrigation Inc.
213 Frontage Road S.
Pacific WA 98047
1 888 833 6220

Northern Waters Inc.
P.O. 1293
Edmonds WA 98020
425 672 9242

Always Testing Inc.
6501 227th St SW
Mountlake Terrace WA 98043
425 672 4345

BATman Testing
PO Box 3558
Everett WA 98213-8558
206 228 1618

Daves Custom Plumbing Inc.
11320 36th Dr. S.E.
Everett WA 98208-7711
425 337 7176

Turfco Services Inc.
3833 Aurora Ave. N
Seattle WA 98103
206 634 2461

R. A. Brown Backflow Testing
14213 95th Ave NE
Bothell WA 98011
425 821 6801

Certified Backflow Testing Inc.
1410 235th Pl
Sammamish WA 98075
425 427 8889
206 601 5550
888 484 FLOW

Dennis McLaughlin's Backflow Prevention
11345 19th Ave N.E.
Seattle WA 98125
206 364 9531

1st Choice Testing
4915 243rd St. SW
Mountlake Terrace WA 98043
425 273 3106

Accurate Testing
6826 E. Gilreath St.
Tacoma WA 98404
253 310 3522

McKinstry CO.
5005 3rd Ave S
Seattle WA 98134
206 762 3311

Advance Backflow Testing
13020 SE 151st St.
Renton WA 980058
425 276 5255

Affordable Washington Backflow Testing and Repair
5227 149th St. SW #3
Edmonds WA 98026
360 333 2057
425 892 4808

Available Backflow Testers
27732 168th Ave SE
Covington WA 98042
425 652 9970

A-Bat Backflow Assembly Testing and Service
P.O. Box 2374
Everett WA 98203
425 334 6423

Archer Construction Inc.
7855 S. 206th St.
Kent WA 98032
253 872 7222

Certified Services, LLC
11031 69th ST NE
Lake Stevens Wa 98258
425 367 4043

Pop's testing Service
130 SW 112th St.
Seattle, WA 98146
206 551 5174

Backflow Solutions INC.
11217 117th St Ct E
Puyallup, WA 98374
253 307 3711

Evergreen Fire & Security
2720 South J Street
Tacoma WA 98409
253 627 3794

Soundview Landscape
6115 NE 195th Pl
Kenmore WA 98028
425 487 2180

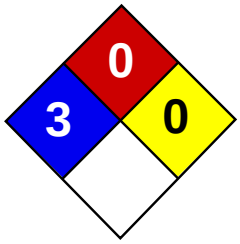
ABC Water Specialty Inc.
12 East Intercity Ave
Everett WA 98208
425 355 9826

Raymark Plumbing and Sewer
10710 Lake City Way NE
Seattle WA 98125
206 440 9077

Appendix 6-B
Cross Connection Control

APPENDIX 6 - C MATERIAL SAFETY DATA SHEETS (MSDS)

ScienceLab.com
Chemicals & Laboratory Equipment



Health	3
Fire	0
Reactivity	0
Personal Protection	

Material Safety Data Sheet
Sodium Hypochlorite, 12% MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium Hypochlorite, 12%

Catalog Codes: SLS3076

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Sodium hypochlorite; Water

CI#: Not applicable.

Synonym: Chlorine Bleach, Soda Bleach; Sodium Hypochlorite, Solution, 12% Available Chlorine.

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium hypochlorite	7681-52-9	12-14
Sodium hydroxide	1310-73-2	1
Water	7732-18-5	85-87

Toxicological Data on Ingredients: Sodium hypochlorite: ORAL (LD50): Acute: 5800 mg/kg [Mouse]. 8910 mg/kg [Rat]. Sodium hydroxide LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, . Hazardous in case of skin contact (corrosive), of eye contact (corrosive). Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

6-C Material Safety Data Sheets

Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Sodium hypochlorite]. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. [Sodium hypochlorite]. Mutagenic for mammalian somatic cells. [Sodium hydroxide]. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to lungs, mucous membranes, skin, eyes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: combustible materials, organic materials, metals

Explosion Hazards in Presence of Various Substances:
Slightly explosive in presence of heat. Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Releases chlorine when heated above 35 deg. C. The substance itself is non-combustible and does not burn. However, when heated to decomposition it emits corrosive and/or toxic fumes. May ignite combustibles. The heat of reaction with combustibles or organic materials may cause igniton. It may be a fire risk in contact with organic materials. Contact with metals may evolve flammable hydrogen gas.

Special Remarks on Explosion Hazards:

Anydrous Sodium Hypochlorite is very explosive. Primary amines and calcium hypochlorite or sodium hypochlorite react to form normal chloroamines, which are explosive. Interaction of ethyleneimine with sodium (or other) hypochlorite gives the explosive N-chloro cmpd. Removal of formic acid from industrial waste streams with sodium hypochlorite soln becomes explosive at 55 deg C. Several explosions involving methanol and sodium hypochlorite were attributed to formation of methyl hypochlorite, especially in presence of acid or other esterification catalyst. Use of sodium hypochlorite soln to destroy acidified benzyl cyanide residues caused a violent explosion, thought to have been due to formation of nitrogen trichloride. (Sodium hypochlorite)

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of acetic acid.

Large Spill:
Corrosive liquid. Oxidizing material. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of acetic acid.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Keep away from heat. Keep away from sources of ignition. Keep away from combustible material.. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as reducing agents, combustible materials, organic materials, metals, acids.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers. Do not store above 20°C (68°F). Air Sensitive Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

Personal Protection:
Face shield. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
Sodium hypochlorite TWA: 1 CEIL: 1 (ppm as Cl2) STEL: 1 (ppm as Cl2) from ACGIH (TLV) [United States] Sodium hydroxide STEL: 2 (mg/m3) from ACGIH (TLV) [United States] TWA: 2 CEIL: 2 (mg/m3) from OSHA (PEL) [United States] CEIL: 2 (mg/m3) from NIOSH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

6-C Material Safety Data Sheets

Physical state and appearance: Liquid. (Clear Liquid.)

Odor: Characteristic. Chlorine-like (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Green to Yellowish. (Light.)

pH (1% soln/water): pH of 10% solution (100 g/l): 12 [Basic.]

Boiling Point: The lowest known value is 100°C (212°F) (Water).

Melting Point: Freezing pt: -3°C (26.6°F)

Critical Temperature: Not available.

Specific Gravity: 1.19 - 1.215 (Water = 1)

Vapor Pressure: 1.6 kPa (@ 20°C)

Vapor Density: The highest known value is 0.62 (Air = 1) (Water).

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, light, air, heat

Incompatibility with various substances: Slightly reactive to reactive with reducing agents, combustible materials, organic materials, metals, acids.

Corrosivity:
Extremely corrosive in presence of aluminum. Moderately corrosive in presence of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Decomposed by carbon dioxide from air. Slowly decomposes on contact with air. Unstable in air unless mixed with sodium hydroxide. Incompatible with ammonium acetate, ammonium carbonate, ammonium nitrate, ammonium oxalate, and ammonium phosphate. Decompostion of sodium hypochlorite takes place within a few seconds with these salts. Also incompatible with primary amines, phenyl acetonitrile, ethyleneimine, methanol, acidified benzyl cyanide, formic acid, urea, nitro compounds, methylscellulose, celloluse, aziridine, ether, ammonia. Mixing this product with chemicals (e.g. ammonia, acids, detergents, etc.) or organic matter (e.g. urine, feces, etc.) will release chlorine gas. Chloramine gas may be evolved when ammonia and bleach are mixed. Decomposed by hot water. Sensitive to light. Exposure to light accelerates decompositon.

Special Remarks on Corrosivity:
Sodium Hypochlorite is extremely corrosive to brass, and moderately corrosive to bronze. There is no corrosivity information for copper.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 5800 mg/kg [Mouse]. (Sodium hypochlorite).

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Sodium hypochlorite]. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. [Sodium hypochlorite]. Contains material which may cause damage to the following organs: lungs, mucous membranes, skin, eyes.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion, . Hazardous in case of skin contact (corrosive), of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May affect genetic material (mutagenic) (Sodium hypochlorite)

Special Remarks on other Toxic Effects on Humans:
Potential Health Effects: May cause severe irritation and burns to skin and eyes. Contact with skin may also cause vesicular eruptions and eczematoid dermatitis which becomes evident upon re-exposure. Prolonged or repeated eye contact may cause conjunctivitis. Ingestion causes burns to the digestive tract. Symptoms may include: 1. pain and inflammation of the mouth, pharynx, esophagus, and stomach, 2. erosion of the mucous membranes (chiefly of the stomach), nausea, vomiting, choking, coughing, hemorrhage, 3. circulatory collapse with cold and clammy skin (due to methemoglobinemia), cyanosis, and shallow respirations, 4. confusion, delirium, coma, 5. edema of the pharynx, glottis, larynx with stridor and obstruction, 6. perforation of the esophagus, or stomach, with mediastinitis or peritonitis. Inhalation causes severe respiratory tract irritation and pulmonary edema. Prolonged or repeated inhalation may cause allergic respiratory reaction (asthma). (Sodium hypochlorite)

Section 12: Ecological Information

Ecotoxicity: It is toxic to fish and aquatic organisms.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Do not discharge effluent containing this product into laks, streams, ponds, estuaries, oceans, or public waters unless this product is specifically identified and addressed in an NPDES permit. Do not discharge effluent containing this product without previously notifying the sewage treatment plant authority. For guidance, contact your State Water Board or Regional Office of the EPA. Reduce with agents such as bisulfites or ferrous salt solutions. Some heat will be produced. Keep on alkaline side and dilute with copious amounts of water. The main end-product is salt water. Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Hypochlorite solution UNNA: 1791 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Sodium hypochlorite Florida: Sodium hypochlorite Minnesota: Sodium hypochlorite Massachusetts RTK: Sodium hypochlorite New Jersey: Sodium hypochlorite TSCA 8(b) inventory: Sodium hypochlorite; Water CERCLA: Hazardous substances.: Sodium hypochlorite: 100 lbs. (45.36 kg);

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS C: Oxidizing material. CLASS E: Corrosive liquid.

DSCL (EEC):
R8- Contact with combustible material may cause fire. R31- Contact with acids liberates toxic gas. R34- Causes burns. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S28- After contact with skin, wash immediately with plenty of water. S36/37/39- Wear suitable protective clothing, gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

6-C Material Safety Data Sheets

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:32 PM

Last Updated: 05/21/2013 12:00 PM

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APPENDIX 6 - D COLIFORM MONITORING PLAN

LAKE FOREST PARK WATER DISTRICT

COLIFORM MONITORING PLAN

A. SYSTEM INFORMATION

LAKE FOREST PARK WATER DISTRICT
PWS ID #40950K
4029 N. E. 178th ST.
LAKE FOREST PARK, WA.
KING COUNTY 98155

SOURCES:

D.O.H. Source number	Source name	(well depth)
S05	8 Artesian Wells	(22 ft. Aver.)
S06	Well #1	(216 ft.)
S06	Well #2	(190 ft.)
S06	Well #3	(161 ft.)
S06	Backup Well #4	(204 ft.)
S08	SPU Intertie	n/a
S09	Horizon View WF	n/a
S10	HV BAM 416, well #1	(465 ft)
S11	HV BAM 417, well #2	(465 ft)

STORAGE:

Name:	Nominal Capacity:	Construction	Pressure Zone:
Low Reservoir	240,000 gallon	Steel tank	Low (294 HGL)
Standby Tank	12,000 gallon	HDPE tank	Low (294 HGL)
Standpipe	200,000 gallon	Steel tank	High (452 HGL)
Horizon Eq. Tank	50,000 gallon	Steel tank	Horizon (569 HGL

TREATMENT:

No treatment at this time. Standby Chlorination was implemented in early 1999 to respond in the event of samples reporting positive in the distribution system.

PRESSURE REDUCING STATIONS:

ZONE	LOCATION	Elevation, ft (NAVD88)
High → Intermediate	3844 N.E. 185th	(EL 165 ft)
High → Intermediate	3753 N.E. 188th	(EL 200ft)
High → Low	5084 N.E. 178th	(EL 250 ft)
Intermediate→ Low	3520 N.E. 182nd	(EL 140 ft)
Low → Beach	17430 Ballinger Way N.E.	(EL 50 ft)
SPU Tolt → Horizon View	46th Ave N.E. at 195th St	(EL 506 ft)
Horizon View → High	187th St at 46th Ave	(EL 308 ft)

6-D Coliform Monitoring

PRESSURE ZONES:

1. Horizon View (569ft)

50,000 gal storage in the Horizon Equalizing Tank is supplied by the Horizon View wells #1 and #2, and the SPU Tolt PRV set at 560ft.

2. High (452ft)

200,000 gallon storage in the Standpipe is supplied by transfer pumps from the Lower Reservoir and the Horizon View PRV at 4__ft and NUD at HGL 426ft.

3. Intermediate (342ft)

Supplied from the High zone through PRVs.

4. Low (294ft)

Supplied by wells in the McKinnon Creek Watershed into the Lower Reservoir, or by PRVs from the Intermediate zone.

5. Beach (232ft)

Supplied by PRV from the Low zone

The well sources in the McKinnon Creek Watershed feed into the Lower Reservoir. The Standpipe is filled by means of a two-pump pump station supplied by the lower reservoir. The well sources in Horizon View Wellhead feed into a 50,000gal equalizing tank before entering the Standpipe via PRV.
The system is made up of five pressure zones. The Standpipe serves the High zone directly then indirectly serves the rest of the system through PRV's. There are also three closed valves between the gradients: 18443 40th Pl. N.E.; 37th and Ballinger Way N.E.; 47th Ave. N.E.

INTERTIES:

The District has two interties;

1) **Intertie with Northshore Utility District** - is located in a vault in the McKinnon Creek Watershed and consists of two 250 gpm pumps for transferring water to N.U.D. and conversely a pressure sensing valve which will open at a set drop in pressure to transfer water from N.U.D. to the High zone. The District has an interlocal agreement with NUD for this intertie.
2) **Intertie with with Seattle Public Utilites** - is located on the South shoulder of 195th Street near 47th Ave. and receives water from the Tolt pipeline. This intertie currently can provide up to 2,000 gpm to the District and is triggered when line pressure from Horizon View wellfield drops below HGL 560 ft. The District has a 50 year emergency intertie agreement with Seattle for thie intertie which allows up to 3,500 gpm for a week for fire or other emergencies.

POPULATION & CONNECTIONS BY PRESSURE ZONE

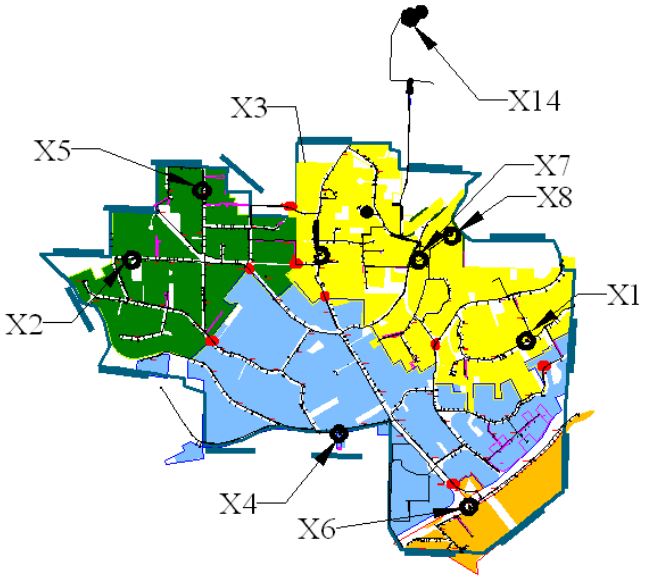
Needs updated

PRESSURE ZONE	HGL	CONNECTIONS	AVG HOUSEHOLD	POPULATION
Horizon View	569 ft	0		
High	452 ft	277	2.554	707
Intermediate	342 ft	242	2.554	618
Low	294 ft	260	2.554	664
Beach	232 ft	76	2.554	194
	Total:	855		2183

6-D Coliform Monitoring

B. SAMPLING INFORMATION

SAMPLING STATIONS:		
H	X1	18005 53rd Ave. N.E.
I	X2	3021 N.E. 185th St.
H	X3	4004 N.E. 185th St.
L	X4	4029 N.E. 178th St.
H	X5	18903 35th Ave. N.E.
B	X6	17301 Beach Dr. N.E.
L	X7	Low Tank (Low Zone)
H	X8	High Tank (High Zone)
S	X9	McKinnon Cr. DW1
S	X10	McKinnon Cr. DW2
S	X11	McKinnon Cr. DW3
S	X12	McKinnon Cr. DW4
S	X13	McKinnon Cr. SW Res.
S	X14	Horizon View Tank
S	X15	Horizon View DW1
S	X16	Horizon View DW2



LAB: Edge Analytical (360) 757-1400 main
(800) 755-9295

SAMPLING REQUIRED BY STATE REGULATION: 3 samples per month.
Note: State required samples taken on first week of each month.
ALL SAMPLES: Presence/Absence (PA) method. No routine samples taken from X7 or X8

ROTATION:
Schedule of rotation for engineering samples

Use this schedule if there are 4 weeks in month.

Order	Sample Site
Week 1	X8,X1,X2
Week 2	X8,X3,X4
Week 3	X8,X5,X6
Week 4	X7,X3,X4

Use this schedule if there are 5 weeks in month.

Order	Sample Site
Week 1	X8,X1,X2
Week 2	X8,X3,X4
Week 3	X8,X5,X6
Week 4	X7,X3,X4
Week 5	X8,X5,X6

Repeat sample sites are available upstream and downstream of all sample sites. The 6 distribution system sample sites are located in the extremes of the system.

All sources can be sampled directly as necessary.

6-D Coliform Monitoring

ROUTINE & REPEAT SAMPLE SITE ADDRESSES

HIGH PRESSURE ZONE	
X1 - Routine Sample Site	18026-53rd Ave. N.E.
Repeat Upstream	18035-53rd Ave. N.E.
Repeat Downstream	5318 N.E. 180th St.
X3 - Routine Sample Site	4004 N.E. 185th St.
Repeat Upstream	4001 N.E. 185th St.
Repeat Downstream	18476-40th Pl. N.E.
X5 - Routine Sample Site	18903-35th Ave. N.E.
Repeat Upstream	18727-35th Ave. N.E.
Repeat Downstream	3417- N.E.190th St.
INTERMEDIATE ZONE	
X2 - Routine Sample Site	3021 N.E. 185th St.
Repeat Upstream	3211 N.E. 185th St.
Repeat Downstream	3021 N.E. 185th. St.
LOW ZONE	
X4 - Routine Sample Site	4029 N. E. 178th St.
Repeat Upstream	4036 N. E. 178th St.
Repeat Downstream	4004 N. E. 178th St.
BEACH ZONE	
X6 - Routine Sample Site - 17301 Beach Dr. N.E.	
Repeat Upstream - 17228 Beach Dr. N.E.	
Repeat Downstream - 17337 Beach Dr. N.E.	

C. PLAN PREPARATION INFORMATION

Lake Forest Park Water District Coliform Sampling Procedure

Coliform sampling requires 2 employees. One employee will be the designated sample taker and the other will drive the district vehicle, unlock and open the sample stations and perform any cleaning, maintenance or flow adjustment that is required. The designated sample taker will only take samples and fill out the needed laboratory forms.

Sample stations should be ran at the same rate of flow for a minimum of 4 minutes before a sample is taken. It is common practice to adjust the flow rate on the sample station the day prior to sample taking.

The following procedures pertain to the sample taker:

Pre-sampling:

Wash your hands thoroughly with soap and water and then fill out the laboratory forms or sample bags except for the time the sample was taken. Then wash your hands thoroughly with soap and water again, apply Hibistat antimicrobial antiseptic to hands and put on nitrile gloves.

Sampling:

Replace nitrile gloves, instruct your co-worker to open the sample station and adjust the flow rate for sample taking. Your co-worker will also perform any needed maintenance on the sample station.

For State required samples use sample bottles.

To avoid contamination while taking the sample, hold the bottle near the bottom with one hand, hold the top of the cap with the other, and then unscrew the cap. **Do not** set the cap down, touch any part of the cap that touches the bottle, or let anything touch the rim of the bottle or the inside of the cap.

Hold the bottle under the stream of water, being careful not to let the bottle touch the sample tap. Fill the bottle to the neck or indicated fill line, but do not allow it to overflow, remove the bottle from the water flow and replace the cap.

Fill out the time slot on the laboratory form and place the form and the sample in the cooler. Repeat until all samples are taken and proceed to the Lab or courier drop off point.

For in house testing use the plastic Whirl-Pak bags. (See Whirl Pak instructions.) Don't forget to mark the time, date and location taken before sampling.

6-D Coliform Monitoring

Lake Forest Park Water District
Water Lab Analysis
Methods and Procedures

Method Summary

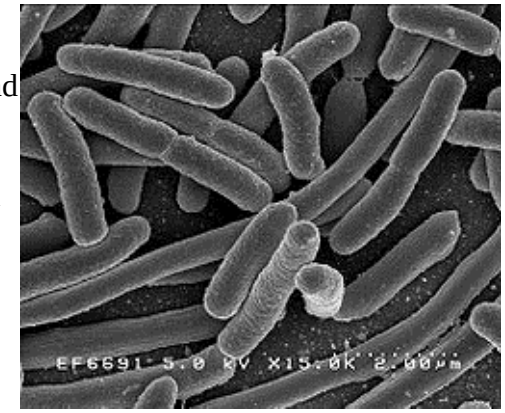
A 100ml water sample passes through a 47mm membrane filter of cellulose ester with a pore size small enough (0.45 micron) to retain the bacteria present in the sample. The filter is placed on an absorbent pad (in a petri dish) saturated with a culture medium that is selective and indicative for coliform growth. The petri dish containing the filter and pad is incubated, upside down, for 24 hours at 35 degrees C. After incubation, the colonies are identified and counted.

Background:
In order to assure water quality standards are met while maintaining the benefits of untreated water, the district employs the latest technology in microbiological analysis for in-house water testing.

Tests for detection and enumeration of indicator organisms, rather than of pathogens, are used. The coliform group of bacteria, as herein defined, is the principal indicator of suitability of water for domestic, industrial, or other uses. The cultural reactions and characteristics of this group of bacteria have been studied extensively.

Experience has established the significance of coliform group density as a criterion of the degree of pollution and thus of sanitary quality. The significance of the tests and the interpretation of results are well authenticated and have been used as a basis for standards of bacteriological quality of water supplies.

Coliforms
As related to the MF technique, the coliform group is defined as those facultative anaerobic, gram-negative, non-spore-forming, rod-shaped bacteria that develop red colonies with metallic (golden) sheen within 24 h at 35° C on an Endo-type medium containing lactose. Some members of the total coliform group may produce dark red, mucoid, or nucleated colonies without a metallic sheen. When verified these are classified as atypical coliform colonies. Generally, pink (non-mucoid), blue, white, or colorless colonies lacking sheen are considered noncoliforms by this technique. Typical genuses included in the coliform group are *Citrobacter, Enterobacter, Escherichia, Hafnia, Klebsiella,* and *Serratia*



Escherichia coli is a species of bacteria that is almost exclusively found in the gut of warm-blooded animals, birds and mammals alike. Most E.coli strains are harmless and form the normal flora of the gut, even benefiting their host, however there are some strains that can cause ill-effects in humans, such as the 0157:H7 strain.

One of the benefits of testing for E.coli is it's ability to survive for brief periods outside the gut, making it indicative of fecal contamination and the possible presence of more serious pathogens.

6-D Coliform Monitoring

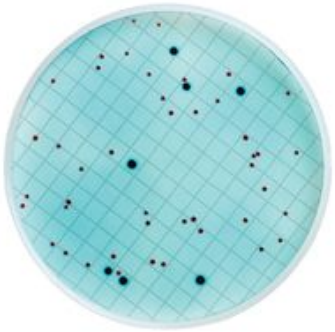
Growth Media

PourRite™ Ampules contain prepared selective media. This eliminates the measuring, mixing, and autoclaving needed when preparing dehydrated media. The ampules are designed with a large, unrestrictive opening that allows media to pour out easily. Each ampule contains enough medium for one test.

m-Endo Broth - Total coliforms appear deep red with distinct green metalic sheen. Coliforms ferment lactose in the medium and produce and acid-aldehyde complex. This complex combines with Schiff's Reagent (also in the medium) to form an iridescent green coating over the colonies.



m-ColiBlue24 Broth - Total Coliform with E. coli detection. Coliforms are red, E. coli are blue, total coliforms is sum.



Bacterial Growth Rate:

In the laboratory, under favorable conditions, a growing bacterial population doubles at regular intervals. Growth is by geometric progression: 1, 2, 4, 8, etc.

When a fresh medium is inoculated with a given number of cells, and the population growth is monitored over a period of time, plotting the data will yield a typical bacterial growth curve

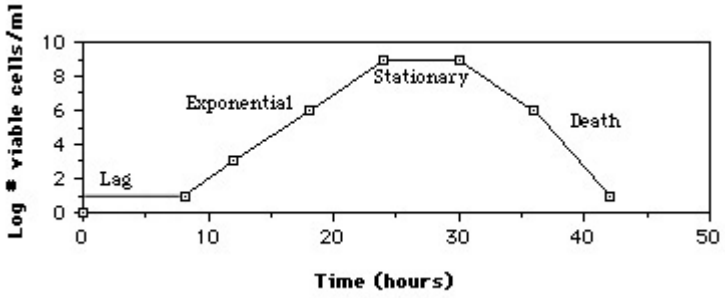


Figure 1. The typical bacterial growth curve. When bacteria are grown in a closed system (also called a batch culture), like a test tube or culture medium, the population of cells almost always exhibits these growth dynamics: cells initially adjust to the new medium (**lag phase**) until they can start dividing regularly by the process of binary fission (**exponential phase**). When their growth becomes limited, the cells stop dividing (**stationary phase**), until eventually they show loss of viability (**death phase**). Note the parameters of the x and y axes. Growth is expressed as change in the number viable cells vs time. Generation times are calculated during the exponential phase of growth. Time measurements are in hours for bacteria with short generation times.

6-D Coliform Monitoring

Generational Time of Various Bacteria

Bacterium	Medium	Generation Time (min)
Escherichia coli	Glucose-salts	17
Bacillus megaterium	Sucrose-salts	25
Streptococcus lactis	Milk	26
Staphylococcus aureus	Heart infusion broth	27-30
Lactobacillus acidophilus	Milk	66-87
Mycobacterium tuberculosis	Synthetic	792-932

Sampling Procedures:

District Sampling with the use of Whirl-Pak sampling bags.

Samples should be collected using aseptic sampling procedures. Samples are collected in sterile 4oz Whirl-Pak™ Sample containers. If sampling water that has a potential chlorine residual, a chlorine test strip is used to determine ppm and line is flushed until <.5ppm.

Samples are placed on ice and maintained at an optimum temperature of <10°C immediately upon collection with maximum of 6hr hold time before filtration.

Equipment and Instruments:



Incubator, Millipore, capable of 35 ± 0.5° C

Water test kit, Millipore
- Reusable 47mm stainless membrane filtration apparatus
- Vacuum source
- Forceps

Millipore ultraviolet sterilization unit

Wickless Alcohol Burner - Refill with denatured alcohol - 90% Ethyl Alcohol

Aspirator Bottles

Sterile, Distilled Water - rinsing of apparatus and dilution of sample
Ethyl Alcohol 90% (Denatured Alcohol) - disinfectant
Methyl Alcohol - used for flame sterilization of filtration apparatus.
Isopropanol - surface disinfectant at 70%

Sterile Petri Dishes 47mm

Sterile M-Endo Broth

Sterile Membrane Filters

white grid marked 47mm diameter with 0.45µm mean pore diameter

Sample containers - Whirl Pak 4oz/100ml self-standing writable

Specifications for Supplies:

6-D Coliform Monitoring

Standard Operating Procedures:

Standard Lab wear - nitrile gloves, lab coat and protective goggles.

1. Turn on incubator to 35° C, incubator takes approximately 30 minutes to warm to operating range. (Incubator must not be in a hot environment or near a source of heat that will raise the incubation above specified temperature.)

2. Check that dish in incubator is full of distilled water to maintain humidity.

3. Wipe Countertop with 70% Isopropanol

4. Label Petri dishes on top side with sample source and date.

5. Wash gloved hands with 70% Isopropanol, allow to air dry.

6. Place petri dishes on counter

7. One at a time, open petri dish and pour contents of broth ampule onto the absorbent pad. Close petri immediately.

8. Remove filter apparatus from uv sterilizor and place on bottom flask

9. Rinse down interior sidewalls of funnel assembly with sterile water

10. Remove funnel from base and place on sterile counter

11. Flame sterilize forceps by dipping tips in ethanol and flaming over burner. Allow to cool.

12. Using Sterilized forceps, place sterile membrane filter on porous filter base, grid side up.

13. Attach filter funnel to base of filter unit, securing the membrane filter between the funnel and base.

14. Add ~10ml of sterile dilution water to the funnel to seat the filter before adding sample.

15. Shake the sample to evenly distribute the bacteria, taking care to prevent spillage.

16. Open top of container and pour into funnel

17. Pump vacuum until sample is completely filtered.

18. Rinse interior sidewalls of the funnel with sterile rinse water careful not to touch tip of bottle to funnel and filter until empty.

19. Disengage funnel from the filter base

20. Flame sterilize the forceps and using aseptic technique, remove the membrane from the filter base

21. Place the filter, grid side up on the absorbent pad using a rolling motion to prevent air bubbles forming under the filter. If bubbles or non-wetted areas occur between the membrane and the medium, reseat the membrane.

22. Close petri immediately

For additional samples, repeat the above steps.

23. Place all petri dishes upside-down in incubator to prevent condensation from dripping onto membrane and disrupting the bacterial growth.

Cleanup
Empty bottom flask and rinse with regular water and finally with 70% isopropanol.
Rinse funnel and filter base with dilution water and place in sterilization chamber.
Spray work area with bleach solution

Allow 24 ± 2hrs incubation and remove dishes.

Observe the colonies on growth medium and document the results.

6-D Coliform Monitoring

Documentation Requirements:

Use the standard form to record the appropriate data for each sample.

No.	Date Collected	Sample Location	Results Read	Coliform	E.Coli	Other
1	/ / | :		/ / | :			

Date: YY/MM/DD HH:MM
Sample Location: X1 - X8 or Address
Coliform: Indicate 0 or + and optionally count CFU's of Coliforms only, excluding *E.coli*
E.Col: Indicate 0 or + and optionally count CFU's of E.coli only.
Other: Optionally count total CFU's which appear as uncolored colonies.

Safety

All lab personnel must be familiar with general safety protocols and additional safety precautions as required by hazardous materials used in the lab. Material Safety Data Sheets (MSDS) are provided where applicable.

APPENDIX 7 CONSTRUCTION STANDARDS

APPENDIX 7 - A DEVELOPER EXTENSION APPLICATION

7-A Developer Extension (DE)

APPLICATION AND AGREEMENT FOR CONSTRUCTION OF WATER DISTRIBUTION SYSTEM EXTENSION BY DEVELOPER

LAKE FOREST PARK WATER DISTRICT

(Short Form – For Projects under $200,000 in value. Specific terms of agreement for larger projects will be established by the District on a case by case basis and may require system improvements that are not a direct part of the developer's proposal.)

Adopted by LFPWD Resolution #281 January 8, 2001

The undersigned property owner ("Developer") hereby makes application to LAKE FOREST PARK WATER DISTRICT for permission to install and connect a water distribution system extension ("Extension") to District's water distribution system.
Upon acceptance of this application by resolution of the Board of Commissioners of District, the following terms shall constitute a binding agreement of the parties:

1. BASIC COVENANTS OF DEVELOPER

1.1 Description of Extension

The Extension shall consist of approximately _water line and appurtenances, including fire hydrants if applicable, and shall be installed by Developer in accordance with plans and specifications (collectively "Plans") which have been provided by District's engineer ("Engineer"). All materials shall be new and shall conform to that specified in the Plans and Specifications by **<ENGINEER FIRM>** dated **<PLAN DATE>** and described as:

<DESCRIPTION OF PLANS>

1.2 Location of Extension/Benefitted Property.

The Extension shall be constructed on roads, easements and right-of-way approved by District to provide water service to Developer's property ("Property") described as follows:

<ADDRESS>

<ATTACH MAP>

1.3 Reimbursement of Costs and Deposit

1.3.1 Fees and Costs

Developer shall reimburse District for all costs incurred in preparing, approving and performing its obligations under this Application and Agreement, including but not limited to the costs of (a) engineering, legal and administrative services, (b) preparing a comprehensive plan amendment if required, (c) performing an annexation or obtaining the approval of the King County Boundary Review Board, if required, (d) applying for permits, (e) preparing and circulating an environmental checklist and threshold determination if required, (f) preparing agreements, bills of sale, deeds, resolutions, applications, and (g) performing tests and inspections.

1.3.2 Deposits/Fees

As a condition to acceptance of this Application and Agreement by District, Developer shall pay to District a non-refundable *deposit* to be applied towards payment of the fees reimbursement of the costs due hereunder as follows:

1.3.3 Administration

The *deposit amount* for the cost of administration shall be $0.10 per lineal foot of the Extension with a minimum fee of $100.

1.3.4 Design Engineering

The *deposit amount* for the cost of design engineering shall be $1.50 per lineal foot of the Extension, with a minimum fee of $500.00

1.3.5 Construction Inspection Services

The *deposit amount* for the cost of construction inspection services shall be $0.50 per lineal foot of the Extension, with a minimum deposit of $500.

1.3.6 Legal Services

The *deposit amount* for the cost of legal services shall be $0.30 per lineal foot of the Extension, with a minimum fee of $250.

1.3.7 Review Fee

The *deposit amount* for the review fee shall be of $300 for District Review and shall be of an additional $300 for District Engineer Review, for a total of $600. A total review fee of $300 for District Review applies when the District Engineer designs the Extension.

1.3.8 Final Acceptance Review/Maintenance Inspections

Developer shall pay to District a *deposit* in the amount of $300 to assure payment of the costs incurred by District in processing final acceptance of the Extension, conducting inspections during the warranty period and releasing the maintenance bond following expiration of the warranty period.

1.3.9 Calculation of Deposit

The total *deposit* is calculated as follows:

	Amount
Administration	$_____
Engineering	$_____
Inspection	$_____
Legal	$_____
Review	$_____
Final Accept./Maint.	$_____
TOTAL:	**$_____**

1.4.0 No offsets/Liability for Excess

The foregoing deposit amounts constitute minimum fees charged by the District for the services rendered under this agreement. If the costs that District incurs in connection with the Extension exceeds the above deposits, Developer shall promptly pay the excess upon demand by District. In the event that the actual charges for a specific category are less than the amount of the applicable deposit, then the shortfall shall not be reimbursed to Developer nor shall it be applied to the overage of costs on any other category.

2. ACTIONS TO BE UNDERTAKEN

FOLLOWING ACCEPTANCE OF APPLICATION

2.1 Documents Provided by Developer

Developer shall furnish to District two (2) copies of the plat plan of the Property, if applicable, contour elevations, proposed road profile and other data required by Engineer.

2.2 Plans.

2.2.1 Preparation

Upon payment of the deposit as provided in Section 1.3and delivery of the documents as provided in Section 2.1, District shall direct Engineer to prepare the Plans for the Extension, provided, however, Developer may, at his option and expense, arrange for the preparation of the Plans by an engineer of his choice. In such event, Engineer and District shall review the Plans and, if they are satisfactory, approve the same. In such event, the deposit amount for design engineering shall be reduced by an equitable amount taking into account, however, the time necessary for Engineer and District to review the Plans. The party preparing the Plans shall provide not less than four (4) sets of the Plans to the District.

2.2.2 Consistency with Standards

The Plans shall be consistent with the standards of the District including those set forth in District's Water System Comprehensive Plan, a copy of which is located in the office of District.

2.2.3 Incorporation by Reference

Upon completion and delivery of the Plans, the Plans shall be automatically incorporated into this Application and Agreement by this reference as if set forth in full herein.

3. CONDITIONS TO COMMENCING CONSTRUCTION

3.1 Permits

Developer shall obtain all permits required by any governmental agency with jurisdiction over construction of the Extension. If required by an agency, District shall apply for a permit, but at Developer's expense. District shall be provided with a copy of all permits prior to commencement of construction.

3.2 Easements/Rights-of-Way

Developer shall obtain all required easements and right-of-way at its expense. Easements shall name District as the grantee be subject to review and approval by District prior to execution and recording.

3.3 Contractors; Subcontractors; Laborers and Materialmen

Developer acknowledges that District has a substantial interest in ensuring that the Extension is constructed in a good workmanlike manner. Developer shall submit to District the names of all contractors, subcontractors, materialmen and suppliers providing either labor or material in the course of construction of the Extension. District has the right to require the developer to replace or reject any unsatisfactory contractor.

3.4 Insurance

Developer shall obtain insurance covering liability and property damage to third parties in which District and its Engineer shall be named insureds in not less than the following amounts:

Bodily Injury	- Each Person	$1,000,000.00
	- Annual Aggregate	$2,000,000.00
Each Accident		$1,000,000.00
Property Damage	- Each Accident	$1,000,000.00
Umbrella Liability	- Each Occurrence	$2,000,000.00
	- Aggregate	$2,000,000.00

Developer shall provide District with written evidence of such insurance prior to the commencement of construction of the Extension.

3.5 Commencement of Work

Developer may commence construction of the Extension upon approval by Engineer or District of the Plans, the issuance of all necessary permits, easements and rights-of-way, District's receipt of the certificate of insurance and list of contractors, subcontractors, material, men and suppliers, District's approval of the construction schedule and the holding of a pre-construction conference.

4. CONSTRUCTION OF EXTENSION

4.1 Responsibility For Work/Inspections

Developer shall be entirely responsible for all work on the Extension. District may inspect the work to ensure that it conforms to the Plans. District reserves the right to disapprove any work not performed in a good and workmanlike manner or not performed in accordance with the Plans or District standards.

4.2 Connection to District Water System

Upon completion of construction of the Extension and within a reasonable time prior to actual connection, Developer shall make written request to District for permission to make the connection to District's water system. The Extension shall not be connected to the District's system prior to flushing and disinfection and without the approval of Engineer or District's designated agent who shall be present to observe the connection.

5. CONDITIONS TO ACCEPTANCE OF EXTENSION

5.1 Performance Bond; Cash Deposit

5.1.1 Bond

If District is subject to risks of non-completion of the Extension or restoration of public or private improvements or District is requested to give any form of assurance of completion of the Extension to King County or any other governmental body prior to its completion and acceptance by District (for example, if Developer desires to record a final subdivision map prior to construction of the Extension), then Developer shall furnish to District a performance bond approved by District in an amount equal to Engineer's estimated cost of the Extension. The bond shall assure and guarantee completion of the Extension and payment to all persons furnishing labor and materials in the course of construction of the Extension including payment of all fees required herein, and such bond shall hold District harmless from any claims thereof whether any such claim would attach under the Public Works Liens statutes or the Mechanics Liens statutes of the State of Washington. Compliance with the requirements of either of such statutes shall not be a condition of recovery upon the bond.

5.1.2 Cash Deposit in Lieu of Bond

In lieu of a performance bond if required above, Developer may deliver to District an assigned savings account in the same amount. The assigned savings account will be refunded to Developer upon satisfactory completion of the Extension. In the event that Developer fails to satisfactorily complete the Extension in accordance with the terms of this Application and Agreement, then, at the District's option, the assigned savings account shall be forfeited and the amount thereof applied to the costs that District incurs in performing all work that Developer was obligated to perform. In the event that the assigned savings account is insufficient to pay all such costs, Developer shall be liable for the deficiency. In the event that the assigned savings account exceeds the cost of the work, then the excess shall be returned to Developer upon completion.

5.2 General Facility Connection Charges

Developer shall pay to District as a condition to the connection of any improvements to the Extension the full amount of District's connection charges and all other related charges then in effect.

5.3 Meter Drop/Installation Fee

Meter, connection and administrative fees in effect at the time of the installation of a water meter connecting to an Extension shall be charged in accordance with District's rate schedule at the time of installation.

5.4 Easement

All original documents granting easements for the Extension shall be delivered to District in a form satisfactory to District together with good and sufficient evidence of title. If required by District, a title insurance policy in the amount of not less than $25,000.00 per 500 feet of easement, insuring clear title to the easement in District, shall be provided at Developer's sole expense.

55 Maintenance Bond

Developer shall furnish a maintenance bond in a form satisfactory to District which shall require the bonding company to correct defects in the Extension for a period of one (1) year from the date of acceptance and transfer of title. The maintenance bond shall be in an amount equal to ten percent (10%) of the costs of said Extension, but not less than $1,000. Developer may deliver to District an assigned savings account for such amount in lieu of a bond.

5.6 Acceptance

District shall accept title to the Extension at such time as the following conditions have been fulfilled to the satisfaction of District:

a. Pressure tests on all lines within the Extension;
b. Testing and acceptance of the Extension by procedures recognized by the District and State of Washington Department of Health;
c. Inspection and approval by District and Engineer of the Extension;
d. Developer's delivery to District of original bill of sale for the Extension and easements for the area upon which the Extension is located;
e. Developer's deliver to District of as-builts or red line drawings of construction.
f. Developer's payment of all fees, charges, costs and expenses incurred by it in connection with the construction of the Extension, whether to materialmen, laborers, grantors of easements of real property and governmental agencies;
g. Developer's payment to District of all of District's fees and charges due hereunder;
h. Developer's delivery to District of a bond or assigned savings account to secure its obligations during the one year warranty period; and
i. Compliance with all applicable resolutions and policies of the District.

5.6 Effect of Final Acceptance

Upon acceptance of the Extension by resolution of the Board of Commissioners of District, the Extension shall become the property of District subject to all rules and regulations as established by District from time to time.

6. GENERAL PROVISIONS

6.1 Warranty

Developer shall correct, at its own expense, defects in workmanship and materials in the Extension for a period of one (1) year from date of final acceptance.

6.2 Indemnity

Developer hereby agrees to indemnify, defend and hold harmless District, its officers, Board of Commissioners, agents and Engineer from any and all claims, demands, actions and liabilities of every kind and nature as may be made against District by contractors, subcontractors, suppliers or any other person or firm in connection with the construction of the Extension and the operation of Developer's water system; provided that Developer shall not be responsible for any such obligations which arise due to the sole negligence of District.

6.3 Failure to Complete Water Distribution System Extension

If the water distribution system extension is not completed and accepted by District within eighteen (18) months from the date of this Application and Agreement, then this agreement and Developer's rights hereunder shall terminate.

6.4 Entire Agreement

This Agreement represents the entire agreement of the parties hereto concerning the design, installation, acceptance and use of the Extension. This Agreement may not be modified except by a written addendum document executed and approved by the parties hereto.

6.5. Litigation.

The parties shall be entitled to specific performance of this agreement. In the event of litigation between the parties concerning the subject matter hereof, venue and jurisdiction shall lie with the King County Superior Court for the State of Washington. The prevailing party in such litigation, as determined by the court, shall be entitled to recover its reasonable attorney fees and costs from the other party.

6.6 Developer's Warranties and Other Obligations.

Developer hereby warrants and represents that that it has the right, power and authority to enter into and carry out this agreement and that the person executing this agreement on its behalf has been duly authorized to do so. Developer acknowledges that is has sole and complete responsibility for the ownership and operation of its water system, which constitutes all materials and equipment located on Developer's side of each of District's water meters and shall comply with all applicable rules, regulations and laws applicable to Developer's water system. Developer further agrees to comply with District's rules, regulations and policies and pay District's rates for water supply and other services.

7-A Developer Extension (DE)

Recommendation of Approval DISTRICT ENGINEER _____

Recommendation of Approval DISTRICT MANAGER _____

By:_____

<DEVELOPER FIRM NAME>
<DEVELOPER FIRM ADDRESS>
<DEVELOPER FIRM PHONE CONTACT>

Title: _____

DATED at _____, Washington this ____ day of ____, .

LAKE FOREST PARK WATER DISTRICT
(formerly King County Water District #83)

By:_____
President

By:_____
Secretary

APPENDIX 7 - B CONTRACT SPECIFICATIONS

7-B Contract Specifications

CONTRACT DOCUMENTS
182ND STREET
WATERMAIN REPLACEMENT

SAMPLE

February 26, 2010

CONTRACT

LAKE FOREST PARK
WATER DISTRICT

SPECIFICATION

GOOD WATER,
NATURALLY

(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155

7-B Contract Specifications

CONTRACT DOCUMENTS
FOR
182nd Street
WATERMAIN REPLACEMENT

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PART II. INSTRUCTIONS TO BIDDERS II-1

PART III. BID FORM III-3

PART IV. AGREEMENT AND CONTRACT FORMS IV-10

PART V. GENERAL CONDITIONS V-1

PART VI. SPECIFICATIONS VI-30

SAMPLE
CONTRACT
SPECIFICATION

PART I. INFORMATION FOR BIDDERS

SEALED PROPOSALS CLEARLY MARKED:

182nd Street
WATERMAIN REPLACEMENT
ADDRESSED TO: ALAN KERLEY
LAKE FOREST PARK WATER DISTRICT
4029 N.E. 178TH ST.
LAKE FOREST PARK, WA 98155

WILL BE RECEIVED UNTIL:

10:00AM. local time, **March 17, 2010**

AT:

LAKE FOREST PARK WATER DISTRICT
4029 N.E. 178TH ST.
LAKE FOREST PARK, WA 98155

THE WORK CONSISTS PRINCIPALLY OF:

- excavate and install 3400 ft of new 8" ductile iron water pipe with fittings
- new service connections for 49 residences
- 8 fire hydrants, 1 air release valve fitting
- surface restoration including Class B asphalt patching

In accordance with the requirements of the Instruction to Bidders, the Owner reserves the right to waive informalities and reject any or all Proposals. The Owner will award the contract to the lowest responsible bidder or it may reject all proposals. The lowest proposal will not necessarily be accepted. Work to be substantially completed within **75 calendar days from notice to proceed (excluding final pavement patch)**. Delay in substantial completion beyond this will result in liquidated damages to the Owner as outlined in the contract documents. The successful bidder will provide a Payment and Performance Bond in accordance with Washington State law. All work must comply with Washington Prevailing Wage requirements (wage table enclosed in Contract Documents).

Proposals shall be on forms included in the Contract Documents and shall be accompanied by a certified or cashier's check, or a guaranty bid bond, payable to the order of the Lake Forest Park Water District, in an amount not less than 5 percent of the amount of the proposal, as a guaranty that the bidder will execute the Contract if awarded in conformance with the proposal. The successful bidder will be required to furnish performance and payment bonds in an amount not less than 100 percent of the contract price.

The Contractor awarded the work shall start within ten (10) calendar days from the date of issuance of Notice to proceed.

7-B Contract Specifications

Inquiries may be directed to the District Superintendent **Alan Kerley**, or District Engineer **Dan Mundall, P.E.** as indicated below:

OWNER:

LAKE FOREST PARK WATER DISTRICT
4029 N.E. 178TH ST.
LAKE FOREST PARK, WA 98155
PHONE (206) 365-3211, FAX (206) 365-3357

Engineer: **Dan Mundall, P.E.**
MUNDALL ENGINEERING & CONSULTING
P.O. BOX 799
SUMAS, WA 98295
Cell (360) 319-1285 Office (800) 313-9705, FAX (250) 455-2276

SAMPLE
CONTRACT
SPECIFICATION

7-B Contract Specifications

BACKGROUND:

Lake Forest Park Water District (formerly King County Water District 83) serves well water to approximately 900 mostly residential customers in Lake Forest Park, Washington. The District infrastructure includes several wells and artesian wells, pumps, distribution reservoirs and over 12 miles of distribution piping. This project is part of a comprehensive upgrade program being carried out by Lake Forest Park Water District to improve system reliability and to replace over 12 miles ageing and leak prone water mains which were installed in the 1940's and 50's.

PROPOSED DESIGN:

- This project will replace a failing, undersized mostly 6" thin wall steel pipe with properly sized 8" Ductile Iron pipe and fittings.
- New services lines will also enhance water delivery, replacing existing aged and tuberculated galvanized steel pipe with HDPE service tube.

SPECIAL CONSIDERATIONS:

Several areas of this project will require special consideration and attention for successful completion. Some of these are indicated below:

1. Construction sequence planning required to minimize interruption of service to residents.
2. Careful attention to reduce the opportunity for breaks in the old 6" steel main while excavation is underway.
3. Sections of the pipe route totalling 600 ft have been designated for hydroexecavation to expose existing utilities or tree roots that require protection in the corridor of the project. An arborist report (attached) details specific measures expected for tree preservation.
4. Right-of-Way Permits are being applied for by the District but there may be delays associated with permit approval.

PART II. INSTRUCTIONS TO BIDDERS

1. SUBMISSION OF PROPOSALS

Sealed Proposals in a plain envelope, clearly marked:

182nd Street WATERMAIN REPLACEMENT

ADDRESSED TO: ALAN KERLEY
LAKE FOREST PARK WATER DISTRICT
4029 N.E. 178TH ST.
LAKE FOREST PARK, WA 98155

Not later than:
DATE
10:00 AM local time, **March 17, 2010**

Proposals must be signed by the bidder and shall be on the form set forth herein. If the bidder is a corporation, a duly authorised officer must sign the Proposal.

Proposals received after such date and time will not be considered. No bidder may withdraw its proposal after such time and date unless the award is delayed beyond such date for a period of sixty (60) days.

2. SITE, LOCATION AND CONDITIONS

Before submitting their Proposal, each bidder shall carefully examine the contract documents and the site. They shall inform themselves fully as to the intent, difficulties, facilities and local conditions to be encountered in performing the work including the nature of subsurface conditions. No claims for extra work will be entertained subsequent to submission of Proposals on the basis that there was any misunderstanding as to the scope, extent, difficulty, facilities or local conditions which may be encountered in performing the Work including weather. No claims for extra Work will be allowed based on differences determined in actual soil conditions on the site.
There will be a site visit with the District on Wednesday, March 10. Bidders are invited to meet in front of the District office by 10:00 am

3. DISCREPANCIES AND OMISSIONS

If a bidder finds discrepancies in, or omissions from the drawings, specifications, or other documents, or has any doubt as to the meaning or intent of any part therein, it shall at once inform the Engineer. The Engineer will make the necessary changes, which may be sent in a written instruction or explanation to all of the bidders. All requests for interpretations shall be made in writing, addressed and forwarded to the District by personal delivery, mail, or facsimile transmission.

4. REQUEST FOR AMENDMENTS

Bidders are advised that no requests for suggested amendments to the Proposal documents, i.e. extension of the scheduled closing date, the completion date and the like, can be entertained unless the request is received at least seven (7) days before the time set for the closing of Proposals.

All requests for alternative materials, equipment or methods of construction shall be submitted in writing and directed to the Engineer prior to the date of the Proposal closing, and allowing sufficient time for evaluation and approval or rejection of the alternatives by the Engineer.

5. ADDENDA

If there are any changes in the work or in the Proposal procedures, the bidders will be informed prior to the bid closing by means of an addendum, a written communication issued by the Engineer.

6. SUB-CONTRACTORS & MATERIAL SUPPLIERS

Bidders shall at the time of submitting proposal list the names of all sub-contractors and material suppliers proposed for the work, and the Engineer must approve any changes to these in writing.

7. ACCEPTANCE OR REJECTION OF PROPOSALS

The Owner reserves the right to accept or reject any or all Proposals and waive any irregularities and formalities at its discretion and to determine the lowest responsible bidder. The lowest Proposal will not necessarily be accepted.

Without limiting the generality of the foregoing, some of the conditions under which a Proposal may be rejected are:

(a) Failure of the bidder to submit a Proposal in accordance with all instructions contained herein.
(b) Failure of the bidder to include supplemental Proposals where these are required.
(c) Failure of the bidder's qualifications to meet with the owner's satisfaction.
(d) Incomplete price sheets.
(e) Obscure or irregular erasures in the price sheets.
(f) Unbalanced price sheets.
(g) Insufficient or irregular proposal guarantees.
(h) Proposal total which exceeds the Engineer's estimate of total costs, whether the said estimate is made public or not.
(i) Failure of the bidder to complete the contractor's questionnaire section of the Proposal.

If any discrepancy is found between the unit prices and the total amount, the unit prices shall be considered as representing the intention of the bidder and the Engineer shall re-calculate the total amount, which shall be used in determining the Proposal amount.

PART III. BID FORM

1 CONDITIONS OF PROPOSAL

Proposal of : _____

_____

_____

_____

(hereinafter called the "BIDDER")

to: **LAKE FOREST PARK WATER DISTRICT**

(hereinafter called the "OWNER")

The undersigned has carefully examined all contract documents and other requirements necessary to complete the work, including:

- Information for Bidders
- Instructions to Bidders
- Bid Form
- Agreement and Contract Forms
- General Conditions
- Supplemental Conditions, if any
- Detailed Specifications
- Plans and Drawings
- Addenda, if any
- Site Conditions.

SAMPLE CONTRACT SPECIFICATION

CONDITIONS OF PROPOSAL – cont.

The Contractor shall furnish and deliver all materials, to provide the necessary equipment and to perform the work in accordance with the contract documents for the prices stated in the schedule of quantities and unit prices in the Bid Form.

The undersigned bidder also agrees as follows:

Where quantities are included in the Proposal and unit prices are requested, it is understood that,

a) The estimates of quantities shown in the unit price tables, which are an integral part of this Bid Form are approximate only and for the sole purpose of comparing Proposals. The actual quantities involved in carrying out the work may be greater or less than the said estimates of quantities set forth in this Bid Form.

b) Payment of work carried out on a unit price basis will be made on the basis of actual quantities as determined by the Engineer at the unit prices set forth in this Bid Form for each respective item of unit price work, which shall be compensation in full for such work notwithstanding variations between actual and estimated quantities.

c) No claim will be made on account of any loss of anticipated profits, for delays in the completion of the work or any portion of the work or for any other matter or thing arising from or related, directly or indirectly, to any variation between the estimated quantities set forth in this Bid Form and the actual quantities as determined by the Engineer.

d) In arriving at the unit prices set forth in this Bid Form, the bidder has made his own estimates of the respective quantities involved and has not relied upon the estimates shown in the unit price tables.

e.) Any Work called for in the specifications or shown or implied on the drawings, or which is necessary for the completion of the work, which is not specifically listed as a separate item in the Bid Form, shall be considered incidental to the purposes of the contract and the cost of such work shall be included in the unit prices or lump sum to which the work is most applicable. Unit prices Proposed shall include the supply of all materials, labor, supervision and equipment, overhead, plant and profit, and shall represent the entire cost for the completed work as specified and shown on the drawings.

f.) Within seven days of issuance of notice of acceptance and prior to executing the contract documents, the successful bidder shall submit to the Engineer in a form acceptable to the Owner, certified copies of all insurance coverage called for in the contract documents.

g.) The Owner may reject any or all Proposals.

h.) That this Proposal includes addenda numbered ____*

* To be completed by the bidder

2 UNIT PRICE TABLES

Schedule "A" Piping and Related Work

182nd Street Watermain Replacement

Item		Unit qty	Unit	Unit Price $$	Extended $$
1	Ductile Iron Water Pipe 8" Class 52 or better, with P.E. sleeve encasement . North American origin only.	3421	Lin-Ft		
2	HDPE Water Pipe 2", 200psi Class, IPS	12	Lin-Ft		
3	Long Water Services TYPICAL1" HDPE, complete per standard detail connect to new meter supplied by District.	37	ea		
4	Short Water Services TYPICAL1" HDPE complete per standard detail connect to new meter supplied by District	28	ea		
5	Fire Hydrant complete assembly with drainwell and other per standard detail Salvage existing fire hydrant intact to District.	8	LS		
6	Locate and Connect to Existing buried pipe	5	ea		
7	Air Release/Vacuum/Vent Assembly per detail w/ 1" HDPE supply from mainline	1	LS		
8	11.25 deg Bend 8" (MJxMJ)	6	ea		
9	22.5 deg Bend 8" (MJxMJ)	5	ea		
10	45 deg Bend 8" (MJxMJ)	2			
11	90 deg Bend 8" (MJXMJ)	1	ea		
12	90 deg Bend 8" (MJXFL)	1			
13	Gate Valve 8" (FLxMJ) NRS type	25	ea		
14	Gate Valve 8" (MJxMJ) NRS type	2			
15	Gate Valve 8" (FLxFL) NRS type	1			
16	Gate Valve 6" (FLxMJ) NRS type	8	ea		
17	Gate Valve 2" (FIPxFIP) including Pac joint and other fittings necessary for connection to HDPE Class 200 IPS	1	ea		
18	Coupling 8" Romac style	2	ea		
19	Coupling 6" Romac style	4			
20	Coupling 2" Pac x MJ	1			
21	Adapter 6""x8" (MJxMJ)	2	ea		
22	Companion Flange 8"x2" (FLxFIP)	1	ea		
23	Tracer Wire 14ga tape to all pipe and services with approved splices at junctions and leads at valve boxes	6280	ft		
24	CDF (Controlled Density Fill) per City of Lake Forest Park specification under traveled roadway only 24" depth typ.	80	cu-yd		
25	Disinfect and pressure test per specification	2	ea		
26	Remove and dispose existing pipe where directed. May include short section of asbestos cement pipe	40	LF		
27	Temporary Asphalt Patch 2" thickness	40	ton		
28	CL B Asphalt Concrete Pavement Patch min thickness as directed. Min. 4" thickness traveled road	80	ton		
29	Imported Gravel Backfill for pipe bedding/cover as required - Note: Estimate only. Replace as directed by engineer depending on soil conditions	300	ton		
30	Crushed Surfacing Base Course for surface restoration shoulder and driveways not paved	65	ton		
31	Remove and dispose existing trees as required for safety or as directed on plans	1	LS		
32	Temporarily re-locate mailbox or sign in corridor of proposed pipeline and replace in original location.	18	ea		
33	Hydro Excavation to expose underground utilities or tree roots as directed	600	LF		
34	Sawcut asphalt	2140	LF		
	Sub-Total Items this Schedule (NOT incl. Local Sales & Use Tax)				**$**

Schedule "B" - General Items

182nd Street Watermain Replacement

Item	Description	Unit qty	Unit	Unit Price $$	Extended $$
1	Mobilize/demobilize (not greater than 6% of Schedule A)	1	LS		
2	Redline Drawings with "as-built" information	1	LS		
3	Main Repair during construction throughout project (if required)	5	ea		
4	Temporary Erosion and Sediment Control throughout project (TESC)	1	LS		
5	Trench Excavation Safety System throughout project if required	1	LS		
6	Abandon Existing Valves & Watermain	1	LS		
7	Restore Pavement Markings all areas of project	1	LS		
8	Proctor Density Backfill Compaction Test (1 per 1000 lin-ft)	3	LS		
	Sub-Total Items this Schedule (not including Local Sales & Use Tax)				**$**

file: raid2/distribution projects/182nd_Ph_V_Tenders.xls

Edit: 26-Feb-10

Project Totals

Schedule A, B Sub-total Before Local Sales & Use Tax		
Local Sales & Use Tax (9.5%)		
Total Project Cost		

SAMPLE
CONTRACT
SPECIFICATION

The bidder shall provide the following information:

3 PROJECT SCHEDULE

Activity	Date

Note: Delay in completion beyond **75 calendar days** will result in liquidated damages payable to the Owner of $50 each day for the first fourteen (14) days and $200 each day beyond this until the work is complete. (**excludes final pavement patch**).

4. STATEMENT OF MATERIAL SUPPLIERS

The list of material suppliers to be used on the work is as follows:

5. STATEMENT OF EQUIPMENT

The list of equipment to be used on the work is as follows:

_____

_____

_____

_____

_____

_____

_____

_____

6. STATEMENT OF SUB-CONTRACTORS

The list of sub-contractors to be used on the work is as follows:

_____

_____

_____

_____

The average number of workers that will be employed and maintained on the project is:_____

The name of the superintendent who will be placed on the project and his previous experience on this type of construction. _____

List of bidder's senior staff and their previous experience on similar projects.

_____

_____

_____

_____

7. FORCE ACCOUNT RATES FOR EQUIPMENT AND LABOUR

A. EQUIPMENT COMPLETE WITH OPERATOR

Description	Model and Size	Regular Rate	O/T Rate

B. PERSONNEL

Occupation	Regular Rate	O/T Rate

SAMPLE
CONTRACT
SPECIFICATION

8. BIDDER'S INFORMATION

Name of Bidder: _____

Legal Status: Corporation ___
Partnership ___
Sole Ownership ___

Mailing Address: _____

_____

_____

_____

Telephone No: _____

Facsimile No: _____

UBI Number: _____

Washington State Contractor Registration No.: _____

PART IV. AGREEMENT AND CONTRACT FORMS

AGREEMENT

State of Washington (County of King)

THIS AGREEMENT ("Agreement") by and between the Lake Forest Park Water District, a municipal corporation, hereinafter designated as the "Owner," and_____ hereinafter designated as the "Contractor," shall be effective upon the execution of this Agreement by the Owner.

In consideration of the mutual covenants, agreements, terms and conditions contained in this Agreement and in the Contract Documents (as defined in the General Conditions) which are attached hereto and made part of this Agreement for:

182nd Street
WATERMAIN REPLACEMENT

1. The Contractor agrees to complete the work, furnish all tools, materials and equipment necessary on the terms and conditions specified in the Contract Documents. The Contractor further agrees to assume and perform all of the covenants and conditions required of the Contractor pursuant to the Contract Documents, for the price of $_____ base bid) plus applicable State & Local Use tax $_____ , for total Contract Price of $_____

2. Lake Forest Park Water District agrees to pay the Contractor for fulfillment of the work and performance of the covenants set forth in the Contract Documents in accordance with the Contractor's bid and the Contract Documents.

3. Except as expressly provided in the Contract Documents, no liability shall attach to the District by reason of entering into this Agreement.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed,

LAKE FOREST PARK WATER DISTRICT	CONTRACTOR
By:_____	By:_____
Title:_____	Title:_____
Date:_____	Date:_____

FORM OF BID BOND

KNOW ALL MEN BY THESE PRESENTS,

That _____,as Principal, and _____, as Surety, are held and firmly bound unto Lake Forest Park Water District, hereinafter called Owner, in the sum of _____Dollars, (not less than 5 percent of the total amount of the bid) for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, said Principal has submitted a bid to said Owner to perform all work required for the Owner's project entitled: _____ as contained in the Contract Documents so entitled and dated

NOW THEREFORE, if said Principal is awarded a contract by said Owner and, within the time and in the manner required in "Information for Bidders" in said Contract Documents, enters into a written contract on the form of agreement bound with said Specifications and furnishes the required performance and payment bonds, then this obligation shall be null and void, otherwise it shall remain in full force and effect. In the event suit is brought upon this bond by said Owner and judgment is recovered, said Surety shall pay all costs incurred by said Owner in such suit, including a reasonable attorney's fee to be fixed by the court.

SIGNED AND SEALED, this _____ day of _____, 2010

_____(SEAL) _____(SEAL)
(Principal) (Surety)

By:_____ By:_____
(Signature) (Signature)

(SEAL AND NOTARIAL ACKNOWLEDGMENT OF POWER OF ATTORNEY)

PERFORMANCE AND PAYMENT BOND

_____ _____

(CONTRACTOR) BOND NUMBER

KNOW ALL BY THESE PRESENTS: That we,_____
as Principal, and, as Surety, a corporation legally doing business in the State of Washington, are held and firmly bound and obligated unto the State of Washington and Lake Forest Park Water District ("Owner"), pursuant to Chapter 39.08 RCW, in the fill sum of the Contract Amount of _____$ **DOLLARS** ($ _____) for the faithful performance of the Agreement referenced below, and for the payment of which sum we do bind ourselves, and each of our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, THE CONDITIONS OF THIS OBLIGATION ARE SUCH THAT the Principal entered into a certain Agreement with the Owner for the **182nd Street WATERMAIN REPLACEMENT** incorporating herein by this reference all of the Contract Documents, as now and as hereinafter amended and modified.

NOW, THEREFORE, if the Principal shall faithfully perform all provisions of such Agreement and pay all laborers, mechanics and subcontractors and materialmen, and all persons who shall supply such person or persons, or subcontractors, with provisions and supplies for the carrying on of such work, then this obligation is void, otherwise to remain in full force and effect.

Provided, however, that the conditions of this obligation shall not apply to any money loaned or advanced to the Principal or to any subcontractor or other person in the performance of any such work.

IT IS FURTHER DECLARED AND AGREED that whenever Contractor shall be, and declared by Owner to be in default under the Contract, the Owner having performed Owner's obligations thereunder, the Surety, at the request of the Owner, shall promptly remedy the default in a manner acceptable to the Owner.

SIGNED this_____ _ day of_____ , 20__

Principal:_____ Surety: By:_____

Title:_____ Title:_____

Address:_____ Address:_____

City/Zip:_____ City/Zip:_____

Telephone:( )_____ Telephone: ( )_____

Note: A power of attorney must be provided which appoints the Surety's true and lawful attorney-in-fact to make, execute, seal and deliver this performance and payment bond.

CERTIFICATE OF INSURANCE

TO: Lake Forest Park Water District

Return this certificate to:

Lake Forest Park Water District
4029 N.E. 178th Street
Lake Forest Park, WA 98155

This certifies to Lake Forest Park Water District that the following described policies have been issued to the Insured named below and are in force at this time:

Insured_____

Address_____

Description of operations/locations/products (show contract name and/or number, if any)

Policies and Insureds	Limits		Policy Number	Expiration Date	Best's Rating
	Bodily Injury	Property Damage			

GENERAL LIABILITY ENDORSEMENT

Lake Forest Park Water District
4029 N.E. 178th St.
Lake Forest Park, WA 98155

A Policy Information

Insurance Company_____ Policy Number_____

Policy Tern: From_____To Effective Date_____

Named Insured_____

Address of Named Insured_____

Limit of Liability Any One Occurrence /Aggregate $_____

Deductible of Self-Insured Retention $_____
(Nil unless otherwise specified)

B. Policy Amendments

1. This endorsement is issued in consideration of the policy premium. Notwithstanding any inconsistent statement in the policy to which this endorsement is attached or any other endorsement attached thereto, it is agreed as follows:

2. INSURED. Owner, its elected or appointed officials, employees or volunteers are included as insureds with regard to damages and defense of claims arising from (a) activities performed by or on behalf of the Named Insured, (b) products and completed operations of the Named Insured, or (c) premises owned, leased or used by the Named Insured**. The City of Lake Forest Park shall be an additional insured and a copy of the completed liability endorsement shall be deposited with the City upon completion**.

3. CONTRIBUTION NOT REQUIRED. As respects (a) work performed by the Named Insured for or on behalf of Owner, or (b) products sold by the Named Insured to Owner; or (c) premises leased by the Named Insured from Owner, the insurance afforded by this policy shall be primary insurance respects Owner, its elected or appointed officials, employees or volunteers; or stand in an unbroken chain of coverage excess of the Named insureds scheduled underlying primary coverage. In either event, any other insurance maintained by Owner, its elected or appointed officials, employees or volunteers shall be excess of this insurance and shall not contribute with it.

4. SCOPE OF COVERAGE. This policy: (1) if primary, affords coverage at least as broad as Insurance Services Office form number CG 0001 (Ed. 07/98), Comprehensive General Liability Insurance (2) if excess, affords coverage which is at least as broad as the primary insurance forms referenced in the preceding section (1).

5. SEVERABILITY OF INTEREST. The insurance afforded by this policy applies separately to each insured who is seeking coverage or against whom a claim is made or a suit is brought, except with respect to the Company's limit of liability.

6. PROVISIONS REGARDING THE INSURED'S DUTIES AFTER ACCIDENT OR LOSS. Any failure to comply with reporting of the policy shall not affect coverage provided to Owner, its elected or appointed officials, employees or volunteers.

7. CANCELLA'T'ION NOTICE. The insurance afforded by this policy shall not be suspended, voided, canceled, reduced in coverage or in .limits except after forty-five (45) days prior written notice by Certified Mail Return Receipt requested has been given to Owner. Such notice shall be addressed as shown in the heading of this endorsement.

C. Signature of Insurer or Authorized Representative of the Insurer

I,_____ (print/type), warrant that I have authority to bind the below listed insurance company and by my signature hereon do so bind this company.

Signature of_____
Authorized Representative (original signature required on endorsement furnished to the Lake Forest Park Water District.)

Organization_____

Address_ Telephone_____

AUTOMOTIVE LIABILITY ENDORSEMENT

Lake Forest Park Water District
4029 N.E. 178th St,
Lake Forest Park, WA 98155

A. Policy Information

1 Insurance Company_____

Policy Number_____

Policy Term: From_____ To _____ Effective Date_____
Named Insured _____
Address of Named Insured_____
Limit of Liability Any One Occurrence/Aggregate : $_____
Deductible of Self-Insured Retention $_____
(Nil unless otherwise specified)

B. Policy Amendments

This endorsement is issued in consideration of the policy premium, Notwithstanding any inconsistent statement in the policy to which this endorsement is attached or any other endorsement attached thereto, it is agreed as follows:

1. INSURED. Owner, its elected or appointed officials, employees or volunteers are included as insureds with regard to damages and defense of claims arising from (a) activities performed by or on behalf of the Named Insured, (b) products and completed operations of the Named Insured, or (c) premises owned, leased or used by the Named Insured.

2. CONTRIBUTION NOT REQUIRED. As respects (a) work performed by the Named Insured for or on behalf of Owner, or (b) products sold by the Named Insured to Owner; or (c) premises leased by the Named Insured from Owner, the insurance afforded by this policy shall be primary insurance respects Owner, its elected or appointed officials, employees or volunteers; or stand in an unbroken chain of coverage excess of the Named Insured's scheduled underlying primary coverage. In either event, any other insurance maintained by Owner, its elected or appointed officials, employees or volunteers shall be excess of this insurance and shall not contribute with it.

3. SCOPE OF COVERAGE. This policy requires Insurance Service Office form number CA 0001 (07-97) or equivalent covering automobile liability, symbol I (any automobile'.

4. SEVERABILITY OF INTEREST. The insurance afforded by this policy applies separately to each insured who is seeking coverage or against whom a claim is made or a suit is brought, except with respect to the Company's limit of liability.

5. PROVISIONS REGARDING THE INSURED'S DUTIES AFTER ACCIDENT OR LOSS. Any failure to comply with reporting of the policy shall not affect coverage provided to Owner, its elected or appointed officials, employees or volunteers.

6. CANCELLATION NOTICE. The insurance afforded by this policy shall not be suspended, voided, canceled, reduced in coverage or in limits except after forty-five (45) days' prior written notice by Certified Mail Return Receipt requested has been given to Owner. Such notice shall be addressed as shown in the heading of this endorsement.

C. Signature of Insurer or Authorized Representative of the Insurer

I,_____(print/type), warrant that I have authority to bind the below listed insurance company and by my signature hereon do so bind this company.

Signature of_____
Authorized Representative (original signature required on endorsement furnished to Lake Forest Park Water District.)

Organization_____

Title_____

Address_____

7-B Contract Specifications

PREVAILING WAGE RATES

SAMPLE

CONTRACT

SPECIFICATION

State of Washington

DEPARTMENT OF LABOR AND INDUSTRIES

Prevailing Wage Section - Telephone (360) 902-5335

PO Box 44540, Olympia, WA 98504-4540

Washington State Prevailing Wage Rates For Public Works Contracts

The PREVAILING WAGES listed here include both the hourly wage rate and the hourly rate of fringe benefits. On public works projects, workers' wage and benefit rates must add to not less than this total. A brief description of overtime calculation requirements is provided on the Benefit Code Key.

7-B Contract Specifications

KING COUNTY

EFFECTIVE 3/3/2010

****

DRAFT

SAMPLE OF PREVAILING WAGE RATES

Classification	PREVAILING WAGE	Over Time Code (See Benefit Code Key)	Holiday Code	Note Code
ASBESTOS ABATEMENT WORKERS				
JOURNEY LEVEL	$40.03	1H	5D	
BOILERMAKERS				
JOURNEY LEVEL	$56.53	1C	5N	
BRICK MASON				
BRICK AND BLOCK FINISHER	$39.49	1M	5A	
JOURNEY LEVEL	$46.35	1M	5A	
BUILDING SERVICE EMPLOYEES				
JANITOR	$17.98	2F	5S	
TRAVELING WAXER/SHAMPOOER	$18.39	2F	5S	
WINDOW CLEANER (NON-SCAFFOLD)	$22.65	2F	5S	
WINDOW CLEANER (SCAFFOLD)	$23.51	2F	5S	
CABINET MAKERS (IN SHOP)				
JOURNEY LEVEL	$16.67	1		
CARPENTERS				
ACOUSTICAL WORKER	$48.60	1H	5D	
BRIDGE, DOCK AND WARF CARPENTERS	$48.47	1H	5D	
CARPENTER	$48.47	1H	5D	
CREOSOTED MATERIAL	$48.57	1H	5D	
DRYWALL APPLICATOR	$48.74	1H	5D	
FLOOR FINISHER	$48.60	1H	5D	
FLOOR LAYER	$48.60	1H	5D	
FLOOR SANDER	$48.60	1H	5D	
MILLWRIGHT AND MACHINE ERECTORS	$49.47	1H	5D	
PILEDRIVERS, DRIVING, PULLING, PLACING COLLARS AND WELDING	$48.67	1H	5D	
SAWFILER	$48.60	1H	5D	
SHINGLER	$48.60	1H	5D	
STATIONARY POWER SAW OPERATOR	$48.60	1H	5D	
STATIONARY WOODWORKING TOOLS	$48.60	1H	5D	
CEMENT MASONS				
JOURNEY LEVEL		1M	5D	
DIVERS & TENDERS				
DIVER		1M	5D	8A
DIVER ON STANDBY		1M	5D	
DIVER TENDER	$52.23	1M	5D	
SURFACE RCV & ROV OPERATOR	$52.23	1M	5D	
SURFACE RCV & ROV OPERATOR TENDER	$48.85	1B	5A	
DREDGE WORKERS				
ASSISTANT ENGINEER	$49.57	1T	5D	8L
ASSISTANT MATE (DECKHAND)	$49.06	1T	5D	8L
BOATMEN	$49.57	1T	5D	8L
ENGINEER WELDER	$49.62	1T	5D	8L

PART V. GENERAL CONDITIONS

These are general conditions to a public works contract issued by the District.

DEFINITIONS AND ABBREVIATIONS

1. DEFINITIONS. The following terms used in this Contract shall be defined and interpreted as follows:

a. "Contract" means this Contract executed by the Contractor and the District, of which these General Conditions are an integral part.

b. "Contract Documents" means all component parts of the Contract as described in paragraph 3 hereafter set forth.

c. "Contractor" means the person, partnership, firm or corporation to whom this Contract is awarded by the District and who is a party thereto.

d. "Subcontractor" means any person, firm or corporation, other than an employee of the Contractor, supplying and under agreement, either with the Contractor or any other Subcontractor of the Contractor, labor or materials, or both at the site of the project in connection with this Contract.

e. "District" or "Owner" means Lake Forest Park Water District of King County, Washington.

f. "Engineer" means the consulting engineer employed by the District, acting either directly or through his properly authorized assistants, including inspectors or such assistants acting severally within the scope of the particular duties assigned to consulting engineer.

g. "Project" means the system of water mains and appurtenances or other water system improvements to be constructed in whole or in part through the performance of this Contract.

h. "Plans" means the plans shall mean all official drawings or reproductions of drawings made or to be made pertaining to the work provided for in the Contract, or to any structure connected therewith and which have been approved by the District, including the plans appended hereto.

i. "Specifications" means the part of this Contract containing prescribed directions, requirements, explanations, terms and provisions pertaining to the various features of the work to be done, or manner and method of performance and the manner and method of measurements and payments. They also include directions, requirements and explanations as set forth on the Plans. Where federal, A.P.W.A., A.W.W.A., A.S.T.M. or any other standard

specifications are referred to or included by reference, the latest issue and/or amendment thereto published at the date of applications shall be incorporated in the Contract by said reference as though set forth in full herein.

j. "Proposal" means the approved proposal form upon which the bidder is to submit, or has submitted, his proposal or bid for performing the work contemplated.

k. "Work" means the work necessary to construct and install the water system improvements including the furnishing and installing of all machinery, equipment and material and/or the furnishing of all labor, tools, material, equipment, construction equipment, working drawings where required and other necessities for the construction and installation of the water system extension shown and called for in the Plans and Specifications and this Contract, and the act of constructing and installing said water system improvements.

l. "Item" means a convenient subdivision of work under these specifications, as herein separately described.

m. "Material or Materials" shall be construed to cover machinery, manufactured articles, materials of construction (fabricated or otherwise) and any other classes of material to be furnished in connection with the Contract.

n. "Equipment" means the machinery, accessories, appurtenances and manufactured articles to be furnished and/or installed under the Contract.

o. "Contractor's Equipment" means all items of materials or equipment remaining in the Contractor's ownership and removed from the site upon completion of the project.

p. "Or Equal" means any manufactured article, material, method or work which in the opinion of the Engineer is equally desirable or suitable for the purpose intended in these Specifications and Contract, as compared with similar articles specifically mentioned herein.

q. "Contract Drawings" or "Drawings" means all details or drawings or plans prepared by the Engineer and approved by the applicable state (or federal, as the case may be) agencies as the case may be as part of or in addition to the plans described in paragraph h.

r. "Details" or "Additional Drawings" means all details or drawings prepared and issued by the Engineer prior to the construction for further explanation or amplification of the Contract Drawings, or for the revision of the same, all as herein provided.

s. "Supplemental Drawings and Instructions" means additional instructions by means of drawings or documents necessary in the opinion of the Engineer for the proper execution of the work. All such drawings and instructions shall be consistent with the Contract Documents and shall be a part of the Contract Documents.

t. "Shop Drawings" means all shop details necessary for the fabrication and installation of structural steel, pipe, machinery, equipment, including schedules and bending diagrams of reinforcing steel and other detailed drawings, to be furnished by the Contractor as required and provided in the Contract Documents.

u. Words and Phrases. Whenever the words, "as directed," "as required," "as permitted," or words of like effect are used, it shall be understood that the direction, requirement or permission of the District and Engineer is intended. The words, "sufficient," "necessary," "proper," and the like shall mean sufficient, necessary or proper, in the judgment of the District and Engineer. The words "approved," "acceptable," "satisfactory" or words of like import shall mean approved by or acceptable to the District and Engineer.

v. "Surety" means a duly qualified and licensed firm or corporation executing a surety bond or bonds payable to the District, securing the performance of the Contract either in whole or in part.

w. "Time Limits" means all time limits stated in the Contract Documents are of the essence of the Contract.

x. "Laws" means the laws of the State of Washington and the ordinances of King County which govern this construction contract.

y. "Line and Grade" means the horizontal and vertical control for all work carried from the Engineer's points.

z. "Points" means all marks, bench marks, reference points, stakes, hubs, tacks, etc., established by the Engineer for maintaining horizontal and vertical control of the work.

2. ABBREVIATIONS. Whenever the following abbreviations are used on the Plans, Specifications, Proposals and Contracts, they shall be construed to mean the words and terms listed below:

Ac.	Acre
A.C.	Asbestos Cement
Adj.	Adjust
Adj. W.M.	Adjust Water Mains
Asp. Pav.	Asphalt Pavement
Asp. Conc. Pave	Asphaltic Concrete Pavement
A.S.T.M.	American Society for Testing Material
Ave.	Avenue
B.D.	Box Drain
B1.F1.	Blind Flange
B.O.	Blow Off
Blvd.	Boulevard
C.B.	Catch Basin

C.B. (etc.) Note	C.B. (etc.) moved to position shown
Cb. Inl.	Curb Inlet
C.I.P.	Cast Iron Pipe
C.I.V.B.	Cast Iron Valve Box
C.L.	Center Line
Conc.	Concrete
Conc. Cb.	Concrete Curb
Conc. Pav.	Concrete Pavement
Conc. Ret. Wall	Concrete Retaining Wall
Conc. Sew.	Concrete Sewer
Cond.	Conduit
Conn.	Connect
Cr.	Cross
C.R.	Curb Radius
C. to C.	Center to Center
C.W.	Concrete Sidewalk
C.X.W.	Concrete Cross Walk
Dr.	Drive or Driveway
E.	East
Elev.	Elevation
Ex.	Existing
Exc.	Excavation
F.	Flange
Ft.	Foot or Feet
G.I.P.	Galvanized Iron Pipe
G.V.	Gate Valve
H.	Hub
H.H.	Handhole
Hyd.	Hydrant
Hyd. Ext.	Hydrant Extension
In.	Inch
Inl.	Inlet
Lbs.	Pounds
Loc.	Location
L.P.	Lamp Post
Mgn.	Margin
M.C.	Monument Case
M.H.	Manhole
M.J.	Mechanical Joint
N.	North
No.	Number
Pav.	Pavement
P.B.T.	Post Base Transformer
P.C.	Point of Curvature

P.J.M.	Premoulded Expansion Joint Material
Pl.	Place
Pri.	Primary
Prop.	Proposed
P.T.	Point of Tangency
Pvt. Dr.	Private Driveway
R.	Radius
R.C. Wire	Rubber Covered Wire
Reb.	Rebuild
Reconn.	Reconnect
S.	South
Sec.	Secondary
Sew.	Sewer
Sp.	Special
Std.	Standard
Stl.	Steel
Trans.	Transformers
V.C.	Vertical Curve
V. Ch.	Valve Chamber
W.	West
W.M.	Water Main
W.P.	Working Point
W.S.P.	Wood Stave Pipe
X. Walk	Cross Walk
Yd.	Yard

CONTRACT DOCUMENTS

3. COMPONENT PARTS. The Contract Documents shall consist of the following listed component parts and all approved revisions thereto:

a. Agreement
b. Change Orders
c. Detail Drawings and Written Instructions
d. Addenda
e. Plans
f. Forms and Legal and Procedural Documents
g. General Conditions
h. Special Provisions
i. Detail Specifications
j. Performance Bond; Payment Bond
k. Advertisement for Proposals or Bid
l. Proposal or Bid Form
m. Information for Bidders
n. Instructions to Bidders

4. CONFLICT OF PROVISIONS. In the event of any conflicting provisions or requirements between the component parts of this Contract, the component parts shall take precedence in the order established in paragraph 3.

5. CORRELATION AND INTENT OF DOCUMENTS. The Contract Documents are complementary, and what is called for by any one shall be binding as if called for by all. The intention of the Contract Documents is to include, unless otherwise specifically stated, all labor, materials and equipment for the proper execution of the work, which will result in a complete facility between the contract limits specified, regardless of whether or not every detail has been set forth in the Contract Documents. The omission of any detail shall not be cause for its omission by the Contractor, to jeopardize in any way, the completeness of the project. The cost of such details shall be included in the prices bid and set forth in the proposal items. When materials or work are described in words which have a well known or technical trade meaning, these descriptions shall refer to such recognized standards.

6. ADDITIONAL INSTRUCTIONS. In the event the Contract Documents are not sufficiently clear to permit the Contractor to proceed with the work, the Engineer, either upon his own initiative or upon request from the Contractor, may furnish additional instructions in writing, as

necessary. When a request is made by the Contractor, it must be made with ample time for the preparation of the additional instructions by the Engineer, before the work described is undertaken. Such additional instructions shall be consistent with the Contract Documents and shall have the same force and effect as if contained in the Contract Documents.

7. EXISTING FACILITIES. Existing facilities, specifically utilities, shown on the drawings are plotted from information available to the Engineer. This information generally comes from "As-Built" drawings for the convenience of the Contractor and unless otherwise stated the Engineer does not guarantee its completeness, precision or dimensions. This shall not relieve the Contractor from any responsibility under this Contract.

Contractor shall not undertake any excavation work without fully complying with "One Call System" requirements.

8. SOILS AND SUBSURFACE CONDITIONS. Data on soils and conditions shown in the Contract Documents are based on available information and there is no guarantee regarding completeness, accuracy or precision.

9. UNFORESEEN CONDITIONS.

a. Contractor acknowledges that it has inspected the Project site and investigated the character, quality and quantity of surface and subsurface materials and facilities which may be encountered, including the results of exploratory work performed by the Owner or Engineer, if any, as well as information presented by the Plans and Specifications. Contractor acknowledges that the accuracy of the Plans and Specifications and other information furnished by the Owner or Engineer as to location or existence of underground structures, subsurface conditions, character of the soil, composition and quantity of surface and groundwater are not guaranteed by the Owner. The Contractor assumes the risks of uncertainties due to adverse weather, ground, hydrological or similar conditions at the Project site. Unforeseen conditions shall not constitute a claim for additional payment under the terms of this contract or constitute a basis for the cancellation thereof.

b. Contractor has satisfied himself as to the nature and location of the work, the general and local conditions including those bearing upon the transportation, disposal, handling and storage of materials and the availability of water, electric power, access, labor and equipment needed for the prosecution of the work.

c. Pursuant to RCW 19.122, an act relating to underground utilities and prescribing penalties, the Contractor shall:

(i) Call the utilities underground location center for field location of the utilities; and

(ii) Not begin excavation until all known underground facilities in the vicinity of the proposed excavation have been located and marked. Location and dimensions shown on the Plans and Specifications for existing facilities are in accordance with available information without uncovering, measuring or other verification. If a utility is known or suspected of having underground facilities within the area of the proposed excavation, and that utility is not a subscriber to the utilities underground location center, then the contractor shall give individual notice to that utility.

10. ERRORS AND OMISSIONS. If the Contractor, in the course of the work, becomes aware of any errors or omissions in the Contract Documents, or in the layout as given by survey points and instructions, or if he becomes aware of any discrepancy between the Contract Documents and the physical conditions of the work, he shall immediately inform the Engineer, and the Engineer, if he deems it necessary, shall rectify the matter and advise the Contractor accordingly. Any work done after such discovery, until authorized, will be done at the Contractor's expense and risk.

11. CONTRACTOR'S COPIES OF CONTRACT DOCUMENTS. At least one set of Contract Documents shall be kept on the site in good condition, and at all times shall be available to the District and Engineer.

12. AS-BUILT DRAWINGS. Upon completion of the Work, Contractor shall furnish District a complete and accurate set of "As-Built" drawings showing locations of all facilities and appurtenances to with 0.5 feet of actual location in the event of variances greater than such tolerances, or lack of adequate marking, District will not make connections until the Contractor deposits with District an amount equal to the costs which District estimates will be incurred in locating the facilities and added costs of making the connection as a result of such departure from the "As-Built" plans.

13. DOCUMENT OWNERSHIP. All Contract Documents are the property of the District, and shall not be used for any other work.

LEGAL RELATIONS AND RESPONSIBILITY

14. INDEMNITY. To the maximum extent permitted by law, the Contractor shall defend, indemnify and hold harmless District, its Board of Commissioners, employees and agents from any and all liability, claims, demands and/or judgments whatsoever for any injuries, loss or damage to persons or property arising out of the performance of this Contract other than that resulting solely from the negligence of District. In the event of concurrent negligence of District and Contractor, Contractor shall be liable hereunder only to the extent of its negligence. Contractor's obligation under this paragraph shall not be limited by any workers' compensation, benefits or disability laws, and Contractor waives any immunity that Contractor may have under the Industrial

Insurance Act, Title 51 RCW and similar workers compensation, benefit or disability laws. The foregoing waiver was mutually negotiated by the parties.

15. COMPLIANCE WITH LAWS.

a. Federal, State and Local Laws. The Contractor shall fully comply with all federal, state and local laws, regulations and ordinances governing, controlling or limiting, in any way, the work or the persons engaged in the work. The method of compliance with certain specific statutes and regulations are set forth in the paragraphs below, however, said paragraphs are not exclusive.

b. Compliance With Environmental Laws. During construction the Contractor shall comply with all applicable requirements of federal, state and local environmental laws and regulations, including, but not limited to, the Federal Clean Air Act, Federal Clean Water Act, state and local noise ordinances, construction site erosion control regulations, and if applicable, shoreline construction requirements.

c. Compliance With Prevailing Wage Laws. Pursuant to RCW chapter 39.12, among its other requirements, the Contractor shall pay prevailing wages and shall not allow any subcontractor or materialman to be engaged as an offsite manufacturer of nonstandard items to be used in performance of this Contract unless such subcontractors and materialman pay prevailing wages to the extent required by such chapter.

d. Notice to Engineer. If the Contractor observes that the Contract Documents, or any part thereof, are inconsistent or at variance with any law, regulation or ordinance, he shall promptly notify the Engineer in writing, and any necessary changes shall be made by instruction or change order. If the Contractor performs any work contrary to such laws, regulations or ordinances, or prior to obtaining permits, permission under franchises, licenses or bonds as required to be furnished by or obtained by the District, he does so at his own risk and his own expense.

16. FRANCHISES, PERMITS AND LICENSES. Permits and licenses of a temporary nature necessary for, and effective during, the prosecution of the work and subsequent guaranty period shall be secured and paid for by the Contractor.

17. ROYALTIES AND PATENTS. The Contractor shall pay all royalties and license fees, and shall hold the District harmless from liability of any nature or kind, including all costs and legal expenses, for, or on account of, any patented invention, process article or appliance, manufactured for or used in the performance of the Contract, including its use by the District, unless specifically stipulated in the Contract.

18. PUBLIC SAFETY AND CONVENIENCE. The Contractor shall conduct his work with proper consideration for public safety and convenience. This requirement shall include, but is

not limited to the maintenance of traffic, access to fire hydrants, use of sidewalks and public and private driveways, and the proper functioning of existing private and public facilities such as gutters, drains, ditches, natural water courses and the like.

Where construction consists of replacement of or modification to existing facilities such as existing sewer or water lines, pumping facilities or treatment works, the Contractor shall provide for the normal maintenance and operation of such facilities21 during construction.

The Contractor shall obtain prior approval from the Engineer, the affected owners and the proper governmental authority to obstruct traffic, or to disturb any existing private or public facility.

19. PROTECTION OF PUBLIC AND PRIVATE PROPERTY. The Contractor shall adequately protect public and private property adjoining or affected by the work, including lawns, trees, shrubs, sidewalks, curbs, pavements, utilities, vehicles and structures. Repair of such property resulting from damage by the Contractor's operations shall be the responsibility and expense of the Contractor.

Whenever it is necessary in the course of the Work, to remove or disturb such property or improvements, without limiting the generality thereof, and whether on private or public property, the disturbed property or improvement shall be replaced to a condition equal to that existing prior to the disturbance.

20. PROTECTION OF WORK. The Contractor shall be responsible for the care and protection of the Work, including all materials delivered, all work performed and all loss or damage thereto, until completion and final acceptance by the District.

21. SAFETY AND HEALTH STANDARDS AND ACCIDENT PREVENTION. The Contractor shall comply with the safety standards of applicable building and construction laws and codes, including the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, and United States Department of Labor (Occupational Safety and Health Administration) Safety and Health Regulations for Construction, as published in the Federal Register of December 16, 1972. The Contractor shall be solely and completely responsible for working conditions on or near the jobsite, including safety of all persons and property during performance of work. These requirements shall apply continuously and shall not be limited to normal working hours.

The Contractor shall maintain at a well known place at the jobsite all articles necessary for giving first aid to the injured and, before employees shall be permitted to work at the jobsite, the Contractor shall make standing arrangements for the immediate removal to a hospital or to a doctor's care of persons, including employees, who may be injured on the jobsite.

The duty of the Engineer to review the Contractor's construction performance does not include review of the adequacy of the Contractor's safety measures.

22. CONTRACTOR'S INSURANCE. Prior to commencing work, Contractor agrees to obtain and continuously carry during the period this Agreement remains in force including warranty period, such public liability and property damage insurance as the District considers necessary for the proper protection of the parties hereto, on forms approved by the District. **District, Engineer, and the City of Lake Forest Park shall be named as additional insured on such policy**. Minimum amounts and units of insurance coverage required shall be as follows:

a. Comprehensive General Liability. Comprehensive General Liability insurance shall be an occurrence policy with Broad Form Property Damage, Broad Form Contractual, Personal Injury, including other coverages on broadening endorsement, XCU Coverage; products and Completed Operations, and Owners and Contractors Protective, and shall have the following minimum limits:

Bodily Injury Liability	$1,000,000 each person
	$1,000,000 each occurrence
Property Damage Liability	$1,000,000 each occurrence

b. Automobile Liability. Automobile Liability insurance shall cover owned automobiles under long-term lease, hired automobile and nonowned automobiles, and shall have the following minimum limits:

Bodily Injury Liability	$1,000,000 each person
	$1,000,000 each occurrence
Property Damage Liability	$1,000,000 each occurrence

c. Workers' Compensation and Employer's Liability. Statutory for State of Washington, and in compliance with Longshore and Harbor Workers Act if work performed under jurisdiction of said Act as determined by the District.

d. Protection and Indemnity Liability. Protection and Indemnity Liability, including Crew Liability for watercraft if applicable as determined by the district. Minimum limits shall be $1,000,000 each occurrence if work performed under jurisdiction of Jones Act.

e. Excess Liability Policy. The policy will follow above coverage and not be limited to items a, b, c and d. Minimum limit of liability shall be $2,000,000.

Contractor shall pay all premiums and costs in connection with all insurance which contractor shall be required to furnish or provide hereunder.

Contractor shall require all insurance companies issuing any policies of insurance to Contractor and which Contractor is required to procure hereunder, to provide a copy or facsimile of insurance policies required hereunder and to certify to the District in writing that such policies have

been issued and are in force and will not be canceled or annulled or materially reduced except upon thirty (30) days' notice in writing to District. Contractor shall not cancel any policies of insurance required hereunder either before or after completion of the work without the consent in writing of the District.

In the event any work to be performed under this Agreement is performed by subcontractor(s), Contractor shall require that they shall comply with the insurance requirements heretofore stated.

CONTROL OF WORK

23. AUTHORITY OF THE ENGINEER. The Engineer shall represent the District in an advisory and consulting capacity in engineering matters relating to the Contract. Nothing contained herein or elsewhere in the Contract Documents shall be construed as requiring the Engineer to direct the method or manner of performing any work by the Contractor under this contract. In such capacity, the Engineer:

a. Shall determine the amount, quality, acceptability and fitness of the work, materials and equipment which are to be paid for under the Contract.

b. Shall decide all questions relative to the true construction, meaning and intent of the Contract documents.

c. Shall decide all questions relative to the classification and measurement of quantities and materials, and the fulfillment of this Contract.

d. Shall have the power to reject or disapprove of Work or material which does not conform to the Contract Documents.

e. Shall have authority to stop the Work, whenever, in his opinion such stoppage may be necessary to ensure the proper execution of the Contract.

f. May direct the sequence of Work where such direction is for the purpose of avoiding conflict with other work being performed by the District or by others in the same general locality.

The decision of the Engineer in the matters described above shall be final. However, nothing herein contained shall be taken to relieve the Contractor of any of his obligations or liabilities under the Contract, nor does Engineer have authority to waive any term, condition or provision of the contract or the obligation of the Contractor to fully perform the Contract.

24. SUGGESTIONS TO THE CONTRACTOR. At various times the District or Engineer may offer suggestions to the Contractor which may or may not be followed at the Contractor's discretion. Any suggestions by the District or the Engineer, if followed by the

Contractor, in whole or in part, shall be used at the sole risk and responsibility of the Contractor. The District and the Engineer shall neither assume nor have any responsibility for the consequences of Contractor following such suggestions, and the Contractor shall not be relieved of any obligations under the Contract.

25. NOTICES TO THE CONTRACTOR. Any notice or other communication, given by the District to the Contractor under this Contract, shall be considered properly served upon the Contractor, if deposited in the U.S. Mail postage prepaid in any post office, to the Contractor at his address given in the Contract Documents.

26. COORDINATION. The Contractor shall coordinate the Work with that of the District or any other party employed by the District in proper sequence, to avoid conflicts, to the satisfaction of the Engineer.

27. ASSIGNMENT OF CONTRACT The Contractor shall not assign this Contract, or any part thereof, or any moneys due thereunder, without the prior written consent of the District and the Surety. Consent of the surety will not be required if the Surety has waived its right to notice of assignment. No assignment of this Contract shall be valid unless it contains a provision that the funds to be paid to the party receiving the assignment of contract are subject to a prior lien for services rendered, or material supplied for performance of the Work under the Contract, in favor of all persons, firms or corporation, rendering such services, or supplying such materials.

28. SUBCONTRACTS. The Contractor shall not sublet this Contract or any part thereof, without the prior written consent of the District, which shall be obtained at least five days prior to the start of a proposed subcontractor's work.

No subcontractor will be recognized by the District, and all persons engaged in the work will be considered by the District as employees or agents of the Contractor, and their work shall be fully subject to the provisions of the Contract. The Contractor shall be fully responsible to the District for all work, and all acts and omissions, of the Subcontractor and persons either directly or indirectly employed by Subcontractor.

The District's consent to subcontracting any part of the work shall not relieve the Contractor of any of his obligations under this Contract, or from any responsibility for performance of the work.

29. CONFORMITY TO PLANS AND SPECIFICATIONS. All Work shall be done in strict conformity to the Plans and Specifications, to the exact lines and grades fixed by the Engineer, and to such instructions with reference thereto as the Engineer may give from time to time.

The District shall have the right to make reasonable changes in dimensions and location of pipe and/or other materials and equipment, if said action will expedite the work or result in a better

constructed and more easily operable facility without incurring any liability to Contractor or Contractor's subcontractor.

30. SUPERVISION OF WORK BY CONTRACTOR. The Contractor shall give full and proper supervision to the work, using his best skill and attention. The Contractor shall keep on the work during its progress, a competent superintendent and necessary assistants, all of whom shall be satisfactory to the Engineer. The Superintendent shall represent the Contractor in his absence and all directions given to him shall be binding as if given to the Contractor.

31. WORKMANSHIP AND MATERIALS. The Contractor shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation and all other facilities necessary for the execution and completion of the work.

The Contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the work any unfit person nor any one not skilled in the work assigned to him.

All workmanship, equipment, materials and articles incorporated in the work shall be new, shall be the best available grade, and shall be of a quality equal to, or better than, that specified.

Whenever in the Contract Documents, any materials, articles, type of construction or process are specified by patent or proprietary name, by name of the manufacturer, or by catalogue number, such specification shall be considered used for the purpose of establishing a standard of quality for describing the material or process desired, and shall be deemed to be followed by the words "or equal" whether or not such words appear.

The Contract shall file three (3) copies of a materials and equipment list with the Engineer prior to proceeding with construction. This list shall include the quantity, manufacturer and model number (if applicable) of materials and equipment to be installed under the Contract. This list will be checked with reasonable promptness by the Engineer regarding conformity with the plans and specifications. The Engineer shall be sole judge in the question of "or equal" of any materials and equipment proposed by the Contractor. The Contractor shall pay to the District the cost of tests and evaluations by the Engineer to determine acceptability of any alternate proposed by the Contractor, in accordance with the established rates of Engineer for time and expense work, the total cost of which may be charged by the district as additional fees.

The Contractor shall make any required corrections and file two (2) corrected copies with the Engineer within one week of notification of deficient or unacceptable items. The Engineer's review and acceptance of the lists shall not relieve the Contractor of his obligations under paragraph 10.

32. WARRANTY OF TITLE FOR MATERIALS. No material, supplies or equipment for the work shall be purchased where an interest in any part thereof is retained by the seller or

supplier. The Contractor warrants full title to all material, supplies and equipment installed or incorporated in the work, and upon completion agrees to deliver the work to the Owner free from any claims, liens or charges. He further agrees that neither he, nor any person, firm or corporation furnishing any materials or labor for any work covered by this Contract, shall have any right to a lien upon the premises or any improvement or any appurtenances thereon. It is provided that this shall not preclude the Contractor from installing metering and other similar equipment belonging to utility companies or to municipalities. In the event of installation of such metering devices or equipment, the Contractor shall advise the owner of the ownership thereof. Nothing contained in this paragraph shall impair the rights of persons furnishing materials or labor under any bond given by the Contractor for their protection, or impair any rights under any law permitting such persons to look to funds due the Contractor in the hands of the Owner. The provisions of this paragraph shall be inserted in all subcontracts and materials contracts, and notice of its provisions shall be given to all persons furnishing materials for the work when no formal contract is entered into for such materials.

33. MATERIALS AND EQUIPMENT FURNISHED BY DISTRICT. Contractor shall receive, inspect, store and accept all District furnished items of material and equipment, subject only to latent defects. Claim shall be made in writing within five (5) days after discovery of any latent defect. Damages or loss shall be limited to the cost of and labor for replacement of any such damaged item. In any event, the liability of District for furnishing an item having a latent defect is limited to damage or loss resulting from use thereof, only to the extent that such loss or damage is recoverable by the District against the supplier. District shall include in its claim to the supplier the amount of damage claimed to the Contractor or Contractor's contractor or District may assign to Contractor any claim which District would otherwise have against any such suppliers, and the sole remedy of Contractor shall be by suit or action on such assigned claim. District agrees to cooperate with Contractor in furnishing facts or data to assist Contractor in prosecuting any action on an assigned claim.

34. STORAGE OF MATERIALS AND EQUIPMENT. Materials and equipment shall be safely stored by the Contractor to ensure the preservation of their quality and fitness for the work. Stored equipment and materials shall be placed so as to facilitate inspection. The Contractor shall be responsible for all loss and/or damage that may occur to all materials and equipment until the same are incorporated in the work and until the completion and final acceptance of the work by the District.

35. SHOP DRAWINGS. The Contractor shall submit with such promptness as to cause no delay in his own work or in that of any other Contractor, three (3) copies of all shop or setting drawings, and schedules required for the work of the various trades in the performance of the work, or where requested by the Engineer.

The Engineer shall pass on the shop drawings with reasonable promptness. If corrections are required, the Contractor shall make the corrections and within one week shall file with the Engineer three (3) corrected copies and furnish such other copies as may be needed. The Engineer will return at least one (1) set of approved drawings to the Contractor. No material shall be fabricated until the shop drawings have been approved by the Engineer.

The Engineer's approval of any shop drawing is understood to be an acceptance of the character and sufficiency of the details and not a check on any dimension, and will not relieve the Contractor from responsibility for errors of any sort in shop drawings or schedules, whether or not such errors are found by the Engineer in his checking or such details.

No charges shall be made in any shop drawing after it has been approved except by the consent or the direction of the Engineer in writing.

The Contractor shall be responsible for all changes in adjacent or related work necessitated by changes in shop details, whether or not these changes are shown in shop drawings.

36. LAND FOR WORK. The Owner will furnish all lands and rights-of-way necessary for carrying out the work, and will use diligence in acquiring said lands and rights-of-way as speedily as possible.

In the event that all lands and rights-of-ways are not obtained before construction begins, the Contractor shall begin his work upon such land rights-of-way as the Owner may have previously acquired. No claim for damages whatever will be allowed by reason of delay in obtaining the remaining lands and rights-of-way.

Should the Owner be prevented or enjoined from proceeding with the work, or from authorizing its prosecution, either before or after the giving of notice to proceed, by reason of any litigation, or by reason of his inability to procure any lands or rights-of-way for said work, the Contractor shall not be entitled to make or assert claim for damage by reason of said delay or to withdraw from the Contract except by consent of the Owner.

Time for completion of the work will be extended to such time as the Owner determines will compensate for the time lost by such delay, such determination to be set forth in writing; provided that in any event, the Contractor may terminate in accordance with paragraph 54.

37. ENGINEER TO GIVE LOCATION. Contractor shall not proceed with the work until timely demand in writing has been made upon Engineer for points, instructions and

construction staking, and until Contractor has received said points instructions, and construction staking.

The Engineer will provide construction staking for location of the various parts of the work and give such lines and grades as necessary in his opinion, for the proper construction of the work. Working operations may be suspended by the Engineer for such brief and reasonable time, as may be required, for the giving of lines and grades and taking of measurements for the location of work. No claim shall be made by the Contractor for extra compensation due to such delays of work. The decision of the Engineer shall be final as to the reasonableness and necessity of the aforesaid operations.

The Contractor shall transfer said lines, grades and measurements, from the points given, to his own work at his own expense.

38. STAKES AND MARKS TO BE PRESERVED. All stakes, bench marks and reference points established by the Engineer shall be carefully preserved by the Contractor. In the case of their destruction by the Contractor or Contractor's subcontractor or any of his employees such stakes and marks will be replaced by the Engineer at the Contractor's expense.

All stakes, bench marks, reference points and official monuments, owned by others, shall be carefully preserved or replaced. In the event any such markers are disturbed as a result of the Contractor's operations, the cost of replacement shall be borne by the Contractor. Replacement markers shall be of a type and quality equal to that originally existing and satisfactory to the Engineer. Replaced markers shall be located so as to clear existing utilities or any other interferences and placed in a manner consistent with recognized engineering and surveying practice.

39. ENGINEER TO HAVE ACCESS. The Engineer at all times shall have access to the work and to the locations where the work is in preparation. The Contractor at all times shall maintain proper facilities for such access.

Where applicable, the Contractor shall also provide proper facilities for access to all sites of contract work for representatives of federal, state and local regulatory agencies, such as the U.S. Environmental Protection Agency, the State Water Pollution Control Agency and Health Departments.

40. INSPECTION AND TESTS.

a. General. Inspection and test of work and materials shall be strictly for the benefit of the District and nothing contained herein shall be construed to relieve the Contractor of his obligations under the Contract.

b. Scheduled Inspections and Tests. The following scheduled inspections and tests shall be conducted by the Engineer:

(i) Start of construction inspection.

(ii) Test inspections.

(iii) Final inspection.

(iv) End of Warranty Period inspection.

Other scheduled inspections and tests may be required to comply with other sections of these contract documents, Engineer's instructions, laws or ordinances. Some inspections and tests may be conducted by an authority other than the Engineer.

c. Requests For Inspections and Tests. The Contractor shall give the Engineer 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 Engineer, the Contractor shall make all arrangements through the Engineer.

d. Intermediate Inspections and Tests. Intermediate inspections and tests during construction will be conducted as deemed necessary by the Engineer and other governing authorities.

e. Examination of Materials. The Contractor shall furnish such samples, testing and labor as may be required for the Engineer to make a thorough inspection and examination of materials to be used in the work. The neglect or failure on the part of the Engineer to condemn or reject inferior material or work shall not be construed to be acceptance of the materials or the work.

f. Certification of Materials. At the request of the Engineer, the Contractor's material suppliers may be required to furnish a certification from a recognized testing laboratory, to certify that the material supplied, and for which the certification was requested, is in full compliance with the Contract Documents.

g. Reflection of Materials and Workmanship. The Engineer shall have the right to reject materials and workmanship which are defective or to require their correction. Rejected workmanship shall be corrected and rejected materials shall be removed from the premises.

h. Questionable Work. Should it be necessary for the Engineer, 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 Contractor shall on request, promptly furnish all necessary facilities, labor and materials to do so.

i. Responsibility For Costs. The following inspection and testing costs shall be incurred by the Contractor:

(i) Costs of material samples and testing.

(ii) Costs of labor, equipment and materials to perform required tests of the work.

(iii) Costs of uncovering and correcting work for inspections or testings that were covered without approval or consent of the Engineer.

(iv) Costs of uncovering questionable work and corrections thereof prior to final acceptance when such work is found to be defective in any respect.

(v) All costs incurred by the District for all further inspections and tests of materials and work rejected at scheduled inspections.

(vi) Costs for overtime inspection in accordance with definition of overtime inspection given in paragraph 48.

41. CORRECTION OF DEFECTIVE WORK. The Contractor shall promptly remove from the construction site all work or materials condemned by the Engineer as failing to conform to the Contract, whether or not incorporated in the Work. The Contractor shall promptly replace and reexecute such defective work in accordance with the intent of the Contract and without expense to the District and shall bear the expense of making good all work of others destroyed or damaged by such removal or replacement. Failure or omission on the part of the Engineer or its representatives to condemn unsuitable, inferior or defective work and/or labor or material or equipment furnished under the Contract shall not release the Contractor or his bond from performing the work in accordance with the Contract Documents.

In the event the Contractor does not accomplish corrections and/or repairs after reasonable notice at or within the time specified, the work will be otherwise accomplished by District and the Cost thereof shall be borne by the Contractor.

If, as a result of the failure of Contractor to make corrections, and/or repairs, or in the event of an emergency and time does not permit the District to give notice to the Contractor before m aking corrections and/or repairs such as where damage may result from delay in making of corrections and/or repairs or where loss of service to customers will result, temporary needed corrections and/or repairs may be made by the District and the cost thereof shall be borne by the Contractor.

When corrections and/or repairs of defects are made, the Contractor shall warrant such corrections and/or repairs for one year after acceptance of the corrections and/or repairs by the District.

The Contractor shall be responsible for any loss, damage, costs and expenses incurred by the District, resulting from defects in the work, including actual damages, costs of materials and labor expended by District in making emergency corrections and/or repairs, costs of engineering, inspection, legal services and District's administrative overhead costs.

42. UTILIZATION OF DEFECTIVE WORK. In the event that the Owner decides that the defective work can be utilized, he may elect to make an equitable deduction rather than require correction. If corrections are ordered, such corrections of defective work shall be made to the Owner's satisfaction before final payment is made, but the final payment shall not be construed as a waiver of the Owner's right to demand correction of faulty workmanship or material which becomes apparent during the guarantee period stipulated in the Contract Documents.

43. GUARANTY. For a period of one (1) year from the date of final acceptance of the work, all parts of the work shall be guaranteed by the Contractor to remain in proper working order and condition except where abused or neglected by the Owner, the Contractor shall work to repair or replace, at his own expense, any work or material that may prove to be defective during the period of this guarantee. Said repairs and replacement work shall be completed within a reasonable time.

In the event the Contractor does not accomplish corrections at the time specified, the work will be otherwise accomplished and the cost shall be borne by the Contractor.

In emergencies, where damage may result from delay, or where loss of service may result, such corrections may be made by the Owner, in which case the cost shall be borne by the Contractor.

When corrections of defects are made, the Contractor shall warrant such corrections for one year after acceptance of the corrections by the Owner.

The Contractor shall be responsible for any expenses incurred by the Owner, resulting from defects in the work, including actual damages, costs of materials and labor extended by Owner in making emergency repairs, costs of engineering, inspection, legal services and Owner's overhead.

PROSECUTION AND PROGRESS OF WORK

44. NOTICE TO PROCEED. Unless another date is specified by District or Engineer within twenty (20) days after the execution of the Contract, written notice to proceed will be given by the Owner to the Contractor. The Contractor shall begin construction within 10 days after the date of delivery of the notice to proceed. Notwithstanding any other provision of the Contract, the Owner shall not be obligated to accept or to pay for any work furnished by the Contractor prior to delivery of notice to proceed whether or not the owner has knowledge of the furnishing of such work.

45. CONTRACT TIME. Time shall be strictly of the essence of the Contract. The Contractor shall promptly begin the work under the Contract and all portions of the project made the subject of the Contract shall be started and so prosecuted that they shall be completed and ready for full use in the time stated in the Special Provisions or other Contract documents. It is the

responsibility of the Contractor to complete the work within the Contract time. The Owner makes no promise or representation that this can or will be done.

46. CONSTRUCTION SCHEDULE. Before beginning the work, the Contractor shall submit a proposed construction schedule indicating the various subdivisions of the work, the dates of commencing and finishing each. The schedule shall show the time allowed for testing and other required procedures prior to the works being put into operation. No later than the 5th day of each calendar month, the Contractor shall submit a copy of the construction schedule with notes thereon indicating the percentage completion of each subdivision of the work on the last day of the previous month.

47. HOURS OF LABOR. Pursuant to the Revised Code of Washington 49.28.010 and 49.28.030, eight hours of labor shall constitute a legal day's work, and the Contractor shall not require more than eight hours of labor in a day from any person employed by him in the performance of the work under the Contract. Failure of the Contractor to perform the work in accordance with this policy of the State of Washington shall be deemed to be a failure on his part to comply with the provisions of the Contract within the meaning of paragraph 53, "Termination of Work By Owner."

48. OVERTIME WORK AND OVERTIME INSPECTION. Overtime and shift work may be established by the Contractor upon the giving of written notice to the Engineer. No work other than overtime and shift work so established shall be done during hours other than normal working hours or Saturdays, Sundays or legal holidays, except work that is necessary for the proper care and protection of the work already performed or except in case of an emergency.

Overtime inspection shall include inspection performed during other than normal working hours on any weekday, and all inspection performed on Saturdays, Sundays and legal holidays. All costs of overtime inspection shall be paid each month by the Contractor to the engineer for engineering, inspection, general supervision, and other overhead expenses which are directly chargeable to the overtime work. In the event the Contractor fails to pay such costs by the 20th day of the month following the furnishing of such service, such payment shall be deducted from payments due the Contractor.

49. UNFAVORABLE WEATHER AND OTHER CONDITIONS. During unfavorable weather and other conditions the Contractor shall prosecute only those portions of the work that will not be damaged thereby. No work whose quality or efficiency will be unfavorable affected shall be constructed while these conditions remain unless the Contractor can overcome said conditions by special means or precautions acceptable to the Engineer.

50. DELAYS IN COMPLETION OF WORK AND EXTENSIONS OF TIME. If the Contractor is delayed at any time in the progress of the work by any of the following causes, the Contract time shall be extended for such reasonable time as the engineer shall determine. The Contractor agrees to complete the work within the Contract time as thus extended. Such extensions shall postpone the beginning of period for payment of liquidated damages, if provided for, but they and the events producing them shall not be ground for claim by the Contractor of damages or for additional costs, expenses, overhead or profit or other compensation.

a. Floods, fire, strikes, lockouts, war, acts of the public enemy, acts of God.

b. Change Orders.

c. Acts of performance or delays in performance by other Contractors employed by Owner or their subcontractors.

d. Causes beyond the control of the Contractor, the delays from which could not have been avoided through the exercise of reasonable care, prudence, foresight and diligence on his part and that of his subcontractors.

All claims for extension of time shall be made in writing to the engineer no more than fifteen (15) days after the Contractor knows or by reasonable diligence should know of the event causing or likely to cause the delay; otherwise they shall be waived. In the case of a continuing cause of delay only one claim is necessary. In the case of change order work he must make the claim for extension within fifteen (15) days after receiving from the engineer the notice to proceed with the change order work.

51. SUSPENSION OF WORK. The Owner may at any time suspend the work, or any part thereof, by giving five (5) days' written notice to the Contractor. The work shall be resumed by the Contractor within ten (10) days of the Owner's written notice to the Contractor to resume work.

Suspension of the work shall not furnish any grounds for claims by the Contractor for damages or for additional costs, expenses, overhead, profit or other compensation, but the period of such suspensions shall be taken into consideration in determining the revised date for completion. The Contractor shall not suspend work under the Contract without the written order of the Owner. Contractor shall take every precaution to prevent any damage or unreasonable deterioration of the work during the time it is suspended.

Upon failure of the Contractor to perform work under the Contract in accordance with its provisions, the Owner may suspend the work for such period as he may deem necessary. Time lost by reason of such failure or in replacing improper work or material shall not furnish any ground to the Contractor for claiming an extension of time or extra compensation, and shall not release the Contractor from damages or liability from failure to complete the work.

52. TERMINATION OF CONTRACT BY OWNER. The Owner may terminate the Contract and take possession of the premises and of all materials thereon and finish the work by whatever methods he may deem expedient, upon the occurrence of any one or more events hereafter specified, and receipt of the certificate by the Engineer that sufficient cause exists to justify such action:

a. If the contractor should be adjudged a bankrupt.

b. If the Contractor should make a general assignment for the benefit of his creditors.

c. If a receiver should be appointed on the account of insolvency of Contractor.

d. If Contractor should persistently or repeatedly refuse or fail to supply a sufficient number of properly skilled workmen or proper materials for completion of the work.

e. If the Contractor should fail to complete the work within the time specified in the Contract.

f. If the Contractor should fail to make prompt payment to Subcontractors or for material or labor.

g. If Contractor should persistently disregard laws, ordinances or regulations of federal, state or municipal agencies or subdivisions thereof.

h. If the Contractor should persistently disregard instructions of Engineer, or otherwise be guilty of a substantial violation of the Contract.

Owner shall give Contractor five (5) days' written notice to cure the default, and if not cured to the satisfaction of Owner as certified by Engineer, the Owner may, upon three (3) days' written notice, elect to so terminate. Any such termination shall be without prejudice to any other right or remedy which Owner may have against Contractor.

In the event of the failure of Contractor to cure the default of which notice is given as above provided, or if the Contractor abandons the work undertaken under the Contract, Owner may, at his option, with such written notice to the surety and without any written notice to Contractor, transfer the employment of said work from Contractor to surety. Upon receipt of such notice, the surety shall enter upon the premises and take possession of all materials, tools and appliances thereon for the purpose of completing the work included under this Contract and employ, by contract or otherwise, any person or persons to finish the work and provide the material therefor, without termination of the continuing full force and effect of the Contract. In case of transfer of such employment to the surety, the surety shall be paid in its own name on estimates covering the work subsequently performed under the terms of the Contract and according to the terms hereof, without any right of Contractor to make any claims for the same or any part thereof.

In case of termination of Contract by Owner as aforesaid, Contractor shall not be entitled to receive any balance of the amount to be paid under this Contract until the work shall have been fully furnished. At such time, if the unpaid balance of the amount to be paid under this Contract exceeds the expense incurred by Owner in finishing the work together with all damages sustained or which may be sustained by Owner by reason of such refusal, neglect, failure or discontinuance of employment, such excess shall be paid by Owner to Contractor. If such expense and damages shall exceed the unpaid balance, Contractor and his surety and each thereof shall be jointly and severally liable therefor to Owner and shall pay the difference to Owner. Such expense and damage shall include all reasonable legal costs incurred by Owner in the employment of attorneys to protect the rights and interests of Owner under the Contract.

53. TERMINATION OF CONTRACT BY CONTRACTOR. The Contractor may stop work and terminate this Contract upon the occurrence of any one or more of the events hereafter specified.

a. If the work should be stopped by order of any court, or other public authority for a period of ninety (90) working days, through no act or fault of the Contractor, anyone employed by him, or any of his Subcontractors.

b. If the Owner suspends the work for any reason other than act or neglect of the Contractor for a period of one hundred and eight (180) consecutive calendar days.

c. If payments due the Contractor under this Contract are unreasonably delayed.

Contractor shall give Owner ten (10) days' written notice of termination of Contract.

Upon termination of the Contract, the Engineer shall estimate all of the work done up to the time of such termination and the Contractor shall be entitled to receive payment therefor in the manner provided in the Contract.

The Owner will pay the Contractor a termination payment of five (5) percent of the difference between the Contract price and the sum of the payments made to the Contractor for work done up to the termination date of the Contract. This payment shall be full settlement for the Contractor's inconvenience, loss of anticipated profits, cost of removing his equipment from the site, and all other expenses whatsoever. The Contractor shall be entitled to no further payment whatsoever for the work.

54. USE OF COMPLETED PORTIONS OF WORK. The Owner shall have the right to take possession of and use any completed or partially completed portions of the work, notwithstanding that the time may not have expired for completing the entire work. Such taking possession and use shall not be deemed to be completion of the Contract in respect to such work nor

shall the same be deemed to be any acceptance of any work not completed in accordance with the Contract Documents.

55. CLEANUP AND RESTORATION. From time to time, the Contractor shall clean up all refuse, rubbish, scrap material and debris caused by his operations, so that the site of the work shall at all times be neat, orderly and presentable.

Upon completion of the work the Contractor shall remove all equipment, unused materials and refuse, and shall leave the work area in a neat and orderly condition. All damaged or otherwise affected areas and items shall be restored to a condition equal to or better than that originally existing.

Cleanup and restoration shall be subject to the approval of the Engineer and must be accomplished before the Contract will be considered complete and final payment made.

56. COMPLETION TIME AND LIQUIDATED DAMAGES. The work shall be completed within **75 calendar days**, following issuance of notice to proceed.

Failure to complete the work within the specified time, except for reasons specified in paragraphs 50 and 51 of the General Conditions, shall subject the Contractor to liquidated damages in the amount of **fifty dollars ($50) per calendar day for each day beyond the completion date for the first 14 days and $200 per day thereafter (excluding final pavement patch, which may be delayed due to weather).** Liquidated damages may be deducted from the Contract Price and any payment due hereunder.

PAYMENT

57. GENERAL. The Contractor shall pay, and cause his Subcontractors to pay, any and all accounts for labor, services and material, used by him and his Subcontractors during the fulfillment of the Contract, as and when such accounts become due. Said payments shall include worker's compensation premiums, state unemployment, Federal social security payments and all other wage and salary deductions required by law.

The Contractor shall furnish the Owner proof of payment of such accounts in the form designated by the Owner, as often as requested. Should payment of such accounts not be made when and as they become due, the Owner shall have the right to make the payments on behalf of the Contractor and to deduct the amounts paid from payments due the Contractor.

The Contractor shall indemnify and hold harmless the Owner from any liability or expense, including legal expenses, arising out of claims or subcontractors, material, men or those furnishing labor or services in connection with the fulfillment of this Contract.

58. CHANGES IN THE QUANTITIES OF CONTRACT ITEMS. The Owner reserves the right to make changes in the Work within the general scope of the Contract, the Contract amount and the Contract tune being adjusted accordingly. Such changes shall be made in writing by the Engineer and shall not be considered a waiver of any condition of the Contract nor invalidate any of the provisions thereof.

It is provided however, that a supplemental agreement shall be executed by both parties of the Contract before any change is made which involves:

a. An extension or shortening of the length of the project by more than twenty-five percent (25%).

b. An increase or decrease of more than twenty-five percent (25%) of the total cost of the work calculated from the original proposal quantities and the unit contract prices.

59. EXTRA WORK AND ALTERATIONS. The Owner reserves the right to order extra work or to alter the work without invalidating the Contract. Except for emergencies and minor changes not inconsistent with the purposes of the work, all extra work or alterations shall be preceded by a supplemental agreement executed by both parties of the Contract. All extra work or alterations shall be subject to the conditions of the original Contract.

The value of any extra work shall be determined in one or more of the following ways:

a. By agreement on a lump sum.

b. By unit prices named in the Contract or subsequently agreed upon.

c. By time and expense basis. Payment will be made for the actual cost of labor, payroll taxes, material, equipment rental and field supervision required, with the addition of fifteen percent (15%) to cover profit, overhead, use of small tools, taxes, insurance, bookkeeping and all other incidental costs.

In such cases the Contractor shall keep and present in such form as the Engineer may direct a correct account of such costs, together with supporting time cards and vouchers. The Engineer shall certify the amount due the Contractor and pending determination of final value, payments on account shall be made on the Engineer's estimate.

60. APPLICATION FOR PAYMENT. At least five (5) working days before each payment falls due, Contractor shall submit to Engineer two (2) copies of an itemized application for payment, supported to the extent required by Engineer by receipts or other vouchers showing payment for materials and labor, payments to Subcontractors, and such other evidence of Contractor's right to payment as Engineer may direct.

Contractor shall be entitled to monthly progress payments corresponding to the stage of the work. Progress estimates will be prepared by Engineer not later than thirty (30) days after commencing work, and every thirty (30) days thereafter, if so entitled, for the duration of construction. These shall be based upon an approximate estimate of quantities of work completed and considered acceptable, multiplied by the unit prices established in the Contract. Deduction from each monthly progress payment in the amount of the retained percentage as required by law will be made. Cost of materials properly stored, protected and insured at the site of the work will be paid on monthly estimates only when provided for in the special provisions and then only for the specific materials listed therein for partial payment. In preparing the monthly estimates, advancement will be made therein for ninety-five percent (95%) of the cost of such materials, as evidenced by invoices to Contractor. Advances will not be made for any item of material amounting to less than five hundred dollars ($500.00). All materials must conform to the requirements of these specifications. However, advancement may have been made for same in the estimates. Deductions at the same rates, and equal in amount to the advancements, will be made on the estimates as the material is used.

Quantities used for progress estimates shall be considered only as approximate and provisional, and shall be subject to recalculation, adjustment and correction by Engineer in subsequent progress estimates and in final estimates. Inclusion of any quantities in progress estimates, or failure to disapprove the work at the time of progress estimates, shall not be construed as acceptance of corresponding work or materials.

61. CHARGES TO THE CONTRACTOR. All cost charges to the Contractor under the terms of the Contract shall be paid by the Contractor to the Owner on demand. The Owner shall have the right to deduct such charges from payments due the Contractor or to recover such charges from the Contractor or his surety.

62. PAYMENT OF TAXES. The Contractor shall pay promptly when due all excises, license fees, industrial insurance premiums and all state and local sales and use taxes accruing during this Contract in a manner as required by the laws and statutes of the state and political subdivisions where the project is located. The Contractor shall withhold and pay any and all withholding taxes, whether state or federal, and pay all social security charges and also all state unemployment compensation charges, and pay or cause to be withheld, as the case may be, any and all taxes, charges, or fees or sums whatsoever, which are now or may hereafter be required to be paid or withheld under any laws.

In the event of the Contractor's default on the payment of taxes, excises and license fees, the Owner shall have the authority to withhold from any payment due the Contractor under this

Contract, the estimated amount of such accrued and accruing taxes, excises, premiums and license fees for the benefit of all taxing authorities to which said Contractor is liable.

Owner shall have the right, but not the obligation, to inspect Contractor's records to determine or confirm that Contractor has made all payments required by this section. Owner may rely upon written statements and certifications by Owner and state agencies attesting to all such payments.

63. PAYMENTS WITHHELD. Notwithstanding the issuance of any payment certificate, Owner may withhold any payment, or portion of payment, or recover any payment theretofore made, to such extent as may be necessary to protect himself from loss on account of:

a. Defective work not remedied.

b. Claims filed or written notice that valid claims will be filed.

c. Failure of Contractor to make payments properly to subcontractors or supplies of material or labor.

d. Reasonable doubt that the contract can be completed for the balance then unpaid.

e. Liquidated damages or other claims against Contractor by Owner.

f. Damage to another Contractor.

g. Failure of Contractor to furnish invoices to support application for payment for materials not incorporated in the work but delivered and suitably stored at the site.

64. RELEASE OF LIENS OR CLAIMS. Before the Owner pays the Contractor his final payment for the work, the Contractor shall sign and deliver to the Owner a release of liens or claims sworn to under oath and duly notarized. The release shall state that the Contractor has satisfied all claims and indebtedness of every nature in any way connected with the work, including (but not limiting the generality of the foregoing) all taxes, payrolls, amounts due to Subcontractors, accounts for labor performed and materials furnished, incidental services, liens and judgments.

If any lien or claim remains unsatisfied after all payments to the Contractor are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such a lien or claim, including all costs and a reasonable attorney's fee.

65. FINAL PAYMENT. Upon completion of all work under this contract, the Contractor shall notify the Engineer, in writing, that he has completed his part of the Contract, provide a Public Works Tax Release, and shall request final payment. If the work has been completed to the extent of the Contract Documents, the Engineer will recommend acceptance of the completed work and submit a final estimate of the amount due the Contractor under this Contract. Upon approval of this final estimate by the Owner and compliance with provisions in paragraph 64,

"Release of Liens or Claims," and other provisions as may be applicable, the Owner shall pay to the Contractor all moneys due him under the provisions of these Contract Documents.

Written notice by the Contractor to Engineer that he has completed his part of the Contract, together with his request for final payment, shall be deemed to constitute and shall constitute a certification by the Contractor of complete compliance by Contractor with all pertinent statutes in connection with all work pertaining to all claims for payment on this Contract.

66. ACCEPTANCE OF FINAL PAYMENT CONSTITUTES RELEASE. The acceptance by the Contractor of the final payment shall release the Owner and the Engineer, as agent of the Owner, from all claims and all liability to the Contractor for all things done or furnished in connection with the work, and every act of the Owner and others relating to or arising out of the work. No payment, however, final or otherwise, shall operate to release the Contractor or his sureties from obligations under this Contract and the performance, payment and other bonds and warranties as herein provided.

PART VI. SPECIFICATIONS

The following section specifies the use of materials and methods of construction acceptable to the District. Work must also meet Washington Department of Health standards, and shall meet other applicable Washington State and local codes including:

- Washington Labor and Industries (L&I). All work is to be completed in accordance with Washington State Prevailing Wage standards. A current copy of prevailing wage rates is included in Part IV AGREEMENT AND CONTRACT FORMS
- City of Lake Forest Park – see also Right-of-Way permit conditions
- Specific instructions not identified here shall meet City of Seattle Standard Specifications 2003 Part 2, 5 and 7

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SECTION VI.1. WATERWORKS MATERIALS

VI.1.a GENERAL

All contractor supplied materials shall be new and undamaged. Unless otherwise approved by the Inspector, the same manufacturer of each item shall be used throughout the Work. All reference specifications herein shall be of the latest revision.

VI.1.b PIPE

1. Ductile Iron Pipe (Preferred)

a. Standard: AWWA C151
b. Cement lining: AWWA Standard C104
c. Exterior Coating: Bituminous coated per AWWA C104
d. Class: Class 52 or as specified in the Special Provisions/Contract Drawings
e. Type of Joint: Tyton joint or as specified in the Special Provisions/Contract Drawings

2. HDPE (High Density PolyEthylene)

a. Standard: AWWA C906 and NSF 61.
b. Class: DR 11
c. Standard Dimension Ratio: DR 11
I. d. Joints: Flange ends by fusion
Fusion joints to be carried out by trained technicians in accordance with manufacturer's requirements. Submittal required of fusion records to include date, temperature, personnel and other as recommended by manufacturer.

3. Copper Service Pipe

Type "K" annealed, use standard brass compression fittings.

4. Poly Water Service Tube (HDPE)

a. Standards: High molecular weight polyethylene (AWWA C901, ASTM 1248) type 3, grade 3 (PE3408) DRISCO, of all virgin material (CS-255-63). Must carry NSF seal of approval. Two sizes will be permitted for permanent piping: 1" and 2" size. 1" pipe shall be iron pipe size and 2" pipe shall be iron pipe size.
b. Type of Joint: Standard brass compression fittings.
c. Working pressure: 200 psi at 73.4^{o}_{F}.

VI.1.c FITTINGS

1. Cast or Ductile Iron

a. Standard:	AWWA C110
b. Compact (Ductile Iron):	Per AWWA C153.
c. Class:	At least equal to class of pipe.
d. Type of Joints:	Compatible with pipe or with an adapter or as specified in the Special Provision/Contract Drawings
e. Lining:	Cement lining per AWWA C104.

2. Fittings for PVC Pipe

"Ring Tite" as manufactured by Tifco or equal.

3. Special

Special fittings shall be as specified in the Special Provisions/Contract Drawings

VI.1.d VALVES

1. Gate Valves

a. Standard:	AWWA C515
b. Description:	Gate valves shall be ductile iron body, resilient wedge valves. Stem nuts shall be identical with District's existing equipment. All valves shall open counter-clockwise and be of the non-rising stem type.
c. Working pressure:	150 psi unless specified otherwise.
d. Type of Joint:	Unless otherwise noted valves shall be flanged with machined flange faces or mechanical joint.

2. Butterfly Valves

Butterfly valves shall in design, material, and workmanship, conform to the standards of AWWA C504. All other specifications shall be provided in the Special Provisions/Contract Drawings.

3. Double Check Valves (Back Flow Prevention)

All back flow prevention devices shall meet Washington State Department of Health "Approved Cross-Connection Control Devices" Listings. They shall be tested and certified at time of installation.

4. Air and Vacuum Release Valves

Air and vacuum release valves shall be Rennselear Figure 372, or equal, as approved by the Engineer.

5. Control Valves

Pressure Reducing, Pressure Relief, Pump Control and other controlling Globe Valves shall be CLA-VAL Automatic Valve or approved equal.

a. Pressure reducing and pressure sustaining valves shall be CLA-VAL Model 92-01 BCS (Auxiliary valve 92-01 BCS) with epoxy coating, a valve position indicator, open & close speed control, a sight gage, spring range 30 - 300 psi.

VI. Valve Boxes

Valve boxes and tops shall be cast iron City of Seattle standard cover with drop handle. Bottom section length shall be 42" minimum adjusted to fit field condition for the particular project or as specified in the Special Provision/Contract Drawings.

VI.1.e FIRE HYDRANT ASSEMBLIES

1. Hydrant

Standard: AWWA C502

2. Description (See also Detail for Fire Hydrant)

Hydrants shall be American Darling or Mueller 5-1/4" type or other approved equal, with MJ end. Operating nuts shall be identical with District's existing equipment. **Connection on pumper ports shall match the standards of Northshore Fire District**. The hydrants shall be equipped with one (1) 5" pumper nozzle including 4" Stortz Fitting, two (2) 2½" hose ports NS . thread, 1¼" pentagon operating nuts, and open by turning counter clockwise. Hydrant valve diameter shall be a minimum of 5-1/4". Hydrants shall be flanged at ground line. Hydrant shall be so constructed that the direction of pumper connection may be rotated to face the roadway. Hydrant shall be of traffic type with designed replaceable break points and shall have a variable length riser. All nozzles shall be equipped with bronze nipples screwed into the hydrant and locked in place. Minimum depth of clear cover over the pipe shall be three (3) feet. An area of minimum 5' radius behind the hydrant shall be kept clear of all natural or man-made obstructions.

3. Piping

a. All hydrant laterals shall be thickness class 52 ductile iron (Or approved equal).

b. Lateral pipelines to Hydrants under 50' in length shall be a minimum of 6" diameter. Laterals over 50' in length shall be a minimum of 8" in diameter.

c. MEGALUG retainer glands required at all lateral pipe to fitting or approved equal.

d. Pipe to pipe shall be mechanical joint with Field-Lok gaskets or approved equal. Where Field-Lok gaskets are used, paint bell blue for future identification.

4. Auxiliary Valve

a. For piping, the auxiliary valve shall conform to D1.d.

VI.1.f SERVICE CONNECTION EQUIPMENT

1. Water Meters

Meters shall be furnished by the District.

2. Corporation Stops

Corporation stops shall be bronze alloy, ball valve type with 1" I.P. thread inlet and 1" IPS Pac Joint Ford, Mueller, or equal, as approved by the Inspector.

3. Saddles

Pipe saddles shall be bronze or ductile iron, suitable for installation on the type and class of pipe being used. Bands shall be flattened and properly formed to fit the outside diameter of the pipe. Bands, bolts, and nuts shall be hot-dip or electro-galvanized. Double bands shall be employed on pipe 8" and larger. Single wide flat bands shall be used on pipe 6" and smaller. Gaskets shall be good quality red rubber, or neoprene. (Ford 202 for 1" service preferred.)

4. Oversized Service Connections

Where the District deems it necessary, 2" copper tube size poly pipe, single service lines, a 2" resilient seat gate valve with a valve box shall be utilized.

5. Tracer Wire

Tracer wire shall be stripped and laid with a positive connection at the corp, spiraled around pipe and brought to surface at termination of service. Wire shall be 12 gauge copper solid strand

VI.1.g JOINTING MATERIALS

1. Rubber Gaskets

a. Standard: AWWA C111

VI.1.h GUARD POSTS

1. Hydrant Guard Post

a. Standard: State of Washington Department of Transportation "Standard Specifications," 1998, Section 9-30.5(6).

b. Description: 9" diameter by 6 feet long precast concrete. Exposed surfaces shall be free from honeycomb or other serious defects.

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VI.1.i CONCRETE

1. Bedding Concrete

Concrete for pipe bedding shall be Portland cement concrete containing not less than four (4) sacks of cement per cubic yard. The water/cement ratio shall be 8.2 gallons per sack of cement. The fine aggregate shall not be less than 30% or more than 50% of the total weight of the aggregate.

2. Miscellaneous Concrete Structures

Concrete for encasement, blocking and other structures shall be Portland cement concrete containing not less than six (6) sacks of cement per cubic yard and produce a 28-day compressive strength of not less than 3,000 psi. The fine aggregate shall not be less than 30% or more than 50% of the total weight of the aggregate. The concrete shall have a maximum slump of five (5) inches.

Core samples and testing of the concrete may be required as directed by the Inspector.

VI.1.j GRAVEL

1. Foundation Gravel

a. General

Foundation gravel to be used shall be a type and gradation to provide a solid compact bedding in the trench. Since trench conditions vary, foundation gravel requirements will change. Bedding requirements for two trench bottom conditions are described as follows:

b. Condition One

Where silty soil or fine sandy soil is encountered that will flow in a stream of water, the gravel should consist of clean bank run sand and gravel, free from dirt, topsoil, and debris, and containing not less than 35% retained on a 3" mesh sieve and 100% passing a 2" screen. This foundation gravel shall be used only in a dry trench bottom, free from quick and/or running sand.

c. Condition Two

Where clay, peat or other soft materials are encountered which may be saturated with water but which will not break down into fine particles and flow as silt or sand will, the trench shall be over excavated 24" and foundation gravel used. The foundation gravel shall be of such gradation that 100% will pass a 3" screen with at least 90% retained on a 1" screen.

The foundation thus stabilized shall be leveled to provide a uniform pipe foundation by using a well-graded gravel ranging in size from 1/4" to 3/4".

2. Bedding Material

Bedding material (other than CDF) shall consist of clean, granular, well graded sand and gravel material as approved by the District Engineer. Imported bedding material will have the following properties:

- 100% will pass the U.S. Standard 3/4" opening
- not more than 3% will pass the U.S. No. 200 (wet sieve),
- minimum sand equivalent of 50 per the test methods of the Materials Laboratory of the Department of Highways, Olympia, Washington (unless otherwise approved by the District Engineer).

Controlled Density Fill (CDF) shall be used in right-of-way crossings and other locations as required by City of Lake Forest Park.

3. Backfill Material

Backfill material will vary depending on the location and availability of suitable approved granular fill material. Unless noted otherwise on the plans, backfill material shall be 100% 3" diameter or less, and may be bank run which has been passed through a 3" screen with a binder content of not more than 20% and reasonable grading from fine to coarse (unless otherwise approved by Engineer). **All crossings of City of Lake Forest Park rights-of-way shall be backfilled to City specifications, which require the use of Controlled Density Fill (CDF) under travelled portion**.

SECTION VI.2 WATERWORKS CONSTRUCTION

VI.2.a GENERAL

Except as otherwise noted herein, all work shall be accomplished as recommended in applicable American Water Works Association (AWWA) Specifications, and according to the recommendations of the manufacturer of the material or equipment used.

VI.2.b CLEARING AND GRUBBING

Clearing and grubbing work shall be performed within the confines of the area indicated on the plans, and as staked out in the field. All resulting debris shall be disposed of by the Contractor and the right-of-way cleaned up in a neat and workmanlike manner. No logs, stumps, rocks, etc., shall be left lying in the right-of-way or an adjacent property without specified written approval by the District, or the Engineer, and the affected adjacent property owner.

VI.2.c EXCAVATION

1. Normal Conditions

Trenches shall be excavated to the line and depth designated by the Inspector to provide a minimum cover of 36" for pipe 12" and less and 48" for pipe over 12", over the top of the pipe unless otherwise specified in the plans. Except where approved by the Inspector, the trench sides shall be excavated vertically. Trench widths shall be only as necessary for adequate working space. The maximum trench width at the top of the pipe shall normally be the outside diameter of the pipe barrel plus 16 inches. The top width of the trench shall not exceed the outside diameter of the pipe plus 30 inches. All excavation and shoring shall conform to WAC 296.

No more than 500 feet of open ditch will be permitted unless so authorized in writing by the Engineer. All trenches shall be backfilled at the end of each work day, or as otherwise secured, as approved by the Inspector.

2. Special Conditions

a. Pavement Cutting (per appropriate governmental agency standards):

In trenching through an existing pavement, the open cut shall be a neat-line cut by either saw cutting or jack hammering a continuous line.

1) Concrete - pavement shall be cut one foot outside the edge of the trench on each side. The concrete shall be cut on a straight line and

shall be beveled so that the cut will be approximately 1-1/2 inches wider at the top than at the bottom.

2) Asphalt -. Pavement shall be cut ahead of the trenching equipment to prevent excessive tearing up of the surface and to eliminate ragged edges.

b. Rock Excavation:

All ledge rock that requires systematic drilling and blasting for its removal, and boulders exceeding one-half cubic yard in volume, shall be removed to provide a minimum clearance of six inches (6") under the pipe.

c. Dewatering:

Pipe trenches shall be kept free from water, during excavation, pipe laying, and jointing, and the pipe embedment, in a manner acceptable to the Inspector. Surface water shall be diverted, and ground water shall be kept pumped down, or otherwise removed, to the extent necessary to keep the trench free from water and the bottom stable.

Before trenching operations begin, the Contractor shall have available on the site of the Work sufficient pumping equipment and/or other machinery to insure that the provisions of the above paragraph can be maintained.

d. Shoring and Movable Shields

The Contractor shall provide shoring and movable shields as necessary to protect workmen, the Work, and existing structures, utilities and other properties in accordance with title 296 WAC. Trench excavation shall be in compliance with OSHA and WISHA regulations and requirements.

e. Tunneling:

When tunneling is required, tunnels shall not be less than 4 feet high and 2 feet wide and not less than 1 foot wider than the outside diameter of the pipe. Tunnels shall be backfilled with materials acceptable to the Inspector and backfill shall be mechanically compacted. When tunneling is used under pavements, subsequent low pressure grouting may be required.

f. Highway Crossing:

The Contractor may use any method which provides satisfactory results and is acceptable to the Inspector and the governmental agency having control of the highway, provided that the Contractor restores the roadway to a condition acceptable to the governmental agency having control of the road and the Inspector.

Normally, highway crossings require the placing of a steel, cast iron or concrete pipe casing by jacking or tunneling and laying the water pipe within this casing.

g. Over-Excavation:

Over-excavation for purposes of these specifications will be deemed to include the loosening of subgrade material below the grade of the pipe or appurtenance, as well as the physical removal of material below the grade of the pipe or appurtenance. In the event of over-excavation, the Contractor shall when required, provide at this own expense, suitably compacted bedding and foundation material (VI.2.d), in place, to the required grade.

VI.2.d FOUNDATION AND BEDDING

1. General

Proper preparation of foundation, placement of foundation material where required, and placement of bedding material shall precede the installation of all pipe. This shall include necessary leveling of the native trench bottom or the top of the foundation material as well as placement and compaction of required bedding material to a uniform grade. The entire length of pipe will rest firmly on a well compacted material.

2. Foundation

Where over-excavation has been necessary, foundation material shall be placed and compacted to form a suitable base for the replacement of the required thickness of bedding material. Imported foundation material may be required in some instances at the direction of the site inspector or engineer..

3. Bedding

Bedding shall consist of the leveling of the bottom of the trench or the top of the foundation material and the furnishing, placing, and compaction of bedding materials under the pipe and along the sides to a minimum depth of six (6) inches over the top of the pipe or as required by the Inspector. If imported bedding is required the minimum thickness of the layer of bedding material required is 4 inches for all pipe sizes. Bedding material shall be thoroughly rammed and tamped around the pipe with the proper tools, so as to provide firm and uniform support over the full length of all pipe and fittings. Care shall be taken to prevent any damage to the pipe or its protective coating.

VI.2.e INSTALLATION OF PIPE AND FITTINGS

1. Alignment

Alignment shall be within 0.5 feet of the specified alignment.

2. Pipe Laying

Pipe laying shall be done in accordance with the specifications and instructions of the manufacturer of the kind of pipe used, subject to the approval of the Inspector. Tools designed especially for installing each particular type and kind of pipe shall be used. All pipe ends shall be square with the longitudinal axis of the pipe, maximum 2" out of square as measured across the diameter of the pipe, and shall be reamed and otherwise smoothed so that good connections can be made. All operations for any special type of pipe, joint or connection shall be carefully done in accordance with the manufacturer's instructions.

Any installation, or repair which involves Asbestos-Cement pipe shall be in accordance with Puget Sound Air Pollution Control Agency guidelines for handling, removal and disposal of asbestos materials.

3. Contamination Prevention

Dirt or other foreign material shall be prevented from entering the pipe or appurtenances during handling or laying operations. Any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned and relayed. The open ends of pipe and fittings shall be plugged with a temporary watertight plug whenever work is stopped and/or whenever water in the trench threatens to enter the pipe.

4. Blocking or Bracing

Concrete for Blocking or Bracing shall:

1) Be in accordance with the Standard Details.
2) Be placed in back of all fittings having unbalanced thrust.
3) Be placed so as to secure bearing on undisturbed earth.
4) Bear against fittings only, shall be clear of joints and have plastic wrapping so as to permit taking up or dismantling joint.
5) Be formed with lumber or timber.
6) Be free of entrapped air pockets, removal method as approved by District/Engineer.
7) Shall have a smooth finish.

Precast blocking shall not be used without prior written approval from the Inspector. Blocking shall not be covered up without approval of the Inspector.

VI.2.f INSTALLATION OF AUXILIARY EQUIPMENT

1. Valves

a. General

Valves shall be set at places designated by the District Engineer. Before placing in the trench in a vertical position, each valve shall be carefully inspected for defects. The stuffing boxes shall be packed with good quality of packing and adjusted so as to permit easy operation and at the same time show leakage. The valve shall be bedded similar to pipe and fittings.

b. Valve Box

Cast iron valve boxes shall be set so they will be in a vertical alignment to the gate valve operating stem. The operating stem shall extend such that the operating nut is no more than 36" from finished grade. The lower casting of the unit is to be installed using ETHAFOAM pad ring, and shall not rest directly upon the body of the gate valve or upon the water main. The upper casting of the unit is to be placed in proper alignment and to such an elevation that its top will be at final grade.

c. Air and Vacuum Relief Valve Assemblies

Installation shall be as shown in the Standard Detail. The assembly shall be set at the high point of the line. A valve guard post shall be placed where there is danger of damage. The relief valve shall be suitable for installation by direct burial.

d. Blow-off Valve Assemblies

Installation shall be as shown in the Standard Detail. The valve shall be enclosed in a standard valve box. The blow-off shall be installed in such a position and location that waste water can be disposed of without damage to surrounding property.

2. Fire Hydrant Assemblies

a. Hydrant

Fire hydrant assemblies shall be made and installed according to Standard Details. Special attention shall be directed to construction of the drainwell and silt barrier. Each hydrant assembly shall be inspected and adjusted as

above specified for valves. Hydrant trenches shall be excavated to not more than two (2) feet beyond the back side of the hydrant. The stuffing boxes shall be packed with good quality packing and shall be adjusted as above specified for valves.

b. Piping

Hydrant laterals shall consist of a section of thickness class 52 D.I. (or approved equal) 6 or 8 inch pipe from the main to the hydrant and shall include an auxiliary gate valve set vertically and placed in the line as indicated in the standard drawing for hydrant settings.

c. Auxiliary Gate Valve

See VI.2.f.

d. Retainer Glands

Use MEGALUG retainer glands or Field-Loc gaskets at all joints within hydrant lateral. Where Field-Loc gaskets are used, paint bell blue for future identification.

e. Hydrant Guard Posts

Hydrant guard posts to be used only as directed by District Inspector

3. Service Connection Equipment

All service connections to water mains shall be made using saddles of the size and type suitable for use with the pipe being installed. Care shall be exercised to assure that the main is not damaged by installation of the saddle.

Service pipe shall be polyethylene (HDPE) water service tube as specified in Paragraph VI.1.b. The depth of trenching for service connection piping shall provide 24 inches of cover over the top of the pipe for that portion of the service connection located in public rights-of-way. That portion of the service connection located on private property shall also have a minimum of 24 inches of cover. All connections to conform to the Uniform Plumbing Code, individual pressure reducing valves are recommended if supply pressure exceeds 80 psi. Connections of di-similar metals must be approved by the inspector prior to installation.

VI.2.g CONNECTION TO EXISTING SYSTEM

1. General

Where connections to the existing system are to be made in existing pipes, the Work shall be conducted at such a time and in such a manner as to minimize the interruption of service. Necessary pipe, fittings, and valves shall be assembled at the site ready for installation prior to shutting-off of water in the existing main. Once the water has been cut-off, the Work shall be prosecuted vigorously and shall not be halted until the line is restored to service. Installation shall be as shown in the Standard Details.

No direct connections to the existing system will be allowed without an approved backflow prevention device until the newly constructed mains have been tested for pressure and purity and approved in accordance with District Standards.

The Contractor shall discuss the proposed interruption schedule with the District Superintendent a minimum of 48 hours prior to the requested time of interruption. The Contractor shall notify each of the affected water users in writing a minimum of 24 hours prior to the interruption.

2. "Cut-in" Connection

The cut-in shall be as shown in the Standard Details, and shall be made only with the approval of and under direct inspection by the Inspector. The tee shall be cast or ductile iron with mechanical joint. The couplings shall be Romac 501 12" long center ring or equal or as approved by the District/Engineer.

3. "Tapping" Connection

The tap shall be as shown in the Standard Details. a standard Cast Iron or Stainless Steel Standard split Tapping Sleeve shall be used. For 12" and larger main diameters a neoprene gasketed joint shall be used. For 10" and smaller main diameters a mechanical joint type shall be used (for tapping connection to AC mains, use split cast iron MJ tapping sleeve). The gate valve shall be resilient seat with "O" rings, non-rising stem, mechanical joint one end, other as required, per AWWA Specifications 7 F 1 (Tapping Valve). The Tapping Sleeve, connected and tested (normal main pressure), in place with valve connected to tee shall be completed before tap is started in existing main.

VI.2.h BACKFILLING

1. General

Compaction and restoration must be done as detailed below and immediately after the trench is backfilled, so as to cause least disruption to traffic. Backfilling of trenches can be made with the same materials excavated from the trenches unless these materials are found to be unsuitable by the Engineer or Inspector or where CDF is required. Prior to the backfilling, all form of lumber and debris shall be removed from the trench. Care shall be exercised to see that large rock, stumps, logs, etc., are excluded from material used for backfill. Machine backfilling shall be carried on so that the trench is continually filled from the end.

2. Consolidation, Grading, and Compaction

At locations where paved streets, driveways, or sidewalk will be constructed or reconstructed over the trench, or where the trench is greater than four (4) feet deep, or where provided for in the Special Provisions or directed by the Inspector, the backfill shall be mechanically compacted to 95% of maximum density. Throughout the length of any pipe run, backfill at depths over 4 feet shall be compacted to 90% maximum density by mechanical compaction. The top 4 feet of the trench line shall then be mechanically compacted to 95%. All densities shall be determined by testing specified in Section 2-03.3(14)D of WSDOT 2002 Standard Specifications. Contractors shall provide weekly reports to the District and the Engineer verifying the required compaction, prepared by a civil engineer registered in the State of Washington. **A minimum of one compaction test shall be taken for each 1000 linear feet of main line trench, or as designated by the District Engineer; one test at subgrade and one at 50% of trench depth.**

In any trench in which 95% density cannot be achieved with existing backfill, the top 4 feet shall be replaced with gravel base as specified in the WSDOT 2002 Standard Specifications, Section 9-03.10. This new material shall then be mechanically compacted to 95%.

Restoration of asphalt pavement shall include a minimum of 6-1/2 inches of crushed surfacing material and 4 inches of asphalt concrete Class B or comparable surfacing approved by the Engineer. Concrete pavement shall be restored consistent with Section 5-05 of the WSDOT 2002 Standard Specifications.

3. Cuts Across Road Alignment

In general, utility trenching through existing pavement across the road alignment will be discouraged, except for service lines.

Trenches in the traveled roadway shall be backfilled with a minimum 24"Controlled Density Fill (CDF), with formulation as directed by City of Lake Forest Park unless directed otherwise by the Engineer (see trench detail). On

asphalt pavement, a permanent hot mix patch the same thickness as the original asphalt or a minimum of 4 inches, whichever is greater, shall be placed and sealed with a paving grade asphalt within 30 calendar days. Cement concrete pavement shall be restored with a 8-sack mix, using either Type II or Type III cement, within 30 calendar days.

4. Excess or Insufficient Material

In all cases where it is not necessary to re-establish original ground level, excess material shall be heaped over the trench as additional mounding. Where necessary, excess material shall be removed and disposed of at the Contractor's expense and in a manner satisfactory to the District and the Engineer.

Imported materials required to properly complete backfilling shall be hauled in and placed by the Contractor at his own expense.

5. Holding Backfill on Steep Slopes

Where, in the opinion of the Inspector, there is a danger of backfill being washed away due to steepness of the slope in the direction of the trench, material will be held in place with hill holders.

6. Barricades

Newly backfilled and/or soft areas shall be immediately and adequately barricaded and marked to warn motorists and pedestrians. All driveways and road crossings shall be graveled when necessary. Proper and sufficient warning signs shall be so placed as to adequately warn the public away from hazardous areas. See Standard Details – Traffic Plans.

VI.2.i PAVEMENT RESTORATION

1. General

Pavement restoration requirements will vary depending on the specific project and location. In general, open trenches shall be backfilled and immediately covered with a temporary patch. The temporary patch to seal the surface until settlement and final paving. Asphalt pavement shall be restored consistent with the WSDOT 2002 Standard Specifications.

2. Time Interval

Final re-paving shall not be attempted until after the backfill has been mechanically compacted and allowed to settle to a degree of compaction satisfactory to the Inspector. During the period of settlement, the trench surface shall be sealed with a

temporary asphalt patch and maintained by the Contractor in such a manner as may be necessary to safely accommodate traffic.

3. Base Course

Where asphaltic concrete pavement has been cut for trenching, backfill shall be removed the width of the trench and to such depth as required to permit installation of six and one-half (6-1/2) inch compacted depth of sub-grade gravel. The top surface shall be rolled or tamped to proper elevation to receive the final paving as called for. Where Portland Cement concrete paving has been cut for trenching, backfill shall be removed the width of the trench and to such depth as required to permit the installation of sub-grade material as may be required by the authority having jurisdiction.

4. Paving

a. Bituminous (Asphalt)

Bituminous paving shall be of the same type and quality as the original pavement. Materials and method of construction shall be subject to approval by the Inspector. Cold patch asphalt shall be immediately placed in traveled areas with minimum thickness 2" to seal surface until favourable conditions exist for final pavement patch. Final pavement patch shall be applied with minimum thickness 4" or as required to match existing pavement. Application of final pavement patch may be delayed for favorable weather conditions.

b. Portland Cement Concrete

Concrete repavement shall be undertaken at such time as may be fixed by the authority having jurisdiction. Temporary repavement shall be six and one-half (6-1/2) inches of crushed rock with a "Light Bituminous Surface Treatment" placed as soon after completion of backfill as the Inspector may direct. Final concrete repavement shall be made using Hi-early strength cement in the concrete, and shall provide the full original thickness. The surface shall be finished to match the existing pavement. Headers shall be installed at the junction with all existing pavement and expansion and contraction joints constructed where directed by the Inspector.

VI.2.k RECOMMEND STANDARD ASESTOS CEMENT PIPE WORK PRACTICE, PROCEDURES AND TRAINING REQUIREMENTS

All personnel on any asbestos project who directly handles asbestos/cement water pipe or asbestos-containing waste materials will be certified per Chapter 296-65 WAC. Provide proof of certification to Owner prior to work on asbestos cement pipe.

All work with asbestos/cement water pipe shall be done as follows:

a. Carbine Blade Cutting (hand-operated only):

Blade cutters consist of a frame, adjustable to the circumference of the pipe and a number of outboard, self-tracking rollers which align one or more carbine-tipped cutting blades. The cutter is rotated around the pipe with the blades cutting a groove into the pipe. As the cutter is rotated, the blades are slowly tightened with crews to cut deeper and deeper into the pipe until the pipe is severed.

b. Snap Cutting:

Snap cutting equipment operates by means of cutting wheels mounted on a chin wrapped around the A/C pipe. Hydraulic or manually-applied pressure simultaneously squeezes the cutting wheels into the pipe wall until the pipe is severed.

c. Hand Saw Cutting:

Large-toothed, cross-cut hand saws used to manually cut small A/C pipes or to trim larger pipes.

d. Repair Band Installation

Repair bands consist of a pliable gasket material held in place by a metal sleeve tightened over the gasket and are used to repair small A/C pipe leaks.

e. Wet/Hot Tapping:

Wet tapping is done with specific equipment that can tap an A/C pipe while it is under pressure. The equipment is designed to tap various sizes of pipe and connect either services or pipe. Normally the A/C debris is contained in the tapping equipment until removed by the operator.

Equipment required: Hand-operated carbine blade cutter or Snap Cutting or Hand Saw or Repair Band and tools necessary for installation or Wet tapping machine of appropriate size; water source and means of application sufficient to maintain a continuously-wetted cutting area; protective equipment including:

- Disposable coveralls
- Respiratory protection (consisting of 1/2 face respirator equipped with HEPA filters or respirator which provides equivalent or better protection).
- Rubber boots.
- Hard hat.

1. Excavate around the A/C pipe in a sufficient distance to assure adequate tool clearance in the area to be cut. Care must be taken to avoid any abrasion to the pipe.

2. Don protective equipment and have sufficient water available before entering trench to begin cutting operations.

3. Clean and wash with water the surface of the pipe in the area to be cut and attach the cutting equipment around the A/C pipe.

4. Begin applying water to area being cut and continue until cutting is complete.

5. Operate the cutting tool in accordance with the manufacturer's instruction until cutting is complete or tap pipe, making sure that water is applied in sufficient quantities to assure that area being cut is continuously wetted and no A/C dust is created.

6. Detach cutting equipment, move to new cutting location and repeat procedure described above. Upon completion of the final cut, thoroughly was the cutting equipment with clean water to remove all A/C debris. Allow wash water to drain into the bottom of the trench. Remove washed cutting equipment from the trench.

7. Install other pipe and fittings as necessary to complete the job taking care to avoid any abrasion to the A/C pipe. Install the repair band and tighten bolts, keeping the entire exposed area of the pipe wet in the vicinity of the repair band during the operation.

8. When all pipe work is completed, any asbestos cement water pipe greater than one (1) linear foot in size may be buried at the project site if it is covered with three feet (3') or more of non-asbestos fill materials. Thoroughly wash tools, boots and hands with clean water to remove all A/C debris. Allow wash water to drain into the bottom of the trench.

   All asbestos-containing waste materials, including pipe fragments, protective clothing, HEPA filters and asbestos-contaminated containers and debris shall be sealed in a leak-tight, labeled container while adequately wet, and disposed in accordance with Puget Sound Air Pollution Control Agency. Asbestos Control Standard, Regulation III, article 4.

9. Exit ditch in such a manner that no A/C debris will contaminate clothing, boots, tools, etc.

VI.2.I OTHER

Removal of structures and obstructions pursuant to 2-02 and not related to Open Cut Pavement Crossings or Replacement of Asbestos Cement Water Main at Pipeline Crossings will be considered incidental to other Work in this Contract and will not be measured or paid for as a separate item. The Contractor shall estimate the amount and cost of this Work and shall include it in one or all of the bid items.

SECTION VI.3. WATERWORKS TESTING

VI.3.a GENERAL

All pipe and appurtenances shall be cleaned, disinfected and flushed, and shall be tested for leakage after backfill has been completed as specified. The Contractor shall furnish all labor, tools, equipment and materials necessary to make the tests and to perform any work incidental thereto.

The Contractor shall conduct preliminary tests and assure himself that the section to be tested is in an acceptable condition before requesting the Inspector to witness the test.

The District/Engineer 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.

Inspection and testing shall be in accordance with Control of Work Section of the Contract Documents.

Note: ***Due to the recent Endangered Species Act the sequence in which the various steps of Waterworks Testing are to occur has been revised. In particular, the pressure testing is to occur after the pipe has been flushed of all chlorinated water to assure that, in the event of a pressure failure, no chlorinated water will be released from the system into the environment.***

VI.3.b DISINFECTION OF WATER MAINS

1. Procedure During Construction

In addition to the procedures for preventing contamination during pipe laying described in paragraph VI.2.e.3, the following procedures shall be maintained:

a. The interior of all pipe, fittings, and auxiliary equipment stockpiled on the project shall be kept free of dirt and other foreign matter at all times.

b. Prior to lowering the pipe or auxiliary equipment into the trench each item shall be carefully inspected inside and thoroughly cleaned of any dirt or foreign matter.

c. Cleaning shall consist of brushing or sweeping of fittings and the use of tight-fitting swabs for pipe cleaning.

d. Water used for rinsing or lubricating during construction shall contain 50 ppm chlorine.

e. A tight stopper or bulkhead shall be placed at the open end of the pipe at all times when pipe is not being inserted into the section already laid.

2. Procedure Prior to Operation

Before being placed into service, all new mains and repaired portions of, or extensions to existing mains shall be disinfected by chlorination. Dosage shall not be less than 50 ppm of available chlorine. A chlorine residual of not less than 10 ppm free chlorine shall remain in the water after standing 24 hours in the pipe. The chlorine shall be applied by placement of dry crystals directly in the pipe **or** the following method:

a. A solution containing approximately 5 percent available chlorine by weight shall be prepared by first making a paste of a chlorine-bearing compound and water and then thinning to the proper proportions with water to insure that all active ingredients are dissolved.

If HTH or Perchloren is used at 70 percent available chlorine, the proportions shall be six (6) pounds of compound per ten (10) gallons of water.

If Clor is used at 15 percent available chlorine, the proportions shall be one (1) part Clor per two (2) parts water.

b. The solution shall be applied through a corporation cock inserted in the horizontal axis of the pipe located at the beginning of the Extension or any valved section thereof. Injection of the solution shall be by means of a hypochlorinator, hand operated pump or motor operated pump approved by the District/Engineer.

c. Water from the existing distribution system, or other source of supply approved by the District/Engineer, shall be controlled to flow very slowly into the newly laid pipe line during application of the chlorine. A color comparator set will be used to determine the chlorine residual of the entering water.

d. No connections shall be made between the existing distribution system and the pipelines not pressure tested and approved for purity constructed under this Contract without a Washington State Department of Health approved backflow prevention device installed in the connecting line. Any connection must be witnessed by the District/Engineer.

e. In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipe line is filled with chlorinating agent and under normal operating pressure.

f. After the twenty-four hour detention period, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its length shows, upon test, the absence of chlorine in excess of that carried in source of supply for flushing. All flushing methods shall conform to District standard D3.c.1.

1. Flushing Mains

After disinfection of all new mains and repaired portions of, or extension to existing mains, all pipes shall be thoroughly flushed through all hydrants, blow-offs or other approved means to assure that all solids and contaminated materials have been removed. Water required for the flushing will be paid for by the District.

When flushing after disinfection, the Contractor shall be responsible for the disposal of treated water flushed from the mains, and shall completely neutralize the wastewater for protection of aquatic life in the receiving water before disposal into any natural drainage channel. Neutralize implies removal of available chlorine by chemical means. The preferred method of chlorine removal is with Ascorbic Acid, which will be supplied by the District). The Contractor shall be responsible for disposing of disinfecting solution to the satisfaction of state and local authorities. Should the Contractor choose to flush to the sewage collection system, these activities must be approved by the District.

Clear, clean, uncontaminated water used in flushing shall be directed to approved storm water runoff conveyance systems. Contractor shall use care to minimize erosion caused by flushing procedures.

Flushing shall be accomplished as follows:

a. The Contractor shall schedule and organize his work so as to use flushing water during off-peak hours only.

b. The District and the Engineer shall be notified a minimum of 48 hours prior to the time of water main flushing.

c. Flushing shall be done only in the presence of a representative of the District.

d. Flushing shall be done through hydrant ports. Where hydrant ports are not available (dead ends) then a tap shall be provided large enough to develop a velocity of at least 2.5 fps in the main.

e. Each section of newly laid pipes between valves or dead ends shall be flushed independently.

f. Fire hydrants and other dead end appurtenances shall be flushed simultaneously with the main line.

VI.3.d HYDROSTATIC PRESSURE TEST

1. General

After the water mains have been disinfected and flushed, they shall be hydrostatically tested. Water mains shall be tested in lengths not to exceed 1000-ft. plus the additional length of main to the nearest valve or to the closest valve.

The mains shall be pressure tested prior to achieving purity after completion of flushing of highly chlorinated water as approved by the Inspector. The system to be tested must be physically separated from the District's Water System during such tests.

Hydrostatic pressure test equipment shall be cleaned, disinfected and flushed prior to connection to pipe system to be tested. Test equipment shall be kept clean of dirt and foreign matter at all times. The test equipment shall be rinsed or swabbed as necessary using a water solution containing a minimum of 50 ppm chlorine. Following disinfection the pressure test equipment shall be flushed with potable water prior to connection to system to be tested. A potable water source shall be used to pump system to test pressure. Potable water shall also be used throughout the hydrostatic test procedure and to serve as a source of make-up water between hydrostatic pressure tests.

2. Equipment

The pumps, saddles, corporation stops, miscellaneous hose and piping, and measuring equipment necessary for performing the test shall be furnished by the Contractor. The District will provide the gauge for the witnessed pressure test. Water meters used to measure water used to re-pressurize the line shall be positive displacement with a sweep unit hand registering 1 gallon per revolution as approved by the Inspector. Also water used to re-pressurize shall be pumped from a container sized and graduated appropriately to measure the amount of water used.

Where the District has water available for testing, it will be furnished without charge. Where water is not available from the District, the Contractor shall provide water for testing from a source approved by the Inspector.

3. Procedure

a. Preparation

1) Tests shall be made after corporation stops and service lines are installed.

2) Insofar as is practicable, tests shall be made prior to backfilling over any joints or fittings.

3) At points where pressure reaction and movement may occur, the pipe shall be properly blocked or braced. Where permanent blocking is not required, the Contractor shall furnish and install temporary blocking and remove it after testing.

4) Prior to calling out the Inspector to witness the pressure test, the Contractor shall have all equipment set up completely ready for operation

and shall have successfully performed the test to assure himself that the pipe is in a satisfactory condition.

b. Test

1) The mains shall be filled with water and all air removed prior to starting the test.

2) The main shall then be pumped up to a hydrostatic pressure equal to 250 psi at all elevations tested. In no case shall the test pressure exceed 200 percent of the safe working pressure of the class of pipe tested.

3) The pump shall then be stopped for a period of 15 minutes.

4) The main shall then be pumped up again to the test pressure.

5) The quantity of water required to restore the pressure shall then be recorded.

4. Acceptance

Acceptability of the test will be determined by two factors:

a. The quantity of water lost from the main during the 15 minute test period shall not exceed the quantities shown in the following table:

Pipe Diameter (inches)	6	8	10	12	14	16
Water Loss (GPH/1000 L.F. Pipe)	0.71	0.95	1.19	1.42	1.66	1.90
Water Loss/1000 L.F. Pipe (15 minute test)	0.18	0.24	0.30	0.36	0.42	0.48

These figures are established by the Ductile Iron Pipe Research Association and apply only to ductile iron pipe. Specific testing requirements will apply to other materials as directed by the Engineer.

b. There shall not be an appreciable or abrupt loss in pressure during the fifteen (15) minute test period.

VI.3.e PURITY TESTING

1. Sampling

After acceptance of pressure testing, the Inspector will arrange for taking samples for bacterial tests.

2. Laboratory testing

The Inspector shall arrange with the District to perform the laboratory testing for purity, which normally takes 2 to 5 working days.

3. Unsatisfactory test results

Should the initial treatment result in an unsatisfactory bacterial test, the original chlorination and flushing procedure shall be repeated by the Contractor until satisfactory results are obtained. Failure to get a satisfactory result on the bacterial test shall be considered as a failure of the Contractor to keep the pipe clean during construction, or to properly chlorinate the main, and Contractor shall be required to clean, repair or replace the newly constructed main until a satisfactory test is achieved. Water required for retesting and flushing shall be paid for by the developer.

VI.3.f SITE CLEANUP

1. Schedule

Final cleanup work shall be completed as closely behind the construction work as it is physically possible to do so.

2. Materials disposal

All excess material, rocks, logs, etc., shall be disposed of by the Contractor to the satisfaction of the Inspector. No debris shall be disposed of by dumping on private property without permission.

3. Drainage ditches

Drainage ditches affected by the construction operation shall be left in as good or better condition than what existed prior to beginning work.

4. Cleanup Completion

Upon completion of all cleanup work, the entire site shall have a neat and workmanlike appearance.

VI.3.g OPERATIONAL TEST

After the Extension has been disinfected, passed the hydrostatic test and before final acceptance, the entire system shall be operated by the Contractor at normal pressure for a period of not less than ten (10) days. Any leaks or defects discovered in the system shall be repaired and the operational test continued until the system is satisfactory to the Inspector. Contractor shall verify that all service lines are active prior to final acceptance. No provision of this section shall be construed as waiving any provision of the Contractor's guarantee.

SECTION VI.4. WATERWORKS CONSTRUCTION STANDARD DETAILS PROVIDED ON PLANS

Please refer to the project plans for Standard Details.

SAMPLE
CONTRACT
SPECIFICATION

SECTION VI.5. MEASUREMENT AND PAYMENT

It is the intention of these specifications that the performance of all work under the bid for each item shall result in the complete construction of the improvements identified in the Contract Documents.

Work and material not specifically listed in the proposal, but required according to the contract plans, specifications, and general practice shall be included in the contractor's bid price. No separate payment of any kind will be made for these incidental items.

Bid Items – 8 or 10" Ductile Iron Water Pipe Class 52 or Better

- A1

The respective price per lineal foot of pipe shall be full compensation for furnishing and installing water main pipe and fittings per plans and specifications **unless delineated separately herein.** The price may include but is not limited to the following: sawcutting, exposing other utitities as required, excavation, pipe bedding, all necessary fittings, temporary and permanent thrust and deadman blocking, all material and labor required for repair of cement concrete driveways, temporary erosion and sedimentation control, placement and compaction of backfill material, disposal of displaced material, compaction, mud and dust control, temporary asphalt patch installation and maintenance, pipe sterilization, dechlorination, pipe flushing, testing, and clean up. Length shall be measured from center of fitting to center of fitting. Payment shall be based upon the length of water main installed.
Pipe required for Fire Hydrants Assemblies, Water Services, and Connection to Existing Water Mains shall be incidental to those bid items and not paid on a per foot basis.

Bid Items HDPE Pipe 2" (200 PSI Class), IPS install by *open trench or directional drilling*

- A2

The respective price per lineal foot of pipe shall be full compensation for furnishing and installing water main and fittings per plans and specifications **unless delineated separately herein.** The price may include but is not limited to the following: sawcutting, exposing other utitities as required, excavation, pipe bedding, all necessary fittings, **fusion of pipe joint and fittings by approved methods**, all material and labor required for repair of cement concrete driveways, temporary erosion and sedimentation control, placement and compaction of backfill material, disposal of displaced material, compaction, mud and dust control, temporary asphalt patch installation and maintenance, pipe sterilization, dechlorination, pipe flushing, testing, and clean up. Length shall be measured from center of fitting to center of fitting. Payment shall be based upon the length of water main installed.
Pipe required for Fire Hydrants Assemblies, Water Services, and Connection to Existing Water Mains shall be incidental to those bid items and not paid on a per foot basis.

Bid Items – Water Services (1-Inch HDPE)

- A3
- A4

The unit price per each shall be full compensation for furnishing and installing the either an open-cut or bored water service assembly per plans and specifications. The price shall include but not limited to the excavation, fittings, adapters, locating wire, backfill, compaction, coordination with District for final

connection, flushing and testing. Payment per each shall be based upon the number of open-cut water services installed.

Bid Items - Fire Hydrants Complete Assembly

- A5

The unit price bid for each hydrant assembly shall constitute complete compensation for all labor, equipment and materials required for the assembly complete in place, including excavation, backfill, compaction, the fire hydrant painted after installation, auxiliary gate valve, cast iron valve box, valve operating nut extension, Megalug retainer glands, Storz fitting, bolts and gaskets, concrete thrust block, a minimum of ten (10) cubic feet of washed gravel and the necessary 8 mil visqueen to cover the gravel drain pocket prior to backfilling. This item shall also include the cost of leveling, grading and compacting an area of at least three (5) feet in radius around the hydrant, 8 foot wide gravel access from shoulder to hydrant, including 12-Inch LCPE culvert pipe if necessary, 3-inch thick concrete pad, bollards, and rockery where indicated on plans. Bid item includes bagging all hydrants which are not in service and Hye-lite pavement marker.

Bid Items - Locate and Connect to Existing pipe

- A6

The price per each shall be full compensation for the connection of the new water main facility to the existing facility per plans and specifications. The price shall include temporary blow offs, back flow prevention apparatus, spools, valves, pipe, fittings, temporary and permanent thrust restraints, temporary domestic demand water supply to existing system, removal of existing improvements, special handling and disposal of asbestos cement pipe if required, excavation, backfill and compaction. Payment shall be per each based upon connections completed.

Bid Items - Air Release Vacuum/Vent Assembly 2" (per detail)

- A7

The price Lump Sum shall be full compensation for furnishing and installing the fitting assembly per standard detail described in the plans and specifications. The price shall include but not limited to the fitting and appurtenances, sawcutting, excavation, disposal of displaced material, pipe bedding, backfill, temporary asphalt patch installation and maintenance, compaction, mud and dust control, testing and cleanup. Payment shall be based upon the number of assemblies installed..

Bid Items - Tee, Bend and other Fittings

- A8 – A12, A18 – A22

The respective unit price per each shall be full compensation for furnishing and installing the fitting assembly per plans and specifications. The price shall include but not limited to the fitting and appurtenances, sawcutting, excavation, disposal of displaced material, pipe bedding, backfill, temporary asphalt patch installation and maintenance, compaction, mud and dust control, testing and cleanup. Payment shall be based upon the number of fittings installed.

Bid Items - Gate Valves

- A13-A17

The respective unit price per each shall be full compensation for furnishing and installing the gate valve assembly per plans and specifications. The price shall include but not limited to the valve, valve box nut extension, valve marker and appurtenances, sawcutting, excavation, disposal of displaced material, pipe

bedding, backfill, temporary asphalt patch installation and maintenance, compaction, mud and dust control, testing and cleanup. Payment shall be based upon the number of gate valves installed.

Bid Items - Tracer Wire

- A23

The unit price per lineal foot shall cover the cost of installing 12 or 14 ga tracer wire measured from valve to valve with risers at valve boxes included incidental to the cost of the tracer wire. The unit price shall also include approved, sealed electrical splice connections as required.

Bid Items - CDF Controlled Density Fill

- A24

The Unit Price per Cubic Yard shall cover the cost of supply and placement in accordance with City of Lake Forest Park standards for CDF and in accordance with Lake Forest Park Water District plans and specifications.

Bid Items - Disinfect and Pressure Test

- A25

The unit bid for disinfecting and pressure testing of the water main and appurtenances in accordance with the drawings and specifications shall include disinfecting materials and testing appurtenances and temporary connections as required. The District will provide chlorine neutralizer (Ascorbic Acid)for disinfection of water.

Bid Items – Remove and dispose existing pipe where directed

- A26

The unit bid per foot shall constitute complete compensation for furnishing all labor, material and equipment necessary to remove and dispose of existing pipe as directed. The price shall include excavation, removal of the existing pipe and. valves necessary to make the connections of the new system to the existing, removal of existing fire hydrants, valve box tops, closing hydrant and branch valves, plugging or capping the existing water main, special handling and disposal of asbestos cement pipe (if any), backfill, restoration of existing improvements, cleaning and delivery to the Owner all salvageable valves and fire hydrants and any other items not covered in the other bid items. Partial payment for this item will be made based upon work completed as determined by the Owner.

Bid Items – Temporary Asphalt Patch

- A27

The unit bid per square foot of temporary asphalt patch, shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in the placement of a temporary patch over excavated areas.

Bid Item - Class B Asphalt Patch (thickness as designated)

- A28

The unit bid per ton shall constitute complete compensation for furnishing all labor, material and equipment necessary to install a minimum of 4" Class B asphalt patch as shown on the plans or as directed by the Owner/Engineer. Included shall be the cost of removing temporary cold-mix patch, adjusting all structures to grade, scarifying and removing the existing surface and trimming the edges of the existing pavement to neat lines. Contractor shall also provide the Inspector or Engineer copies of the truck haul tickets for their records.

Bid Items - Gravel Backfill for pipe bedding/cover

- A29

The unit price shown per ton shall be full compensation for furnishing select backfill in accordance with the plans and specifications. Payment shall be per ton of gravel backfill in place on actual truck weight tickets. The minimum price per ton shall be $5.00.

Bid Items - Crushed Surfacing for surface restoration

- A30

The unit price per ton shall be full compensation for furnishing and placing 5/8" crushed rock shoulder gravel base per plans and specifications. The price shall include, all necessary grading of based, installation and compaction of the crushed rock. Payment shall be per ton of crushed rock in place on actual truck weight tickets.

Bid Items – Remove and dispose existing trees

- A31

The Lump Sum Price (LS) shall be full compensation for safe cutting, removal and disposal of all tree or trees that must be removed in performance of the construction work. Price shall also include any necessary permits required for removal of tree(s).

Bid Items – Temporarily re-locate mailbox or sign in corridor of proposed pipeline and replace in original condition.

- A32

The unit price is for each mailbox, or sign that requires relocation (or mailbox assembly in the case of mailbox clusters). The item shall include the relocating of existing mailbox or sign in the project corridor that will be impacted by the construction activities. Includes temporary relocation as directed during construction, and permanent placement in original location after construction is complete. This activity shall be guided by rules of the City of Lake Forest Park and the US Postal Service.

Bid Items - Hydro Excavation to Expose Underground Utilities as required

- A33

The unit price per Lineal Foot (LF) shall be full compensation for locating and exposing existing underground utilities by non destructive hydro-excavation "Vactor Truck", and shall include all associated costs, including disposal. This item shall only apply in areas indicated on plans and as otherwise approved by the Engineer.

Bid Item - Sawcut Asphalt

The unit price per Lineal Foot (LF) shall be full compensation for saw cut of asphaltic concrete or cement portland cement concrete as defined in the plans and specifications. No additional compensation is made regarding thickness of asphalt concrete pavement.

- A34

Bid Item - Mobilize/Demobilize

- B1

The lump sum price shall cover the complete cost of providing, furnishing, and installing all work and materials necessary to move or organize equipment and personnel onto and off of the site, provide and maintain support facilities, obtain all necessary permits, licenses, and bonds. **Lump sum not to exceed 6% of total bid**.

Bid Item - Redline "As-Built" Drawings

- B2

Lump sum price shown shall cover the complete cost of providing all mark-up drawings necessary for the Owner to create accurate as-built records as detailed in the specifications. The work includes surveying all structures and utilities to determine their as-constructed locations and elevations. The price for this work will be as specified in the schedule of prices. Failure to comply with the as-built requirements and furnish acceptable as-built records will result in the deletion of this bid item by change order. Payment for this work will not be made prior to the final payment. Payment shall be lump sum.

Bid Item - Main Repair During Construction

- B3

The unit price shall include all materials and labor for temporary leak repair of each leak in existing steel main that occurs during construction IF that leak did not result from needless impact by Contractor during excavation or other activity as determined by the Engineer.

Bid Item - Temporary Erosion and Sediment Control

- B4

The lump sum (LS) price shall constitute complete compensation for furnishing all labor, materials, and equipment necessary to install the filter fence, straw bales, straw wattle dams, Visqueen, hydroseeding, street cleaning, dust control and other temporary erosion and sedimentation control measures as required by King County and other agencies.

Bid Item - Trench Excavation Safety System if required

- B5

The lump sum (LS) price bid for this item shall be full compensation for providing safe trench environment, in compliance with Washington Industrial Safety Standards for Construction Work (Chapter 296-155 WAC), General Safety and Health Standard (Chapter 296-24 WAC), General Occupational Health Standard (Chapter 296-22 WAC), and any other appropriate safety and health codes.

Bid Item – Abandon Existing Watermain & Valves

- B6

The Lump Sum (LS) price shall constitute complete compensation for furnishing all labor, materials and equipment necessary to properly abandon existing watermain and valves in accordance with standard proceedure.

Bid Item – Restore Pavement Markings all areas of project

- B7

The Lump Sum price shall include all materials and labor for restoring pavement markings in accordance with requirements of the City of Lake Forest Park.

Bid Item – Proctor Density Backfill Compaction Test

- B8

The item price shall include all labor and professional services for collection of sample, submission to approved soils testing laboratory and analysis.

SAMPLE
CONTRACT
SPECIFICATION

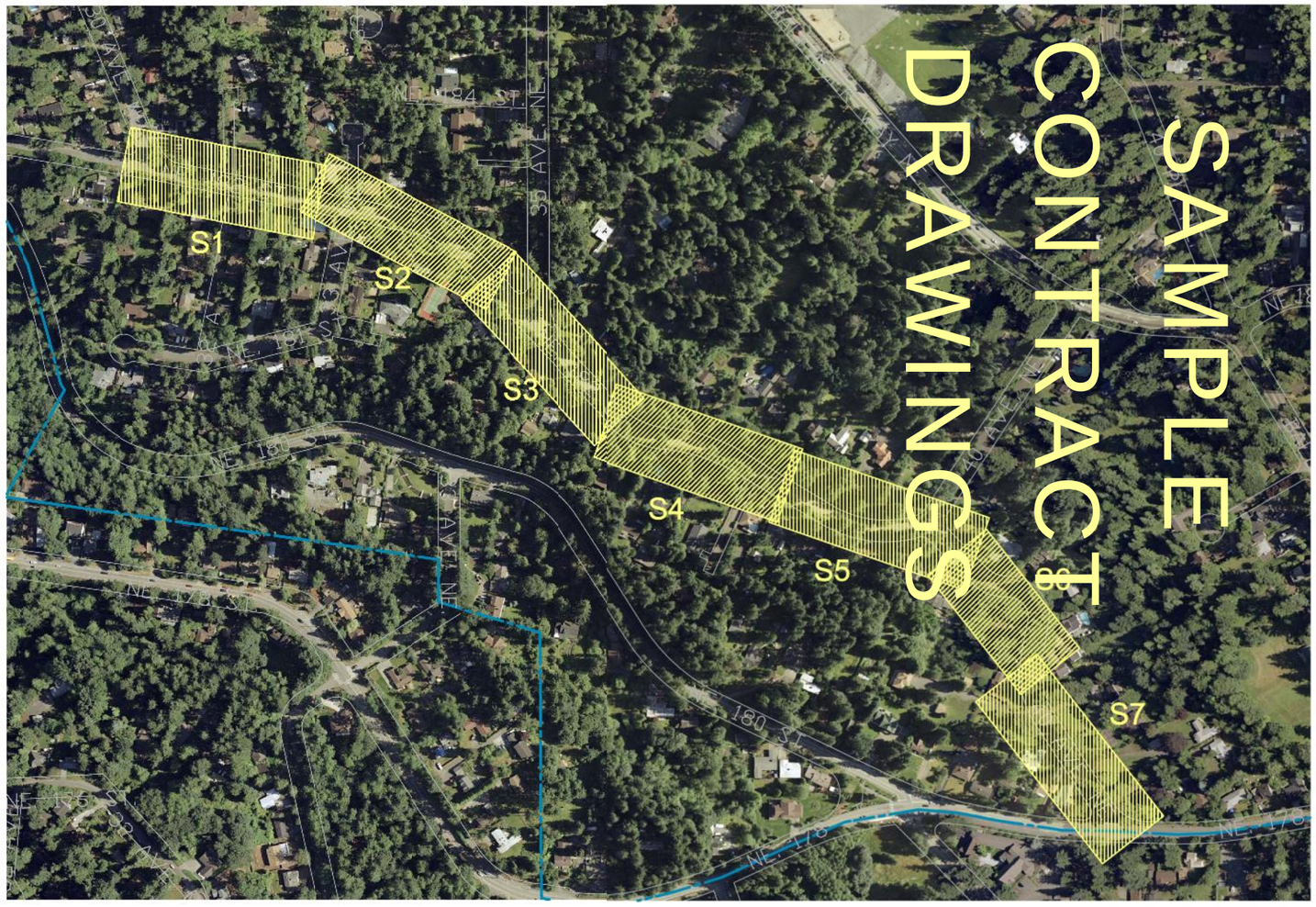
LAKE FOREST PARK WATER DISTRICT
WATER SYSTEM IMPROVEMENTS

PHASE V - 182nd (178th to 30th Ave. NE)

LAKE FOREST PARK WATER DISTRICT

GOOD WATER NATURALLY

7-B Contract Specifications



INDEX TO DRAWINGS

182nd-CP	AREA MAP, VICINITY MAP & INDEX TO DRAWINGS
182nd-S1	182nd - 30th Ave. NE to 3300 NE 182nd
182nd-S2	182nd - 33rd Ave. NE to 3356 NE 182nd
182nd-S3	182nd - 35th Ave. NE to 3530 NE 182nd
182nd-S4	182nd - 3534 NE 182nd to 3574 NE 182nd
182nd-S5	182nd - 3590 NE 182nd to 18208 40th Ave. NE
182nd-S6	182nd - 17890 40th Ave. NE to 17856 40th Ave. NE
182nd-S7	182nd - 17846 40th Ave. NE to 17804 40th Ave. NE
182nd-DT1	CONSTRUCTION DETAILS 1
182nd-DT2	TRAFFIC DETAILS

CONTACT PERSONNEL

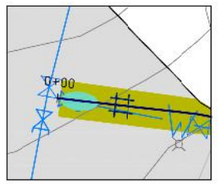
NAME	AGENCY	PHONE
ALAN KERLEY	LAKE FOREST PARK WATER DISTRICT 4029 NE 178TH ST. LFP, WA 98155	206-365-3211 cell 425-471-5307
DAN MUNDALL	MUNDALL ENGINEERING	800-313-9705 cell 360-319-1285
FRANK ZENK	CITY OF LAKE FOREST PARK	206-368-5440
SANDRA SIMMONS	QWEST ENGINEER	206 345 5055
24-HR REPAIR	AT&T CABLE	877-824-2288
24-HR REPAIR	PUGET SOUND ENERGY	888-225-5773
DENIS DEVRIES	SEATTLE CITY LIGHT	206-625-3000

DISTRICT BOUNDARY

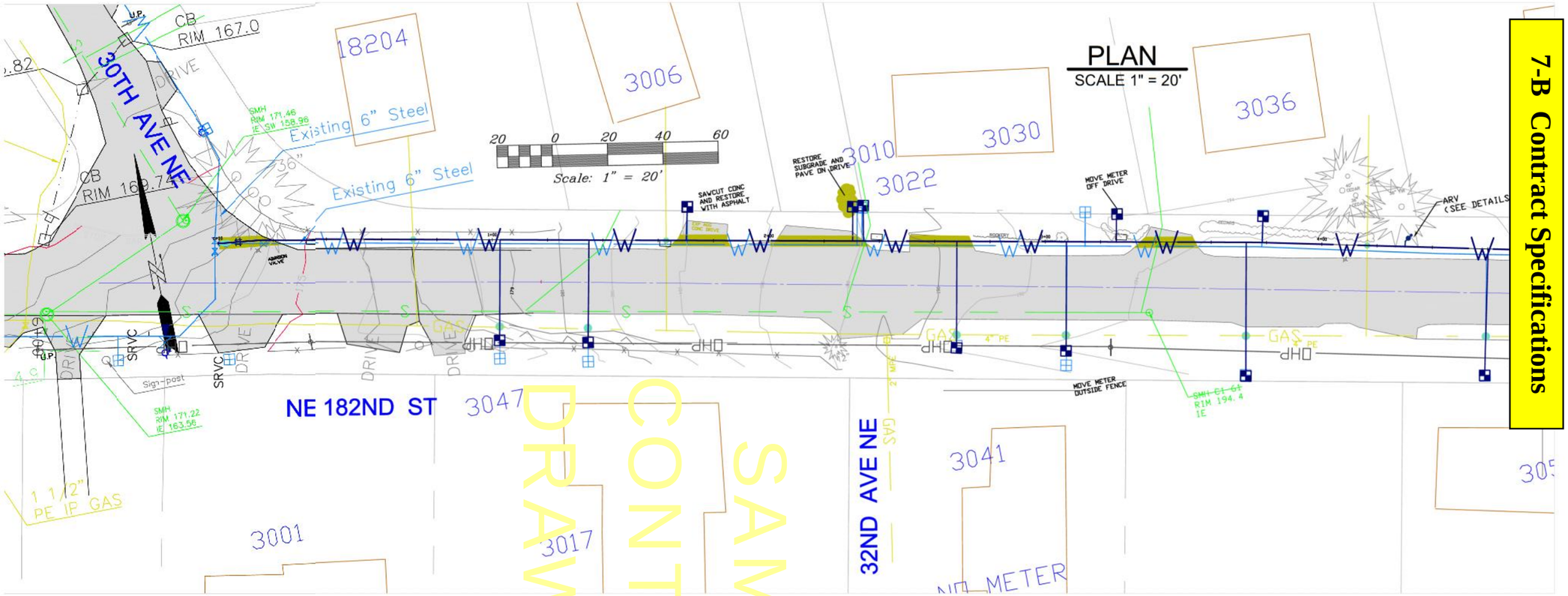
CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555

MUNDALL ENGINEERING & CONSULTING
P.O. Box 799, Sumas Washington 98295 — Bus. (250)-855-0265, FAX (250)-855-2276
P.O. Box 56, Lytton, B.C. V0K 1Z0 — Cellular (360)-319-1285, E-Mail Engr@Mundall.com, (800)-313-9705
WATER RESOURCES WASTEWATER CIVIL AGRICULTURAL

JOB NO.	M109-001
DRAWING NO.	182nd-CP
SHEET	CP . 10
OF	



DETAIL STA 0+00
TIE INTO EXISTING 8" DI VALVE
1 - 8" ROMAC STYLE COUPLING





7-B Contract Specifications

KEY

- GAS VALVE
- CATCH BASIN
- FIRE HYDRANT
- MAILBOX
- SAN SEWER MANHOLE
- EXISTING VALVE
- PROPOSED WATER METER
- EXISTING WATER METER
- UTILITY POLE
- STREET SIGN
- PARCELS
- EXISTING WATER
- PROPOSED WATER
- EXISTING SAN. SEWER
- EXISTING GAS
- EXISTING COM. CABLE
- FENCELINE
- EXISTING STORM DRAIN
- DISTRICT BOUNDARY
- OVERHEAD POWERLINES
- ASPHALT PAVEMENT
- CONCRETE PAVEMENT
- ASPHALT PATCH
- POTHOLE AND EXPOSE BY HYDRO-EXCAVATION

CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555

SAMPLE CONTRACT DRAWINGS

REVISIONS	GENERAL NOTES
FEBRUARY 26, 2010 - TENDER ISSUE FEBRUARY 25, 2010 - PERMIT ISSUE DECEMBER 9, 2009 - DRAFT	DATUM: Control Data from King County Survey Control Points #127, 117 (HPGN-IIARN) VERTICAL DATUM: Elevations are NAVD88, conversion factor for data imported from NGVD29 = +3.57'

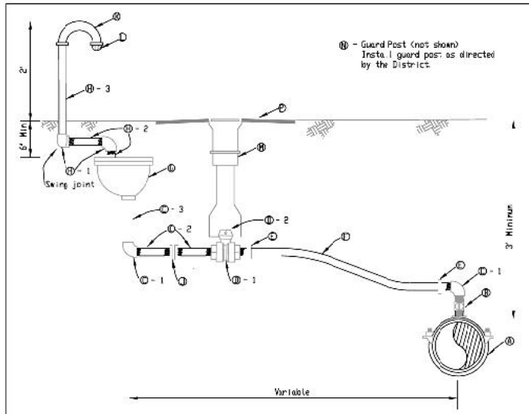
DESIGNED BY	DM
DRAWN BY	SM
CHECKED BY	DM
APPROVED BY	
DATE PRINTED	2-26-10
SCALE	1"=20' H 1"=8' V
F.B. NO.	

MUNDALL ENGINEERING & CONSULTING
P.O. Box 799, Sumas Washington 98295 — P.O. Box 50, Lytton, B.C. V0K 1Z0
Bus. (250)-455-0085 FAX (250)-455-2276 Cellular (360)-319-1286 E-Mail Don@Mundall.com (800)-313-9705

LAKE FOREST PARK WATER DISTRICT
GOOD WATER NATURALLY

LAKE FOREST PARK WATER DISTRICT
INTERMEDIATE ZONE IMPROVEMENTS
PHASE V
182nd Street

JOB NO.	M109-001
DRAWING NO.	182nd-S1
SHEET	2 OF 10



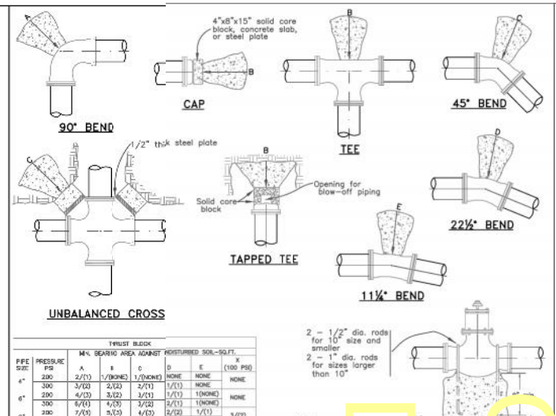
BIL OF MATERIALS

MARK	QUANTITY	DESCRIPTION
Ⓐ	1	Single Strap Saddle, Romac 101S or Equal with AWWA taper tap
Ⓑ	1	1" Corporation Stop, AWWA inlet MIP
Ⓒ - 1	2	1" x 90° Brass Elbow
Ⓓ - 2	2	1" Brass Nipple
Ⓓ - 3	1	1" Brass Pipe
Ⓔ - 1	1	1" Ball Valve
Ⓔ - 2	1	Operating Nut
Ⓕ	2	1" MIP x Pack Joint Adaptor
Ⓖ	1	1" MI-Mol Pipe
Ⓗ	1	1" Air and Vacuum Valve, screwed, APCI No. 143C or equal
Ⓘ - 1	2	1" x 90° GIP Elbow
Ⓙ - 2	2	1" GIP nipples
Ⓚ - 3	1	1" GIP
Ⓛ	1	1" Brass Unior
Ⓜ	1	1" Return Bend, open pattern
Ⓝ	1	1" Beehive Strainer
Ⓞ	1	18"x24" Valve Box, Seattle Std. or APWA #67
Ⓟ	2	Standard 9" Concrete Guard Posts (see Hydrant Guard Post Detail)
Ⓠ	1	2'x2' Asphalt Pad

1" AIR & VACUUM RELEASE VALVE ASSEMBLY

NO SCALE

Rev. 7/85 – SBO
WCEAIR1.DWG



NOTE
Additional blocking must be provided if gate valve is at end of line during test.

THRUST BLOCK

PIPE SIZE	PRESSURE PSI	MIN. BEARING AREA AGAINST UNDISTURBED SOIL–SQ.FT. A	B	C	D	E	X (100 PSI)
		2/(1)	1/(NONE)	1/(NONE)	NONE	NONE	NONE
4"	200	3/(2)	2/(2)	2/(1)	1/(1)	NONE	
	200	4/(3)	3/(2)	3/(1)	1/(1)	1/(NONE)	NONE
6"	200	6/(5)	4/(3)	3/(2)	2/(1)	1/(1)	
	200	7/(5)	5/(3)	4/(3)	2/(2)	1/(1)	3/(2)
8"	200	11/(7)	8/(5)	6/(4)	3/(2)	2/(1)	
	200	11/(8)	8/(6)	5/(4)	3/(2)	2/(1)	4/(3)
10"	275	16/(11)	11/(7)	8/(6)	5/(3)	3/(2)	
	200	18/(11)	11/(8)	9/(6)	5/(3)	3/(2)	5/(4)
12"	250	24/(16)	17/(11)	13/(9)	7/(5)	4/(3)	
	200	22/(13)	16/(11)	12/(8)	6/(4)	3/(2)	
14"	250	33/(22)	23/(16)	18/(12)	9/(6)	5/(3)	7/(6)
	200	29/(19)	21/(14)	16/(11)	8/(5)	5/(3)	10/(7)
16"	225	33/(16)	23/(16)	17/(12)	8/(6)	5/(3)	
	200	36/(24)	26/(17)	20/(13)	10/(7)	6/(4)	13/(9)
18"	200	45/(29)	32/(21)	24/(15)	13/(8)	7/(4)	16/(11)
20"	200	64/(43)	46/(30)	35/(23)	18/(12)	9/(6)	23/(16)
24"	200						

NOTE
1. Square feet of concrete thrust - block area based on safe bearing load of 2000/(3000) pounds per square feet.
2. Areas must be adjusted for other size pipe, pressures and soil conditions.
3. Concrete blocking shall be cast in place and have a minimum of 1/2 square foot bearing against the fitting.
4. Block shall bear against fittings only and shall be clear of joints to permit taking up or dismantling joint.
5. Contractor shall install blocking adequate to withstand full test pressure as well as to continuously withstand operating pressure under all conditions of service.

SAFE BEARING LOADS IN LBS./SQ. FT.

The safe bearing loads given in the following table are for undisturbed soil at depths when the depth of cover over the pipe is 2 feet.

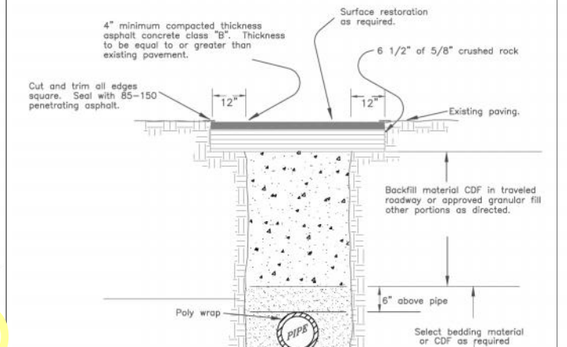
SOIL	SAFE BEARING LOAD LBS./SQ. FT.
*Muck, peat, etc.	0
Soft clay	1,000
Sand	2,000
Sand and gravel	3,0
Sand and gravel cemented with clay	4,000
Hard shale	10,000

*In muck, peat, all thrusts shall be restrained by piles or tie rods to solid foundations or by removal of muck or replacement with ballast of sufficient density to resist thrusts.

CONCRETE BLOCKING

NO SCALE

Rev. June 2002



NOTE
Minimum trench width shall be the pipe O.D. + 12" (6" each side of pipe)

Maximum trench width:
12" diameter and smaller: 40"
18" diameter and larger: 1–1/2 x I.D. + 18"

RIGID PIPE
TYPICAL TRENCH SECTION

NO SCALE

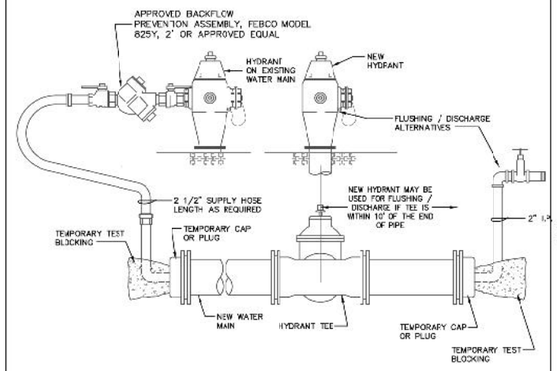
Rev. 6/03
Trench Section.dwg

NOTES:

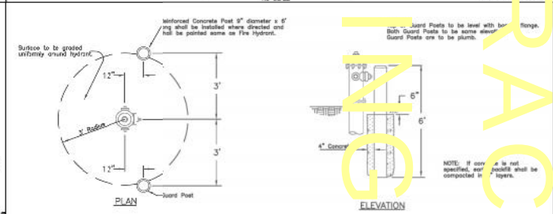
NEW SECTIONS OF WATER MAIN THAT ARE INSTALLED WHEN EXPANDING A DISTRIBUTION SYSTEM MUST BE SEPARATED FROM THE EXISTING SYSTEM. UNTIL SATISFACTORY FLUSHING, DISINFECTION AND BACTERIOLOGICAL SAMPLING HAS BEEN COMPLETED, THE NEW WATER MAIN MUST BE CONSIDERED CONTAMINATED. IN ADDITION, THE CHLORINE CONCENTRATION USED FOR DISINFECTION PROCEDURES (MINIMUM 25 mg/l) MAKES WATER NON-POTABLE.

AN APPROVED BACKFLOW PREVENTON ASSEMBLY MUST BE USED ON THE SUPPLYING WATER LINE WHEN FILLING THE NEW WATER MAIN DURING DISINFECTION AND FLUSHING. THE BACKFLOW PREVENTION ASSEMBLY AND SUPPLY PIPING MUST BE REMOVED DURING HYDROSTATIC PRESSURE TESTING OF THE NEW WATER MAIN.

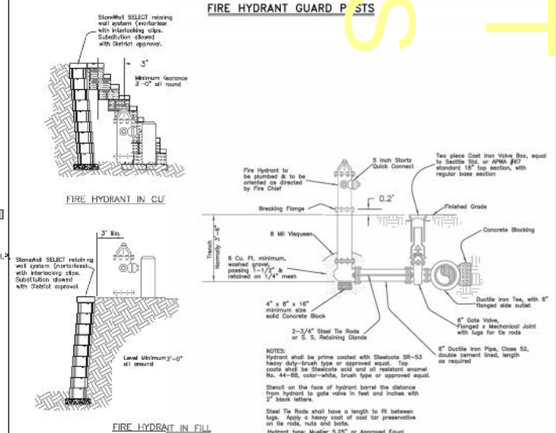
AFTER SATISFACTORY BACTERIOLOGICAL SAMPLE RESULTS ARE OBTAINED FROM THE NEW WATER MAIN, SECTIONS OF CONNECTING PIPE MUST BE INSTALLED BETWEEN IT AND THE EXISTING SYSTEM. BEFORE INSTALLATION, THE INTERIORS OF ALL PIPE AND FITTINGS USED TO MAKE THE CONNECTION MUST BE SWABBED OR SPRAYED WITH A 1% AVAILABLE CHLORINE SOLUTION.



WATER MAIN FILLING DETAIL



FIRE HYDRANT GUARD POSTS



FIRE HYDRANT LOCATION IN CUT OR FILL

FIRE HYDRANT ASSEMBLY

STANDARD FIRE HYDRANT DETAIL

NO SCALE

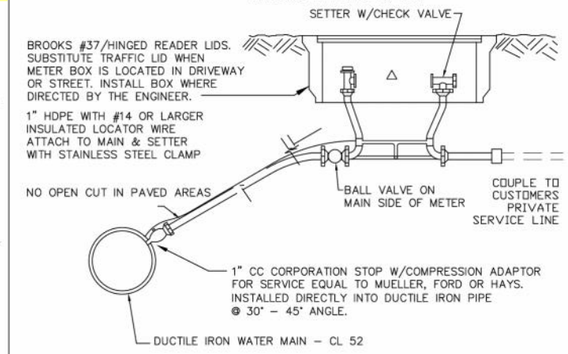
Rev. 1/10/01 DLM
FIRE HYDRANT ASSEMBLY.DWG

1" SERVICE LINE TO BE DRISCO D2239 SDR 7 200 PSI POLYPIPE
1" COPPER WATER EQUAL TO MUELLER, FORD, MCDONALD, OR HAYS, EQUIPPED AS FOLLOWS.

- PADLOCK WINGS ON BALL VALVE
- ANGLE CHECK ON METER OUTLET
- IRON PIPE CONNECTIONS ON SETTER INLET
- COMPRESSION ADAPTOR ON SETTER INLET AND OUTLET
- INSTALL TYPE K COPPER AND MISC. BRASS FITTINGS FOR CONNECTION TO CUSTOMER'S LINE

HEIGHT OF SETTER CAN VARY BETWEEN 9" AND 15"

COPPER SETTER SHALL BE SET LEVEL AND CENTERED IN THE METER BOX.



METER BOX SHALL BE INSTALLED FLUSH W/FINAL GRADE AND MUST BE SIZED TO ALLOW FOR MIN. CLEARANCE REQUIREMENTS.

1" – SINGLE WATER SERVICE DETAIL

NO SCALE

Rev. 6/03
Service, One inch.dwg

CONSTRUCTION NOTES

GENERAL NOTES:

1. THE CONTRACTOR SHALL SCHEDULE A PRE-CONSTRUCTION MEETING WITH LAKE FOREST PARK WATER DISTRICT.
2. A COMPLETE SET OF PLANS SHALL BE MAINTAINED BY THE CONTRACTOR DURING CONSTRUCTION, AND SHALL REFLECT ANY VARIATION IN CONSTRUCTION FROM THE PLANS. THESE "AS-BUILT" PLANS SHALL BE PROVIDED TO THE DISTRICT AT THE COMPLETION OF CONSTRUCTION.
3. THE CONTRACTOR SHALL COORDINATE HIS CONSTRUCTION ACTIVITIES WITH THE PERTINENT UTILITY COMPANIES TO ENSURE WATER METERS, TELEPHONE VAULTS, ETC., ARE BROUGHT TO GRADE PRIOR TO CONSTRUCTION OF CURB AND SIDEWALKS.
4. THE CONTRACTOR WILL BE FULLY RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL EXISTING UTILITIES. THE UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE AND WILL NEED FIELD VERIFICATION FOR EXACT ALIGNMENT AND DEPTH. THERE MAY BE EXISTING UTILITIES NOT SHOWN ON THE PLANS.
5. CONTRACTOR SHALL COORDINATE CONSTRUCTION WITH SEATTLE CITY POWER & LIGHT FOR UTILITY POLE STABILIZATION IF REQUIRED.
6. ALL EXCAVATION METHODS AND SHORING TECHNIQUES SHALL BE IN ACCORDANCE WITH WAC 296 TRENCH EXCAVATION SAFETY SYSTEMS.
7. THE DISTRICT SHALL AT ALL TIMES HAVE ACCESS TO THE WORK AND TO THE LOCATIONS WHERE THE WORK IS IN PREPARATION.
8. THE CONTRACTOR SHALL NOTIFY ONE CALL UTILITY LOCATING SERVICE PRIOR TO ANY CONSTRUCTION TO VERIFY LOCATION OF EXISTING UTILITIES, AT (800) 424-5555.

WATER NOTES:

1. ALL WORK, MATERIALS, CONCRETE BLOCKING AND TESTING OF WATER LINES SHALL CONFORM LAKE FOREST PARK WATER DISTRICT STANDARD DETAILS AND THE AMERICAN WATERWORKS ASSOCIATION (AWWA) SPECIFICATIONS.
2. THE WATER MAIN SHALL BE INSTALLED WITH MINIMUM OF 36 INCHES OF COVER (10-INCH PIPE AND SMALLER) AND 48 INCHES COVER (12-INCH PIPE OR LARGER), AS MEASURED FROM THE TOP OF THE PIPE TO FINISHED GRADE, UNLESS OTHERWISE APPROVED. WHERE UTILITY CONFLICTS OCCUR, THE WATER MAIN SHALL BE LOWERED TO CLEAR AS APPROVED BY THE DISTRICT. THIS INFORMATION SHALL BE REFLECTED ON THE "AS-BUILT" RECORD BY CONTRACTOR.
3. EXACT LOCATIONS AND CONFIGURATION OF WATER METERS AND VAULTS SHALL BE APPROVED BY THE DISTRICT PRIOR TO CONSTRUCTION.
4. BEDDING FOR WATER MAINS SHALL BE PROVIDED AS REQUIRED IN THE STANDARD DETAIL AND SPECIFICATIONS.
5. ALL SERVICE CONNECTIONS SHALL BE MADE IN ACCORDANCE WITH LAKE FOREST PARK WATER DISTRICT REQUIREMENTS.
6. ALL FIRE HYDRANTS SHALL BE INSTALLED, INSPECTED AND ADJUSTED IN ACCORDANCE WITH THE DISTRICT'S STANDARD DETAILS.
7. AFTER THE PIPE AND APPURTENANCES ARE IN PLACE AND THE SYSTEM HAS BEEN SATISFACTORILY PRESSURE TESTED, IT SHALL BE FLUSHED WITH WATER OF SUFFICIENT VELOCITY TO REMOVE ALL DIRT AND OTHER FOREIGN MATERIALS AND DISINFECTED/CHLORINATED IN ACCORDANCE WITH RECOMMENDED AWWA STANDARDS. THE CONTRACTOR SHALL REQUEST A BACTERIOLOGICAL SAMPLE TO BE TAKEN AT LEAST 24 HOURS AFTER FLUSHING AND DISINFECTING.
8. DUCTILE IRON PIPE SHALL CONFORM TO AWWA C-151 WITH A STANDARD THICKNESS CLASS 52. FITTINGS FOR D.I. PIPE SHALL BE DUCTILE IRON OR CLASS 250 GRAY IRON CONFORMING TO AWWA C-110.
9. PRIOR TO BACKFILLING, ALL MAINS AND APPURTENANCES SHALL BE INSPECTED AND APPROVED FOR BACKFILLING BY THE DISTRICT.
9. PRIOR TO BACKFILLING, ALL MAINS AND APPURTENANCES SHALL BE INSPECTED AND APPROVED FOR BACKFILLING BY THE DISTRICT.
10. NO CONNECTIONS TO THE EXISTING WATER SYSTEM SHALL BE MADE WITHOUT AN APPROVED BACKFLOW PREVENTION DEVICE AND THE DISTRICT'S APPROVAL. PERMANENT CONNECTION SHALL NOT BE MADE UNTIL NEW MAINS HAVE BEEN DISINFECTED, FLUSHED AND HAVE PURITY IN ACCORDANCE WITH DISTRICT REQUIREMENTS. ANY CONNECTION TO THE EXISTING WATER SYSTEM SHALL BE WITNESSED BY THE DISTRICT INSPECTOR.
11. ALL THRUST BLOCKS SHALL BE FORMED IN PLACE. BLOCKS SHALL NOT BE BACKFILLED PRIOR TO SPECIFIC APPROVAL OF THE DISTRICT AND THE FIRST AGES OF THE CONCRETE CURING PROCESS ARE EVIDENT.
12. WATER PIPE ABANDONMENT:
    - REMOVE WHERE DIRECTED AND SALVAGE TO DISTRICT
    - OPEN ALL MAIN VALVES AND CAP ENDS OF PIPE
    - REMOVE VALVE BOX TOPS AND RESTORE SURFACE

TEMPORARY EROSION AND STORM CONTROL (TESC):

1. CONTRACTOR SHALL HAVE EROSION CONTROL MEASURES IN PLACE BEFORE BEGINNING CONSTRUCTION
2. ALL RELEASES OF PETROLEUM PRODUCTS, PAINTS, SOLVENTS, AND OTHER DELETERIOUS MATERIALS MUST BE PROMPTLY CONTAINED AND REMOVED IN A MANNER THAT WILL PREVENT THEIR DISCHARGE TO WATERS AND SOILS. BARRELS, PETROPHILIC PADS, TARPS AND OTHER EQUIPMENT NECESSARY FOR SPILL RECOVERY AN DISPOSAL SHALL BE MAINTAINED BY CONTRACTOR ON-SITE.
3. DUST CONTROL SHALL BE PROVIDED BY CONTRACTOR AS DIRECTED BY THE ENGINEER
4. CONTRACTOR SHALL SECURE LOADS PER RCW 46.61.655

LANDSCAPING RESTORATION:

1. REPLACE ALL TREES, LANDSCAPING, AND IRRIGATION DAMAGED DURING CONSTRUCTION
2. PROVIDE HYDROSEED FOR ALL UNPAVED AND NON-GRAVEL AREAS DISTURBED DURING CONSTRUCTION

ROADWAY, SIDEWALK, CURB AND GUTTER RESTORATION:

1. SIDEWALK, CURB AND GUTTERS DISTURBED BY CONSTRUCTION SHALL BE REPLACED WITH NEW SECTIONS IN ACCORDANCE WITH THE CITY OF LAKE FOREST PARK RIGHT-OF-WAY PERMIT AND PER THE TECHNICAL SPECIFICATIONS OF THE CONTRACT
2. ROAD SHOULDERS DISTURBED DURING CONSTRUCTION SHALL BE RE-GRADED WITH 5/8-MINUS CRUSHED ROCK

TRAFFIC CONTROL:

1. CONTRACTOR SHALL SUBMIT A DETAILED TRAFFIC CONTROL PLAN TO THE CITY OF LAKE FOREST PARK FOR APPROVAL PRIOR TO CONSTRUCTION
2. TRAFFIC CONTROL DEVICES SHALL MEET THE *MANUAL OF UNIFORM TRAFFIC CONTROL* DEVICES STANDARDS. BARRICADES SHALL HAVE AMBER FLASHING LIGHTS THAT ARE USED AT NIGHT
3. CONTRACTOR SHALL PROVIDE EMERGENCY VEHICLE ACCESS TO ALL PROPERTIES ADJACENT TO THE PROJECT. CONTRACTOR SHALL NOTIFY THE CITY OF LFP OF ANY CHANGES TO THE TRAFFIC PLAN DURING CONSTRUCTION
4. WORK SHALL ALSO BE COORDINATED WITH LAKE FOREST PARK ELEMENTARY

CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555

7-B Contract Specifications

CONTRACT PLANS SAMPLE

REVISIONS	GENERAL NOTES
FEBRUARY 25, 2010	

DESIGNED BY	.
DRAWN BY	.
CHECKED BY	.
APPROVED BY	.
DATE PRINTED	2-25-10
SCALE	.
F.B. NO.	.

MUNDALL ENGINEERING & CONSULTING
P.O. Box 799, Sumas Washington 98295 — P.O. Box 50, Lytton, B.C. V0K 1Z0
Bus. (250)-455-0285 FAX (250)-455-2276
Cellular (360)-319-1285 E-Mail mundall@prynet.com (800)-313-9705
WATER RESOURCES WASTEWATER CIVIL AGRICULTURAL

LAKE FOREST PARK WATER DISTRICT
GOOD WATER NATURALLY

LAKE FOREST PARK WATER DISTRICT
WATER MAIN IMPROVEMENTS

CONSTUCTION DETAILS

JOB NO.	M109-001
DRAWING NO.	182nd-DT1
SHEET	9 OF 10

7-B Contract Specifications

BUFFER DATA										
BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	—
LENGTH (feet)	55	85	120	170	220	280	335	415	485	

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R			
VEHICLE TYPE	TYPICAL VEHICLE LOADED WEIGHT (LBS)	POSTED SPEED (mph)	STATIONARY OPERATION (feet)
4 YARD DUMP TRUCK	24,000	50-55	75
		45	50
2 TON CARGO TRUCK	15,000	50-55	100
		45	75
1 TON CARGO TRUCK	6,000	50-55	150
		45	100

ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT.

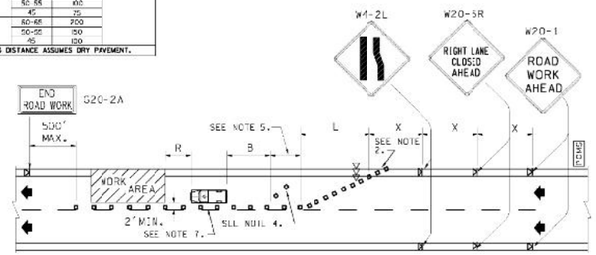
CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
50/55	40	80
35/40	30	60
25/30	20	40

MINIMUM TAPER LENGTH = L (FEET)										
LANE WIDTH (Feet)	Posted Speed (mph) 25	30	35	40	45	50	55	60	65	
10	105	150	205	270	450	500	550	-	-	
11	115	165	225	295	495	550	605	-	-	
12	125	180	245	320	540	600	660	-	-	

NOTES

1. EXTEND DEVICE TAPER ACROSS SHOULDER.
2. DEVICES SHOULD NOT ENCROACH INTO ADJACENT LANES.
3. INSTALL PORTABLE CHANGEABLE MESSAGE SIGN (WHEN SPECIFIED) APPROXIMATELY 1 MILE IN ADVANCE OF LANE CLOSURE.
4. USE TRANSVERSE DEVICES IN CLOSED LANE EVERY 1000' +-
5. TRAFFIC SAFETY DRUMS RECOMMENDED FOR HIGH SPEED ROADWAYS AND IN TAPER SECTIONS. USE (IN LIEU OF CONES).
6. ANALYZE THE TRAFFIC VOLUMES TO DETERMINE WORK HOURS TO MINIMIZE TRAFFIC IMPACTS.
7. A TEMPORARY RIGHT EDGE LINE IS REQUIRED FOR A LONG TERM CLOSURE.

SIGN SPACING = X (FEET)		
Rural Roads	45/55 MPH	500'+-
Urban Arterials & Rural Roads	35/40 MPH	350'+-
Rural Roads, Urban Streets Residential Areas & Business Districts	25/30 MPH	200'+-
All signs are black on orange unless otherwise designated.		



PCMS	
1	2
RIGHT LANE CLOSED	1 MILE AHEAD
.5 SEC	1.5 SEC

PORTABLE CHANGEABLE MESSAGE SIGN DISPLAYS

LEGEND

- SIGN LOCATION-TRIPOD MOUNTED
- SEQUENTIAL ARROW SIGN
- TEMPORARY TRAFFIC CONTROL DEVICES
- PROTECTIVE VEHICLE (WHEN SPECIFIED IN CONTRACT)
- PROTECTIVE VEHICLE WITH TRUCK MOUNTED ATTENUATOR (WHEN SPECIFIED IN CONTRACT FOR HIGH SPEED ROADWAYS)
- PCMS PORTABLE CHANGEABLE MESSAGE SIGN (WHEN SPECIFIED IN CONTRACT)

ALAN O. KING — STATE OF WASHINGTON — 15013 — REGISTERED PROFESSIONAL ENGINEER

EXPIRES NOVEMBER 23, 2003

RIGHT LANE CLOSURE FOR DIVIDED HIGHWAY

STANDARD PLAN K-6

SHEET 1 OF 1 SHEET

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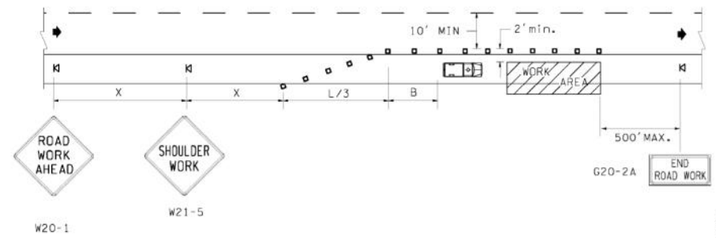
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BUFFER DATA										
BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45					
LENGTH (feet)	55	85	120	—	—					

CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
35	30	60
25/30	20	40

SIGN SPACING = X (FEET)		
Urban Arterials	35 MPH	350'+-
Urban Streets Residential Areas & Business Districts	25/30 MPH	200'+-
All signs are black on orange unless otherwise designated.		

MINIMUM TAPER LENGTH (L) IN FEET					
Lane Width (feet)	Posted Speed (mph) 25	30	35	40	
10	105	150	205	-	
11	115	165	225	-	
12	125	180	245	-	



LEGEND

- SIGN LOCATION-TRIPOD MOUNTED
- TEMPORARY TRAFFIC CONTROL DEVICES
- PROTECTIVE VEHICLE (WHEN SPECIFIED IN CONTRACT)

(35 MPH OR LESS)

ALAN O. KING — STATE OF WASHINGTON — 15013 — REGISTERED PROFESSIONAL ENGINEER

EXPIRES NOVEMBER 23, 2003

SHOULDER CLOSURE LOW SPEED

STANDARD PLAN K-10

SHEET 1 OF 1 SHEET

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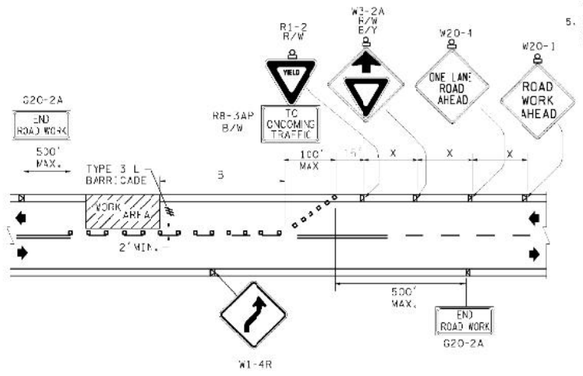
SIGN SPACING = X (FEET)		
Rural Roads	45/55 MPH	500'+-
Urban Arterials	35/40 MPH	350'+-
Urban Streets Residential Areas & Business Districts	25/30 MPH	200'+-
All signs are black on orange unless otherwise designated.		

CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
35/45	30	60
25/30	20	40

NOTES

1. EXTEND DEVICES TAPER ACROSS SHOULDER.
2. SIGN SEQUENCE IS THE SAME FOR BOTH DIRECTIONS OF TRAVEL ON THE HIGHWAY.
3. STEADY BURNING WARNING LIGHTS (TYPE C, MUTCD) SHALL BE USED TO MARK TRAFFIC CONTROL DEVICES AT NIGHT.
4. FOR USE WHEN TRAFFIC VOLUMES ARE SUCH THAT SUFFICIENT GAPS EXIST FOR MOTOR VEHICLES THAT MUST YIELD.
5. DRIVERS MUST HAVE ADEQUATE SIGHT DISTANCE TO SEE OPPOSING TRAFFIC AS THEY APPROACH, OTHERWISE FLAGGERS AND/OR TEMPORARY SIGNAL IS REQUIRED.

BUFFER DATA						
BUFFER SPACE = B						
SPEED (MPH)	25	30	35	40	45	
LENGTH (feet)	55	85	120	170	220	



LEGEND

- SIGN LOCATION - TRIPOD MOUNT
- TEMPORARY TRAFFIC CONTROL DEVICES
- FLASHING WARNING LIGHT
- TYPE 3L BARRICADE

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EXPIRES NOVEMBER 23, 2003

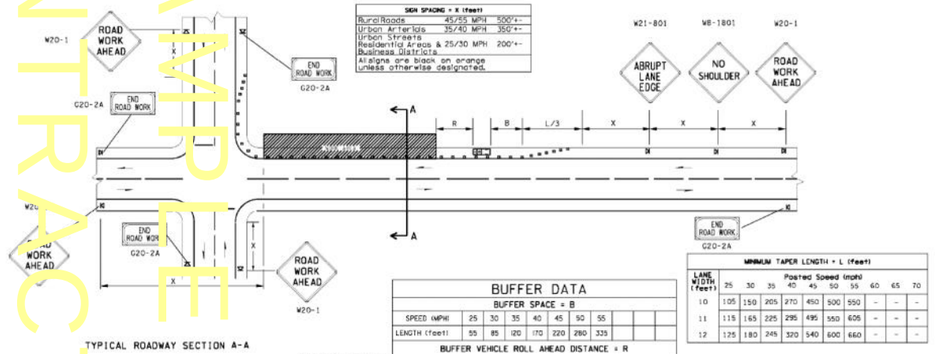
LANE CLOSURE ON LOW-VOLUME TWO-LANE ROAD WITHOUT FLAGGERS

STANDARD PLAN K-22

SHEET 1 OF 1 SHEET

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SIGN SPACING = X (feet)		
Rural Roads	45/55 MPH	500'+-
Urban Arterials	35/40 MPH	350'+-
Urban Streets Residential Areas & 25/30 MPH Business Districts		200'+-
All signs are black on orange unless otherwise designated.		

BUFFER DATA										
BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55			
LENGTH (feet)	55	85	120	170	220	280	335			

BUFFER VEHICLE ROLL AHEAD DISTANCE = R				
VEHICLE TYPE	TYPICAL VEHICLE LOADED WEIGHT (lbs)	POSTED SPEED (mph)	STATIONARY OPERATION (feet)	MOVING OPERATION (feet)
4 YARD DUMP TRUCK	24,000	50-55	75	
		45	50	
2 TON CARGO TRUCK	15,000	50-55	100	
		45	75	

ROLL AHEAD STOPPING SIGHT DISTANCE ASSUMES DRY PAVEMENT

MINIMUM TAPER LENGTH = L (feet)										
LANE WIDTH (feet)	Posted Speed (mph) 25	30	35	40	45	50	55	60	65	70
10	105	150	205	270	450	500	550	-	-	-
11	115	165	225	295	495	550	605	-	-	-
12	125	180	245	320	540	600	660	-	-	-

LEGEND

- SIGN LOCATION - TRIPOD MOUNT
- TEMPORARY TRAFFIC CONTROL DEVICES
- PROTECTIVE VEHICLE (WHEN SPECIFIED IN CONTRACT)
- PROTECTIVE VEHICLE WITH TRUCK MOUNTED ATTENUATOR (WHEN SPECIFIED IN CONTRACT FOR HIGH SPEED ROADWAYS)

NOTES

1. FOR LONG-TERM PROJECTS, CONFLICTING PAVEMENT MARKINGS NO LONGER APPLICABLE SHALL BE REMOVED. TEMPORARY MARKINGS SHALL BE USED AS NECESSARY AND SIGNS SHALL BE POST MOUNTED.

CHANNELIZING DEVICE SPACING (feet)		
MPH	TAPER	TANGENT
50/70	40	80
35/45	30	60
25/30	20	40

ALAN O. KING — STATE OF WASHINGTON — 15013 — REGISTERED PROFESSIONAL ENGINEER

EXPIRES NOVEMBER 23, 2003

INTERSECTION SHOULDER WORK

4 WAY INTERSECTION

STANDARD PLAN K-13

SHEET 1 OF 1 SHEET

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SAMPLE CONTRACT DRAWINGS

CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555

REVISIONS	GENERAL NOTES		
FEBRUARY 26, 2010 - Tender Issue FEBRUARY 25, 2010 - Permit Issue	DATUM: Control Data from Kirg County Survey Control Points #127, 117 (HPGN-tARN) VERTICAL DATUM: Elevations are NAVD88, conversion factor for data imported from NGVD29 = +3.57'	DESIGNED BY .	
		DRAWN BY . SM	
		CHECKED BY . DM	
		APPROVED BY .	
		DATE PRINTED . 2-26-10	
		SCALE .	
		F.B. NO. .	

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FAX (250)-455-2276 E-Mail mundall@spynet.com (800)-313-9705
WATER RESOURCES WASTEWATER CIVIL AGRICULTURAL

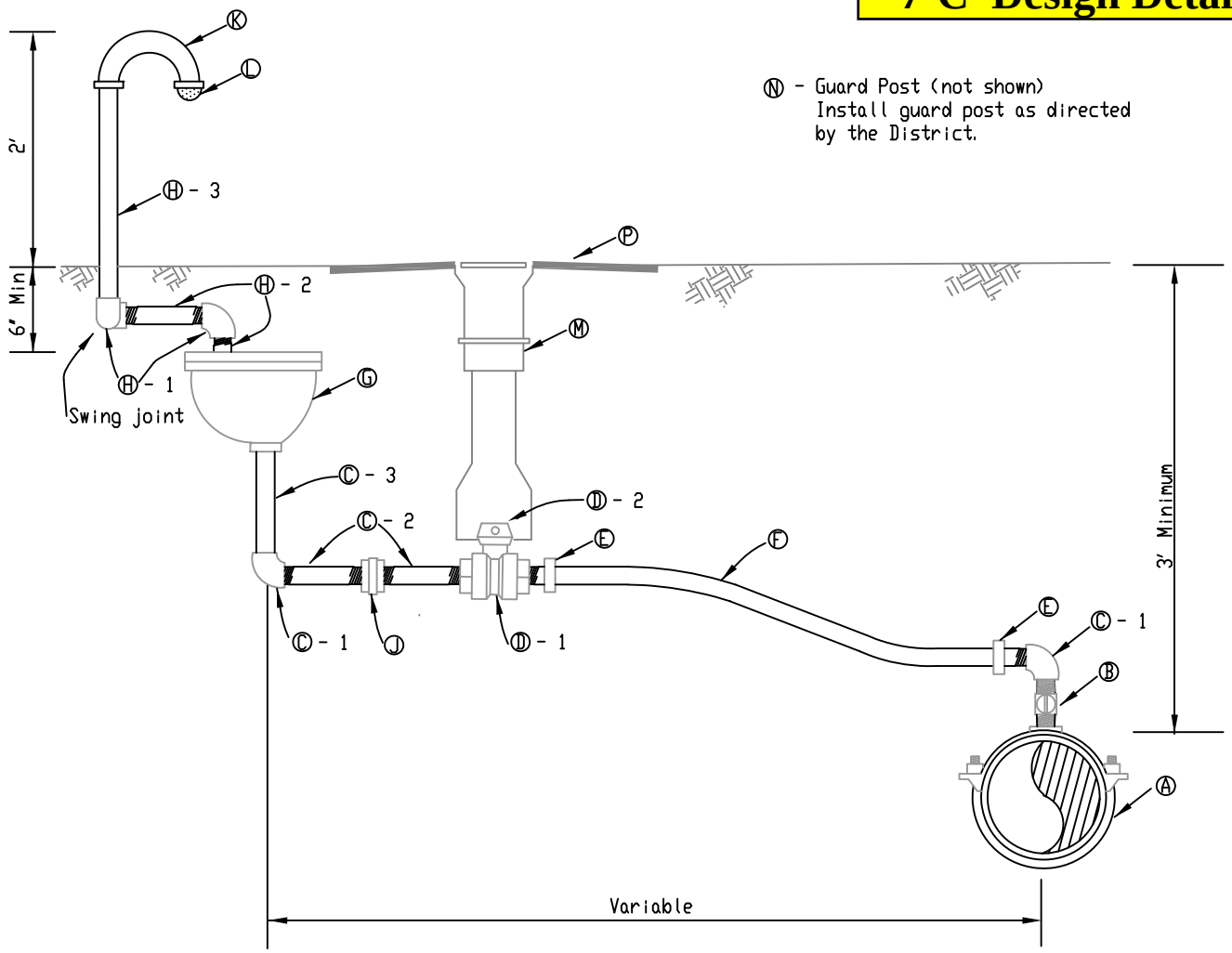
LAKE FOREST PARK WATER DISTRICT — GOOD WATER NATURALLY

LAKE FOREST PARK WATER DISTRICT
WATER MAIN IMPROVEMENTS

STREET TRAFFIC DETAILS

JOB NO.	DRAWING NO.	SHEET	OF
M109-001	182nd-DT2	10	10

APPENDIX 7 - C INFASTRUCTURE CONSTRUCTION DESIGN DETAILS



BILL OF MATERIALS

MARK	QUANTITY	DESCRIPTION
Ⓐ	1	Single Strap Saddle, Romac 101S or Equal with AWWA taper tap
Ⓑ	1	1" Corporation Stop, AWWA inlet MIP
Ⓒ - 1	2	1" x 90° Brass Elbow
Ⓒ - 2	2	1" Brass Nipple
Ⓒ - 3	1	1" Brass Pipe
Ⓓ - 1	1	1" Ball Valve
Ⓓ - 2	1	Operating Nut
Ⓔ	2	1" MIP x Pack Joint Adaptor
Ⓕ	1	1" HI-Mol Pipe
Ⓖ	1	1" Air and Vacuum Valve, screwed, APCO No. 143C or equal
Ⓗ - 1	2	1" x 90° GIP Elbow
Ⓗ - 2	2	1" GIP nipples
Ⓗ - 3	1	1" GIP
Ⓙ	1	1" Brass Union
Ⓚ	1	1" Return Bend, open pattern
Ⓛ	1	1" Beehive Strainer
Ⓜ	1	18"x24" Valve Box, Seattle Std. or APWA #67
Ⓝ	2	Standard 9' Concrete Guard Posts (see Hydrant Guard Post Detail)
Ⓟ	1	2'x2' Asphalt Pad

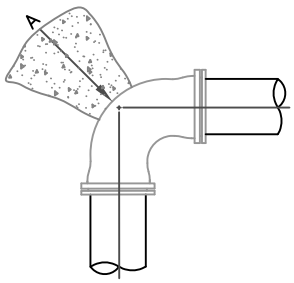
7

1" AIR & VACUUM RELEASE VALVE ASSEMBLY

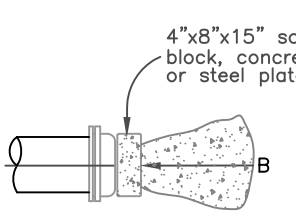
NO SCALE

Rev. 7/96 – SGO
WDETAVR1.DWG

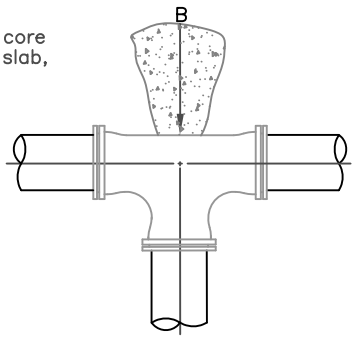
7-C Design Details



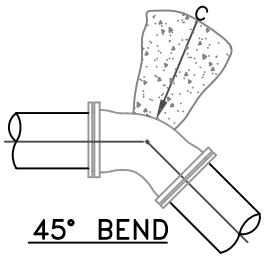
90° BEND



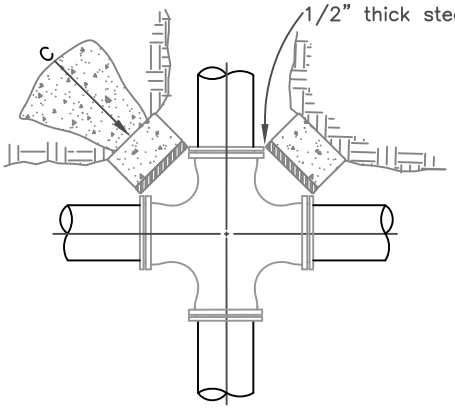
CAP



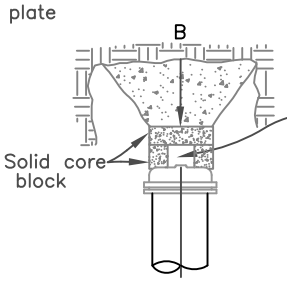
TEE



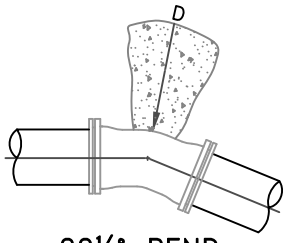
45° BEND



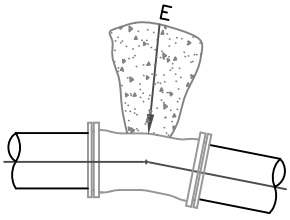
UNBALANCED CROSS



TAPPED TEE



22½° BEND

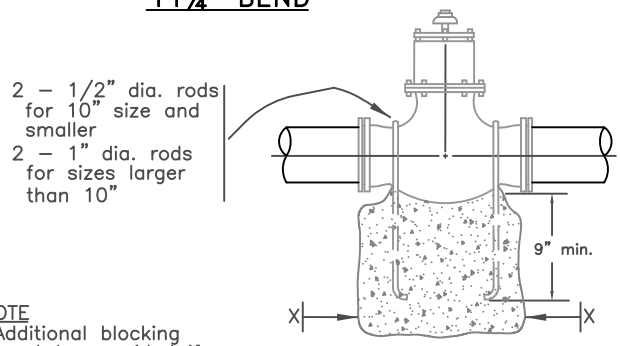


11¼° BEND

THRUST BLOCK							
		MIN. BEARING AREA AGAINST UNDISTURBED SOIL–SQ.FT.					
PIPE SIZE	PRESSURE PSI	A	B	C	D	E	X (100 PSI)
4"	200	2/(1)	1/(NONE)	1/(NONE)	NONE	NONE	NONE
	300	3/(2)	2/(2)	2/(1)	1/(1)	NONE	
6"	200	4/(3)	3/(2)	3/(1)	1/(1)	1(NONE)	NONE
	300	6/(4)	4/(3)	3/(2)	2/(1)	1(NONE)	
8"	200	7/(5)	5/(3)	4/(3)	2/(2)	1/(1)	3/(2)
	300	11/(3)	8/(5)	6/(4)	3/(2)	2/(1)	
10"	200	11/(8)	8/(6)	6/(4)	3/(2)	2/(1)	4/(3)
	275	16/(11)	11/(7)	9/(6)	5/(3)	3/(2)	
12"	200	16/(11)	11/(8)	9/(6)	5/(3)	3/(2)	5/(4)
	250	24/(16)	17/(11)	13/(9)	7/(5)	4/(3)	
14"	200	22/(13)	16/(11)	12/(8)	6/(4)	3/(2)	7/(6)
	250	33/(22)	23/(16)	18/(12)	9/(6)	5/(3)	
16"	200	29/(19)	21/(14)	16/(11)	8/(6)	5/(3)	10/(7)
	225	23/(16)	23/(16)	17/(12)	9/(6)	5/(3)	
18"	200	36/(24)	26/(17)	20/(13)	10/(7)	5/(4)	13/(9)
20"	200	45/(29)	32/(21)	24/(16)	13/(8)	7/(4)	16/(11)
24"	200	64/(43)	46/(30)	35/(23)	18/(12)	9/(6)	23/(16)

NOTE

1. Square feet of concrete thrust – block area based on safe bearing load of 2000/(3000) pounds per square feet.
2. Areas must be adjusted for other size pipe, pressures and soil conditions.
3. Concrete blocking shall be cast in place and have a minimum of 1/2 square foot bearing against the fitting.
4. Block shall bear against fittings only and shall be clear of joints to permit taking up or dismantling joint.
5. Contractor shall install blocking adequate to withstand full test pressure as well as to continuously withstand operating pressure under all conditions of service.



GATE VALVE

NOTE
Additional blocking must be provided if gate valve is at end of line during test.

SAFE BEARING LOADS IN LBS./SQ. FT.

The safe bearing loads given in the following table are for horizontal thrusts when the depth of cover over the pipe exceeds 2 feet.

SOIL	SAFE BEARING LOAD LBS./SQ. FT.
*Muck, peat, etc.	0
Soft caly	1,000
Sand	2,000
Sand and gravel	3,000
Sand and gravel cemented with clay	4,000
Hard shale	10,000

*In muck or peat, all thrusts shall be restrained by piles or tie rods to solid foundations or by removal of muck or peat and replacement with ballast of sufficient stability to resist thrusts.

CONCRETE BLOCKING

NO SCALE

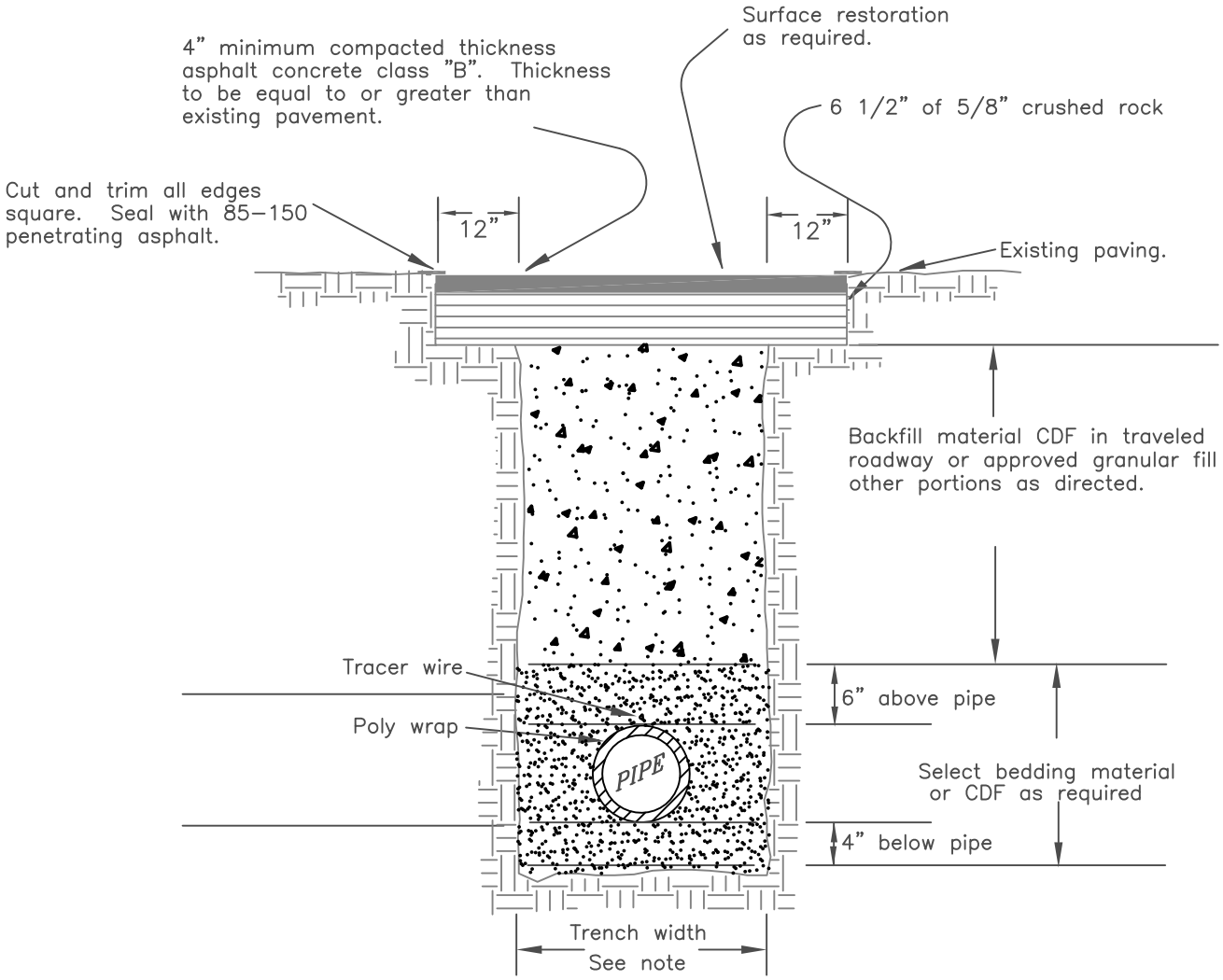
Rev. June 2003
Contrete Blocking.dwg

LAKE FOREST PARK WATER DISTRICT

STANDARD CONSTRUCTION DETAILS

DETAIL 2 OF 8

LAKE FOREST PARK WATER DISTRICT
GOOD WATER NATURALLY



NOTE:
Minimum trench width shall be the pipe O.D. + 12" (6" each side of pipe)

Maximum trench width:
15" diameter and smaller: 40"
18" diameter and larger: 1–1/2 x I.D. + 18"

RIGID PIPE
TYPICAL TRENCH SECTION

NO SCALE

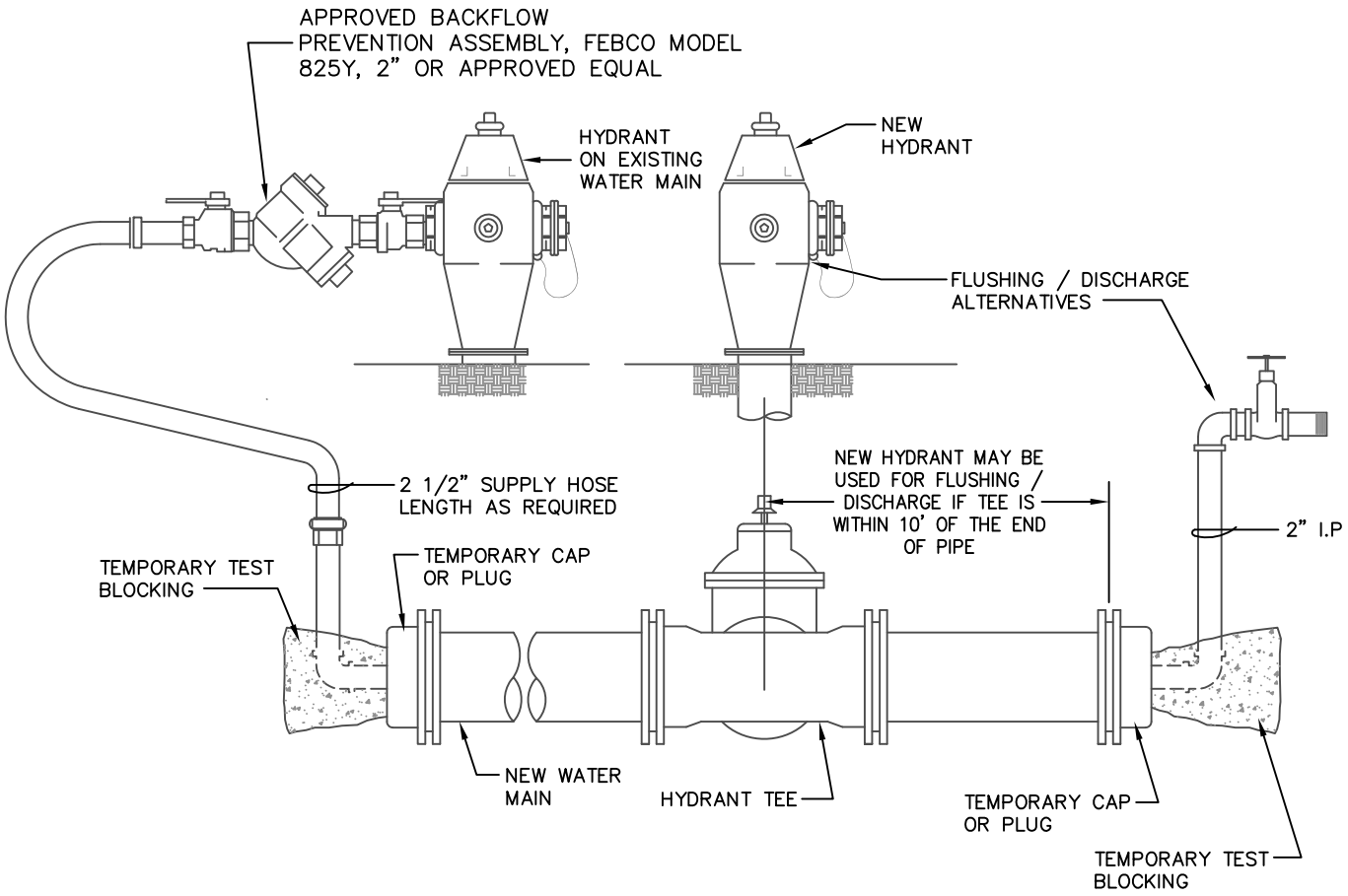
Rev. 6/03
Trench Section.dwg

NOTES:

NEW SECTIONS OF WATER MAIN THAT ARE INSTALLED WHEN EXPANDING A DISTRIBUTION SYSTEM MUST BE SEPARATED FROM THE EXISTING SYSTEM. UNTIL SATISFACTORY FLUSHING, DISINFECTION AND BACTERIOLOGICAL SAMPLING HAS BEEN COMPLETED, THE NEW WATER MAIN MUST BE CONSIDERED CONTAMINATED. IN ADDITION, THE CHLORINE CONCENTRATION USED FOR DISINFECTION PROCEDURES (MINIMUM 25 mg/l) MAKES WATER NON–POTABLE.

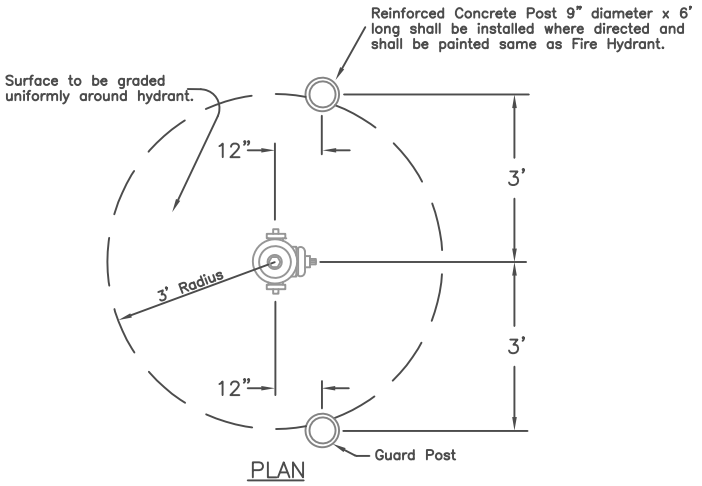
AN APPROVED BACKFLOW PREVENTION ASSEMBLY MUST BE USED ON THE SUPPLYING WATER LINE WHEN FILLING THE NEW WATER MAIN DURING DISINFECTION AND FLUSHING. THE BACKFLOW PREVENTION ASSEMBLY AND SUPPLY PIPING MUST BE REMOVED DURING HYDROSTATIC PRESSURE TESTING OF THE NEW WATER MAIN.

AFTER SATISFACTORY BACTERIOLOGICAL SAMPLE RESULTS ARE OBTAINED FROM THE NEW WATER MAIN, SECTIONS OF CONNECTING PIPE MUST BE INSTALLED BETWEEN IT AND THE EXISTING SYSTEM. BEFORE INSTALLATION, THE INTERIORS OF ALL PIPE AND FITTINGS USED TO MAKE THE CONNECTION MUST BE SWABBED OR SPRAYED WITH A 1% AVAILABLE CHLORINE SOLUTION.

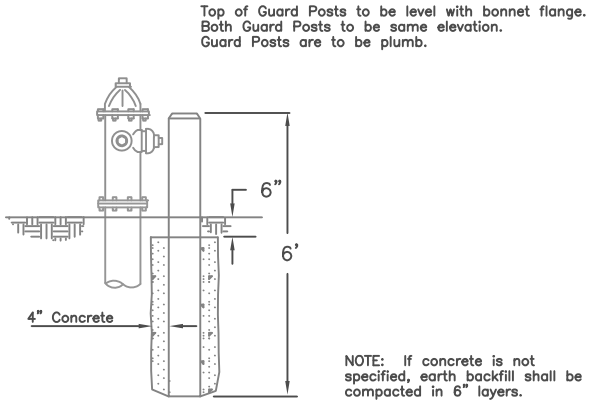


WATER FILLING DETAIL

NO SCALE

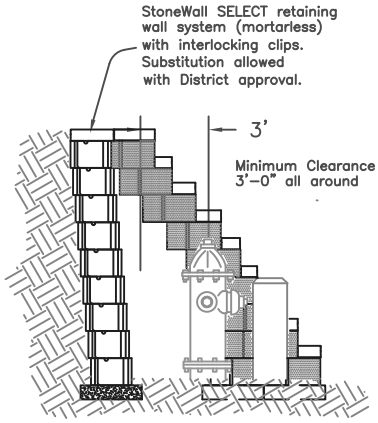


PLAN

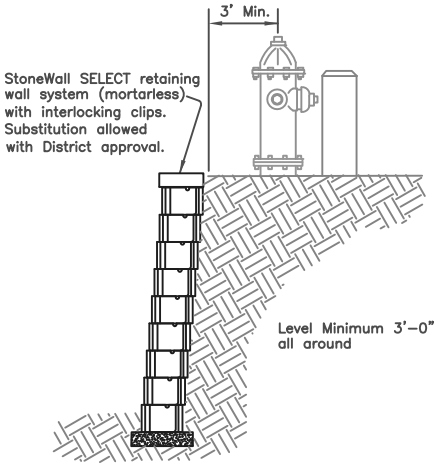


ELEVATION

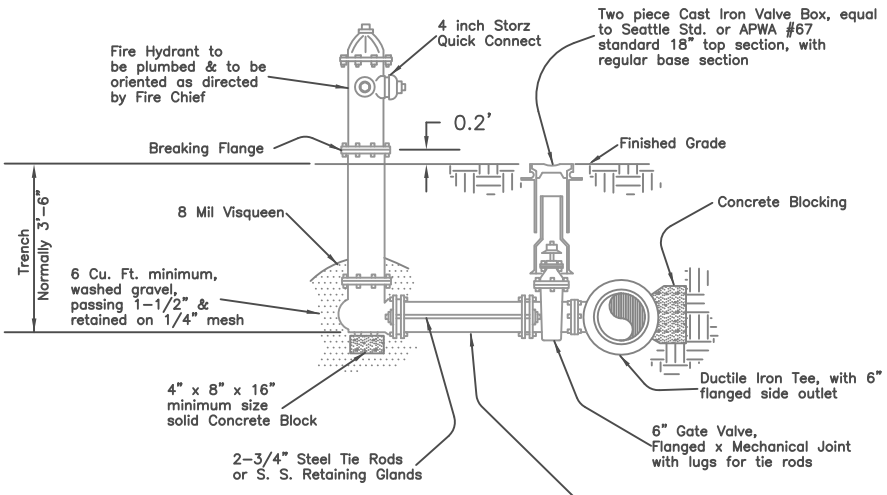
FIRE HYDRANT GUARD POSTS



FIRE HYDRANT IN CUT



FIRE HYDRANT IN FILL



NOTES:
Hydrant shall be prime coated with Steelcote SR-53 heavy duty-brush type or approved equal. Top coats shall be Steelcote acid and oil resistant enamel No. 44-68, color-white, brush type or approved equal.

Stencil on the face of hydrant barrel the distance from hydrant to gate valve in feet and inches with 2" black letters.

Steel Tie Rods shall have a length to fit between lugs. Apply a heavy coat of coal tar preservative on tie rods, nuts and bolts.

Hydrant type: Mueller 5.25" or Approved Equal

FIRE HYDRANT ASSEMBLY

FIRE HYDRANT LOCATION IN CUT OR FILL

STANDARD FIRE HYDRANT DETAIL

NO SCALE

3

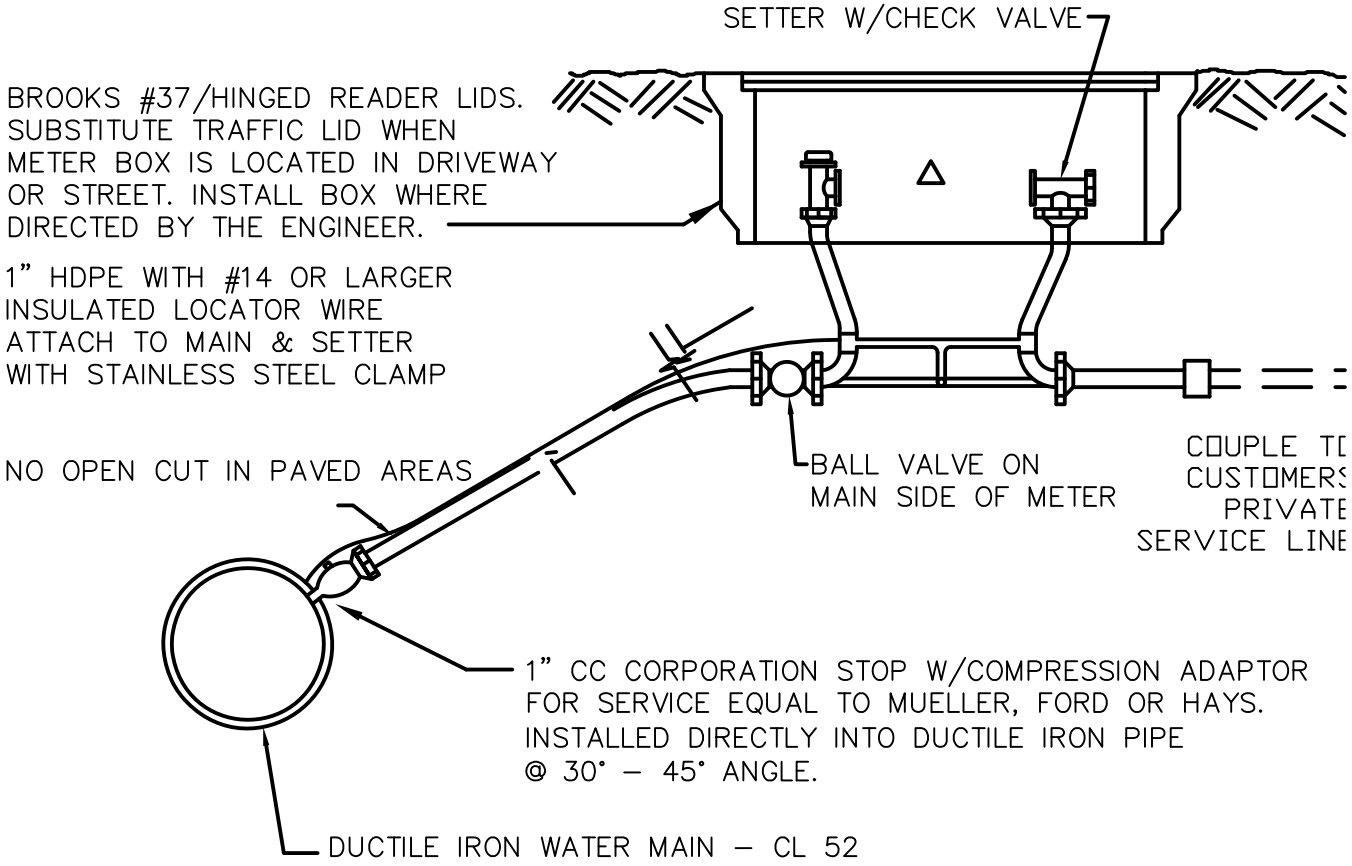
Rev. 1/10/01 DLM
FIRE HYDRANT ASSEMBLY.DWG

1" SERVICE LINE TO BE DRISCO D2239 SDR 7 200 PSI HDPE
1" COPPER SETTER EQUAL TO MUELLER, FORD, MCDONALD, OR HAYS, EQUIPPED AS FOLLOWS.

- PADLOCK WINGS ON BALL VALVE
- ANGLE CHECK ON METER OUTLET
- IRON PIPE CONNECTIONS ON SETTER INLET AND OUTLET
- COMPRESSION ADAPTOR ON SETTER INLET AND OUTLET
- INSTALL TYPE K COPPER AND MISC. BRASS FITTINGS FOR CONNECTION TO CUSTOMER'S LINE

HEIGHT OF SETTER CAN VARY BETWEEN 9" AND 15"

COPPER SETTER SHALL BE SET LEVEL AND CENTERED IN THE METER BOX.

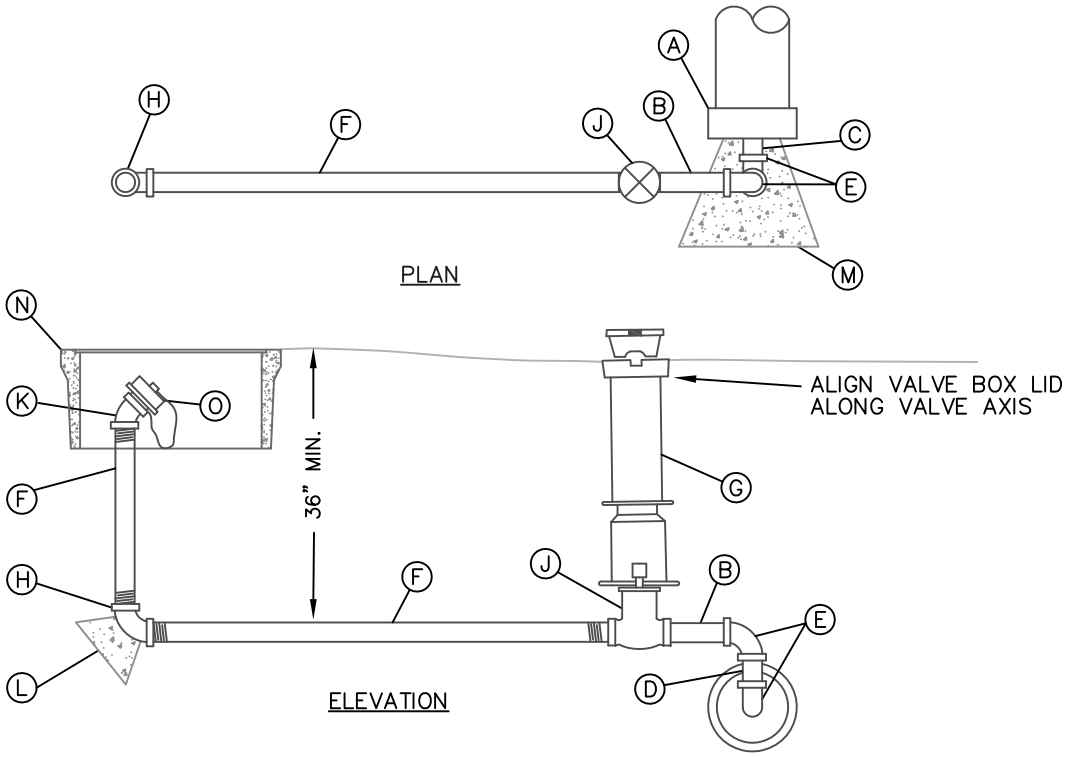


METER BOX SHALL BE INSTALLED FLUSH W/FINAL GRADE AND MUST BE SIZED TO ALLOW FOR MIN. CLEARANCE REQUIREMENTS.

1" – SINGLE WATER SERVICE DETAIL

NO SCALE

Rev. 6/03
Service, One Inch



MATERIAL LIST

MARK	QUANTITY	ITEM DESCRIPTION
A	1	D.I. CAP, TAP 2', IPS
B	1	2" NIPPLE, BRASS., 1'–0" LONG
C	1	2" NIPPLE, BRASS., 6" LONG
D	1	2" NIPPLE, BRASS., 3" LONG
E	2	2" 90° ELBOW, BRASS., SWING JOINT
F	2	2" GALV., STEEL PIPE, THREADED, LENGTH TO SUIT
G	1	VALVE BOX–OWNER STANDARD
H	1	2" 90° ELBOW, GALV., DRILL w" HOLE (THREADED)
J	1	2" GATE VALVE–OWNER STANDARD
K	1	2" 45° ELBOW, GALV. (THREADED)
L	1/4 CY	WASHED GRAVEL–PASSING 1i" AND RETAINED ON r" MESH
M	1	CONCRETE THRUST BLOCK, CAST IN PLACE BEARING AGAINST CAP ONLY 10 MIL PLASTIC AGAINST CAP
N	1	METER BOX–OWNER STANDARD
O	1	2" PLUG WITH SQUARE HEAD, GALV. 2" MIPx2 1/2"MIP N.S.T. ADAPTOR (FIRE HOSE) W–CAP

2" BLOW–OFF ASSEMBLY

CONSTRUCTION NOTES
GENERAL NOTES:

1. THE CONTRACTOR SHALL SCHEDULE A PRE-CONSTRUCTION MEETING WITH THE DISTRICT AND ENGINEER.
2. A COMPLETE SET OF PLANS SHALL BE MAINTAINED BY THE CONTRACTOR DURING CONSTRUCTION, AND SHALL REFLECT ANY VARIATION IN CONSTRUCTION FROM THE PLANS. THESE "AS-BUILT" PLANS SHALL BE PROVIDED TO THE DISTRICT AT THE COMPLETION OF CONSTRUCTION.
3. THE CONTRACTOR SHALL COORDINATE HIS CONSTRUCTION ACTIVITIES WITH THE PERTINENT UTILITY COMPANIES TO ENSURE WATER METERS, TELEPHONE VAULTS, ETC., ARE BROUGHT TO GRADE PRIOR TO CONSTRUCTION OF CURB AND SIDEWALKS.
4. THE CONTRACTOR WILL BE FULLY RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL EXISTING UTILITIES. THE UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE AND WILL NEED FIELD VERIFICATION FOR EXACT ALIGNMENT AND DEPTH. THERE MAY BE EXISTING UTILITIES NOT SHOWN ON THE PLANS.
5. CONTRACTOR SHALL COORDINATE CONSTRUCTION WITH SEATTLE CITY POWER & LIGHT FOR UTILITY POLE STABILIZATION IF REQUIRED.
6. ALL EXCAVATION METHODS AND SHORING TECHNIQUES SHALL BE IN ACCORDANCE WITH WAC 296 TRENCH EXCAVATION SAFETY SYSTEMS.
7. THE DISTRICT SHALL AT ALL TIMES HAVE ACCESS TO THE WORK AND TO THE LOCATIONS WHERE THE WORK IS IN PREPARATION.
8. THE CONTRACTOR SHALL NOTIFY ONE CALL UTILITY LOCATING SERVICE PRIOR TO ANY CONSTRUCTION TO VERIFY LOCATION OF EXISTING UTILITIES, AT (800) 424-5555.

WATER NOTES:

1. ALL WORK, MATERIALS, CONCRETE BLOCKING AND TESTING OF WATER LINES SHALL CONFORM TO STANDARD DETAILS OF LAKE FOREST PARK WATER DISTRICT AND AWWA STANDARDS.
2. THE WATER MAIN SHALL BE INSTALLED WITH MINIMUM OF 36 INCHES OF COVER (10-INCH PIPE AND SMALLER) AND 48 INCHES COVER (12-INCH PIPE OR LARGER), AS MEASURED FROM THE TOP OF THE PIPE TO FINISHED GRADE, UNLESS OTHERWISE APPROVED. WHERE UTILITY CONFLICTS OCCUR, THE WATER MAIN SHALL BE LOWERED TO CLEAR AS APPROVED BY THE WATER DISTRICT. THIS INFORMATION SHALL BE REFLECTED ON THE "AS-BUILT" RECORD BY CONTRACTOR.
3. EXACT LOCATIONS AND CONFIGURATION OF WATER METERS AND VAULTS SHALL BE APPROVED BY THE DISTRICT PRIOR TO CONSTRUCTION.
4. BEDDING FOR WATER MAINS SHALL BE PROVIDED AS REQUIRED IN THE STANDARD DETAIL AND SPECIFICATIONS.
5. ALL SERVICE CONNECTIONS SHALL BE MADE IN ACCORDANCE WITH LAKE FOREST PARK WATER DISTRICT REQUIREMENTS.
6. ALL FIRE HYDRANTS SHALL BE INSTALLED, INSPECTED AND ADJUSTED IN ACCORDANCE WITH THE DISTRICT'S STANDARD DETAILS.
7. AFTER THE PIPE AND APPURTENANCES ARE IN PLACE AND THE SYSTEM HAS BEEN SATISFACTORILY PRESSURE TESTED, IT SHALL BE FLUSHED WITH WATER OF SUFFICIENT VELOCITY TO REMOVE ALL DIRT AND OTHER FOREIGN MATERIALS AND DISINFECTED/CHLORINATED IN ACCORDANCE WITH RECOMMENDED AWWA STANDARDS. THE CONTRACTOR SHALL REQUEST A BACTERIOLOCICAL SAMPLE TO BE TAKEN AT LEAST 24 HOURS AFTER FLUSHING AND DISINFECTING.
8. DUCTILE IRON PIPE SHALL CONFORM TO AWWA C-151 WITH A STANDARD THICKNESS CLASS 52. FITTINGS FOR D.I. PIPE SHALL BE DUCTILE IRON OR CLASS 250 GRAY IRON CONFORMING TO AWWA C-110.
9. PRIOR TO BACKFILLING, ALL MAINS AND APPURTENANCES SHALL BE INSPECTED AND APPROVED FOR BACKFILLING BY THE DISTRICT.
10. NO CONNECTIONS TO THE EXISTING WATER SYSTEM SHALL BE MADE WITHOUT AN APPROVED BACKFLOW PREVENTION DEVICE AND THE DISTRICT'S OR LAKE FOREST PARK WATER DISTRICT'S APPROVAL. PERMANENT CONNECTION SHALL NOT BE MADE UNTIL NEW MAINS HAVE BEEN DISINFECTED, FLUSHED AND HAVE PURITY IN ACCORDANCE WITH DISTRICT REQUIREMENTS. ANY CONNECTION TO THE EXISTING WATER SYSTEM SHALL BE WITNESSED BY THE DISTRICT'S INSPECTOR.
11. ALL THRUST BLOCKS SHALL BE FORMED IN PLACE. BLOCKS SHALL NOT BE BACKFILLED PRIOR TO SPECIFIC APPROVAL OF THE DISTRICT AND THE FIRST AGES OF THE CONCRETE CURING PROCESS ARE EVIDENT.
12. WATER PIPE ABANDONMENT:
    - REMOVE WHERE DIRECTED AND SALVAGE TO DISTRICT
    - OPEN ALL MAIN VALVES AND CAP ENDS OF PIPE
    - REMOVE VALVE BOX TOPS AND RESTORE SURFACE

TEMPORARY EROSION AND STORM CONTROL (TESC):

1. CONTRACTOR SHALL HAVE EROSION CONTROL MEASURES IN PLACE BEFORE BEGINNING CONSTRUCTION
2. ALL RELEASES OF PETROLEUM PRODUCTS, PAINTS, SOLVENTS, AND OTHER DELETERIOUS MATERIALS MUST BE PROMPTLY CONTAINED AND REMOVED IN A MANNER THAT WILL PREVENT THEIR DISCHARGE TO WATERS AND SOILS. BARRELS, PETROPHILIC PADS, TARPS AND OTHER EQUIPMENT NECESSARY FOR SPILL RECOVERY AN DISPOSAL SHALL BE MAINTAINED BY CONTRACTOR ON-SITE.
3. DUST CONTROL SHALL BE PROVIDED BY CONTRACTOR AS DIRECTED BY THE ENGINEER
4. CONTRACTOR SHALL SECURE LOADS PER RCW 46.61.655

LANDSCAPING RESTORATION:

1. REPLACE ALL TREES, LANDSCAPING, AND IRRIGATION DAMAGED DURING CONSTRUCTION
2. PROVIDE HYDROSEED FOR ALL UNPAVED AND NON-GRAVEL AREAS DISTURBED DURING CONSTRUCTION

ROADWAY, SIDEWALK, CURB AND GUTTER RESTORATION:

1. SIDEWALK, CURB AND GUTTERS DISTURBED BY CONSTRUCTION SHALL BE REPLACED WITH NEW SECTIONS IN ACCORDANCE WITH THE CITY OF LAKE FOREST PARK RIGHT-OF-WAY PERMIT AND PER THE TECHNICAL SPECIFICATIONS OF THE CONTRACT
2. ROAD SHOULDERS DISTURBED DURING CONSTRUCTION SHALL BE RE-GRADED WITH 5/8-MINUS CRUSHED ROCK

TRAFFIC CONTROL:

1. CONTRACTOR SHALL SUBMIT A DETAILED TRAFFIC CONTROL PLAN TO THE CITY OF LAKE FOREST PARK FOR APPROVAL PRIOR TO CONSTRUCTION
2. TRAFFIC CONTROL DEVICES SHALL MEET THE *MANUAL OF UNIFORM TRAFFIC CONTROL* DEVICES STANDARDS. BARRICADES SHALL HAVE AMBER FLASHING LIGHTS THAT ARE USED AT NIGHT
3. CONTRACTOR SHALL PROVIDE EMERGENCY VEHICLE ACCESS TO ALL PROPERTIES ADJACENT TO THE PROJECT. CONTRACTOR SHALL NOTIFY THE CITY OF LFP OF ANY CHANGES TO THE TRAFFIC PLAN DURING CONSTRUCTION

APPENDIX 8 CAPITAL IMPROVEMENT PROGRAM

APPENDIX 8 - A MISC DOCUMENTS

8-A Misc. Documents Cap. Imp.

CWSP 2005

CAPITAL IMPROVEMENTS 2000 - 2020

LAKE FOREST PARK WATER DISTRICT

GOOD WATER, NATURALLY

D2 - 332 Ft. 8" D.I.
D18 - 6" & 2" PRV w/ Relief
D3 - 1004 Ft. 8" D.I.
D33 - Refurbish PRV
SS2 - Intertie
D4 - 326 Ft. 8" D.I.
D5 - 398 Ft. 8" D.I.
D6 - 663 Ft. 8" D.I.
D7 - 274 Ft. 3" Poly
D8 - 1173 Ft. 8" D.I.
D9 - 397 Ft. 8" D.I.
D34 - 1948 Ft. 8" D.I.
D10 - 688 Ft. 8" D.I.
D14 - 668 Ft. 8" D.I.
D12 - 223 Ft. 3" Poly
D11 - 1190 Ft. 8" D.I.
D13 - 333 Ft. 8" D.I.
D14 - 619 Ft. 8" D.I.
D35 - 656 Ft. 8" D.I.
D16 - 635 Ft. 10" D.I.
D17 - 6" & 2" PRV w/ Relief
D54 - 1265 Ft. 8" D.I.
D55 - 1331 Ft. 8" D.I.
D56 - 1815 Ft. 8" D.I.
D27 - 1200 Ft. 2" Poly

D1 - 258 Ft. 8" D.I.
D20 - 1996 Ft. 8" D.I.
D21 - 347 Ft. ??????
D46 - 1000 Ft. 4" Poly
D45 - 550 Ft. 4" Poly
SV3 - 36 New Services
D44 - 600 Ft. 4" Poly
D43 - 700 Ft. 4" Poly
D31 - Booster Pump
D19 - 928 Ft. 10" D.I.
D30 - 8060 Ft. 3" Poly
D32 - Intertie NUD
SV2 - 23 New Services
D29 - 850 Ft. 3" Poly
D42 - 441 Ft. 8" D.I.
D50 - 332 Ft. 8" D.I.
D49 - 2477 Ft. 8" D.I.
D25 - 300 Ft. 8" D.I.
D51 - 392 Ft. 8" D.I.
D26 - 220 Ft. 2" Poly
D52 - 2422 Ft. 8" D.I.
D36 - 1415 Ft. 12" D.I.
D28 - 989 Ft. 8" D.I.
D37 - 1217 Ft. 12" D.I.
D57 - 388 Ft. 8" D.I.
D53 - 504 Ft. 8" D.I.
D38 - Replace PRV
D22 - 320 Ft. 2" Poly
D24 - 118 Ft. 2" Poly
D23 - 150 Ft. 2" Poly

LEGEND

- HIGH PRESSURE ZONE
- MED. PRESSURE ZONE
- LOW PRESSURE ZONE
- BEACH PRESSURE ZONE
- DISTRICT BOUNDARY
- 2000 to 2006
- 2006 to 2010
- 2010 to 2020

FEET 200 0 200 500 1000 1500

APPENDIX 9 FINANCIAL PLAN

APPENDIX 9 - A PIPE LIFESPAN – SUPPORTIVE DOCS

9-A Pipe Lifespan

Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION
FORENSIC INVESTIGATION

August 29, 2013

KA No. 096-13239
Lab Report No. 1

Mr. David McMorris (E-Mail)
NORTHSHORE UTILITY DISTRICT
6830 NE 185th Street
Kenmore, WA 98028

Dan,
These samples were taken at approximately 10455 NE 145th ST.

Dave Kaiser, P.E.
Engineering Director
Northshore Utility District
(425) 398-4422 - phone
(206) 419-4789 - cell

RE: SOIL LABORATORY TESTING
AWWA C105 Lab Testing
4303 198th Street SW
Lynnwood, WA

Dear Mr. McMorris:

In accordance with your request and authorization, we have performed laboratory tests for the above referenced project. Laboratory testing was performed in accordance with ASTM and AASHTO standards at our sub-consultant laboratory. The results of the laboratory tests are presented below.

Sample ID No:	46333 (A-C)				
Description	Various Soil Samples				
Sample Location	Client Provided				
Sample Date	3-6-13 (delivered to Krazan on 8/12/13)				
Description	Resistivity	pH	Redox Potential	Sulfides	Moisture Content
Pipe #1 (A)	7,300 ohm-cm	7.07	464.9 mV	<1.11 mg/kg	7.28%
Pipe #2 (B)	45,000 ohm-cm	6.20	282.3 mV	<1.28 mg/kg	16.70%
Pipe #1 Backfill (C)	5,200 ohm-cm	7.05	516.5 mV	1.03 mg/kg	3.38%
AWWA C105 points (per Table A.1)	0	0	0	2	1

If you have any questions; or if we can be of further assistance, please do not hesitate to contact our office.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

Jeffrey S. Mercer
Operations Manager
Pacific Northwest Division
JSM/lm

9-A Pipe Lifespan

BY RICHARD W. BONDS, LYLE M. BARNARD, A. MICHAEL HORTON, AND GENE L. OLIVER

The Ductile Iron Pipe Research Association, formerly the Cast Iron Pipe Research Association, has conducted research on iron pipe since 1928. This research has dealt primarily with corrosion and corrosion control of ductile- and gray-iron pipe. A statistical analysis of a large database derived from these test programs and in-service inspections concluded that (1) the 10-point soil evaluation system published in the Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems (C105/A21.5; ANSI/AWWA, 1999) is an accurate and dependable method of evaluating soils for their corrosiveness of iron pipe; (2) polyethylene encasement is effective as a corrosion control system; and (3) damages to polyethylene encasement do not accelerate the corrosion rate beyond that of iron pipe that is not encased.

Corrosion and corrosion control of iron pipe:

75 years of research

Iron was known to humans in prehistoric ages, and there is ample evidence of its use in early history. Human ability to cast pipe probably developed from or coincided with the manufacture of cannons, which occurred as early as 1313. There is an official record of cast-iron pipe manufactured at Siegerland, Germany, in 1455 for installation at the Dillenburg Castle.

In 1664, Louis XIV of France ordered the construction of a cast-iron main extending 15 mi (24 km) from a pumping station at Marly-on-Seine to Versailles to supply water for the town and its fountains. This cast-iron pipe provided continuous service for more than 330 years. Cast-iron pipe was first used in the United States around 1816 (AWWA, 2003).

Ductile-iron pipe was cast experimentally for the first time in 1948 and was introduced to the marketplace in 1955. Since 1965 ductile-iron pipe has been manufactured in accordance with the Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water and Other Liquids (AWWA/ANSI, 2002), using centrifugal casting methods that have been commercially developed and refined since 1925.

POLYETHYLENE ENCASEMENT FOR CORROSION CONTROL

Corrosion protection of these early installations was virtually nonexistent until the mid-1990s. Still, this early pipe fared well in most soil environments, and its longevity is well demonstrated. More than 600 utilities in the United States and Canada have had cast-iron pipe that provided more than 100 years of continuous

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9-A Pipe Lifespan



The Ductile Iron Pipe Research Association conducts pipe-testing programs at installations similar to this test site.

service, and more than 20 utilities have had cast-iron pipe in continuous service for 150 years or more (DIPRA, 2002).

For decades, the Ductile Iron Pipe Research Association (DIPRA), formerly the Cast Iron Pipe Research Association (CIPRA), has researched corrosion control methods including select backfill, bonded coatings, concrete coatings, sacrificial coatings, and cathodic protection. This article focuses on corrosion control using polyethylene encasement, which has proven to be an easy, economical, and low-maintenance corrosion protection system for iron pipe. Protection is achieved simply by encasing the pipe with a tube or sheet of loose polyethylene at the trench immediately before installation.

How polyethylene encasement works. Polyethylene encasement is an engineered corrosion control system using specially designed material with minimum mechanical requirements, e.g., strength, elongation, propagation tear resistance, impact resistance, and dielectric strength, that are specified in national and international standards. Recycled polyethylene is not used in the manufacture of the film.

Once installed, polyethylene acts as an unbonded film that prevents direct contact of the pipe with the corrosive soil. It also effectively limits the electrolytes available to support corrosion activity to whatever moisture might be present in the very thin annular space between the pipe and wrap. Although polyethylene encasement is not a watertight system, the weight of the earth backfill and surrounding soil after installation prevents any significant exchange of groundwater between the wrap and the pipe. Although some groundwater typically will seep beneath the wrap, the water's corrosive characteristics are soon depleted by initial corrosion reactions—usually oxidation.

After the available dissolved oxygen in the moisture film under the wrap has been consumed, further corrosion activity is effectively halted, and a uniform environment exists around the pipe. This in turn helps eliminate the formation of localized corrosion cells that typically occurs on the surface of a pipe exposed to a nonhomogeneous soil environment. Additionally, the polyethylene film provides an essentially impermeable barrier that restricts the access of additional oxygen to the pipe surface and the diffusion of corrosion products away from the pipe surface (Stroud, 1989). The film also has a high dielectric strength that mitigates the accumulation of stray electrical currents.

Another important aspect of polyethylene encasement's corrosion protection is that research has shown the buried

TABLE 1 Specimens and inspections in database

Pipe Type	Total	Bare Pipe	Sand-blasted Pipe	Shop-coated Pipe	Encased Pipe	Encased Pipe With Intentional Damage
Gray iron	457	225	36	103	92	1
Ductile iron	922	252	171	160	277	62

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FIGURE 1 Ductile Iron Pipe Research Association database test site locations



film does not degrade over time and compromise the system. After test-site exhumations and in-service inspections of exposure times of up to 45 years, samples of the film have been returned to the DIPRA laboratory and tested. In every case, the film exceeded the minimum physical requirements as defined in standard C105/A21.5 (ANSI/AWWA, 1999) at the time of installation.

Since its initial testing at DIPRA test sites in 1951, polyethylene encasement has been installed and used successfully on thousands of miles of gray- and ductile-iron pipe throughout the United States. This has led to the development of an international standard (8180; ISO, 2000) and numerous national standards including C105/A21.5 and A674-00 (ASTM, 2000) in the United States; BS6076 (British Standards Institution, 1996) in Great Britain; AS 3680-2003 (Standards Australia, 2003) in Australia; and JDPAZ2005 (Japanese Standards Association, 2005) in Japan. All of these standards specify material requirements and recommended installation procedures.

The photograph on page 91 shows a side-by-side comparison of polyethylene-encased and unprotected ductile-iron pipe after exhumation and sand blasting. After only 4.25 years of exposure in aggressive conditions at the DIPRA test site in the Florida Everglades, the unprotected ductile-iron pipe exhibited severe corrosion pitting with multiple penetrations of the pipe wall, whereas the polyethylene-encased pipe exhibited no corrosion pitting and was in excellent condition.

The efficacy of polyethylene encasement has sometimes been dismissed because of its simplicity. However, following an international conference at which papers on polyethylene encasement were presented, Potter (1968) concluded, "This technique seems to disobey the rules, particularly concerning its reported success even when perforated. Thus it appears that the rules are wrong and that some rethinking is needed. One must surely concede that loose polyethylene sleeving as a protective method lacks elegance. . . . Nevertheless . . . it is reassuring to know there is a handy means to avoid the worst excesses of pipeline corrosion."

EVALUATION OF POLYETHYLENE ENCASEMENT

In 1928, DIPRA launched the first of its many research projects: an evaluation of the strength of corrosion products of gray-iron pipe. Rather than short-term laboratory tests, these research projects involved long-term field tests in the most aggressive soils in the United States to replicate real-world applications to the greatest extent possible. Over the decades, as projects were completed, reports were filed separately on a project-by-project basis.

Creation of the database. Recently, these projects were reviewed and incorporated into a common database along with in-service inspections and failure investigations. This database consists of more than 60,000 entries and includes

TABLE 2 10-point soil test evaluation for iron pipe

Soil Characteristics	Points*
Resistivity—Ωcm†	
<1,500	10
≥1,500–1,800	8
>1,800–2,100	5
>2,100–2,500	2
>2,500–3,000	1
>3,000	0
pH	
0–2	5
2–4	3
4–6.5	0
6.5–7.5	0‡
7.5–8.5	0
>8.5	3
Redox potential—mV	
>+100	0
+50 – +100	3.5
0 – +50	4
Negative	5
Sulfides	
Positive	3.5
Trace	2
Negative	0
Moisture	
Poor drainage, continuously wet	2
Fair drainage, generally moist	1
Good drainage, generally dry	0

*10 points: corrosive to iron pipe; protection is indicated.
†Based on water-saturated soil box. This method is designed to obtain the lowest and most accurate resistivity reading.
‡If sulfides are present and low (<100 mV) or negative redox-potential results are obtained, three points should be given for this range.

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Ref. NUD soil samples at 10455 NE 145th St. 3-6-13

9-A Pipe Lifespan

research on more than 2,000 specimens and inspections extending over a 75-year period. To identify each specimen or inspection, entry data included

- pipe size and type,
- location,
- exposure time,
- type of protection,
- weight loss,
- up to the 10 deepest pit depths,
- 10-point soil evaluation,
- soil sulfates and chlorides,
- soil bacteria counts, and
- other descriptive entries.

Following review of the complete database, a subset of the data was developed that consisted of 1,379 specimens and inspections involving more than 300 soil environments. The source of the data presented in this article, this subset included all specimens and inspections pertaining to bare (annealing oxide but otherwise unprotected), sand-blasted, shop-coated, and polyethylene-encased gray- and ductile-iron pipe. The breakdown of the specimens and inspections is shown in Table 1. Exposure time for the gray- and ductile-iron specimens and inspections ranged from 1 to 103 years for gray iron and 1 to 35 years for ductile iron.

Statistical analysis. The database was subjected to a statistical analysis by a third-party statistician to determine the corrosion rate of gray-iron pipe versus ductile-iron pipe, the effect of damaged polyethylene encasement on the corrosion rate, the corrosion rate of unprotected iron pipe, and the corrosion protection afforded iron pipe by polyethylene encasement in a variety of soil environments. This analysis was part of a three-year joint effort by DIPRA and Corrpro Companies Inc. of Medina, Ohio, and resulted in a risk-based corrosion protection model[1] for buried ductile-iron pipe (Kroon, 2004).

Test site research. Many of the data cited in this article were obtained from research programs involving specimen burial programs at test sites located throughout the United States. These programs involved specimens of production gray- and ductile-iron pipe 4–8 ft (1.22–2.44 m) in length placed in various soil environments. The specimens were identified and weighed before burial. No internal lining was provided in order to eliminate weight gain from moisture absorption, and the ends were capped to prevent internal corrosion. Groups of specimens were exhumed at timed intervals of exposure over the testing period (sometimes 20 or more years) and returned to the laboratory for examination and data collection for such aspects as weight loss, pit depth measurement, photographing, and evaluation. The photograph on page 89 shows a typical research program test-site installation.

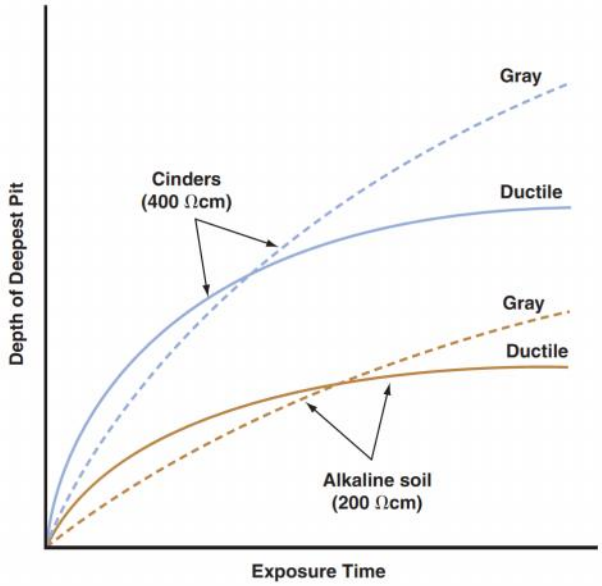
The majority of DIPRA test sites are considered corrosive to iron pipe and were selected to provide a variety of aggressive environments, i.e., tight clay soils, alkali soils, muck, peat bogs, elevated microbiological activity, and coastal environments. Figure 1 shows a map of the test-site locations included in the database discussed in this article.



This photograph shows 6-in. (150-mm) ductile-iron pipe specimens from the Everglades, Fla., that were exhumed after an exposure of 4.25 years. The specimen in the center is polyethylene-encased pipe whereas the other two specimens are unprotected pipe.

In-service digup examinations. In 1963, DIPRA initiated a program involving water utilities to inspect and evaluate polyethylene-encased gray- and ductile-iron water mains in operating systems. The purpose of the program was and still is to evaluate the effectiveness of polyethylene encasement as a means of corrosion protection for gray- and ductile-iron pipe. These investigations are performed after the mains have been in service for a prolonged time. DIPRA works closely with water utilities to

FIGURE 2 Increases of maximum pit depth with time for ductile- and gray-iron pipes buried in two US sites



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TABLE 3 10-point soil evaluation parameters at database test sites

Location	Total Points	Resistivity Ωcm	pH	Redox mV	Sulfides	Moisture
Absecon, N.J.	23.5	76	6.9	–50	Positive	Wet
Everglades, Fla.	23.5	110	7.1	–100	Positive	Wet
Logandale, Nev.	15.5	70	7.1	+100	Negative	Wet
Lombard, Ill.	15.5	2,000	7.0	+90	Trace	Wet
Spanish Fork, Utah	15.5	520	8.2	+90	Negative	Wet
Watsonville, Calif.	15.5	960	6.2	+175	Positive	Wet
Marston Lake, Colo.	14	406	7.3	+144	Trace	Wet
Los Angeles, Calif.	13†	300	8.6	NA	NA	NA
Raceland, La.	13	1,000	6.7	+280	Trace	Moist
Overton, Nev.	12	68	7.7	+167	Negative	Wet
Hughes, Ark.	11	500	4.8	+200	Negative	Moist
Bay County, Fla.	10.5	46,000	6.0	–192	Positive	Wet
Aurora, Colo.	10	1,600	7.6	+122	Negative	Wet
Birmingham, Ala.	10* (cinders)	400	5.5	NA	NA	NA
Casper, Wyo.	10*	160	8.1	NA	NA	NA
Wisconsin Rapids, Wis.	8.5 (peat)	5,000	3.6	+300	Positive	Wet

NA—not measured

*Point count for resistivity only
†Point count for resistivity and pH only

perform these investigations. As a matter of course, the utility selects a location where it is known that polyethylene-encased iron pipe has been installed in a corrosive soil environment.

The results have shown that polyethylene encasement is an effective, engineered system to protect gray- and ductile-iron pipe. At the same time, however, these investigations have underscored the importance of properly installing and handling polyethylene encasement. The database used in this study included 188 such investigations (121 conducted by DIPRA and 67 by U.S. Pipe). An additional 96 in-service examinations of nonencased shop-coated iron pipe were also included in the subset database for a total of 284 investigations.

An investigation was conducted on the first polyethylene-encasement installation in an operating system. The 4-in. (100-mm) gray-iron water main was installed in Louisiana's LaFourche Parish Water District Number 1 in early 1958 and was inspected in May 2003. The soils were highly corrosive with a resistivity of 460 Ωcm and showed the presence of microbiological activity and saturated conditions. The investigation revealed that the polyethylene encasement had provided excellent protection for this pipe during 45 years of service, with no evident pitting or graphitization.

EVALUATING THE CORROSION POTENTIAL OF SOILS

Because retrofitting for corrosion protection is costly and difficult, an effective corrosion prevention program should begin with the identification of potentially corrosive conditions in the area where pipeline construction is planned. It is also beneficial to have a thorough understanding of corrosion and its causes in order to properly evaluate available methods of protection.

Causes of corrosion. Common causes of corrosion on underground pipelines include low-resistivity soils, anaerobic bacteria, dissimilar metals, differences in soil composition, differential aeration of the soil around the pipe, and stray direct current from external sources. Corrosive conditions can exist in every soil environment to some degree. From a practical standpoint, however, most environments are not considered corrosive to ductile-iron pipe. Whether corrosion will be a problem on a given pipeline is more dependent on the rate of corrosion than on the possible existence of corrosion cells (Stroud, 1989).

Iron pipe inherently possesses good resistance to corrosion and does not require additional protection in most soil environments. Experience has shown, however, that there are certain environments in which external corrosion protection of iron pipe is generally warranted. Examples include soils contaminated by coal mine wastes, cinders, refuse, or salts, as well as certain naturally occurring corrosive soils such as expansive clays, alkali soils, and soils found in swamps and peat bogs. In addition, soils in low-lying wet areas are generally more corrosive than soils in well-drained areas.

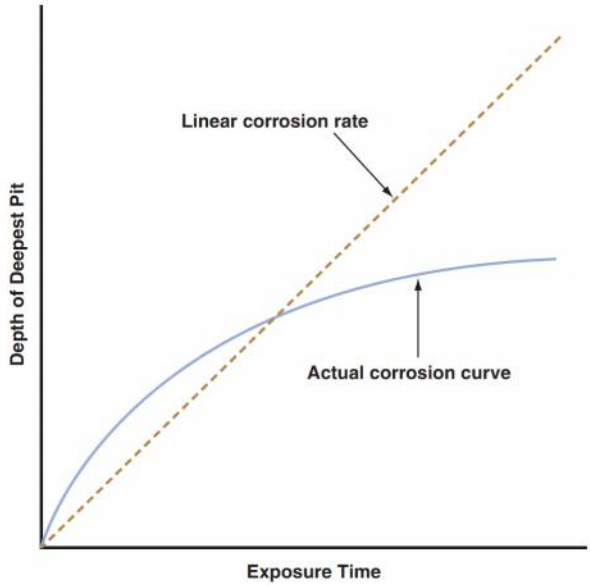
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The 10-point system. In cases in which the relative corrosivity of the soil environment is unknown, several soil-test evaluation procedures can be used to predict whether corrosion is likely to be a problem. The procedure used to evaluate corrosion potential with respect to iron pipe in this analysis was the soil-test evaluation procedure, or 10-point system, included in appendix A of standard C105/A21.5 (ANSI/AWWA, 1999) and A674-00 (ASTM, 2000). The 10-point system (Table 2) was originally developed and recommended by CIPRA in 1964 and has since been used to successfully evaluate soil conditions of more than 100 mil ft (30.48 × 10^6 m) of proposed pipeline installations.

The 10-point system, like all such evaluation procedures, is intended to serve as a guide for identifying potentially corrosive conditions to iron pipe. It should be used by qualified engineers or technicians experienced in soil analysis and evaluation. In many cases, experience with existing installations can provide the most valuable prediction of potential corrosion concerns.

The 10-point system's evaluation procedure uses information drawn from five tests and observations: soil resistivity, pH, oxidation–reduction potential, sulfides, and moisture. For a given soil sample, each parameter is evaluated and assigned points according to its contribution to corrosivity. The points for all five areas are totaled, and if the sum is 10 or more, the soil is considered potentially corrosive to iron pipe and warrants taking protective measures. Table 3 shows the soil parameters with respect to the 10-point system and their related assigned points for the test sites in the database cited in this article.

FIGURE 3 Deepest pit rate



COMPARISON OF CORROSION RATES FOR GRAY- AND DUCTILE-IRON PIPE

Statistical analysis responses variable. It has long been known that corrosion rates of buried gray- and ductile-iron pipe decrease over time. This is largely attributable to the formation of graphite-containing corrosion products that adhere firmly to the unattacked metal substrate, providing a barrier and limiting the rate at which further corrosion attacks can occur. Fuller (1972) of the British Cast Iron Research Association investigated the corrosion rates of iron pipe from Great Britain, France, Germany, and the United States. He gathered and studied data from these sources and concluded that rates of corrosion tend to decrease over time and that this decrease is more pronounced in ductile-iron pipe than it is in gray-iron pipe. Fuller also concluded that the diminution of the attack rate will appear earlier on ductile iron than on gray iron (Figure 2). Ricciardiello studied corrosion rates in 300 specimens of gray iron in liquid sulfur at temperatures between 572°F (300°C) and 752°F (400°C) and also found that rates of corrosion tend to decrease over time (Ricciardiello, 1974).

Ideally, corrosion rate curves would be generated from the data obtained in this study and mathematical functions developed to predict realistic decreasing corrosion pitting rates for extended times of exposure. However, these functions vary not only with soil type but also with moisture, oxygen content, and bacterial counts, all of which can fluctuate over time. Additionally, the pipes in this study's database were subjected to numerous soils, and these would have their own unique corrosion function. For this reason as well as for simplicity and conservatism, it was decided to treat the corrosion rate as a linear straight-line function (Figure 3). When this assumption is used, the

More than 600 utilities in the United States and Canada have had cast-iron pipe that provided more than 100 years of continuous service, and more than 20 utilities have had cast-iron pipe in continuous service for 150 years or more.

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TABLE 4 Mean deepest pitting rate of ductile- and gray-iron bare specimens

Everglades, Fla.		Absecon, N.J.		Birmingham, Ala.		Casper, Wyo.		Four Test Sites Combined	
Pipe Type* and Number of Specimens	Mean Pitting Rate *in. (mm) per year*	Pipe Type* and Number of Specimens	Mean Pitting Rate *in. (mm) per year*	Pipe Type* and Number of Specimens	Mean Pitting Rate *in. (mm) per year*	Pipe Type* and Number of Specimens	Mean Pitting Rate *in. (mm) per year*	Pipe Type	Combined Mean Deepest Pitting Rate *in. (mm) per year*
DI, 87	0.0428 (1.07)	DI, 7	0.030 (0.75)	DI, 61	0.0226 (0.565)	DI, 60	0.00922 (0.2305)	DI	0.0273 (0.6825)
GI, 61	0.0475 (1.1875)	GI, 18	0.0456 (1.4)	GI, 67	0.0261 (0.6525)	GI, 49	0.00848 (0.212)	GI	0.0302 (0.755)

*DI—ductile iron, GI—gray iron

TABLE 5 Mean deepest pitting rate of ductile- and gray-iron sand-blasted specimens

Watsonville, Calif.		Raceland, La.		Two Test Sites Combined	
Pipe Type* and Number of Specimens	Mean Pitting Rate *in. (mm) per year*	Pipe Type and Number of Specimens	Mean Pitting Rate *in. (mm) per year*	Pipe Type	Combined Mean Deepest Pitting Rate *in. (mm) per year*
DI, 37	0.0215 (0.5375)	DI, 29	0.0180 (0.45)	DI	0.0200 (0.5)
GI, 17	0.0321 (0.8025)	GI, 15	0.0392 (0.98)	GI	0.0354 (0.885)

*DI—ductile iron, GI—gray iron

corrosion rate is understated in the early years of exposure and overstated in the later years. In the following analysis, the function was extrapolated to predict expected pitting rates in the later years of exposure, making such an assumption conservative.

For the analyses discussed in this article, the authors created a corrosion rate function based on the single deepest corrosion pit observed on each specimen and divided that measured depth by the exposure time in years. This value, termed the "deepest pit rate," was used in making comparisons.

Each specimen provided a point on the curve of the corrosion function; a group of specimens (whatever the reason for the grouping) was described as having a "mean deepest pitting rate" (arithmetic average of the individual values). For example, if a particular research project involved the burial of 15 specimens in the same soil environment (test site) with exhumations of three specimens every five years for a 25-year period, the mean deepest pitting rate would be the average of the pitting rates of the deepest pit from each specimen (15 pits). For the various test conditions studied, mean values of deepest pit rates were compared using *t*-tests and analysis of variance (95% confidence) as well as visually with multiple box plots.

Corrosion pitting rates. The database was analyzed regarding the corrosion pitting rate of gray-iron pipe versus ductile-iron pipe for two main reasons. First, corrosion comparison studies conducted by DIPRA and others had reported that ductile-iron pipe had a lower pitting rate than gray-iron pipe (Stroud, 1989; Fuller, 1972). DIPRA wanted to see if the large database confirmed those findings. Second, if there was no significant difference in the deepest pit rate between gray-iron and ductile-iron pipe, the gray-iron and ductile-iron data could be combined to provide the benefits of an increased sample size in further analyses.

Specimens in the database included sand-blasted, bare, and asphaltic shop-coated pipe. Comparisons of the mean deepest pitting rate for ductile- and gray-iron bare (without a shop coat) and sand-blasted pipes are shown in Tables 4 and 5, respectively. Four of the DIPRA test sites included both bare gray-iron and bare ductile-iron specimens, and two included both sand-blasted gray-iron and sand-blasted ductile-iron specimens for comparison. Shop-coated specimens were not compared because of possible variations in thickness and type of the asphaltic shop-coat. The bare specimens were more representative of production pipe than were the sand-blasted specimens. Although the thickness of the specimens varied, it did

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TABLE 6 Mean deepest pitting rate of intentionally damaged polyethylene encasement and asphaltic shop-coated specimens

Everglades, Fla.		Overton, Nev.		Logandale, Nev.		Hughes, Ark.		Aurora, Colo.		Five Test Sites Combined	
Pipe Type* and Number of Specimens	Mean Pitting Rate *in. (mm) per year*	Pipe Type and Number of Specimens	Mean Pitting Rate *in. (mm) per year*	Pipe Type and Number of Specimens	Mean Pitting Rate *in. (mm) per year*	Pipe Type and Number of Specimens	Mean Pitting Rate *in. (mm) per year*	Pipe Type and Number of Specimens	Mean Pitting Rate *in. (mm) per year*	Pipe Type	Combined Mean Deepest Pitting Rate *in. (mm) per year*
DPE, 38	0.0121 (0.3025)	DPE, 3	0.0045 (0.1125)	DPE, 10	0.0206 (0.515)	DPE, 3	0.0058 (0.145)	DPE, 8	0.0000 (0.0000)	DPE	0.0112 (0.28)
ASC, 54	0.0320 (0.8)	ASC, 5	0.0205 (0.5125)	ASC, 12	0.0268 (0.67)	ASC, 12	0.0041 (0.1025)	ASC, 6	0.0000 (0.0000)	ASC	0.0247 (0.6175)

*DPE—damaged polyethylene encasement, ASC—asphaltic shop-coated

not affect the calculated pitting rates, which were determined by dividing the depth of the single deepest pit by the time of exposure.

The mean deepest pitting rates of the bare ductile-iron specimens were less than those of bare gray-iron specimens in three of the four test sites. Specific results were as follows: 10% or 0.0047 in. (0.1175 mm) per year less at the Everglades test site, 34% or 0.0156 in. (0.39 mm) per year less at the Absecon, N.J., test site, and 13% or 0.0035 in. (0.0875 mm) per year less at the Birmingham, Ala., test site. At the Casper, Wyo., test site, however, the bare ductile specimens' mean deepest pitting rate was 9% or 0.0007 in. (0.0175 mm) per year greater than that of the gray-iron specimens.

The mean deepest pitting rates for the sand-blasted ductile-iron specimens were 33% or 0.0106 in. (0.265 mm) per year less than those of sand-blasted gray-iron specimens at the Watsonville, Calif., test site and 54% or 0.0212 in. (0.53 mm) per year less than those at the Raceland, La., test site.

This study showed that the mean deepest pitting rates of the more representative bare ductile-iron specimens were on average lower than those of gray iron (with the exception of the Casper test site). Overall results indicated that the corrosion pitting rates of ductile- versus gray-iron pipe were soil-specific to an extent but were essentially the same statistically (*t*-tests, 95% confidence). For this reason, the ductile- and gray-iron pipe data were combined to obtain the benefits of an increased sample size in subsequent analyses. Given that gray-iron pressure pipe has not been commercially available in North America for more than 25 years, the combined gray- and ductile-iron data would result in conservative observations regarding currently available ductile-iron pipe.

POLYETHYLENE ENCASEMENT DATA

Effect of damaged polyethylene encasement on corrosion rate. This study used data on manufactured asphaltic shop-coated pipe to investigate the effect that damaged polyethylene encasement has on the corrosion rate. Of the 369 asphaltic shop-coated polyethylene-encased specimens in the database, 63 were subjected to intentional damage at the time of installation. Normally, the intentional damage was in the form of a 2-in. (50-mm) equilateral triangle, a 0.125-in. (3.125-mm) diameter hole, and a 3-in. (75-mm) slit in the polyethylene at the six and three o'clock positions as the pipe lay in the trench. The controls for these studies were standard production asphaltic shop-coated specimens buried side by side with the intentionally damaged polyethylene-encased specimens. Sets of specimens were exhumed after exposure periods of 1–12 years at five of the DIPRA test sites. The maximum exposure times in the test sites for this comparison were 12 years at Logandale, Nev.; 11 years at

Common causes of corrosion on underground pipelines include low-resistivity soils, anaerobic bacteria, dissimilar metals, differences in soil composition, differential aeration of the soil around the pipe, and stray direct current from external sources.

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TABLE 7 Mean deepest pitting rate for case 1 (<10-point soils)

Pipe Condition	Number of Specimens	Mean Deepest Pitting Rate *in. (mm) per year*	Years to Penetration*
Asphaltic shop-coated	43	0.000667 (0.0167)	375
Polyethylene encased (undamaged)	12	0.0000 (0.0000)	Infinity

*Years to penetration are based on the single deepest pit in each specimen, a linear pitting rate, and a pipe wall thickness of 0.25 in. (6.25 mm), the thinnest ductile-iron pipe wall available.

TABLE 8 Mean deepest pitting rate for case 2 (≥10-point soils, not uniquely severe)

Pipe Condition	Number of Specimens	Mean Deepest Pitting Rate *in. (mm) per year*	Years to Penetration*
Bare	22	0.0151 (0.3775)	17
Sand-blasted	102	0.0253 (0.6325)	10
Asphaltic shop-coated	103	0.0105 (0.2625)	24
Polyethylene-encased (undamaged)	151	0.000453 (0.01133)	552
Vinyl-encased	6	0.000 (0.000)	Infinity

*Years to penetration are based on the single deepest pit in each specimen, a linear pitting rate, and a pipe wall thickness of 0.25 in. (6.25 mm), the thinnest ductile-iron pipe wall available.

Everglades; five years at Aurora, Colo.; three years at Hughes, Ark.; and three years at Overton, Nev.

After exhumation, the specimens were sand-blasted, and pit depths were measured to compare the unprotected asphaltic shop-coated specimens with the areas of damage on the polyethylene-encased specimens. The mean deepest pitting rates for the intentionally damaged polyethylene-encased specimens were less than those of the unprotected asphaltic shop-coated specimens in three of the five test sites (Table 6). No corrosion pitting occurred on any of the specimens exhumed from the fifth test site (Aurora). This site's soil scored only 10 points when analyzed in accordance with the 10-point soil evaluation system. As this analysis showed, not only was the corrosion at the damaged areas in the polyethylene encasement not accelerated beyond that of unprotected asphaltic-coated specimens, it was actually less.

These findings supported field tests started in 1963 at a site at Oldenburg, Germany, where the peaty clay soil was severely corrosive and had a resistivity of 1,000 Ωcm (Wolf, 1971). Six 5.74-ft (1.75-m) lengths of 4-in. (100-mm) diameter ductile-iron pipe were protected with 8-mil (200-μm) thick polyethylene sleeves. Exhumation of the specimens after five years of exposure showed that the pipe was not corroded, except for local areas of sleeving damage. At the local areas of sleeving damage, the corrosion was stated to be ~70% less than that of unprotected pipes. Other researchers have reported that small punctures, tears, or holidays in the film did not produce accelerated corrosion and, if small enough to prevent direct contact between the pipe and the soil, had little deleterious effect (Whitchurch & Hayton, 1968).

CORROSION RATES IN A VARIETY OF SOIL ENVIRONMENTS

Categorizing soils. To analyze the corrosion rates of unprotected and polyethylene-encased iron pipe, the authors considered the soils associated with the 1,379 specimens or inspections and divided these soils into three cases relative to the 10-point soil evaluation system:

- Case 1 included <10-point soils.
- Case 2 included ≥10-point soils (not including uniquely severe environments).
- Case 3 included uniquely severe environments.

The 10-point system does not, and was never intended to, quantify the corrosivity of a soil. It is a tool used to distinguish nonaggressive from aggressive soils relative to iron pipe. Soils <10 points are considered nonaggressive to iron pipe, whereas soils ≥10 points are considered aggressive. A 15- and a 20-point soil are both considered aggressive to iron pipe; however, because of the nature of the soil parameters measured, the 20-point soil may not necessarily be more aggressive than the 15-point soil.

Uniquely severe soils are defined in appendix A of standard C105/A21.5 (ANSI/AWWA, 1999) as having all the following characteristics: (1) soil resistivity ≤500 Ωcm; (2) anaerobic conditions in which sulfate-reducing bacteria thrive (neutral pH, 6.5–7.5; low or negative redox potential, negative to +100 mV; and the presence of sulfides, positive or trace); and (3) water table intermittently or continually above the invert of the pipe. Although research has shown that polyethylene encasement alone is a viable corrosion protection system for ductile- and gray-iron pipe in most environments, other options should be considered for the uniquely severe environments defined here.

The statistical analysis results of the three cases are shown in Tables 7–9. As presented in these tables and in this article, the terms "mean deepest pitting rate" and "years to penetration" reflect the single deepest pit in each pipe and a linear pitting rate, both of which are conservative assumptions. Furthermore, the term "years to penetration" is based on a pipe wall thickness of 0.25

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9-A Pipe Lifespan

in. (6.25 mm), which is the thinnest pipe wall available for ductile-iron pipe and is available only in diameters of 3–8 in. (75–200 mm). Another consideration is that the life of the pipe is not necessarily over when the first penetration is observed. A leak clamp may be incorporated that allows the pipe to continue to function. Additionally, complete graphitization penetration of the pipe wall can occur without leakage because of the tightly adhered corrosion products inherent to iron pipe.

TABLE 9 Mean deepest pitting rate for case 3 (uniquely severe soils)

Pipe Condition	Number of Specimens	Mean Deepest Pitting Rate *in. (mm) per year*	Years to Penetration*
Bare	173	0.0442 (1.105)	6
Sand-blasted	54	0.0379 (0.9475)	7
Asphaltic shop-coated	70	0.0287 (0.7175)	9
Polyethylene-encased (undamaged)	85	0.0068 (0.17)	37
Vinyl-encased	7	0.0055 (0.1375)†	45†

*Years to penetration are based on the single deepest pit in each specimen, a linear pitting rate, and a pipe wall thickness of 0.25 in. (6.25 mm), the thinnest ductile-iron pipe wall available.
†After three years of exposure, one of the seven vinyl specimens had a pit with a corrosion rate of 0.0192 in. (0.48 mm) per year or a "life of pipe" of 13 years. Without this one specimen, the mean deepest pitting rate for vinyl encasement would be 0.0032 in. (0.08 mm) per year or a "life of pipe" of 78 years.

Case 1: <10-point soil. The total of years to penetration for all soils that tested nonaggressive to iron pipe (<10 points when analyzed in accordance with the 10-point soil evaluation system) was 375 years for production asphaltic-coated iron pipe and infinity (zero pitting reported) for polyethylene-encased iron pipe. The long life of unprotected pipe in these soils indicates the success of the 10-point system at predicting nonaggressive environments.

Case 2: ≥10-point soils (not including uniquely severe environments). The total of years to penetration for all soils testing aggressive to iron pipe (≥10 points but not uniquely severe) was only 24 years for production asphaltic-coated iron pipe and 552 years for polyethylene-encased iron pipe. When the results of cases 1 and 2 are considered together (e.g., the short life of the unprotected pipe in the case 2 soils), the 10-point system is shown to be effective at predicting when corrosion protection is warranted. The long life of the polyethylene-encased pipe in the corrosive case 2 soils is testimony to its effectiveness as a corrosion control system for iron pipe.

Case 3: uniquely severe environments. For uniquely severe environments, the tests showed only nine years to penetration for production asphaltic shop-coated iron pipe and 37 years for polyethylene-encased iron pipe. This is the environment for which the 10-point system recommends considering options other than polyethylene encasement (e.g., cathodic protection). The soil characteristics defined in appendix A of the standard for polyethylene encasement for ductile-iron pipe systems for uniquely severe environments are typically associated with swamps and tidal muck areas. In such environments, it is difficult to install polyethylene encasement well enough to prevent exchange of groundwater and entrapment of corrosive materials (e.g., silt and muck) under the wrap. Additionally, the liquid or semiliquid state of such environments prevents the backfill material from compressing the polyethylene film tightly against the pipe (as in normal installations), which leaves no room for error. Consequently, rather than attempting to implement additional installation requirements for polyethylene encasement, users should consider other options when such environments are encountered or avoid these areas whenever possible.

DIPRA is currently researching vinyl encasement for use in these uniquely severe soil environments. Vinyl encasement greatly reduces or eliminates the moisture between the pipe and film and may offer an alternative in uniquely severe environments. A limited 15-year study has been completed and has led to expanded studies now under way.

Soils with high resistivity. Forty-five specimens in the database were subjected to soils with resistivities >2,000 Ωcm as determined using a saturated soil box. Of these 45 pipes, 30 (67%) showed no corrosion pitting with exposures ranging up to 103 years. Of those 30 pipes, 13 had exposures greater than 50 years. Of the 15 pipes in this sample that did reveal pitting, the mean deepest pit rate was 0.0006 in. (0.0152 mm) per year. These findings imply that under these same conditions, more than half of the pipes will not pit, and those that do will average 403 years before penetration.

CONCLUSION

This article summarizes corrosion research that DIPRA has conducted over the past 75 years regarding bare, sand-blasted, asphaltic shop-coated, and polyethylene-encased iron pipe. This research included 1,379 pipe specimens or inspections involving more than 300 different soil environments from test-site evaluations and inspections of in-service operating systems. A statistical analysis of these data yielded the following findings:

- For this study, the mean deepest pitting rate of ductile-iron pipe was less than that of gray-iron pipe and was soil-specific to an extent. However, the conservative approach taken by this study considered the pitting rates to be the same.
- The corrosion rates of iron pipe at damaged areas in polyethylene encasement were not greater than those of nonencased iron pipe.

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- The 10-point soil evaluation system published in appendix A of C105/A21.5 (ANSI/AWWA, 1999) was shown to be an accurate and dependable method of evaluating soils to determine whether corrosion protection is warranted for iron pipe.
- Production asphaltic-coated ductile-iron pipe does not require additional corrosion protection in soils totaling <10 points as analyzed in accordance with appendix A of C105/A21.5 (ANSI/AWWA, 1999).
- Polyethylene encasement is effective as a corrosion control system in all soils tested except uniquely severe environments.
- More data are needed regarding vinyl encasement.

With regard to the longevity of protected iron pipe, this article is more concerned with the "big picture" than with exact predictions. For example, in aggressive soils—as evaluated by the 10-point soil evaluation system for case 2 situations—the years to penetration of polyethylene-encased iron pipe were predicted as 552. This prediction, although indicative of the effectiveness of polyethylene encasement, is not the key point. What this research showed is that polyethylene encasement of ductile-iron pipe is an effective corrosion control system for pipe exposed to aggressive soils, and if properly installed, will provide protection beyond the design life of the pipeline.

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FOOTNOTES

[1]Design Decision Model™, Corrpro Companies Inc., Medina, Ohio

If you have a comment about this article, please contact us at journal@awwa.org.

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~~APPENDIX 9 - B PENINSULA FINANCIAL RATE REVIEW~~

REDACTED

APPENDIX 9 - C COMMERCIAL ACCOUNT ERU CALCULATIONS FOR CAPITAL IMPROVEMENT FEE

9-C Capital Improvement Fee - Commercial Accounts

Capital Improvement Fee Cost Allocation for Cycle 4 (Commercial) Users

Calculation of Equivalent Residental Units (ERU)

LAKE FOREST PARK WATER DISTRICT (KCWD #83)

Revisions: Feb. 2000, Feb 2002, Feb 2006, July 2013, Nov. 2015

District Policy assumptions:

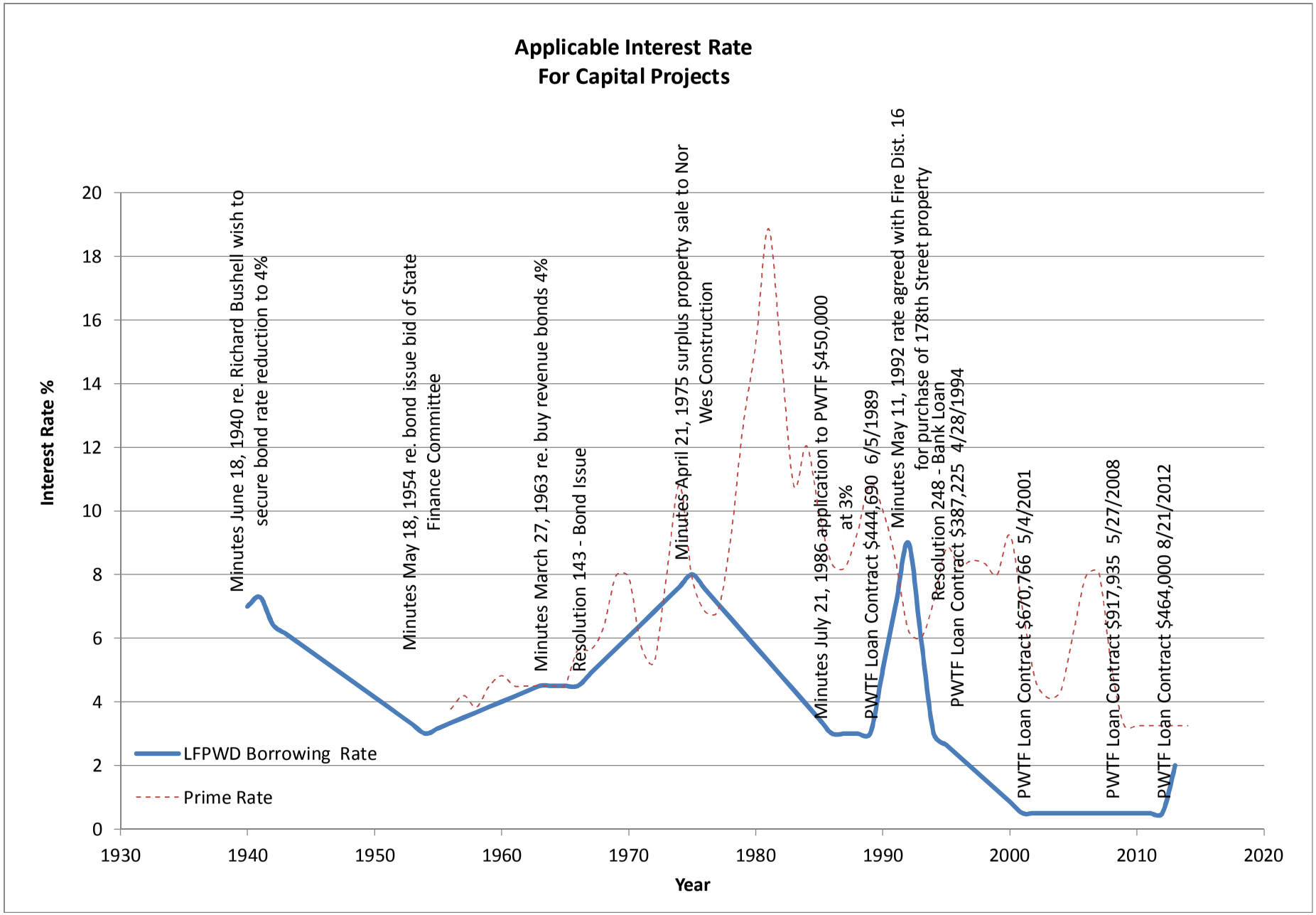
- Calculation of apportioned ERU based on previous 5 year records of usage for the account
- Apportioned ERU for commercial accounts computed individually for each separate location
- Apportioned ERU is truncated to the nearest integer but with **minimum** 1 ERU for any account

1 ERU = 197 gal

Account #	Meter	End Read	End Date	Start Read ccf	Start Date	Corrections for register turns or meter change	Period Usage ccf	Account Total	Elapsed Days	Average Daily Usage, gal	Apportioned ERU for Account
4711	Neptune 8"	83881	12/31/2012	70268	12/29/2006		13613		2194		
	Compound	11153	12/31/2012	61644	12/29/2006	100000	49509	**63122**	2194	21523	109
TBD	Main								0		
TBD	Compound							0	0		
12	2" meter	624	12/31/2012	596	12/29/2006	1000	1028	1028	2194	351	1
21	1" meter	0	12/31/2012	0	12/29/2006		0	0	2194	0	1
801	3/4" meter	432	12/31/2012	314	12/29/2006		118	118	2194	40	1
1110	1" meter	132	12/31/2012	132	12/29/2006		0	0	2194	0	1
1180	1" meter	272	12/31/2012	141	12/29/2006		131	131	2194	45	1
8588	1" meter at annex modular	99	12/31/2012	14	12/29/2006		85	85	2194	29	1
4771	Main meter	7011	12/31/2012	3731	12/29/2006		3280		2194		
	Compound	11443	12/31/2012	4746	12/29/2006		6697	**9977**	2194	3402	17
3890	3/4" meter	98	12/31/2012	18	12/29/2006	0	80	80	2194	27	1
800	1" meter	293	12/31/2012	488	12/29/2006	3000	2805	2805	2194	956	4
4900	3/4" meter	361	12/31/2012	23	12/29/2006	0	338	338	2194	115	1
791		338	12/31/2012	103	12/29/2006	0	235	235	2194	80	1
790		391	12/31/2012	329	12/29/2006	0	62	62	2194	21	1
3951		353	12/31/2012	128	12/29/2006	0	225	225	2194	77	1
4760		553	12/31/2012	381	12/29/2006		172	172	2194	59	1
4120	3/4" meter	17	12/31/2012	510	12/29/2006	1000	507	507	2194	173	1
20	1-1/2" meter	655	12/31/2012	345	12/29/2006	1000	1310	1310	2194	447	2
TOTAL								**80195 ccf**		**27345**	**145**

file: Raid-2\Water Usage\Customer Usage Data Summary.xls

APPENDIX 9 - D SYSTEM DEVELOPMENT CHARGE (SDC) AND GASB-34


Applicable Interest Rate
For Capital Projects
Interest Rate %
Year
LFPWD Borrowing Rate
Prime Rate
Minutes June 18, 1940 re. Richard Bushell wish to secure bond rate reduction to 4%
Minutes May 18, 1954 re. bond issue bid of State Finance Committee
Minutes March 27, 1963 re. buy revenue bonds 4%
Resolution 143 - Bond Issue
Minutes April 21, 1975 surplus property sale to Nor Wes Construction
Minutes July 21, 1986 application to PWTF $450,000 at 3%
PWTF Loan Contract $444,690 6/5/1989
Minutes May 11, 1992 rate agreed with Fire Dist. 16 for purchase of 178th Street property
Resolution 248 - Bank Loan
PWTF Loan Contract $387,225 4/28/1994
PWTF Loan Contract $670,766 5/4/2001
PWTF Loan Contract $917,935 5/27/2008
PWTF Loan Contract $464,000 8/21/2012

APPENDIX 10 PLAN SUPPORT DOCUMENTS

APPENDIX 10 - A WASHINGTON STATE DEPARTMENT OF HEALTH (WSDOH) COMMENTS TO SYSTEM PLAN DRAFT DATED 12/17/2015 AND LFPWD RESPONSE

10-A Dept. of Health Comments

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
NORTHWEST DRINKING WATER REGIONAL OPERATIONS
20425 72nd Avenue South, Suite 310, Kent Washington 98032-2388

April 12, 2016

F. Alan Kerley
Lake Forest Park Water District
4029 NE 178th ST
Lake Forest Park WA 98155

Subject: Lake Forest Park Water District , PWS ID # 40950
King County
Water System Plan – 2016 (Review)
Submittal #16-0105

Dear Mr. Kerley :

Thank you for submitting the draft Water System Plan (WSP) for Lake Forest Park Water District (the District), which was received in this office on January 13, 2016. This WSP is a very well done planning document and establishes a good baseline for the District's ongoing efforts to achieve and maintain technical, managerial and financial capacity. Compliments to you and Dan Mundall.

We have reviewed the plan and offer the following comments. These comments must be adequately addressed prior to approval of the WSP. Comment # 6 under the System Analysis section is for your consideration, with the intent that it will make your WSP an even stronger planning document.

System Description

1. Identify the District's Retail Service Area (RSA) on the service area map in the WSP, in addition to a narrative description. This is a requirement from the Municipal Water Legislation. The RSA is defined as where a utility currently serves customers and where it plans to serve customers in the future, with a recognition of a Duty to Serve responsibility for new requests for water service in that defined area.

10-A Dept. of Health Comments

2. Provide a determination of Local Government Consistency (LGC) from the City of Lake Forest Park. If the District has service area within the corporate boundaries of Kenmore, provide a LGC from Kenmore.

3. Provide an Adoption Ordinance for your WSP from King County, if the District provides water service in unincorporated King County.

Basic Planning Data

4. We understand there are some unresolved boundary issues with neighboring utilities. For example, the 71 connections within the District's corporate boundary, presently served by North City Water District. What are the District's objectives regarding service connections, 1) inside the District's retail service area, 2) outside the District's retail service area, 3) served by District, 4) not served by the district, or 5) future connections in these areas? How does the District plan to meet these objectives?

System Analysis- Water Quality

5. We recognize that the District has a strong "no chlorine" preference. We also note that the District has had repeated coliform bacteria detections in recent years: June, Aug, Sept, Nov 2015; Aug, Sept, Dec 2014; Sept, Oct 2013 (note that months with "violations" are underlined). We are concerned that District may hit the "significant non-compliance" trigger of 4 violations in a running 12 month period where continuous disinfection treatment would be required. "Spot disinfection" as written on page 3-19 is discouraged; it can mask problems and interfere with representative routine coliform monitoring results. Please contact us at 253-395-6775 prior to any spot disinfection to discuss an appropriate action plan.

6. Your water system plan identifies several key efforts (source water protection, investigative coliform sampling, cast iron main replacement) to help maintain bacteriological water quality – this is a good start. We also wanted to share a valuable resource prepared by the folks at Mt. View-Edgewood Water Company, "Best Management Practices (BMPs) to Protect Water Quality" (enclosed). Further, we encourage you to go beyond investigative coliform sampling and consider developing seasonal distribution profiles for additional water quality parameters (pH, alkalinity, sulfate, HPC using R2A agar) that can help prioritize facility maintenance and capital improvements. We encourage you to implement as many as possible while at the same time developing an action plan (financial and engineering) on how to achieve continuous and effective disinfection should the need arise. Please let us know your thoughts.

10-A Dept. of Health Comments

7. Has the District developed an *E. coli* response plan in case it should have an *E. coli* MCL violation or identify *E. coli* in its raw source water under the Groundwater Rule? Our Mercer Island experience indicates that consumers want this water quality information as soon as possible and an *E. coli* Response Plan can position a community to be successful. Please visit the following link for templates, http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/Contaminants/Coliform/PreparingaColiformMonitoringPlan/LargeorMultipleSource

8. The Revised Total Coliform Rule, effective April 1, 2016, requires all water utilities to conduct a Level 1 or Level 2 assessment of its water system and submit it to the department within 30 days of reaching the trigger. Our draft rule will be out for informal comment very soon. Please give some thought to developing an approach to conducting a complete assessment prior to the effective date of the rule. We have a "RTCR Level 1 Assessment Guidance Template" available on line at the following link. http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/Contaminants/Coliform/RevisedTotalColiformRuleRTCR

Water Use Efficiency/ Water Rights

9. Please describe any changes in operation in response to drought conditions in 2015. Did you observe any changes in supply, or demand?

Operations & Maintenance

10. P. 6-1 , make following correction: General Manager calls DOH Northwest Regional Office Manager Robert James within 24 hours at (253) 395-6768.

11. Provide a status report of your current cross connection control program. Who is the District's Cross Connection Control Specialist and when was the plan last evaluated? How many Table 9 hazards are identified in the District's service area? How many are protected? What is the annual compliance percentage of device testing? What additional implementation actions need to be taken during this planning period?

12. How do you test service meter reliability?

13. Several pages (e.g., 6-8, 6-11, and 6-14) describe what the O&M *should be*. What are the O&M policies presently employed and embraced by the District?

10-A Dept. of Health Comments

Financial Plan

14. The financial chapter presents a large amount of financial information and analysis. In the final WSP submittal, provide the balanced, 6 year financial operating plan that the District's commissioners have adopted. Summarize proposed rate increases, other revenue and financing sources that will support the balanced financial plan.

Miscellaneous

15. Provide signed PE stamp with the final WSP submittal.

16. The water system must meet the consumer input process outlined in WAC 246-290-100(8). Please include documentation of a consumer meeting discussing the WSP, prior to DOH approval of the WSP.

17. Prior to DOH approval, the District's governing body must approve and adopt the WSP. This is a new requirement resulting from the Municipal Water Legislation.

18. Please provide copies of any comments made by adjacent purveyors or other interested parties along with the City's response to those comments.

19. Is Lake Forest Park a member of WARN, either locally or at the state level?

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 **July12, 2016**. 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 of fees for review of planning, engineering, and construction documents were adopted August 3, 2007 (WAC 246-290-990). The total cost is **$2280.00**. An itemized invoice is enclosed. Please note that this fee covers our current review and one more submittal for this project. If additional submittals are required, then an invoice for additional fees will be included with our final approval letter. Please remit your complete payment in the form of a check or money order within thirty days of the date of this letter to: **WSDOH, Revenue Section, PO Box 1099, Olympia WA 99507-1099.**

10-A Dept. of Health Comments

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 me.

Sincerely,

Richard Rodriguez

Richard Rodriguez
Regional Planner
(253) 395-6771

Enclosure (invoice)

cc: Brietta Carter, DOH
Derek Pell, DOH
Steve Hirschey, King County UTRC
Seattle/ King County Health
Dan Mundall, PE, Mundall Engineering

Commissioners:
William F. Donahue
David A. Hammond
Eli B. Zehner

LAKE FOREST PARK WATER DISTRICT

GOOD WATER, NATURALLY

(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155
www.lfpwd.org

August 31, 2016

Attn: Richard Rodriguez, Regional Planner
Northwest Regional Office (NWRO)
20435 72nd Avenue South, Suite 200
Kent, Washington 98032

RE: **Lake Forest Park Water District (40950K) Water System Plan Submittal #16-0105**

Dear Richard,

We have attached an updated Comprehensive Water System Plan document dated 8/31/2016. The revised document contains edits and an itemized response to your comments (4/12/2016) to our DRAFT submission dated 12/17/2016. Please advise if you require any further information in these regards.

Sincerely,



Alan Kerley, General Manager

Encl. - Lake Forest Park Water District CWSP 2015 – Final Edited Copy 8/31/2016
- Water System Plan Submittal Form (#331-040)
- WSP Checklist

c.c. - Mundall Engineering & Consulting

Part I General Information – System Description	LFPWD Response to DOH 4/12/2016
1. Identify the District's Retail Service Area (RSA) on the service area map in the WSP, in addition to a narrative description. This is a requirement from the Municipal Water Legislation. The RSA is defined as where a utility currently serves customers and where it plans to serve customers in the future, with a recognition of a Duty to Serve responsibility for new requests for water service in that defined area.	We have updated the map to reflect our existing and future RSA.
2. Provide a determination of Local Government Consistency (LGC) from the City of Lake Forest Park. If the District has service area within the corporate boundaries of Kenmore, provide a LGC from Kenmore.	TO FOLLOW
3. Provide an Adoption Ordinance for your WSP from King County, if the District provides water service in unincorporated King County.	We do not provide water service in unincorporated King County. However, we will submit our finalized plan to King County for approval.
4. We understand there are some unresolved boundary issues with neighboring utilities. For example, the 71 connections within the District's corporate boundary, presently served by North City Water District [and Northshore Utility District]. What are the District's objectives regarding service connections, 1) inside the District's retail service area, 2) outside the District's retail service area, 3) served by District, 4) not served by the district, or 5) future connections in these areas? How does the District plan to meet these objectives?	In answer to DOH questions: 1. to serve 2. to serve if feasible 3. to continue to provide service where logical and feasible 4. to cooperate with neighboring districts and to serve if feasible 5. to cooperate with neighboring districts and to serve if in retail service area. Our objective is to resolve boundary overlap issues through interlocal agreements with neighboring districts utilizing the annexation and de- annexation process with the King County Boundary Review Board. The plan has been revised to indicate our intention.

10-A Dept. of Health Comments

Part III System Analysis – Water quality	LFPWD Response to DOH 4/12/2016
5. We recognize that the District has a strong "no chlorine" preference. We also note that the District has had repeated coliform bacteria detections in recent years: June, Aug, Sept, Nov 2015; Aug, Sept, Dec 2014; Sept, Oct 2013 (note that months with "violations" are underlined). We are concerned that District may hit the "significant non-compliance" trigger of 4 violations in a running 12 month period where continuous disinfection treatment would be required. "Spot disinfection" as written on page 3-19 is discouraged; it can mask problems and interfere with representative routine coliform monitoring results. Please contact us at 253-395-6775 prior to any spot disinfection to discuss an appropriate action plan.	Thank you for your observation and recommendation regarding coliform violations. LFPWD Source water has never tested positive for coliform, thus we remain committed to a non-chlorinated system. The phrase “spot disinfection” seems to have created a misunderstanding. Please see revision.
6. Your water system plan identifies several key efforts (source water protection, investigative coliform sampling, cast iron main replacement) to help maintain bacteriological water quality — this is a good start. We also wanted to share a valuable resource prepared by the folks at Mt. View-Edgewood Water Company, "Best Management Practices (BMPs) to Protect Water Quality" (enclosed). Further, we encourage you to go beyond investigative coliform sampling and consider developing seasonal distribution profiles for additional water quality parameters (pH, alkalinity, sulfate, HPC using R2A agar) that can help prioritize facility maintenance and capital improvements. We encourage you to implement as many as possible while at the same time developing an action plan (financial and engineering) on how to achieve continuous and effective disinfection should the need arise. Please let us know your thoughts.	Thank you for sharing Mt. View-Edgewood’s BMP’s. Since receiving your comment the District’s operator of record has met with Mt. View-Edgewood and is currently employing several of the BMP’s suggested by them. The District has also written its own District specific BMP’s for integration into our field operation manual and put these practices into effect. This document has been included in the appendices and we believe these practices will resolve the issue of coliform bacteria detections. We are presently building a water pump facility which will support installation of water disinfection in the future through the use of ozone and/ or filtration should the need arise.
7. Has the District developed an E. coli response plan in case it should have an E. coil MCL violation or identify E. coil in its raw source water under the Groundwater Rule? Our Mercer Island experience indicates that consumers want this water quality information as soon as possible and an E. coil Response Plan can position a community to be successful.	Yes, the E. coli response plan is in the District’s Emergency Response Plan.
8. The Revised Total Coliform Rule, effective April 1, 2016, requires all water utilities to conduct a Level 1 or Level 2 assessment of its water system and submit it to the department within 30 days of reaching the trigger. Our draft rule will be out for informal comment very soon. Please give some thought to developing an approach to conducting a complete assessment prior to the effective date of the rule.	Thank you for the information and comment. The District has reviewed and is aware of the revised coliform rule. We conducted an assessment prior to the rule effective date and have a plan in place.

Part IV Water Use Efficiency/Water Rights	LFPWD Response to DOH 4/12/2016	Ref. Page
9. Please describe any changes in operation in response to drought conditions in 2015. Did you observe any changes in supply, or demand?	In response to the drought conditions in 2015, we continued conservation measures and observed no changes in the level of our aquifers or demand levels outside of historical parameters. No special conservation measures were triggered.	4-5

Part VII Operations & Maintenance	LFPWD Response to DOH 4/12/2016	Ref. Page
10. P. 6-1, make following correction: General Manager calls DOH Northwest Regional Office Manager Robert James within 24 hours at (253) 395-6768.	Please see edits on Page 6-19 which address these comments.	6-19
11. Provide a status report of your current cross connection control program. Who is the District's Cross Connection Control Specialist and when was the plan last evaluated? How many Table 9 hazards are identified in the District's service area? How many are protected? What is the annual compliance percentage of device testing? What additional implementation actions need to be taken during this planning period?	Please see edits on page 6-9 which address these comments. No additional implementation actions are foreseen at this time.	6-9
12. How do you test service meter reliability?	Service meters replaced by age with testing in house as needed or requested. Please see page 6-13 for edits to plan.	6-13
13. Several pages (e.g., 6-8, 6-11, and 6-14) describe what the O&M should be. What are the O&M policies presently employed and embraced by the District?	Please see edits these sections where “should” is replaced with language more descriptive of intent.	6-8, 6-11, and 6-14

Part IX Financial Plan	LFPWD Response to DOH 4/12/2016	Ref. Page
14. The financial chapter presents a large amount of financial information and analysis. In the final WSP submittal, provide the balanced, 6 year financial operating plan that the District's commissioners have adopted. Summarize proposed rate increases, other revenue and financing sources that will support the balanced financial plan.	Working with Donna and Bill D. on this one	DOH, KC

10-A Dept. of Health Comments

Miscellaneous	LFPWD Response to DOH 4/12/2016	Ref. Page
15. Provide signed PE stamp with the final WSP submittal.	Please see plan cover page "i"	Cover page "I"
16. The water system must meet the consumer input process outlined in WAC 246-290-100(8). Please include documentation of a consumer meeting discussing the WSP, prior to DOH approval of the WSP.	Please see attached LFPWD agendas and minutes of meetings in Appendix Ten	App. 10
17. Prior to DOH approval, the District's governing body must approve and adopt the WSP. This is a new requirement resulting from the Municipal Water Legislation.	Please see attached LFPWD resolution #367	App. 10
18. Please provide copies of any comments made by adjacent purveyors or other interested parties along with the [District's] response to those comments.	Please see Appendix Ten.	App. 10
19. Is Lake Forest Park a member of WARN, either locally or at the state level?	No. The District will continue to evaluate the need for membership.	

10-A Dept. of Health Comments

APPENDIX 10 - B KING COUNTY COMMENTS TO SYSTEM PLAN DRAFT DATED 12/17/2015 AND LFPWD RESPONSE

10-B King County Comments

King County

Utilities Technical Review Committee
Department of Natural Resources and Parks
King Street Center
201 South Jackson Street, Suite 512
Seattle, WA 98104-3855
www.kingcounty.gov

May 24, 2016

F. Alan Kerley
Lake Forest Park Water District
4029 NE 1781
Lake Forest Park WA 98155

Dear Mr. Kerley:

Thank you for submitting the Lake Forest Park Water District (District) Comprehensive Water System Plan (Plan), December 2015, for King County review. The Plan was received on April 19, 2016. In accordance with King County Code 13.24 and chapter 57.16 Revised Code of Washington, the 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.

In reviewing the Plan, the UTRC found that the Plan requires the following additions and clarifications to be consistent with the County's comprehensive plan and code. We request you provide the following in your final Plan:

- Clarification of the District's service area policies related to the provision of water service, and the time interval for addressing a water service availability application;
- Complete the King County Reclaimed Water Checklist as part of the Plan. The checklist can be downloaded here: http://www.kingcounty.gov/depts/dnrp/utilities-technical-review-committee.aspx;
- Include a Water Loss Control Plan consistent with State rule requirements in Chapter 246-290 Washington Administrative Code;
- Revise the financial and budget information in the draft to reflect a six-year operating budget or financial plan;
- Include a signed State Environmental Policy Act Checklist and threshold determination for the District's approval of the Plan;
- Include a consistency statement from the City of Lake Forest Park where you provide service to affirm the Plan is consistent with their planning efforts; and
- Include the resolution from the District's Board of Commissioners approving the Plan.

10-B King County Comments

We look forward to seeing the final Plan and working with you to recommend the Plan for approval to the King County Council. 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 the letter, please do not hesitate to call me at 206-477-5387.

Sincerely,

Stephen Hirschey
Chair, Utilities Technical Review Committee

cc: Richard Rodriguez, Regional Planner, Washington State Department of Health

Commissioners:
William F. Donahue
David A. Hammond
Eli B. Zehner

LAKE FOREST PARK WATER DISTRICT

GOOD WATER, NATURALLY

(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155
www.lfpwd.org

August 31, 2016

Attn: Stephen Hirschey, Chair, Utilities Technical Review Committee
King County Department of Natural Resources and Parks
201 South Jackson Street, Suite 512
Seattle, WA 98104-3855

RE: **Lake Forest Park Water District Comprehensive Water System Plan 2015**

Dear Stephen,

We have attached an updated Comprehensive Water System Plan document dated 8/31/2016. The revised document contains edits and input reflecting your comment dated 6/17/2016. Please advise if you require any further information in these regards.

Sincerely,

Alan Kerley, General Manager

Encl. - Lake Forest Park Water District CWSP 2015 – Final Submission dated 8/31/2016

DRAFT LFPWD Response to King County comments on LPFWD Comprehensive Plan

King County – Utilities Technical Review Committee comments 5/24/2016	**LFPWD Response to King County 6/22/2016**
1.General Information	
• Clarification of the District's service area policies related to the provision of water service, and the time interval for addressing a water service availability application;	**Thank you for your comment. The District is able to address water service availability within one to two weeks from date of application.**
• Complete the King County Reclaimed Water Checklist as part of the Plan. The checklist can be downloaded here: http//www.kingcounty.gov/depts./dnrp/utilities-technical-review-committee.aspx;	**To be completed.**
• Include a Water Loss Control Plan consistent with State rule requirements in Chapter 246-290 Washington Administrative Code;	**Water Loss Control Plan has been included. Please see revision.**
• Revise the financial and budget information in the draft to reflect a six-year operating budget or financial plan;	
• Include a signed State Environmental Policy Act Checklist and threshold determination for the District's approval of the Plan;	**To be completed. Thank you for your comment.**
• Include a consistency statement from the City of Lake Forest Park where you provide service to affirm the Plan is consistent with their planning efforts; and	**To be completed. Thank you for your comment.**

Include the resolution from the District's Board of Commissioners approving the Plan.	**To be completed. Thank you for your comment.**

10-B King County Comments

APPENDIX 10 - C CITY OF LAKE FOREST PARK COMMENTS

Dan Mundall, P.E.

10-C LFP City Comments

From: Rodriguez, Richard (DOH) <Richard.Rodriguez@DOH.WA.GOV>
Sent: Thursday, September 22, 2016 9:40 AM
To: Dan Mundall P.E.
Subject: RE: Lake Forest Park Water District - Comprehensive Water System Plan - Local Government Consistency Review for Dept. of Health

Dan, works for me.

Thank you,

From: Dan Mundall P.E. [mailto:dan@mundall.com]
Sent: Thursday, September 22, 2016 12:17 AM
To: Rodriguez, Richard (DOH) <Richard.Rodriguez@DOH.WA.GOV>
Cc: Alan Kerley <alan@lfpwd.org>; engr@lfpwd.org
Subject: Fwd: Lake Forest Park Water District - Comprehensive Water System Plan - Local Government Consistency Review for Dept. of Health

Dear Richard,

I am forwarding a response from the City of Lake Forest Park review for consistency with local government. Also included below are correspondence in these regards.

Please advise if this is not adequate. LFP advises me that the format of their response matches that given to Northshore Utility District for their consistency review.

Best Regards,

Dan Mundall, PE
MUNDALL ENGINEERING & CONSULTING
Box 799
Sumas, WA 98295

360-319-1285

On behalf of:

LAKE FOREST PARK WATER DISTRICT
4029 NE 178th Street
Lake Forest Park, WA 98155

Sent from my iPhone

Begin forwarded message:

> **From:** Stephen Bennett <SBennett@ci.lake-forest-park.wa.us>
> **Date:** September 21, 2016 at 4:56:18 PM PDT
> **To:** "Dan Mundall, P.E." <dan@mundall.com>
> **Cc:** 'Alan Kerley' <alan@lfpwd.org>, "engr@lfpwd.org" <engr@lfpwd.org>, Andrea Flower <aflower@ci.lake-forest-park.wa.us>, Pete Rose <prose@ci.lake-forest-park.wa.us>

Subject: RE: Lake Forest Park Water District - Comprehensive Water System Plan - Local Government Consistency Review for Dept. of Health

10-C LFP City Comments

Dan,

Thank you for reaching out to Lake Forest Park for input on the 2015 LFPWD Comprehensive Water System Plan. We appreciate your analysis in response to my initial comments. As we've discussed, the City's 2015 Comprehensive Plan makes no specific changes to the land use densities in the areas within District's boundaries, so the District's reliance on the 2005 LFP Comprehensive Plan does not create consistency issues between the City's and the District's comprehensive plans. The City may start a town center district subarea planning process early next year, so it will be important to revisit density and demand forecasts in the District's next plan update. At this point, however, I find no significant consistency issues between the City's and the District's plans and have no further comments on the LFPWD Plan.

Let me know if you have any questions.

Steve Bennett
Director
Planning and Building Department

17425 Ballinger Way NE
City of Lake Forest Park, WA
206-957-2812
www.cityoflfp.com



Disclaimer: This email is considered a public record and may be subject to public disclosure.

From: Dan Mundall, P.E. [mailto:dan@mundall.com]
Sent: Thursday, September 15, 2016 11:54 AM
To: Stephen Bennett <SBennett@ci.lake-forest-park.wa.us>
Cc: 'Alan Kerley' <alan@lfpwd.org>; engr@lfpwd.org; Andrea Flower <aflower@ci.lake-forest-park.wa.us>
Subject: RE: Lake Forest Park Water District - Comprehensive Water System Plan - Local Government Consistency Review for Dept. of Health

Stephen Bennett, Planning and Building Director
City of Lake Forest Park

Dear Steve,

Re-consideration of development potential in LFPWD over the next 20 years

Thank you for your review of the growth projections contained in our DRAFT Comprehensive Water System Plan 2015 (edit 12/17/2015) and for your suggestions regarding additional potential development in the District due to infill and subdivision of larger parcels. The projections used in our

plan are primarily based on an extrapolation of historical growth with adjustment for increased household size based on US Census and PSRC data.

10-C LFP City Comments

How we analyzed development potential in the District in this review

Further to your suggestion to analyze parcels over a certain size threshold for development potential, we used ARCGIS to extract parcels in the LFPWD service area that were more than twice the size of current allowed zoning density to determine potential subdivision and infill development.

What were our findings?

There is potential for 259 new detached dwellings in the District under current LFP zoning. The attached map describes the number of additional units that could be built under zoning rules. An additional 68 units could be assumed by the District if there were service area agreements with Northshore Utility District (NUD) and North City Water District (NCWD) and some of these could be subdivided. Additionally, there has been discussion in years past of mixed residential/commercial development at the LFP Towne Center but this is considered speculative and not on the horizon. Potential development is thus:

Development	Resid. Units (ERU)	Notes
LFP Towne Center mixed use residential/commercial development	0	Former owner, Madison Marquette had discussed a 300 unit mixed use residential development but this never got past the conceptual planning stage. Current owner Merlone Geier has not indicated any expansion plans yet.
Subdivision of existing developed SFD to LFP zoning potential	196	Based on under-developed parcels where parcel size is more than 2X zoning allowance.
Infill vacant lots with subdivision	46	These are parcels that are in LFPWD bounds but are undeveloped.
Boundary service agreement - customers from NUD, NCWD	68	Most conservative calculation, assumes ALL customers in LFPWD boundary now served by others will transfer to District. This is unlikely, but possible. (note CWSP delineation of "71" customers differs as 3 parcels are accounted below as having subdivision potential)
Customers from NUD, NCWD Subdivision SFD to LFP zoning potential	17	Based on under-developed parcels where parcel size is more than 2X zoning allowance.
TOTAL **(SFD=Single Family Dwelling)**	**327**	"worst case" most extreme development scenario. Empirical data projecting historical growth in suggests there may only be 60 additional Equivalent Residential Units (ERU) by 2034, and this is used in development of the plan.

What is the impact if all this development materialized?

Assuming that all the potential development happens by 2034 there is potential for increase of *peak day* demand to 1.08 MG/day (750 GPM) and calculated *peak hour* demand to 1,564 GPM (Wash. Dept. of Health formula). Currently the District has 973 GPM of instantaneous water rights so distribution storage might be called on to augment *peak hour* demand by 2034 but *peak day demand* (over 24 hours) is well within water right allowances. Well source capacity by 2034 (not including interties) will be at

least 1,790 GPM; in excess of water rights and will not be a limiting factor. Distribution piping in small networks like LFPWD is almost always governed by fire capacity, so it is unlikely there would be any impact on proposed piping design.

What is an appropriate action for the District's CWSP 2015?

Considering the low probability of *all* this development occurring, and considering that vital factors such as water rights and supply capacity are more than adequate, we believe that design assumptions in CWSP 2015 are adequate at this time although development trends should be reconsidered during preparation of the next comprehensive plan update in 6 – 10 years. Actual development should be compared with these projections at that time and adjusted accordingly.

Please let me know if you find this information adequate for your consistency review or if we can provide anything else.

Best Regards,

Dan Mundall, PE

From: Stephen Bennett [mailto:SBennett@ci.lake-forest-park.wa.us]
Sent: Friday, July 29, 2016 5:29 PM
To: Dan Mundall, P.E.
Cc: 'Alan Kerley'
Subject: RE: Lake Forest Park Water District - Comprehensive Water System Plan - Local Government Consistency Review for Dept. of Health

Dan and Alan,

My apologies for not getting back to you by Tuesday, but I do have some questions:

On page 1-22 the plan says that only 66 of the 1038 parcels in the District are 'vacant or un-developed'. Did you consider whether parcels are under-developed? I don't think the district is as saturated as the Plan implies. We're getting a lot of short plat applications these days. There's a one acre parcel at 18623 40TH PL NE (zone RS-9600) is going from one residence to four soon? You've also got one of the SPU properties with WD boundaries which could probably support 2-4 units if the City doesn't purchase it. There are several 1 acre or larger parcels along 40th Place and 185th St. that are zoned RS-9600 or RS-10,000 that will probably support 4 lots. We don't have any recent data on capacity of under-utilized parcels (last land use capacity analysis is about 15 years old), but since you only have about 1000 parcels in your district, seems like you could do a quick analysis of single family parcels over a certain size that are zoned for 4 units per acre or higher.

The new Comp Plan also promotes amending City codes to encourage more accessory dwelling units. In the last two years we're averaging about six per year. If we adjust the regulations, it would easily double that and all of those large lots (RS-15,000 and RS-20,000) in core of the District would be prime candidates for ADUs, being so close to Town Center. Would the District have the capacity to provide adequate service if say, half those large lots had ADUs by 2033?

Give me a call if that's easier, Steve

Stephen Bennett
Planning & Building Director
City of Lake Forest Park
steve@cityoflfp.com

Phone: 206.368.5440
Direct: 206.957.2812

10-C LFP City Comments

From: Dan Mundall, P.E. [mailto:dan@mundall.com]
Sent: Friday, July 22, 2016 11:19 AM
To: Stephen Bennett <SBennett@ci.lake-forest-park.wa.us>
Cc: 'Alan Kerley' <alan@lfpwd.org>
Subject: RE: Lake Forest Park Water District - Comprehensive Water System Plan - Local Government Consistency Review for Dept. of Health

Thank you Steve,

We just wanted to make sure we weren't forgotten!

Dan

From: Stephen Bennett [mailto:SBennett@ci.lake-forest-park.wa.us]
Sent: Thursday, July 21, 2016 12:21 PM
To: Dan Mundall, P.E.
Cc: 'Alan Kerley'
Subject: RE: Lake Forest Park Water District - Comprehensive Water System Plan - Local Government Consistency Review for Dept. of Health

Dan and Alan,

We've been slammed since you submitted this but I will do my best to complete the review and respond by Tuesday end of day.

Steve

From: Dan Mundall, P.E. [mailto:dan@mundall.com]
Sent: Friday, July 15, 2016 10:46 AM
To: Stephen Bennett <SBennett@ci.lake-forest-park.wa.us>
Cc: 'Alan Kerley' <alan@lfpwd.org>
Subject: FW: Lake Forest Park Water District - Comprehensive Water System Plan - Local Government Consistency Review for Dept. of Health

Hello Steve,

I'm just checking to see if you had a chance to do our LGC review yet. Let me know if I can do anything to help.

Regards,

Dan Mundall, PE
MUNDALL ENGINEERING & CONSULTING

On behalf of:

Lake Forest Park Water District
4029 NE 178th St.
Lake Forest Park, WA 98155

Office (206) 365-3211

10-C LFP City Comments

From: Dan Mundall, P.E. [mailto:dan@mundall.com]
Sent: Thursday, June 16, 2016 4:55 PM
To: Stephen Bennett (SBennett@ci.lake-forest-park.wa.us)
Cc: 'Alan Kerley'; engr@lfpwd.org
Subject: Lake Forest Park Water District - Comprehensive Water System Plan

Hello Steve,

It was good visiting with you today. I am enclosing a link (below) to download the District's DRAFT Comprehensive Water System Plan 2015 as discussed. Note that there is discussion of the potential LFP Towne Center expansion on Page 2-5; we omitted the potential mixed use residential development from our calculations due to the uncertainty of this actualizing in the planning period, however, the system has adequate water to supply this development, as described in Part 4 of the DRAFT System Plan. I can get you more detailed information on adequacy of supply if you require.

Link for downloading System Plan:

http://www.lfpwd.org/component/content/article/117-comp-plan-2015

Please let me know if I can provide anything else to help you in your plan consistency review.

Best Regards,

Dan Mundall, PE

MUNDALL ENGINEERING & CONSULTING
BOX 799
SUMAS, WA 98295

Off. (800) 313-9705
Dan's Cell (360) 319-1285

MAR 01 2016

Received By:
MAR 01 2016
Lake Forest Park WD

Mayor
Jeff R. Johnson

17425 Ballinger Way NE
Lake Forest Park, WA 98155-5556
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CITY OF LAKE FOREST PARK
INCORPORATED 1961

Councilmembers
Tom French
Phillippa M. Kassover
Mark Phillips
E. John Resha III
Catherine Stanford
Hilda Thompson
John A. E. Wright

February 29, 2016

10-C LFP City Comments

Lake Forest Park Water District
Alan Kerley, General Manager
4209 NE 178th Street
Lake Forest Park, WA 98155

Re: Agency Comments on District Comprehensive Plan

Dear Alan:

Thank you for the opportunity to comment on the Lake Forest Park Water District Water System Comprehensive Plan. You and Mr. Mundall are to be commended for the broad effort put into this document that describes the system and identifies its needs. We appreciate the opportunity to develop a deeper understanding of the District's services and infrastructure.

A team of four staff at the City looked at this plan and I offer the comments shown in the attached document. I hope you find them to be useful. There are several pages of comments, so it is hard for our priorities to come through. As we review the plan, three things are of paramount interest.

The District bases its reputation on its pure, clean water. The concern is that the water makes it to the tap in its pure form. Your plan makes a compelling case that the distribution infrastructure is not up to that standard – whether it is pipe breaches or contaminant exceedances. We hope the capital improvements can be carried out in a systematic manner. However, the system is fragile, aging and needs a lot of attention. You may be heading into a more difficult and risky period than is conveyed by the tone of the plan. The third issue is financial needs. The plan as presented needs some more work, and relies so much on borrowing that you need to be sure it is sufficient and flexible enough for bonded indebtedness.

To be true to our interests, we talk about well-field protection in a couple of entries, but please be sure that we understand the big picture.

Sincerely,

Pete Rose

Pete Rose
City Administrator

10-C LFP City Comments

LFP WD COMP PLAN NOTES

1. General Information
    a. Encourage Independent Operation: Page 1-2 of Section 1 states "the City has opted to encourage independent operation as the best means of service to the end users." Could you point us to the policy decisions that have stated this in the affirmative manner you use in this section?
    b. Resource Pooling: Page 1-2 mentions the resource pooling concept, which is possible by way of forming a regional authority. This presentation appeared to speak to a more political audience and was not a refined presentation, just an introduction. The City is ready to discuss serious proposals to work cooperatively with LFP WD to achieve mutual benefits. Examples would be such as things such as billing and emergency management/recovery (see Table 1-5).
    c. West watershed discontinued 1965. This section mentions it and in a later chapter it talks about water rights being transferred. The reader is left wondering where it is/was located, what is its status and if the wells are properly and completely decommissioned.
    d. Aquifer in Brier: This section discussed on page 1-9 more study being needed in Brier. As a risk factor, it discussed this being the location where the water source is on the surface. It was unclear in the CIF section whether this study will be done in the pendency of the 20-year plan. This area is not named in project A2 on Table 8-1.
    e. Franchise Renewal: This section uses the phrase "renewed by default". This phrase can have negative connotations. We would prefer the notation, "Neither party chose to initiate negotiations for changes."
    f. LFP Comp Plan: Page 1-21, LFP WD states that the border is wrong in LFP comp plan. Has this been changed, and if so, can this notation be rewritten in the final version? If not, please let us know the issue and location.

2. Production and Consumption Forecasts
    a. Projected Population: Just to be clear, are the financial projections counting on any increased connections from the chart on 2-4?
    b. Un-accounted Water Losses: How is unaccounted water estimated? Just the difference between that metered at the well and consumption at the water meter? The City is concerned about the impact of seeping water on its infrastructure. Does the 20% include the water that is exhausted into McKinnon Creek from the artesian wells?

3. Facility Condition & Performance Analysis
    a. In-House Water Production: On page 3-2, it gives a range of cost from $2,000 to $3,000 per MG as the purchase price from the SPU surface system. In the Financial Plan, it is shown as $3,000 on page 9-0 (should

page number be 9-1?). Please be sure that any calculations relying on peak & non-peak costs are using the correct figure.

b. Available Water: On page 3-3, the artesian wells are attributed 100 gpm (presumably combined) as a source. It has been described to City staff in the past as a back-up source. Is it used in regular domestic supply? Is the amount exhausted to McKinnon Creek metered?

c. Quiet Title: Page 3-5 is one of several references to dispute and/or litigation over this subject. From the City perspective, the aggregate of these entries does not tell the entire story nor does it respect the mutual history that established the first trail in about 1989. Further along in the document, the text references negotiations. There has been one negotiating session following the Superior Court process, which ruled in favor of the City, after which the District filed an appeal of the litigation. This appeal came without notice and before the City staff could even meet with the City Council and discuss the "offer" made by the District in negotiations. The City stands ready to discuss this matter in a reasonable and genuine manner.

d. Intertie: Page 3-14 discusses two interties with NUD and SPU. The described purpose is for emergency or peak fire flow demand. Have either of the interties ever been used for regular domestic consumption purposes?

e. Water Quality Testing: Pages 3-16 & 3-17 discuss testing and total coliform. Looking at the state Department of Health records for exceedances for those public water systems serving Lake Forest Park, it appears that total coliform has been a testing criterion since 1996. While the text describes the total coliform class of bacteria as largely harmless, it is still a matter of concern. From the perspective of the City, it is indicative of bacteria, including harmful pathogens, finding their way into the system. It may also be an indicator of high levels of nutrients in the system that can increase the growth rate of bacteria. Today's "harmless" could be tomorrow's tragedy, especially among the young, weaker and ill. The District has apparently concluded that failing distribution pipe is the cause, and the capital improvement plan outlines a fairly aggressive replacement process for the pipe. These types of exceedances can also be caused by dead-end pipes which do not naturally flush. We cannot tell if any of the exceedances are driven by lack of looping or whether any of the pipe replacement capital improvement projects on Table 8-1 will correct any problem areas. We do not see looping projects until Table 8-3, beginning in 2027.

The exceedance statistics and the comparison to the other public water systems serving Lake Forest Park underscore the need, especially the exceedances since 2009. This water comp plan should give more direct assurance that this is attacking the locations of the exceedances and that project priorities go after the problem. Have you considered discussing exceedances in comparison to the other providers? Unfortunately, in any

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way and time period, the LFP WD compares poorly. The exceedance statistics from 2009 through 2015 appear dispositive to the pipe replacement decision. They are stark. There are 28 in that period, compared to 1 for the North City District, 8 for the Northshore Utility District and 21 for the entire Seattle Public Utilities. This data was reviewed on the DOH web site at: https://fortress.wa.gov/doh/eh/portal/odw/si/SingleSystemViews/ExceedSingleSys.aspx y.
Exceedances per 1,000 hook-ups during this period are 31.8 for LFP WD (879 hook-ups), 0.00009 for North City (10,620 hook-ups), 0.00024 for NUD (33,209 hook-ups) and 0.12 for SPU (172,207 hook-ups).

4. Rights, Conservation, Reliability: No additional comments beyond those posted elsewhere that are related to this subject.

5. Source Protection:
   a. Potential Source Contaminants: Page 5-22 and other locations in the Plan discuss the subject of well-head protection. In aggregate, this is something of a black box discussion that never quite identifies what is needed to armor the wells in order to protect them from surface contamination or sabotage. There is reliance on the state definition of high and moderate risk based on depth without the realistic discussion of what could be done to any active or abandoned well, similar to the modern protections given to the Horizon View wells in order to virtually eliminate any practical risk. In Appendix 3, the DOH source inspection spoke of the path by not saying it would be incompatible, but rather saying, "If this project were to go forward, the District would require more stringent protection of groundwater sources against vandalism, traffic and potential risk of contamination." What are they? Further along in Section 8, there is a Table 8-1 project to study of protections that may be needed, with another to make the improvements. Both are identified as funded completely by outside grant source and the amounts of $10,000 and $30,000 respectively appear to be plugged figures. The City has secured the services of Aspect Consulting to try to better understand the risks and needs and will share the results with District staff.
   b. Horizon View Abandoned Well: This well has been properly decommissioned by the City, with the attendance of LFP WD staff. This can be readjusted to past tense in the table.
   c. Wellhead Protection and Communications Advisory Committee: This is referenced on page 5-21. Who are the members on it and when does it meet?

6. Operation & Maintenance Program
   a. Have there been occasions when the emergency chlorination system has been used?

10-C LFP City Comments

7. Construction Standards
    a. The City appreciates its inclusion in the risk transfer language in the draft construction contract shown in Appendix 7.

8. Capital Improvement

    a. Coordinate Capital Program: The City may be funded for an SR 522 Corridor Study. It will seek funding for a Ballinger Way Corridor Study. The City Strategic Plan will determine whether to conduct a town center sub-area plan. As a utility sharing some of the same infrastructure rights of ways, the City would hope that both in the capital program and operations program, the District will participate. The District plans a robust pipe replacement program, largely in City rights of way. Please coordinate with the City early in the planning phases.
    b. SDC Charge: The capital improvement section includes discussion of additional customer capture by way of resolving border issues where potential customers are served by another district, with projects in the 2027-2034 time period (Table 8-3). The financial section goes through options to apply a systems development charge. The District should note that all the potential customers already have water main extensions and water service and should be considered vested members of the other utility. Without detail as to how this would occur, the City is concerned about extension of a second (redundant) water main and a customer having to buy into a second water system.
    c. Recent & Ongoing Improvements: On page 8-3, the plan shows the cost of recent projects except Phase VI, Ballinger PRV at 175th. On page 8-4, the SPU Intertie description is in the past tense except the last sentence, which is in future tense.
    d. Recent Administrative Program Improvements: The discussion of in-house bacterial analysis (Page 8-6) is worded in a way that could be implied that you will know about bacterial contamination before it occurs. We assume the correct meaning is that you will know from your own test before the results are transmitted from the outside lab. On page 8-7, the Water Rights Amendments, fourth bullet, are a little too much "inside baseball" to understand what transpired with water certificate #498.
    e. III. Near Term Improvements: In the discussion of Table 8-1 and Figure 8-1 the discussion of project suffixes resulting in reduction of capital costs is a little difficult to understand. Is the point that there is project prioritization resulting in some projects being pushed back into later project planning periods? Is this being made for financial reasons? Also, it is noted that there are two projects on Table 8-2 that have an identified failure rate above some of those on Table 8-1.

10-C LFP City Comments

f. Projects D1A & D1B: That portion of 178th Street NE received an arterial thickness overlay in 2014. Please coordinate with City to assure that it retains its excellent surface following restoration.
g. Project A2: The City supports the District studying its security needs.
h. Projects D30, D33, D36A, D 36B: All are described as being at risk of "devastating pipe rupture", but are in the 2027-2034 list, which would presumably have the lower priorities. D33 is the closest to the water distribution main that runs through the catch basin. Will that be replaced by this project?
i. Projects D2 & D3: Are these completed now?
j. Page 8-12: Item b) talks about electronic billing. Virtually all customers of the District also receive a sewer bill from the City, which already has electronic billing. Should there be some discussion of joint billing?
k. Page 8-12: Would the first sentence in item c) more properly be expressed as: "The District or predecessor entities have produced water at the McKinnon wellfield since 1910."
l. Page 8-16: The dates for the third CIP period are shown under the section title "CAPITAL FACILITY/INFRASTRUCTURE IMPROVEMENTS $3.44 MILLION" as 2026 to 2033. Other pages and tables show the third CIP period as 2027-2034.
m. Pages 8-17 & 8-18: There is a discussion of capital projects to capture customers within LFP WD borders that are being served by another district. Laying a redundant line where citizens already have water service is correctly shown as a lower priority, when the district has numerous high priorities.
n. Tables 8-1, 8-2, 8-3: The status column has "state loan" in almost every entry. The Public Works Assistance Account has been a great friend to local governments to finance, but it may be out of the picture for the time being, at least until schools are funded. Other loan options should be considered, as well as bonding.

9. Financial Plan
   a. Revenue Requirement Analysis: The end of the first paragraph of text makes the statement that, "… the costs are spread out over time such that, to the extent possible, today's customer is paying today's costs." This is an *all other things equal* philosophy. A strong argument can be made that with the amount of test exceedances and failing pipe that the current customer will be paying yesterday's foregone costs.
   b. Table 9-9; Additional Capital Improvement Fund Revenue: This chart introduces the $2 monthly increase to the CIF rate, one which additional text and charts show increases for each year of the 20-year plan. The narrative and the subtext of the plan show a lot of work needing to be done now. The District should consider sharing that narrative with the ratepayers and consider a substantial increase to start the program and to cover debt service, and perhaps backing it down in later years.

10-C LFP City Comments

c. Page 9-10; Projected Results: The sentence, "Restricting any increases to the capital improvement fee in the near term is considered appropriate because the need for increased revenue is to fund capital improvements." By continuing the increase in the capital charge each year reality goes beyond that statement. Table 9-10 shows a transfer from Capital to O&M starting in 2021 and continuing through the entire plan period to 2034. This increases each year until the transfer in 2034 is $249,500. Operating revenues are flat, indicating no increase in user rates/use, but O&M costs increase by $317,300. An ancillary effect is that excise taxes to the state and franchise payments to the City do not increase for 20 years, even in the face of operating subsidy and a major program of digging up City streets. The City asks that the District rethink and re-balance this approach.

d. Page 9-14 includes the statement **'The most important indicator of financial soundness is positive net revenue from operation and the District is currently meeting this test'**. Whether the statement that the District is currently meeting this test is difficult to assess based on the information presented; the Financial Plan purports to meet this test in the current year albeit by a very thin margin. Table 9-9 indicates that the current state of meeting this test will be short lived; table data shows that this will not be the case in three of the next four years. To acknowledge that the District will not meet this important indicator of financial soundness by next year is concerning.

e. Page 9-14 continues **'The second most important financial test is the level of capital reserves and the District's reserves are not optimal and may be deficient to allow the District to utilize certain debt funding'.** By its own admission the district is not meeting this test of financial stability despite having used the most risky calculation. The following notes explain why the District's calculation is risky. Based on Department of Health recommendations the District is calculating its cash reserve for operations requirement for only 30 days, acknowledging only in the label that the recommendation is 30-45 days. Additionally, the Emergency Reserve appears to be artificially low and includes a lengthy disclaimer. The Capital Improvement Reserve is set only at the amount of annual debt service payments, before debt service payments are expected to be required on anticipated future debt.

   Based on the Financial Plan the ability of the District to continue operations for many years into the future without increasing rates beyond what is discussed in the Financial Plan is questionable. Further, it is questionable whether the District will be able to secure financing for its Capital Improvement Program in future years due to the weak financial position and the effect the financial position will have on the District's ability to obtain financing at a reasonable rate of interest.

Additional Notes

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- *The rate of interest that the financial plan assumes the District will earn on its excess cash is a rate not readily available in the investment market. While the financial plan does not provide the assumptions used to develop the estimate; based on the LGIP's current rate the interest earned during the period on an average balance of $200k (the ending 2014 fund balance per the financial plan), interest income is overstated by approximately $9,000 each year.*
- *Table 9-13 Shows that the District has the second highest base rate of the 27 providers listed, yet it gets the water inventory for free. Appears the District is on the wrong side of economies of scale at every turn.*

a. · *The Capital Asset Evaluation is suspect at best. The Financial Plan acknowledges that the asset evaluation is not consistent with GASB 34, nonetheless claims to make that 'a more complete accounting of all significant depreciable infrastructure in the District' (9-24).*

10. Other Information

No further comments are offered at this time.

Commissioners:
William F. Donahue
David A. Hammond
Eli B. Zehner

LAKE FOREST PARK WATER DISTRICT

GOOD WATER, NATURALLY

(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155
www.lfpwd.org

August 31, 2016

Attn: Pete Rose, Administrator
17425 Ballinger Way NE
Lake Forest Park, WA 98155

RE: **Lake Forest Park Water District (40950K) Water System Plan**

Dear Pete,

We have attached an updated Comprehensive Water System Plan document dated 8/31/2016. The revised document contains edits and an itemized response to your comments dated 2/29/2016. Please advise if you require any further information in these regards.

Sincerely,

Alan Kerley, General Manager

Encl. - Lake Forest Park Water District CWSP 2015 – Final Submission dated 8/31/2016

DRAFT LFPWD Response to City of Lake Forest Park Notes of LPFWD Comprehensive Plan

City of Lake Forest Park Comments 2/29/2016	LFPWD Response to City of Lake Forest Park 7/28/2016
1. General Information:	
a) **Encourage Independent Operation:** Page 1-2 of Section 1 states "the City has opted to encourage independent operation as the best means of service to the end users." Could you point us to the policy decisions that have stated this in the affirmative manner you use in this section?	**Please see revision of page 1-2.**
b) **Resource Pooling:** Pages 1-2 mentions the resource pooling concept, which is possible by way of forming a regional authority. This presentation appeared to speak to a more political audience and was not a refined presentation, just an introduction. The City is ready to discuss serious proposals to work cooperatively with LFP WD to achieve mutual benefits. Examples would be such as things such as billing and emergency management/recovery (see Table 1-5).	**We are open to discussion of items of mutual benefit.**
c) **West Watershed discontinued 1965:** This section mentions it and in a later chapter it talks about water rights being transferred. The reader is left wondering where it is/was located, what is its status and if the wells are properly and completely decommissioned.	**In our view, this level of detail is outside the scope of this document. LFPWD is not aware of any wells that are improperly abandoned.**
d) **Aquifer in Brier:** This section discussed on page 1-9 more study being needed in Brier. As a risk factor, it discussed this being the location where the water source is on the surface. It was unclear in the CIF section whether this study will be done in the pendency of the 20-year plan. This area is not named in project A2 on Table 8-1.	**Subsequent to the draft of this document the District secured a Source Water Protection Assistance grant and this study is underway. It has been included in Table 8-1 Project A-1. This study may define a need for a future capital project.**
e) **Franchise Renewal:** This section uses the phrase "renewed by default". This phrase can have negative connotations. We would prefer the notation, "Neither party chose to initiate negotiations for changes."	**This phrase has been removed.**
f) **LFP Comp Plan:** Page 1-21, LFPWD states that the border is wrong in LFP comp plan. Has this been changed, and if so, can this notation be rewritten in the final version? If not, please let us know the issue and location.	**Thank you for implementing edits to mapping in the LFP City Draft Comprehensive Plan to which this comment refers. We observe that the completed plan more accurately reflects the formal service area recognized by the Boundary Review Board and our comment has been revised because the error was corrected by the City.**
2. Production and Consumption Forecasts:	
a) **Projected Population:** Just to be clear, are the financial projections counting on any increased connections from the chart on 2-4?	**Financial projections in Part Nine are conservative and do not reflect growth of customer base as this growth is expected to be offset by declining use per customer.**
b) **Un-accounted Water Losses:** How is unaccounted water estimated? Just the difference between that metered at the well and consumption at the water meter? The City is concerned about the impact of seeping water on its infrastructure. Does the 20% include the water that is exhausted into McKinnon Creek from the artesian wells?	**Unaccounted water is calculated by subtracting metered water and facility use water (such as watermain flushing) from produced water according to DOH requirements Assuming all unaccounted water loss is from leaks in the remaining steel pipe (15,224 ft) this equates to about 1 garden hose every 4 city blocks where steel pipe remains. The District does not consider this volume of water to be a significant risk to infra-**

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	structure. Artesian well water not used for supplementing peak flows is not metered.
3. Facility Condition & Performance Analysis:	
a) **In-House Water Production:** On page3-2, it gives a range of cost from $2,000 to $3,000 per MG as the purchase price from the SPU surface system. In the Financial Plan, it is shown as $3,000 on page 9-0 (should page number be 9-1?). Please be sure that any calculations relying on peak & non-peak costs are using the correct figure.	**SPU water cost varies depending on the time of year; this explains the variation in figures. Summer rates are considered in the comparison in this section of the plan.**
b) **Available Water:** On page 3-3, the artesian wells are attributed 100 gpm (presumably combined) as a source. It has been described to City staff in the past as a back-up source. Is it used in regular domestic supply? Is the amount exhausted to McKinnon Creek metered?	**The shallow wells are source water for LFPWD. They are used for supplementing peak flows. The District's Emergency Response Plan identifies this source as an emergency supply due to its ability to be converted to gravity. This may have led to misunderstanding of its use by the City. They are in fact connected and routinely used.**
c) **Quiet Title:** Page 3-5 is one of several references to dispute and/or litigation over this subject. From the City perspective, the aggregate of these entries does not tell the entire story nor does it respect the mutual history that established the first trail in about 1989. Further along in the document, the text references negotiations. There has been one negotiating session following the Superior Court process, which ruled in favor of the City, after which the District filed an appeal of the litigation. This appeal came without notice and before the City staff could even meet with the City Council and discuss the "offer" made by the District in negotiations. The City stands ready to discuss this matter in a reasonable and genuine manner.	**Thank you for your comment. Text remains unchanged as it is a brief summary.**
d) **Intertie:** Pages 3-14 discuss two interties with NUD and SPU. The described purpose is for emergency or peak fire flow demand. Have either of the interties ever been used for regular domestic consumption purposes?	**No they have not.**
e) **Water Quality Testing:** Pages 3-16 & 3-17 discuss testing and total coliform. Looking at the State Department of Health records for exceedances for those public water systems serving Lake Forest Park, it appears that total coliform has been a testing criterion since 1996. While the text describes the total coliform class of bacteria as largely harmless, it is still a matter of concern. From the perspective of the City, it is indicative of bacteria, including harmful pathogens, finding their way into the system. It may also be an indicator of high levels of nutrients in the system that can increase the growth rate of bacteria. Today's "harmless" could be tomorrow's tragedy, especially among the young, weaker and ill. The District has apparently concluded that failing distribution pipe is the cause, and the capital improvement plan outlines a fairly aggressive replacement process for the pipe. These types of exceedances can also be caused by dead-end pipes which do not naturally flush. We cannot tell if any of the exceedances are driven by lack of looping or whether any of the pipe replacement capital improvement projects on Table 8-1 will correct any problem areas. We do not see looping projects until Table 8-3, beginning in 2027. The exceedance statistics and the comparison to the other public water systems serving Lake Forest Park underscore the need, especially the exceedances since 2009. This water comp plan should give more direct assurance that this is attacking the locations of the exceedances and that project priorities go after the problem. Have you considered discussing exceedances in comparison to the other providers? Unfortunately, in any way and time period, the LFP WD compares poorly. The exceedance statistics from 2009 through 2015 appear dispositive to the pipe replacement decision. They are stark. There are 28 in that	**LFPWD's drinking water meets all State and Federal requirements. Please contact the WSDOH for clarification of what an exceedance is and how it relates to drinking water.** **In response to the City's question:** **1. We take exception to the City's assumption that failing pipe is the cause.** **2. Comparisons to a chlorinated system are not valid.** **3. We believe the exceedances to be anomalous operational issues and related to the commissioning and integration of new infrastructure.**

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period, compared to 1 for North City District, 8 for the Northshore Utility District and 21 for the entire Seattle Public Utilities. This data was reviewed on the DOH web site at: https://fortress.wa.gov/doh/eh/portal/odw/si/SingleSystemViews/ExceedSingleSys.aspxy. Exceedances per 1,000 hook-ups during this period are 31.8 for LFP WD (879 hook-ups), 0.00009 for North City (10,620 hook-ups), 0.00024 for NUD (33,209 hook-ups) and 0.12 for SPU (172,207 hook-ups).	
4. Rights, Conservation, Reliability: No Additional comments beyond those posted elsewhere that are related to this subject.	
5. Source Protection:	
a) Potential Source Contaminants: Page 5-22 and other locations in the Plan discuss the subject of well-head protection. In aggregate, this is something of a black box discussion that never quite identifies what is needed to armor the wells in order to protect them from surface contamination or sabotage. There is reliance on the state definition of high and moderate risk based on depth without the realistic discussion of what could be done to any active or abandoned well, similar to the modern protections given to the Horizon View wells in order to virtually eliminate any practical risk. In Appendix 3, the DOH source inspection spoke of the path by not saying it would be incompatible, but rather saying, "If this project were to go forward, the District would require more stringent protection of groundwater sources against vandalism, traffic and potential risk of contamination." What are they? Further along in Section 8, there is a Table 8-1 project to study of protections that may be needed, with another to make the improvements. Both are identified as funded completely by outside grant source and the amounts of $10,000 and $30,000 respectively appear to be plugged figures. The City has secured the services of Aspect Consulting to try to better understand the risks and needs and will share the results with District staff.	**The District is now in receipt of the Aspect report. The District has recently secured a Source Water Protection Assistance grant to further characterize the Critical Aquifer Recharge Area and this work is underway.** **Protections are conditional on intended uses. Further assessment is required.**
b) Horizon View Abandoned Well: The well has been properly decommissioned by the City, with the attendance of LFP WD staff. This can be readjusted to past tense in the table.	**The requested edit has been made.**
c) Wellhead Protection and Advisory Committee: This is referenced on page 5-21. Who are the members on it and when does it meet?	**Membership of the committee is posted on the District website. The Advisory Committee meets a minimum of 4 times annually.**
6. Operation & Maintenance Program:	
a) Have there been occasions when the emergency chlorination system has been used?	**Not during the tenure of the current system operator. There was an event in the August 2005 where the emergency chlorination system was activated for a short time as a precaution due to coliform presence in a sample. Further investigation proved the bacteria presence was related to sampling error and was not a public health risk.**
7. Construction Standards:	
a) The City appreciates its inclusion in the risk transfer language in the draft construction contract shown in Appendix 7.	**Thank you for your comment.**

8. Capital Improvement:		
a)	**Coordinate Capital Program:** The City may be funded for an SR 522 Corridor Study. It will seek funding for a Ballinger Way Corridor Study. The City Strategic Plan will determine whether to conduct a town center sub-area plan. As a utility sharing some of the same infrastructure rights of ways, the City would hope that both in the capital program and operations program, the District will participate. The District plans a robust pipe replacement program, largely in City rights of way. Please coordinate with the City early in the planning phases.	**LFPWD recently participated in two City capital projects and looks forward to further partnership when feasible.**
b)	**SDC Charge:** The capital improvement section includes discussion of additional customer capture by way of resolving border issues where potential customers are served by another district, with projects in the 2027-2034 time period (Table 8-3). The financial section goes through options to apply a systems development charge. The District should note that all potential customers already have water main extensions and water service and should be considered vested members of the other utility. Without detail as to how this would occur, the City is concerned about extension of a second (redundant) water main and a customer having to buy into a second water system.	**Thank you for your comment.**
c)	**Recent & Ongoing Improvements:** On page 8-3, the plan shows the cost of recent projects except Phase VI, Ballinger PRV at 175th. On page 8-4, the SPU Intertie description is in the past tense except the last sentence, which is in the future tense.	**Thank you for your comments.**
d)	**Recent Administrative Program Improvements:** The discussion of in-house bacterial analysis (Page 8-6) is worded in a way that could be implied that you will know about bacterial contamination before it occurs. We assume the correct meaning is that you will know from your own test before the results are transmitted from the outside lab. On page 8-7, the Water Rights Amendments, fourth bullet, are a little too much "inside baseball" to understand what transpired with water certificate #498.	**Thank you for your comment regarding Page 8-6. This has been edited for clarity.** **Contact DOE for further clarification regarding Certificate #498.**
e)	**III. Near Term Improvements:** In the discussion of Table 8-1 ad Figure 8-1 the discussion of project suffixes resulting in reduction of capital costs is a little difficult to understand. Is the point that there is project prioritization resulting in some projects being pushed back into later project planning periods? Is this being made for financial reasons? Also, it is noted that there are two projects on Table 8-2 that have an identified failure rate above some of those on Table 8-1.	**LFPWD prioritizes capital projects based on many factors including pipe failure rate, financial capacity and expected capital projects of LFP City.**
f)	**Projects D1A & D1B:** That portion of 178th Street NE received an arterial thickness overlay in 2014. Please coordinate with City to assure that it retains its excellent surface following restoration.	**Thank you for your comment**
g)	**Project A2:** The City supports the District studying its security needs.	**Thank you for your comment.**
h)	**Projects D30, D33, D36A, D36B:** All are described as being at risk of "devastating pipe rupture", but are in the 2027-2034 list, which would presumably have the lower priorities. D33 is the closest to the water distribution main that runs through the catch basin. Will that be replaced by this project?	**While a risk of "devastating pipe rupture" exists with any Asbestos Cement, PVC or Cast Iron pipe, the *probability* of an event is low compared with aging thin wall steel "liberty pipe". Hence, priority for replacement is lower.** **The water main in question through the catch basin is scheduled to be replaced as part of Project D4 (2014 – 2019)**
i)	**Projects D2 & D3:** Are these complete now?	**Yes.**
j)	**Page 8-12:** Item b) talks about electronic billing. Virtually all customers of the District also receive a sewer bill from the City, which already has electronic billing. Should there be some discussion of joint billing?	**Thank you for your comment. The District would a consider proposal from the City.**
k)	**Page 8-12:** Would be first sentence in item c) more properly be expressed as: "The District or predecessor entities have produced water at the McKinnon wellfield since 1910."	**Please see revision.**

l)	**Page 8-16:** The dates for the third CIP period are shown under the section title "CAPITAL FACILITY/INFRASTRUCTURE IMPROVEMENTS $3.44 MILLION" as 2026 to 2033. Other pages and tables show the third CIP period as 2027-2034.	**Thank you for your comment. The edit has been made.**
m)	**Pages 8-17 & 8-18:** There is a discussion of capital projects to capture customers within LFPWD borders that are being served by another district. Laying a redundant line where citizens already have water service is correctly shown as a lower priority, when the district has numerous high priorities.	**Thank you for your comment.**
n)	**Tables 8-1, 8-2, 8-3:** The status column has "state loan" in almost every entry. The Public Works Assistance Account has been a great friend to local governments to finance, but it may be out of the picture for the time being, at least until schools are funded. Other loan options should be considered, as well as bonding.	**Noted.**
9. Financial Plan:		
a)	**Revenue Requirement Analysis:** The end of the first paragraph of text makes the statement that, "… the costs are spread out over time such that, to the extent possible, today's customer is paying today's costs." This is an *all other things equal philosophy*. A strong argument can be made that with the amount of test exceedances and failing pipe that the current customer will be paying yesterday's foregone costs.	**Thank you for your comment.**
b)	**Table 9-9; Additional Capital Improvement Fund Revenue:** This chart introduces the $2 monthly increase to the CIF rate, one which additional text and charts show increases for each year of the 20-year plan. The narrative and the subtext of the plan show a lot of work needing to be done now. The District should consider sharing that narrative with the ratepayers and consider a substantial increase to start the program and to cover debt service, and perhaps backing it down in later years.	**The District increased the CIF rate by $3 per month at the end of 2015. Please see revisions Part Nine, Page 9-10. Further increases will be made at the discretion of the LFPWD Board of Commissioners.**
c)	**Page 9-10; Projected Results:** The sentence, "Restricting any increases to the capital improvement fee in the near term is considered appropriate because the need for increased revenue is to fund capital improvements." By continuing the increase in the capital charge each year reality goes beyond that statement. Table 9-10 shows a transfer from Capitol to O&M starting in 2021 and continuing through the entire plan period to 2034. This increases each year until the transfer in 2034 is $249,500. Operating revenues are flat, indicating no increase in user rates/use, but O&M costs increase by $317,300. An ancillary effect is that excise taxes to the state and franchise payments to the City do not increase for 20 years, even in the face of operating subsidy and a major program of digging up City streets. The City asks that the District rethink and re-balance this approach.	**Thank you for your comment. Please see revisions Part Nine, Please see Page 9-10, and 9-11 which address these comments.**
d)	**Page 9-14** includes the statement '**The most important indicator of financial soundness is positive net revenue from operation and the District is currently meeting this test'.** Whether the statement that the District is currently meeting this test is difficult to assess based on the information presented; the Financial Plan purports to meet this test in the current year albeit by a very thin margin. Table 9-9 indicates that the current state of meeting this test will be short lived; table data shows that this will not be the case in three of the next four years. To acknowledge that the District will not meet this important indicator of financial soundness by next year is concerning.	**The District increased the CIF rate by $3 per month at the end of 2015. Thank you for your comment.**
e)	**Page 9-14 continues 'The second most important financial test is the level of capital reserves and the District's reserves are not optimal and may be deficient to allow the District to utilize certain debt funding'.** By its own admission the district is not meeting this test of financial stability despite having used the most risky calculation. Based on Department of Health recommendations the District is calculating its cash reserve for operations requirement for only 30 days, acknowledging only in the label that the recommendation is 30-45 days. Additionally, the Emergency Reserve appears to be artificially low and includes a lengthy disclaimer. The Capital Improvement Reserve is set only at the amount of annual	**The District increased the CIF rate by $3 per month at the end of 2015. Thank you for your comment.**

debt service payments, before debt service payments are expected to be required on anticipated future debt. Based on the Financial Plan the ability of the District to continue operations for many years into the future without increasing rates beyond what is discussed in the Financial Plan is questionable. Further, it is questionable whether the District will be able to secure financing for its Capital Improvement Program in future years due to the weak financial position and the effect the financial position will have on the District's ability to obtain financing at a reasonable rate of interest.	
Additional Notes	
The rate of interest that the financial plan assumes the District will earn on its excess cash is a rate not readily available in the investment market. While the financial plan does not provide the assumptions used to develop the estimate; based on the LGIP's current rate the interest earned during the period on an average balance of $200k (the ending 2014 fund balance per the financial plan), interest income is overstated by approximately $9,000 each year. *Table 9-13 shows that the District has the second highest base rate of the 27 providers listed, yet it gets the water inventory for free. Appears the District is on the wrong side of economies of scale at every turn.* **a)** *The Capital Asset Evaluation is suspect at best. The Financial Plan acknowledges that the asset evaluation is not consistent with GASB 34, nonetheless claims to make that 'a more complete accounting of all significant depreciable infrastructure in the District' (9-24).*	**Thank you for your comment.**
10. Other Information: No further comments are offered at this time.	**Thank you for your comment.**

10-C LFP City Comments

APPENDIX 10 - D SEATTLE PUBLIC UTILITIES COMMENTS TO LFPWD SYSTEM PLAN DRAFT DATED 12/17/2015 AND LFPWD RESPONSE

Dan Mundall, P.E.

10-D Seattle Public Utilities Comments

From: Kersnar, Joan <Joan.Kersnar@seattle.gov>
Sent: Friday, June 17, 2016 8:29 AM
To: Dan Mundall, P.E.
Cc: engr@lfpwd.org; 'Alan Kerley'; Kersnar, Joan
Subject: RE: Lake Forest Park Water District DRAFT Comprehensive Water System Plan (CWSP) 2015

We do have one comment with respect to the concept of constructing a new intertie with Seattle Public Utilities (page 3-49). If Lake Forest Park Water District considers pursuing this change, mutual agreement must be reached between both parties per Section 2, of the Emergency Intertie Agreement between SPU and Lake Forest Park Water District, and this should be done in advance of this concept being developed any further. If/when you would like to begin discussions on a new intertie, or if you have other questions about the Agreement with SPU, please contact Terri Gregg, SPU's Wholesale Water Contracts Manager, at terri.gregg@seattle.gov or 206-684-7975.

Thank you for the opportunity to review and comment on the draft water system plan.

Joan M. Kersnar, P.E.
Drinking Water Planning Manager
Seattle Public Utilities
700 Fifth Avenue, 59th Floor
P.O. Box 34018 (mailing address)
Seattle, WA 98124-4018
Direct: (206) 684-0839
FAX: (206) 684-0206
joan.kersnar@seattle.gov
http://www.seattle.gov/util

From: Dan Mundall, P.E. [mailto:dan@mundall.com]
Sent: Tuesday, April 19, 2016 2:36 PM
To: Kersnar, Joan <Joan.Kersnar@seattle.gov>
Cc: engr@lfpwd.org; 'Alan Kerley' <alan@lfpwd.org>
Subject: Lake Forest Park Water District DRAFT Comprehensive Water System Plan (CWSP) 2015

Attn: Joan Kersnar, Water System Planning
Seattle Public Utilities (SPU)
(206) 684-0839

Dear Joan,

On behalf of Lake Forest Park Water District I am pleased to provide you with a link to download the District's DRAFT Comprehensive Water System Plan 2015.

http://www.lfpwd.org/cwsp2015

Please let me know if you have any problems viewing the DRAFT CWSP 2015 documents or if you need a CD or Hard Copy (bound)version of the draft plan.

Commissioners:
William F. Donahue
David A. Hammond
Eli B. Zehner

LAKE FOREST PARK WATER DISTRICT

GOOD WATER, NATURALLY

(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155
www.lfpwd.org

August 31, 2016

Joan M. Kersnar, P.E.
Drinking Water Planning Manager
Seattle Public Utilities
700 Fifth Avenue, 59th Floor
P.O. Box 34018 (mailing address)
Seattle, WA 98124-4018
Direct: (206) 684-0839

RE: **Lake Forest Park Water District Comprehensive Water System Plan 2015**

Dear Joan,

We have attached an updated Comprehensive Water System Plan document dated 8/31/2016. The revised document contains edits and input reflecting your comment dated 6/17/2016. Please advise if you require any further information in these regards.

Sincerely,

Alan Kerley, General Manager

Encl. - Lake Forest Park Water District CWSP 2015 – Final Submission dated 8/31/2016

10-D Seattle Public Utilities Comments

APPENDIX 10 - E NORTHSHORE UTILITY DISTRICT COMMENTS TO LFPWD SYSTEM PLAN DRAFT DATED 12/17/2015 AND LFPWD RESPONSE

NO COMMENTS RECEIVED

Commissioners:
William F. Donahue
David A. Hammond
Eli B. Zehner

LAKE FOREST PARK WATER DISTRICT

GOOD WATER, NATURALLY

(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155
www.lfpwd.org

August 31, 2016

Attn: Fanny Yee, General Manager
Northshore Utility District
6830 NE 185th St.
Kenmore, WA 98028

RE: **Lake Forest Park Water District Comprehensive Water System Plan 2015**

Dear Fanny,

We have attached an updated Comprehensive Water System Plan document dated 8/31/2016. The revised document contains edits to our previous DRAFT copy dated 12/17/2015 and reflects comments received from other agencies. Please advise if you require any further information in these regards.

Sincerely,



Alan Kerley, General Manager

Encl. - Lake Forest Park Water District CWSP 2015 – Final Submission dated 8/31/2016

APPENDIX 10 - F NORTH CITY (SHORELINE) WATER DISTRICT COMMENTS TO SYSTEM PLAN DRAFT DATED 12/17/2015 AND LFPWD RESPONSE

10-F North City Water Comments

NORTH CITY Water District

1519 NE 177th St. • P.O. Box 55367 • Shoreline, WA 98155 • Phone: 206.362.8100 • Fax: 206.361.0629

Commissioners:
Ron Ricker
Charlotte Haines
Larry Schoonmaker
District Manager:
Diane Pottinger, P.E.

April 4, 2016

Alan Kerley, General Manager
Lake Forest Park Water District
4029 NE 178th Street
Lake Forest Park, WA 98155

RE: Comments on the Lake Forest Park Water District's Comprehensive Water System Plan 2015

Dear Alan:

Thank you for the opportunity to review and comment on the District's (LFPWD) draft Water System Plan 2015. We appreciate the opportunity to submit our comments beyond the March 1, 2016 requested due date given our miscommunication. We are returning the paper copy of your plan along with this comment letter.

North City Water District (NCWD) has six comments on the plan. They are as follows:

1. Executive Summary, part two: *Capturing of additional areas presently served by NUD and NCWD would increase demand by 10%.* The term "capturing" is problematic for NCWD. The term "capture" is defined as "to take into one's possession or control by force." We are sure you did not intend to mean that LFPWD will "take by force" the 21 customers that that NCWD has been serving for over sixty years. Yes, NCWD recognizes that we are serving some of LFPWD's customers, just as LFPWD is serving some of NCWD's customers. The customers that NCWD has been serving within LFPWD's corporate boundary are ones that LFPWD has been unable to provide water service for at a reasonable cost and will not be able to do so for at least ten years, according to the Capital Facilities Plan in Part 8. NCWD would like to respectfully propose that instead of "capturing" these properties, that LFPWD consider revising the Plan to state "Evaluate the most cost effective method to provide service to customers within the District's corporate boundaries and presently are being served by NUD and NCWD and whether a change of water provider is in the best interests of those customers". This proposed language is consistent with the 2014 Memorandum of Understanding between LFPWD and NCWD.

2. Glossary, F-N NCWD: We are recommending changing the second half of the sentence from … *including about a third of the City of Lake Forest Park* to …*including about forty four percent (44%) of the City of Lake Forest Park*, assuming you are using the City of Lake Forest Park's 2015 Water and Wastewater Utility Status and Alternatives for the Future study.

3. Part 1, Table 1-1: Several actions by Lake Forest Park Water District with North City Water District (previously Shoreline Water District and King County Water District No. 42) and Northshore Utility District were not included in the table. They are as follows:

10-F North City Water Comments

1953 - Withdrawal of Territory by King County Resolution 14167
1958 - Withdrawal of Territory by King County Resolution 18075 and 18722
1960 - Withdrawal of Territory by King County Resolution 21283 and 21376
1986 - Agreement with KCWD 42 for joint storage and emergency interties
1993 - Joint storage and emergency interties agreement expires with KCWD 42
2006 - KCWD83's request for joint use of storage in SWD's 2.0 MG reservoir
2008 - Discussions and meetings with LFPWD and SWD regarding potential merger
2013 - Regional Governance Study completed with neighboring utilities
2014 - Memorandum of Understanding with North City Water District regarding service anomalies along District Boundaries.

4. Part 8, Page 2.5, First Paragraph: The text states *Boundary Agreements resulting in adjustment with NUD and NCWD*. Similar to comment 1, NCWD would like to recommend that as part of any future discussions about boundaries would include reviewing the financial costs so as "*to determine the most cost effective method to address these areas so that the corporate boundaries and service areas align for both District"*

5. Part 8, Figure 8-1: The maps shows a corporate boundary along 30th Avenue NE and halfway between 28th and 29th Ave NE from NE 185th to 187th Streets. NCWD believes the second corporate boundary was incorrectly added and should be removed.

6. Part 10, Section 1: The tables identify which properties are serviced the adjacent utility providers both within the District's corporate boundary and adjacent to the corporate boundary. It does not include the parcels that the District is serving in adjacent water purveyor's boundaries which are outside the District's corporate boundary. NCWD is recommending LFPWD include those parcels in this section also.

Thank you again for the opportunity to comment.

Sincerely,

N. Diane Pottinger

Diane Pottinger, PE
District Manager

C: Joe Bennett, District Attorney
Board of Commissioners

Commissioners:
William F. Donahue
David A. Hammond
Eli B. Zehner

LAKE FOREST PARK WATER DISTRICT

GOOD WATER, NATURALLY

(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155
www.lfpwd.org

August 31, 2016

Attn: Diane Pottinger, PE
District Manager
1519 NE 177th Street
PO Box 55367
Shoreline, WA 98155

RE: **Lake Forest Park Water District Comprehensive Water System Plan 2015**

Dear Diane,

We have attached an updated Comprehensive Water System Plan document dated 8/31/2016. The revised document contains edits and an itemized response to your comments dated 4/4/2016. Please advise if you require any further information in these regards.

Sincerely,

Alan Kerley, General Manager

Encl. - Lake Forest Park Water District CWSP 2015 – Final Edited Copy 8/31/2016

Executive Summary and Glossary	LFPWD Response to NCWD 4/4/2016
1. **Executive Summary**, part two: Capturing of additional areas presently served by NUD and NCWD would increase demand by 10%. The term "capturing" is problematic for NCWD. The term "capture" is defined as "to take into one's possession or control by force." We are sure you did not intend to mean that LFPWD will "take by force" the 21 customers that that NCWD has been serving for over sixty years. Yes, NCWD recognizes that we are serving some of LFPWD's customers, just as LFPWD is serving some of NCWD's customers. The customers that NCWD has been serving within LFPWD's corporate boundary are ones that LFPWD has been unable to provide water service for at a reasonable cost and will not be able to do so for at least ten years, according to the Capital Facilities Plan in Part 8. NCWD would like to respectfully propose that instead of "capturing" these properties, that LFPWD consider revising the Plan to state "Evaluate the most cost effective method to provide service to customers within the District's corporate boundaries and presently are being served by NUD and NCWD and whether a change of water provider is in the best interests of those customers". This proposed language is consistent with the 2014 Memorandum of Understanding between LFPWD and NCWD.	In recognition of NCWD's concern we will edit these references to "assuming service of additional areas presently served by NUD and NCWD by interlocal agreement could increase demand by 10%" Regarding mention of "2014 Memorandum of Understanding between LFPWD and NCWD" we respectfully note that on March 17, 2015 LFPWD gave written correspondence to NCWD that negotiations were at an end.
2. **Glossary, F-N NCWD**: We are recommending changing the second half of the sentence from ... including about a third of the City of Lake Forest Park to ... including about forty four percent (44%) of the City of Lake Forest Park, assuming you are using the City of Lake Forest Park's 2015 Water and Wastewater Utility Status and Alternatives for the Future study.	Please see edits in Glossary F-N with updated figures.

Part I General Information	LFPWD Response to NCWD 4/4/2016
3. **Part 1, Table 1-1**: Several actions by Lake Forest Park Water District with North City Water District (previously Shoreline Water District and King County Water District No. 42) and Northshore Utility District were not included in the table. They are as follows: 1953 - Withdrawal of Territory by King County Resolution 14167 1958 - Withdrawal of Territory by King County Resolution 18075 and 18722 1960 - Withdrawal of Territory by King County Resolution 21283 and 21376 1986 - Agreement with KCWD 42 for joint storage and emergency interties 1993 - Joint storage and emergency interties agreement expires with KCWD 42 2006 - KCWD83's request for joint use of storage in SWD's 2.0 MG reservoir 2008 - Discussions and meetings with LFPWD and SWD regarding potential merger 2013 - Regional Governance Study completed with neighboring utilities 2014 - Memorandum of Understanding with North City Water District regarding service anomalies along District Boundaries.	Noted.

10-C North City Water Comments

Part VIII Capital Plan	LFPWD Response to NCWD 4/4/2016
4. **Part 8, Page 2.5, First Paragraph**: The text states Boundary Agreements resulting in adjustment with NUD and NCWD. Similar to comment 1, NCWD would like to recommend that as part of any future discussions about boundaries would include reviewing the financial costs so as "to determine the most cost effective method to address these areas so that the corporate boundaries and service areas align for both District"	Thank you for your comment. While we appreciate your concern, LFPWD will not be prescriptive in the rationale for determining service boundary adjustments, which are in any event subject to interlocal agreement.
5. **Part 8, Figure 8-1**: The maps shows a corporate boundary along 30th Avenue NE and halfway between 28th and 29th Ave NE from NE 185th to 187th Streets. NCWD believes the second corporate boundary was incorrectly added and should be removed.	Our map will be updated.

Part X Miscellaneous Documents	LFPWD Response to NCWD 4/4/2016
6. **Part 10, Section 1**: The tables identify which properties are serviced the adjacent utility providers both within the District's corporate boundary and adjacent to the corporate boundary. It does not include the parcels that the District is serving in adjacent water purveyor's boundaries which are outside the District's corporate boundary. NCWD is recommending LFPWD include those parcels in this section also.	Thank you for your comment.

APPENDIX 10 - G PUBLIC MEETING RECORD SYSTEM PLAN

LAKE FOREST PARK WATER DISTRICT
REGULAR MEETING AGENDA
APRIL 20, 2016 6:00 PM

10-G Public Comment Meeting

CALL TO ORDER/ROLL CALL

TREASURERS REPORT

APPROVAL OF VOUCHERS FOR MARCH 2016-approximate length of 30 minutes

March Vouchers Numbered 115395 through 115442 in the amount of $51,142.24

APPROVAL OF MINUTES

Minutes from the March 16th Regular Board Meeting

UNFINISHED BUSINESS-approx. length of 20 minutes

- NE 178th St.
- Brightwater Tunnel Monitoring Wells
- 2016 Capital Budget
- Insurance Carrier
- CARA

UNFINISHED BUSINESS- Not scheduled for discussion

- Website
- Credit Card Payment Options

NEW BUSINESS - approx. length of 15 minutes

- Resolution 365 (Leak Adjustment)
- Resolution 366 (Rescinding Res. 235)

ADVISORY COMMITTEE- approx. length of 20 minutes

- CARA
- McKinnon Creek Run Off Study
- 2016 Work Plan
- Flyer
- Brookside Science Fair

PUBLIC COMMENT LFPWD DRAFT WATER SYSTEM PLAN- approx. length of 15 minutes

GENERAL MANAGER'S REPORT-approximate length of 15 minutes

ENGINEER'S REPORT- approx. length of 45 minutes

- Source and Supply Improvements in WHPA (PWTF 2013)
- SCADA Upgrades
- Draft Water System Plan

OPEN DISCUSSION - approx. length of 10 minute

MEETING ADJOURNED- approx. adjournment time of 8:50 PM

10-G Public Comment Meeting

LAKE FOREST PARK WATER DISTRICT
REGULAR MEETING MINUTES
APRIL 20, 2016

Commissioners present: William Donahue, Eli Zehner,

Others present: F. Alan Kerley, General Manager ; Patty Cornaby, Admin. Assistant; Richard Jonson, Attorney; and Dan Mundall, Engineer ; Traci Furtani, Advisory Committee.

Call to Order: The meeting was called to order by President Donahue at 6:20 PM at the District Office.

Treasurer's Report
Tabled.

Approval of March Vouchers
Tabled.

Approval of Minutes
Approval of the March 16th, 2016 Regular Meeting Minutes was moved, duly seconded and approved.

Unfinished Business

Mr. Kerley reported on the following:

NE 178th St.: Still awaiting project as-built drawings and invoicing from City of LFP.

Brightwater Tunnel Monitoring Wells: The data presently received seems to be adequate for the present.

2016 Capital Budget: Presented to the Board. Review will follow at an upcoming meeting.

Insurance Carrier: WSRMP has accepted the District's letter of withdrawal. Master agreement with Enduris will be presented to the President of the Board for signature at the next Board meeting.

Mr. Furtani enters at 6:39 PM.

CARA: Ms. Cornaby updated the Board as to the status of the WA State DOH grant application and timelines to complete the work as outlined in the grant.

Mr. Mundall enters at 6:44 PM.
Ms. Cornaby exits at 6:45 PM.

New Business

10-G Public Comment Meeting

Resolution 365: A resolution repealing resolution no. 270 and establishing new critera for customer leak adjustments was presented. Discussion followed. Motion to approve Resolution 365 was duly made, seconded and approved.

Resolution 366: A resolution repealing resolution no. 235 (relating to outdated SPU water conservation plan) was presented. Motion to approve Resolution 366 was duly made, seconded and approved.

Advisory Committee

Mr. Furtani reported on behalf of the Committee.

CARA: Lidar images will be reviewed to help determine the area of the outfall for Abbeyview pond.

McKinnon Creek Run Off Study: No change.

2016 Work Plan: Public outreach to include sponsoring a booth at the LFP Farmer's Market.

Flyer: Still being drafted.

Brookside Science Fair: The District will have a booth. A wellfield model will be provided through North Seattle Community College.

Public Comment LFPWD Draft Water System Plan

Mr. Kerley noted that this item has been on the agenda for several months now with no comment from the general public. He suggested that including an invite on this item in the upcoming district newsletter may increase interest.

Mr. Furtani exits at 7:35 PM.

General Manager's Report

Tree Removal: The trees that blew down at 18704 46th Ave NE have been cleared. There was no property damage.

Vehicles: The blower on the vactor trailer was rebuilt in-house and the vactor is back in service. Our portable generator that we use to power tools out in the field had an exhaust issue where the catalic converter packing blew into the exhaust manifold causing a small explosion and fire! Repairs were also made in house.

Wellfields: A noxious weed inventory was done in our wellfields by Karen Fisher of King County. This was done by invite.

District Office: Painting and re-arranging underway.

10-G Public Comment Meeting

Low Tank: Sensor or sensor line issue is reporting false high level readings. We are investigating the cause.

Storm outfall improvement: A safety concern came in about an open pipe that discharges storm water into the McKinnon Creek Wellfield. The District installed what is called a trash rack.

Discussion regarding developing a full District financial statement with balance sheet was discussed. Mr. Kerley was requested to add that item as a year end goal.

Engineer's Report

Mr. Mundall reported on the following:

Source and Supply Improvements in WHPA (PWTF 2013): Noise impact assessment was prepared and submitted to the City as requested as part of our conditional use permit. Hearing should be in May with site development work (first phase of project) hopefully in June or July

Draft Comprehensive Water System Plan: The agency comments the District has received up to this point were presented to the Board. The District is still awaiting comments from S.P.U. and King County. Discussion followed.

SCADA Upgrades: No change.

Open Discussion:
Mr. Donahue stated that Wednesday evening meetings were becoming more difficult for him to attend and that he would like to ask the Board to revisit the regularly scheduled Board meeting dates and time at the next Board Meeting.

Mr. Zehner attended the Spring WASWD Conference. He noted that attendance was lower than in past years.

Discussion of Commissioner compensation amounts to be added to next regular meeting agenda.

There being no further business, the meeting was adjourned at 8:59 PM.

_____

_____

_____

Commissioners

Attest: DH

CONSERVATION TIPS

- Install drip irrigation systems that get water directly to plants without overspray waste.
- Spreading a layer of organic mulch around plants retains moisture and saves water, time and money.
- Plant native species. They are hardy and acclimated to our environment and require less watering.
- Choose shrubs and groundcovers instead of turf for hard-to-water areas such as steep slopes and isolated strips.
- Plant in fall and let nature water your young plants until they develop deep roots.

WELLFIELD SURVEY FOR INVASIVE PLANTS COMPLETED

A King County well field survey was recently completed at the request of the District in both of the District well fields. King County provides a service to identify invasive plant species. It was found that the District has several species that are considered weeds of concern. However, no species that require control in King County were found. The District is considering methods to control non-native weeds and plant species in its wellfields.

You are receiving this Newsletter because you are either a District customer; reside within our Wellhead Protection Area or within our corporate boundaries.

WA COURT OF APPEALS DECISION

Division I of the Washington State Courts of Appeal, in an unpublished decision issued on April 25, 2016, affirmed a trial court ruling that a 1988 City of Lake Forest Park ordinance vacating the right of way through the District's watershed was void from its inception.

The District's Board of Commissioners is disappointed with the ruling but has determined to not seek further review of the decision. The effect of the decision is that right of way in question, as shown in a 1912 era plat but never opened, is an easement overlaying the District's fee title ownership of the underlying land. The right of way bisects the District's watershed in a steep ravine traversed by a stream. The District owns and operates multiple artesian and shallow wells within the right of way. Despite this ruling, the District remains committed to preserving the watershed and its untreated ground water sources that serve the central part of the City of Lake Forest Park.

PHOTO SEARCH!!

Lake Forest Park Water District is requesting any residents, who have old photos of interest from Lake Forest Park, especially pertaining to the building or maintaining of our water system to please email or call District office so that we can copy or scan them. All photos will become a part of the District archive and become a shared history of our community's past.

LAKE FOREST PARK WATER DISTRICT

GOOD WATER, NATURALLY

LAKE FOREST PARK WATER DISTRICT
4029 NE 178TH STREET
Lake Forest Park, WA 98155
(206) 365-3211

WWW.LFPWD.ORG

MAY 2016

10-G Public Comment Meeting

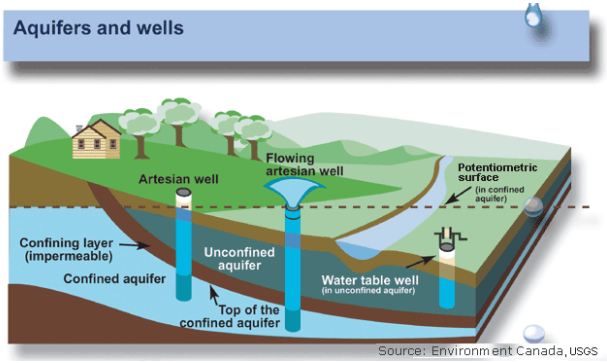
OUR UNIQUE WATER SOURCE

Our water is sourced from a local aquifer that has been providing natural, non-chlorinated water to local residents for over a hundred years. **Do your part to insure and protect our natural water source by limiting the use of fertilizers and pesticides and keeping pets out of the designated wellfield areas. Properly dispose of chemicals, paint and motor oil.** Our water is a resource generations before us have protected, it is our responsibility to do the same to ensure future generations to continue to benefit from locally sourced, natural drinking water.



WATER SYSTEM PLAN UPDATE

The District's Draft Water System Plan is available for review at lfpwd.org. The District welcomes public comment at every Board Meeting held on the 3rd Wednesday of every month at 6 PM. There have been two source protection meetings that many stakeholders attended and provided comments. The Draft Water System Plan has been updated with issues raised at those meetings. We welcome your input.



GRANT AWARDED TO LFPWD BY WA STATE DEPT. OF HEALTH TO DELENIATE LOCAL AQUIFER

The District has received a Source Water Protection Grant from the WA State Department of Health to complete an aquifer study that will delineate the boundary, potential contaminants, and vulnerability of the source of our drinking water; our aquifer.

An aquifer is a large underground permeable area that serves as storage for natural water sources. Currently it is believed that the aquifer that provides our drinking water recharges and flows under parts of the City of Brier, into McKinnon Creek and Horizon View Wellfields and then empties into Lake Washington. Delineating the aquifer will determine if the aquifer extends further North and the types of activities that may be potentially detrimental to our water supply.

DISTRICT PARTICIPATION AT LFP GREEN FAIR and BROOKSIDE ELEMENTARY SCIENCE FAIR

District staff and Advisory Committee members presented at this year's **Green Fair**. Many customers stopped by as well as residents who wished they were customers! As part of the District display table, the District provided samples of our water and there were many compliments regarding the taste of LFPWD water. District also provided sitka spruce trees, shrubs and bulbs for planting to encourage customers to plant species that require less summer watering and 'green' our neighborhoods at the same time.

On May 6th, Staff and Advisory Committee members also attended the **Brookside Science Fair.** Tracy Furtani, an LFPWD Advisory Member brought a model to demonstrate how aquifers and wells function and how contaminants can leach into drinking water. Thank you to everyone who attended and spent day with us. We are fortunate to have great Communication Advisory Team

Look for a LAKE FOREST PARK WATER DISTRICT informational table at the Lake Forest Park Farmer's Market this September

10-G Public Comment Meeting

10-G Public Comment Meeting

LAKE FOREST PARK WATER DISTRICT
REGULAR MEETING AGENDA
MAY 18, 2016 6:00 PM

CALL TO ORDER/ROLL CALL

TREASURERS REPORT

APPROVAL OF VOUCHERS FOR MARCH and APRIL 2016-approximate length of 40 minutes

March Vouchers Numbered 115395 through 115442 in the amount of $51,142.24

April Vouchers Numbered 115443 through 115502 in the amount of $39,721.12

APPROVAL OF MINUTES

Minutes from the April 20th Regular and the May 4th and May 10th Special Board Meetings

UNFINISHED BUSINESS-approx. length of 20 minutes

- NE 178th St.
- Brightwater Tunnel Monitoring Wells
- 2016 Capital Budget
- Insurance Carrier
- CARA

UNFINISHED BUSINESS- Not scheduled for discussion

- Website
- Credit Card Payment Options

NEW BUSINESS - approx. length of 15 minutes

- Commissioner Compensation

ADVISORY COMMITTEE- approx. length of 20 minutes

- CARA
- McKinnon Creek Run Off Study
- 2016 Work Plan
- Flyer
- LFP Farmer's Market

PUBLIC COMMENT LFPWD DRAFT WATER SYSTEM PLAN- approx. length of 15 minutes

GENERAL MANAGER'S REPORT-approx. length of 15 minutes

ENGINEER'S REPORT- approx. length of 20 minutes

- Source and Supply Improvements in WHPA (PWTF 2013)
- SCADA Upgrades
- Draft Water System Plan

EXECUTIVE SESSION- Considering a personnel matter under RCW 42.30.110 section 1(g) -approx. length of 20 minutes

OPEN DISCUSSION - approx. length of 10 minutes

MEETING ADJOURNED- approx. adjournment time of 8:55PM

10-G Public Comment Meeting

LAKE FOREST PARK WATER DISTRICT
REGULAR MEETING MINUTES
MAY 18, 2016

Commissioners present: William Donahue, David Hammond.

Others present: F. Alan Kerley, General Manager; Richard Jonson, Attorney; Dan Mundall, Engineer.

Call to Order: The meeting was called to order by President Donahue at 6:02 PM at the District Office.

Treasurer's Report
Tabled.

Approval of March and April Vouchers
Review of vouchers. Approval tabled.

Mr. Jonson enters at 6:12 PM.

Approval of Minutes
Approval of the May 4th and 10th 2016 Special Meeting Minutes was moved, duly seconded and approved.

Unfinished Business

Mr. Kerley reported on the following:

NE 178th St.: Still awaiting project as-built drawings and invoicing from City of LFP.

Brightwater Tunnel Monitoring Wells: Mr. Kerley reported that the data presently received seems to be adequate for the present. Discussion was held. Staff and engineering was directed to continue review of data and to document the review.

2016 Capital Budget: Tabled

Insurance Carrier: Application sent to Enduris and accepted as complete. Mr. Donahue signed the Master agreement with Enduris.

CARA: Mr. Kerley informed the Board that the DOH grant has now been signed by both parties and that the District and Associated Earth Sciences Inc. now have a contract and that meets the legal requirements of the District and the time lines of the Grant.

New Business

Commissioner Compensation: Tabled.

10-G Public Comment Meeting

Advisory Committee

Mr. Kerley reported on behalf of the Committee.

CARA: No Change.

McKinnon Creek Run Off Study: Next water testing will be in June.

Brochure: A subcommittee has been formed to further work on this.

LFP Farmer's Market: A subcommittee has been formed to further work on this.

Public Comment LFPWD Draft Water System Plan

No public comment.

General Manager's Report

The Horizon View tank and the high tank have both been pressure washed in preparation of roof painting.

Tnemec, the paint manufacturer on all of our tanks was consulted and the paint was ordered. No special license is required to apply the particular exterior coating system that we have. We decided to do the work in-house.

Horizon View tank now has a bright white roof.

I recently visited Mt. View-Edgewood Water Company, one of the largest non-chlorinated water districts in Western Washington, to see first-hand how they implement many of their Best Management Practices.

We have not received any bids yet on the surplus Jeep and Chevy work truck.

Engineer's Report

Mr. Mundall reported on the following:

Source and Supply Improvements in WHPA (PWTF 2013): Our conditional use permit hearing may now be in July. Discussion was held. Staff was directed to contact the City of LFP planning dept.

Draft Comprehensive Water System Plan: The District is awaiting comments from S.P.U. and King County. After compiling agency responses and staff comment is complete, a Special Meeting will be scheduled.

SCADA Upgrades: No change.

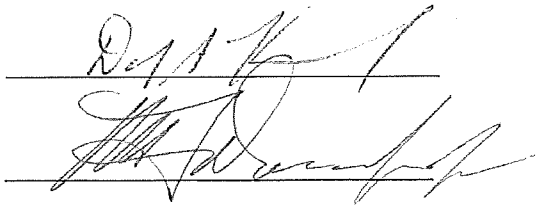
10-G Public Comment Meeting

Executive Session: Tabled.

Open Discussion:

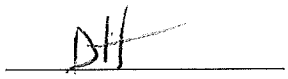
Mr. Zehner's absence was excused by a motion duly seconded and approved as he is representing the District at a WASWD function.

There being no further business, the meeting was adjourned at 7:07 PM.



Commissioners

Attest:



Secretary

APPENDIX 10 - H PLAN SUBMITTAL RECORD

Comprehensive Water System Plan 2015
Agency Review Copy
EDIT Dated: 8/31/2016

DISTRIBUTION RECORD

Organization	Media	Recipient Name	Date Sent	Receipt Confirmed	Notes
North City Water District	e-mail link + CD	Diane Pottinger 206-362-8100	9/12/16 CD 9/13/16 email	9/13/16 email	
North Shore Water & Sewer	e-mail link + CD	Fanny Yee	9/12/16 CD 9/13/16 email		
City of Lake Forest Park	Binder +CD		9/12/16 B+CD 9/13/16 email		
King County	e-mail link + CD	Steve Hirschey 206-477-5387	9/12/16 CD 9/13/16 email		9/14 Rec'd 2 copies Bound
LFPWD Office	Binder + CD	Alan Kerley	9/12/16 B+CD		
Mundall Engineering	Binder +CD	Dan Mundall	9/12/16 B+CD		
Commissioner Bill Donahue	Binder +CD		9/13/16 email		
Commissioner Eli Zehner	Binder +CD		9/13/16 email		
Commissioner David Hammond	Binder +CD		9/13/16 email		
PUBLIC	Website + Binder In office		9/12/16 B+CD		
Wash. Dept. of Ecology	e-mail link + CD	c/o Dept. of Health Richard Rodriguez	~~9/12/16 B+CD~~		
Wash. Dept. of Health Drinking Water	binder x ~~3~~ 1	Richard Rodriguez	9/12/16 B+CD 9/13/16 email		Includes submittal form #331-040 and checklist
City of Seattle (SPU)	e-mail + CD	Joan Kersnar	9/12/16 CD 9/13/16 email		

Washington State Department of Health
Water System Plan Submittal Form

This form is required to be submitted along with the Water System Plan (WSP). It will serve to expedite review and approval of your WSP. WSPs will not be reviewed until submittal form and checklist are completed.

LAKE FOREST PARK WATER DISTRICT	40950K	COMMUNITY OWNED
1. Water System Name	2. PWS ID# or Owner ID#	3. System Owner Name
ALAN KERLEY	206-365-3211	General Manager
4. Contact Name for Utility	Phone Number	Title
4029 NE 178th Street	Lake Forest Park	WA 98295
Contact Address	City	State Zip
DAN MUNDALL, MSCE, PE MUNDALL ENGINEERING & CONSULTING	360-319-1285	P.E.
5. Project Engineer	Phone Number	Title
BOX 799	Sumas	WA 98295
Project Engineer Address	City	State Zip
SAME	206-365-3211	206-365-3357
6. Billing Contact Name (required if not the same as #4)	Billing Phone Number	Billing Fax Number
SAME		
Billing Address	City	State Zip

6. How many services are presently connected to the system? [Residential + Commercial] 894_____
7. Is the system expanding? (seeking to extend service area or increase number of approved connections) ☐ Yes ☒ No
8. If number of services is expected to increase, how many new connections are proposed in the next six years? 10_____
9. If the system is private-for-profit, is it regulated by the State Utilities and Transportation Commission? ☐ Yes ☒ No
10. Is the system located in a Critical Water Supply Service Area? ☐ Yes ☒ No
11. Is the system a customer of a wholesale water purveyor? ☐ Yes ☒ No
12. Will the system be pursuing additional water rights from the State Department of Ecology in the next ten years? ☐ Yes ☒ No
13. Is the system proposing a new intertie? ☒ Yes ☒ No
14. Do you have projects currently under review by the Department of Health? ☐ Yes ☒ No
15. 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
16. Are you requesting distribution related project report and construction document submittal exception, and if so, does the WSP contain distribution facilities design and construction standards, including internal engineering review procedures? ☒ Yes ☐ No
17. Have you sent copies of the draft WSP to adjacent purveyors and the County for their review and comment? ☒ Yes ☐ No

If answer to question 17 is yes, list adjacent utilities/entities that have received a copy of the draft WSP: Northshore Utility District, North City Water District, City of Lake Forest Park, King County, City of Seattle

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

Please enclose the following number of copies of the WSP:

2 copies for Department of Health
1 copy for Department of Ecology
1 additional copy if you answered "yes" to question 9

___1___ Copies Required

____1__ Total copies sent

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

☒ **Northwest Drinking Water Operations**
Department of Health
20425 72nd Ave. S, Ste 310
Kent, WA 98032-2358
(253) 395-6750

☐ **Southwest Drinking Water Operations**
Department of Health
PO Box 47823
Olympia, WA 98504-7823
(360) 664-0768

☐ **Eastern Drinking Water Operations**
Department of Health
1500 W. Fourth Ave, Suite 305
Spokane, WA 99204
(509) 456-2997

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).

WSP Checklist

	CONTENT DESCRIPTION	MUST BE SUBMITTED (✓)*	PAGE # IN WSP
Chapter 1	**DESCRIPTION OF WATER SYSTEM**		
	Ownership and Management	(✓)	1-1to 2, App. 1-A
	System Background	(✓)	1-3 to 7, 1-9 to 13, Table1-1, App. 1-B, Figure 1-1
	Inventory of Existing Facilities	(✓)	1-14 to 16, 1-18, Figure 1-5
	Related Plans (e.g., CWSP)	(✓)	1-21
	Existing and Future Service Area and Characteristics	(✓)	1-22 to 24
	Agreement	( )	1-25, App.1-C
	Map	(✓)	Figures 1-6 and 1-7
	Service Area Policies (Including SMA Policy and Conditions of Service	(✓)	1-27
Chapter 2	**BASIC PLANNING DATA**		
	Current Population, Number of Service Connections, and ERUs	(✓)	2-1 to 3, Table 2-1
	Current Water Use and Data Reporting	(✓)	2-6, Table 2-1
	Current and Future Land Use	(✓)	1-24
	Future Population, Number of Service Connections, and ERUs (6 and 20 years)	(✓)	2-4 to 5, Table 2-1
	Future Water Use (Demand Forecast for 6 and 20 years)	(✓)	2-4 to 9, Table 2-1
Chapter 3	**SYSTEM ANALYSIS**		
	System Design Standards	(✓)	3-2, 3-16, 3-20, 3-23
	Water Quality Analysis	(✓)	3-16 to 19
	System Description and Analysis	(✓)	3-1to 54
	Source	(✓)	3-2 to 4
	Treatment	( )	3-16 to 19
	Storage	(✓)	3-20 to 22
	Distribution System/Hydraulics	(✓)	3-23 to 52
	Summary of System Deficiencies	(✓)	3-5, 3-11, 3-13, 3-18 to19, 3-22, 3-25 to 31, 3-39 to 54
	Analysis of Possible Improvement Projects	(✓)	3-39 to 55
Chapter 4	**CONSERVATION PROGRAM AND SOURCE OF SUPPLY ANALYSIS**		
	Conservation Program	(✓)	4-4to 5
	Water Right Evaluation	(✓)	4-2 to 3, 4-7, Table 4-1
	Source of Supply Analysis	( )	
	Water Supply Reliability Analysis with Water Shortage Response Plan	(✓)	4-6 to 7
	Interties	( )	1-16, 4-6, App. 1-C
Chapter 5	**SOURCE WATER PROTECTION (CHECK ONE OR BOTH)**		
	Wellhead Protection Program	( )	5-1to 28, Figure 5-3, Table 5-1, App. 5-F, App. 5-G
	Watershed Control Program	( )	
Chapter 6	**OPERATION AND MAINTENANCE PROGRAM**		
	Water System Management and Personnel	(✓)	6-1 to 6
	Operator Certification	(✓)	6-6
	Routine Operating Procedures, Preventive Maintenance and Record Keeping	(✓)	6-7 to 17
	Water Quality Sampling Procedures (Comprehensive Monitoring Plan)	(✓)	6-7 to 9, Table 6-2
	Coliform Monitoring Plan	(✓)	1-6 to 7,3-19,6-9, Table 6-2
	Emergency Response Program	(✓)	6-18 to 22
	Safety Procedures	(✓)	6-22
	Cross-connection Control Program	(✓)	1-26,6-9
	Customer Complaint Response Program	( )	1-28, 6-24 to 29
	Summary of O & M Deficiencies	(✓)	6-26 to 28
Chapter 7	**DISTRIBUTION FACILITIES DESIGN AND CONSTRUCTION STANDARDS**		
	Standard Construction Specification for Distribution Mains	( )	7-4, App. 7-B
	Design and Construction Standards for Distribution Related Projects, including Internal Engineering Review Procedures (i.e., Alternative Review)	( )	3-2, 3-16, 3-20, 3-23, 7-3
Chapter 8	**IMPROVEMENT PROGRAM**		
	Selection and Justification of Proposed Capital Improvements Projects	( )	8-1, 8-8 to 9, 8-13, 8-16 to 17, 8-19
	Selection and Justification of Non-Capital Projects	( )	8-12, 8-15
	Improvement Schedule (6 and 20 years)	(✓)	Table 8-1, and Tables 8-2 and 8-3
Chapter 9	**FINANCIAL PROGRAM**		
	Identification of Cost of Capital and Non-Capital Improvements	(✓)	9-0 to 2, 9-5
	Identification of Annual O & M Expenses	(✓)	9-3 to 4
	Six-Year Balanced Operating Budget	(✓)	9-9
	Discussion of Water Rates Including Proposed Increases and Rate Structures	(✓)	9-5 to 13
	Financial Viability Test (for systems serving less than 1000)	( )	9-14
	UTC Financial Viability and Feasibility Test (for UTC regulated systems)	( )	N/A
Chapter 10	**MISCELLANEOUS DOCUMENTS**		
	County/Adjacent Utility Correspondence	(✓)	App. 10- A to C (to follow)

State Environmental Policy Act (SEPA) Determination	( )	10-3 to 20
Agreements	( )	App. 1-C
Satellite Management Program	( )	N/A

*At the pre-plan conference, a formal determination will be made on what must be submitted.

Comprehensive Water System Plan 2015
Agency Review Copy
Dated: 8/31/2016

SEPA CHECKLIST/DNS DISTRIBUTION RECORD

Organization	Media	Recipient Name	Date Sent	Receipt Confirmed	Notes
North City Water District	mail	Diane Pottinger 206-362-8100	9/12/16		
North Shore Water & Sewer	mail	Fanny Yee	9/12/16		
City of Lake Forest Park	mail	Pete Rose	9/12/16		
King County	mail	Steve Hirschey 206-477-5387	9/12/16		
LFPWD Office	posted	Alan Kerley			
✓ PUBLIC	Advert for DNS	DJC JEFF Mosley	9/8/2016	9/12/16 ✓	AD RUN ✓ D.M. 9/12/2016
Wash. Dept. of Ecology	mail	Maia Bellon	9/12/16		
Wash. Dept. of Health Drinking Water	mail	Richard Rodriguez	9/13/16		
City of Seattle (SPU)	mail	Joan Kersnar (206) 684-0839	9/12/16		
Northshore Fire District	mail	Jim Torpin	9/12/16		
Shoreline School District	mail	Superintendent	9/12/16		
Muckleshoot Tribal Council	mail	Virginia Cross	9/12/16		
Tulalip Tribal Council	mail	Melvin Sheldon Jr.	9/12/16		
Library District	mail	Board of Trustees	9/12/16		

Appendix 10-H Plan Submittal Record

Draft Comprehensive Water System Plan 2015

Agency Review Copy

Dated: 12/17/2105

Scan 7/28/16

DISTRIBUTION RECORD

Organization	Media	Recipient Name	Date Sent	Receipt Confirmed	Notes
North City Water District	e-mail link + CD	DIANA POTTINGER	12/30 EMAIL 15		
~~North Shore Water & Sewer~~ UTILITY DIST.	e-mail link + CD	FANNY YEE	12/30 EMAIL 15		
City of Lake Forest Park	Binder +CD	PAT E ROSE	12/30 EMAIL 15	1-12-2016 Jennifer Martin	HAND DELIVERED TO RECEPTIONIST BY D. MUNDALL
King County	e-mail ✓ link + ✓ CD ~~Binder~~	TAD SULLIVAN	12/31/2015 MAILED HARD COPY		4/19/16 COMMUNICATION BY EMAIL FROM STEVE HIRSCHEY 206 477-5387
LFPWD Office / Public access	Binder + CD + WEBV	- WEB POST - DOCS IN OFFICE	12/30/2015 12/30/2015		
Mundall Engineering	Binder ✓ +CD ✓		12/30/2015		
Commissioner Bill Donahue	Binder +CD	- WEB/EMAIL - ~~WEB~~	12/30/2015 12		
Commissioner Eli Zehner	Binder +CD	- WEB/EMAIL	12/30/2015		
Commissioner David Hammond	Binder +CD	- WEB/EMAIL	12/30/2015		
PUBLIC	Website ✓ + office ✓ copy	WEB + OFFICE COPY	12/30/2015		
Wash. Dept. of Ecology ↕	e-mail link + CD	RICHARD RODRIGUEZ	AA.	HAND DELIVERED JAN. 13, 2016 ↕	& mailed formal CD to DOE
Wash. Dept. of Health Drinking Water	binder x 3	E-MAIL COPIES PRINTED FOR MAILING	12/31/2015 12/31/2015	HAND DELIVERED JAN. 13, 2016	Includes submittal form #331-040 and checklist

CITY OF BLIER – PH. NICOLE GAUDETTE 2/17/16 – NOT NEEDED, HOPE TO GET C.A.R.A. WHEN ITS READY.

CITY OF SEATTLE (SPU) JOAN KERSNAR 4/19/2016 - EMAIL LINK 6/16/2016 E-MAIL

Appendix 10-H Plan Submittal Record - cont

04/19/2016 CALLED EUGENE MANTEUFEL, SPU RE. SYSTEM PLAN SUBMITTAL, REVIEW
206-684-0335 - LEFT MSG

EUGENE M. RT CALL, E-MAILED 2 NAME
JOAN KERSNAR

Appendix 10-H Plan Submittal Record - cont

Washington State Department of Health
Water System Plan Submittal Form

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1. Water System Name	2. PWS ID# or Owner ID#	3. System Owner Name
ALAN KERLEY	206-365-3211	General Manager
4. Contact Name for Utility	Phone Number	Title
4029 NE 178th Street	Lake Forest Park	WA 98295
Contact Address	City	State Zip
DAN MUNDALL, MSCE, PE MUNDALL ENGINEERING & CONSULTING	360-319-1285	P.E.
5. Project Engineer	Phone Number	Title
BOX 799	Sumas	WA 98295
Project Engineer Address	City	State Zip
SAME	206-365-3211	206-365-3357
6. Billing Contact Name (required if not the same as #4)	Billing Phone Number	Billing Fax Number
SAME		
Billing Address	City	State Zip

6. How many services are presently connected to the system? 874
7. Is the system expanding? (seeking to extend service area or increase number of approved connections) ☐ Yes ☒ No
8. If number of services is expected to increase, how many new connections are proposed in the next six years? 10
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Is this plan: ☒ an Initial Submittal ☐ a Revised Submittal

Please enclose the following number of copies of the WSP:

2 copies for Department of Health
1 copy for Department of Ecology
1 additional copy if you answered "yes" to question 9

___3___ Copies Required

____3__ Total copies sent

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

☒ **Northwest Drinking Water Operations**
Department of Health
20425 72nd Ave. S, Ste 310
Kent, WA 98032-2358
(253) 395-6750

☐ **Southwest Drinking Water Operations**
Department of Health
PO Box 47823
Olympia, WA 98504-7823
(360) 664-0768

☐ **Eastern Drinking Water Operations**
Department of Health
1500 W. Fourth Ave, Suite 305
Spokane, WA 99204
(509) 456-2997

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).

DOH Form #331-040 (Revised 11/05)

WSP Checklist

Appendix 10-H Plan Submittal Record - cont

	CONTENT DESCRIPTION	MUST BE SUBMITTED (✓)*	PAGE # IN WSP
Chapter 1	**DESCRIPTION OF WATER SYSTEM**		
	Ownership and Management	(✓)	1-1to 2, App. 1-A
	System Background	(✓)	1-3 to 7, 1-9 to 13, Table1-1, App. 1-B, Figure 1-1
	Inventory of Existing Facilities	(✓)	1-14 to 16, 1-18, Figure 1-5
	Related Plans (e.g., CWSP)	(✓)	1-21
	Existing and Future Service Area and Characteristics	(✓)	1-22 to 24
	Agreement	( )	1-25, App.1-C
	Map	(✓)	Figures 1-6 and 1-7
	Service Area Policies (Including SMA Policy and Conditions of Service	(✓)	1-27
Chapter 2	**BASIC PLANNING DATA**		
	Current Population, Number of Service Connections, and ERUs	(✓)	2-1 to 3, Table 2-1
	Current Water Use and Data Reporting	(✓)	2-6, Table 2-1
	Current and Future Land Use	(✓)	1-24
	Future Population, Number of Service Connections, and ERUs (6 and 20 years)	(✓)	2-4 to 5, Table 2-1
	Future Water Use (Demand Forecast for 6 and 20 years)	(✓)	2-4 to 9, Table 2-1
Chapter 3	**SYSTEM ANALYSIS**		
	System Design Standards	(✓)	3-2, 3-16, 3-20, 3-23
	Water Quality Analysis	(✓)	3-16 to 19
	System Description and Analysis	(✓)	3-1to 54
	Source	(✓)	3-2 to 4
	Treatment	( )	3-16 to 19
	Storage	(✓)	3-20 to 22
	Distribution System/Hydraulics	(✓)	3-23 to 52
	Summary of System Deficiencies	(✓)	3-5, 3-11, 3-13, 3-18 to19, 3-22, 3-25 to 31, 3-39 to 54
	Analysis of Possible Improvement Projects	(✓)	3-39 to 55
Chapter 4	**CONSERVATION PROGRAM AND SOURCE OF SUPPLY ANALYSIS**		
	Conservation Program	(✓)	4-4to 5
	Water Right Evaluation	(✓)	4-2 to 3, 4-7, Table 4-1
	Source of Supply Analysis	( )	
	Water Supply Reliability Analysis with Water Shortage Response Plan	(✓)	4-6 to 7
	Interties	( )	1-16, 4-6, App. 1-C
Chapter 5	**SOURCE WATER PROTECTION (CHECK ONE OR BOTH)**		
	Wellhead Protection Program	( )	5-1to 28, Figure 5-3, Table 5-1, App. 5-F, App. 5-G
	Watershed Control Program	( )	
Chapter 6	**OPERATION AND MAINTENANCE PROGRAM**		
	Water System Management and Personnel	(✓)	6-1 to 6
	Operator Certification	(✓)	6-6
	Routine Operating Procedures, Preventive Maintenance and Record Keeping	(✓)	6-7 to 17
	Water Quality Sampling Procedures (Comprehensive Monitoring Plan)	(✓)	6-7 to 9, Table 6-2
	Coliform Monitoring Plan	(✓)	1-6 to 7,3-19,6-9, Table 6-2
	Emergency Response Program	(✓)	6-18 to 22
	Safety Procedures	(✓)	6-22
	Cross-connection Control Program	(✓)	1-26,6-9
	Customer Complaint Response Program	( )	1-28, 6-24 to 29
	Summary of O & M Deficiencies	(✓)	6-26 to 28
Chapter 7	**DISTRIBUTION FACILITIES DESIGN AND CONSTRUCTION STANDARDS**		
	Standard Construction Specification for Distribution Mains	( )	7-4, App. 7-B
	Design and Construction Standards for Distribution Related Projects, including Internal Engineering Review Procedures (i.e., Alternative Review)	( )	3-2, 3-16, 3-20, 3-23, 7-3
Chapter 8	**IMPROVEMENT PROGRAM**		
	Selection and Justification of Proposed Capital Improvements Projects	( )	8-1, 8-8 to 9, 8-13, 8-16 to 17, 8-19
	Selection and Justification of Non-Capital Projects	( )	8-12, 8-15
	Improvement Schedule (6 and 20 years)	(✓)	Table 8-1, and Tables 8-2 and 8-3
Chapter 9	**FINANCIAL PROGRAM**		
	Identification of Cost of Capital and Non-Capital Improvements	(✓)	9-0 to 2, 9-5
	Identification of Annual O & M Expenses	(✓)	9-3 to 4
	Six-Year Balanced Operating Budget	(✓)	9-9
	Discussion of Water Rates Including Proposed Increases and Rate Structures	(✓)	9-5 to 13
	Financial Viability Test (for systems serving less than 1000)	( )	9-14
	UTC Financial Viability and Feasibility Test (for UTC regulated systems)	( )	N/A
Chapter 10	**MISCELLANEOUS DOCUMENTS**		
	County/Adjacent Utility Correspondence	(✓)	App. 10- A to C (to follow)

State Environmental Policy Act (SEPA) Determination	( )	10-3 to 20
Agreements	( )	App. 1-C
Satellite Management Program	( )	N/A

*At the pre-plan conference, a formal determination will be made on what must be submitted.

Appendix 10-H Plan Submittal Record - cont

Commissioners:
William F. Donahue
David A. Hammond
Eli B. Zehner

LAKE FOREST PARK WATER DISTRICT

GOOD WATER, NATURALLY

(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155
www.lfpwd.org

December 31, 2015

Attn: Richard Rodriguez
Northwest Regional Office (NWRO)
20435 72nd Avenue South, Suite 200
Kent, Washington 98032

RE: **Lake Forest Park Water District (40950K) Water System Plan**

Dear Richard,

You should have recently received an e-mail with a link to download our DRAFT Comprehensive Water System Plan 2015. We are now enclosing the same documents in printed binder and CD media for your convenience.

If you have any comments from review of the plan, please provide them in writing no later than March 1, 2016. Upon receipt of comments from Department of Health (DOH) the District will promptly revise the plan and re-submit it to DOH for final approval so comments received after March 1 may not be addressed in the final version of the plan.

Thank you,

Alan Kerley, General Manager

Encl. - Lake Forest Park Water District CWSP 2015 – Agency Review Draft Dec. 17, 2105
- Water System Plan Submittal Form (#331-040)
- WSP Checklist

Appendix 10-H Plan Submittal Record - cont

Commissioners:
William F. Donahue
David A. Hammond
Eli B. Zehner

LAKE FOREST PARK WATER DISTRICT

GOOD WATER, NATURALLY

(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155
www.lfpwd.org

December 31, 2015

King County Water and Land Resources
Attn: Ted Sullivan, PBRS/CUT Program Analyst
Mail Stop: KSC-NR-0600
201 S Jackson St # 600, Seattle, WA 98104

Phone:(206) 477-4800

RE: **Lake Forest Park Water District (40950K) Water System Plan**

Dear Ted,

You should have recently received an e-mail with a link to download our DRAFT Comprehensive Water System Plan 2015. We are now enclosing the same documents in printed binder and CD media for your convenience.

If you have any comments from review of the plan, please provide them in writing no later than March 1, 2016. Upon receipt of comments from Department of Health (DOH) the District will promptly revise the plan and re-submit it to DOH for final approval so comments received after March 1 may not be addressed in the final version of the plan.

Thank you,

Alan Kerley, General Manager

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Appendix 10-H Plan Submittal Record - cont

Commissioners:
William F. Donahue
David A. Hammond
Eli B. Zehner

LAKE FOREST PARK WATER DISTRICT

GOOD WATER, NATURALLY

(206) 365-3211
FAX: 365-3357
4029 N.E. 178th St.
Lake Forest Park
WA 98155
www.lfpwd.org

December 30, 2015

Attn: Pete Rose, Administrator
17425 Ballinger Way NE
Lake Forest Park, WA 98155

Dear Pete,

You should have recently received an e-mail with a link to download our DRAFT Comprehensive Water System Plan 2015. We are now enclosing the same documents in printed binder and CD media for your convenience.

If you have any comments from review of the plan, please provide them in writing no later than March 1, 2016. Upon receipt of comments from Department of Health (DOH) the District will promptly revise the plan and re-submit it to DOH for final approval so comments received after March 1 may not be addressed in the final version of the plan.

Thank you,

Alan Kerley, General Manager

Encl. CWSP 2015 – Agency Review Draft Dec. 17, 2105