Geosyntec consultants

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24 February 2015

Mr. Bob Williams
Oregon Department of Environmental Quality
Northwest Region Portland Office
2010 SE 4th Ave., Suite 400
Portland, OR 97201

Subject: TGA Well Decommissioning Work Plan
Cascade Troutdale Gravel Aquifer Remedy
Fairview, Oregon
ECSI No. 635

Dear Bob:

Geosyntec Consultants (Geosyntec) has prepared this monitoring well decommissioning Work Plan for the Cascade Corporation Troutdale Gravel Aquifer (TGA) remedy located at 2201 and 2525 NE 201st Ave, Fairview, Oregon (Site). The Oregon Department of Environmental Quality (DEQ) approved closure of the TGA remedy in their Project Closure Memorandum dated 26 November 2014 and issued a Certificate of Completion on 21 January 2015.

This Work Plan describes proposed decommissioning of thirteen TGA wells: MW-31s, MW-32s, MW-33s, MW-35s, MW-42, MW-43, MW-47a, MW-47b, MW-48a, MW-48b, MW-49, EX-1, and B-5. Twelve of the thirteen monitoring wells are located on or next to the TGA Off-site remediation property at the address of 2525 NE 201st, and one monitoring well, EX-1, is located on the Cascade Corporation facility property at 2201 NE 201st Avenue. The Site and locations of the thirteen monitoring wells are shown on Figure 1.

Five other monitoring wells, MW-45, MW-46, MW-47c, MW-48c, and B-6, which are installed in the confining unit 1 (CU1) that underlies the TGA, will not be decommissioned at this time. These monitoring wells will be incorporated into the underlying Cascade Troutdale Sandstone Aquifer (TSA) remedy for potential future monitoring use. This Work Plan outlines the well construction information, decommissioning methodologies, reporting, and proposed schedule for decommissioning.

Initial conversations in December 2014 with the Oregon Water Resources Department (OWRD) indicated that both over-drilling and/or backfilling may be required, as noted in Table 1 and described below. OWRD will make the final decision on decommissioning methods (over-drilling or backfilling) based on the groundwater analytical results and monitoring well construction information.

WELL CONSTRUCTION INFORMATION

Monitoring well construction details for the thirteen wells are summarized in Table 1. Monitoring well construction logs are included in Attachment A. The TGA monitoring wells were constructed between 1993 and 2013. The wells were constructed of PVC well materials, except EX-1, which is wire wrapped steel. The wells range in depth from 25 to 30 feet below ground surface (bgs) with well diameters of 2 or 4 inches. Three wells were completed with flush mount monuments, one is within a surface vault, and nine were above ground completions.

METHODOLOGY

Well decommissioning will follow applicable Oregon Administrative Rules (OARs) 690-240-510 (OWRD, 2014). Geosyntec will subcontract a licensed driller to perform the decommissioning activities. AYM Maintenance will complete vault removal and surface restoration.

Prior to decommissioning activities, the following activities will be completed:

- Submit start cards, well logs, and recent analytical data to the OWRD. OWRD will confirm decommissioning method for each well.
- Coordinate private and public underground utility locate surveys to determine the potential presence and location of buried utilities in the well vicinities.
- Measure the depth to water and the total depth of the well.
- Remove concrete pads and other surface items (e.g. bollards) using an excavator or similar heavy equipment. At MW-49, the electrical conduit and depowered electrical lines, pump and gauges, and steel vault will be removed.

Backfilling in Place

Two wells, EX-1 and MW-47a, are expected to be approved for decommissioning by backfilling in place with bentonite grout. Decommissioning by backfilling will follow these general steps:

- The wells will be backfilled with bentonite grout slurry from the bottom of the well to approximately 5 feet bgs. The bentonite grout slurry will meet the requirements of OAR 690-240-0475 for backfill materials. Hydrated bentonite chips will be used to backfill the boring from 5 feet bgs to ground surface.
- The work area will be cleaned up, decommissioning materials and debris removed, and the ground surface restored to match surrounding terrain (e.g. gravel, pavement, or grass).

Over-Drilling

Over-drilling is expected to be used to decommission nine wells: B-5, MW-31s, MW-32s, MW-33s, MW-35s, MW-42, MW-43, MW-47b, MW-48a, MW-48b, and MW-49. Based on prior decommissioning activities at the Site (Prowell Environmental, 2011), hollow stem auger drilling methods were successfully used to decommission TGA wells of similar construction. Decommissioning by over-drilling will follow these general steps:

- For PVC well materials, the casing, screen, and well seal materials (e.g. filter pack sand, bentonite) will be over-drilled from ground surface to total depth of the well. The size of the auger flights selected for over-drilling will be based on the well size (2 inch or 4 inch diameter) and the original boring diameter (6 to 10 inches).
- The drill cuttings, sand filter pack, and other debris will be removed from the boring as part of the over-drilling.
- The boring will be backfilled with bentonite grout slurry from the bottom of the boring to approximately 5 feet bgs. The bentonite grout slurry will meet the requirements of OAR 690-240-0475 for backfill materials. Hydrated bentonite chips will be used to backfill the boring from 5 feet bgs to ground surface.
- The work area will be cleaned up, decommissioning materials and debris removed, and the ground surface restored to match surrounding terrain.

SITE CLEANUP AND WASTE MANAGEMENT

Solid wastes and soil cuttings generated during decommissioning will be contained in 10 or 20 cubic yard containers lined and covered with plastic (i.e. roll-off box) that will be temporarily stored at the TGA off-site area. The roll-off boxes will be staged pending characterization results and approval for transport to a permitted, off-site disposal facility.

Metal, such as the vault and stainless steel well material removed from the well, will be decontaminated and recycled at an appropriate facility.

Wastewater collected will be temporarily stored into an onsite holding tank and decanted into the existing TSA central treatment system (CTS) for treatment and permitted discharge.

NOTIFICATION AND SCHEDULE

DEQ will be notified via email prior to and upon the completion of the well decommissioning. Notification information will include the following, in accordance with OAR 690-240-0510(6) (notification requirements):

1. Well identification information,

2. Original start card number
3. Decommissioning methodology,
4. Amount and type of sealant/backfill material (i.e. bentonite grout) used, and
5. Other information as required by the OWRD and/or DEQ.

An email notifying DEQ of completion of the decommissioning will be sent to DEQ within two weeks after decommissioning activities are completed. A complete report documenting the well decommissioning activities will be submitted following completion of the well decommissioning, receipt of the driller's well reports, and waste disposal receipts.

TGA well decommissioning is scheduled to begin in spring 2015 and is expected to require approximately one to two weeks to complete. Vault removal, backfilling, and resurfacing will occur over the same time frame. Final surface restoration will be completed following well decommissioning.

REFERENCES

Oregon Department of Environmental Quality, 2014. Project Closure Memorandum, Cascade Corporation File, ECSI #635. 26 November 2014.

Oregon Department of Environmental Quality, 2015b. Order on Consent, DEQ No. WMCSR-NWR-96-09, Certification of Completion. 21 January 2015.

Oregon Water Resources Department. 2014. *Construction, Maintenance, Alteration, Conversion and Abandonment of Monitoring Wells, Geotechnical Holes and Other Holes in Oregon.* Water Resources Department. Well Construction Standards. OAR 690-240. 25 November 2014.

Prowell Environmental, 2011. 2009 and 2010 Well Decommissionings Report, Troutdale Gravel Aquifer Remedy, East Multnomah County. 14 November 2011.

CLOSURE

We look forward to your review and approval of this Work Plan. Please contact us at (503) 222-9518 with any questions regarding this Work Plan or if you need additional information

Sincerely,

Geosyntec Consultants, Inc.

Cindy Bartlett, R.G.
Geologist/Project Manager

Brent A. Miller, P.E.
Principal Engineer

Attachments:

Figure 1	TGA Well Locations
Table 1	TGA Wells to be Decommissioned
Attachment A	Boring and Well Construction Logs

N

Retaining Wall
(Location Approximate)

CMW-46

CMW-45

SW-1A (Shepard Spring)

Poplar Tree Field

B-5

CMW-47B

CMW-47C

CMW-47A

B-6

CMW-48A

CMW-48C

CMW-48B

CMW-31s

CMW-32s

CMW-35s

CMW-49

CMW-43

CMW-33s

CMW-42

184 FWY WB

184 FWY EB

UP

EX-1 (CMW-28s)

NE 201ST AVE

NE THOMPSON ST

Cascade
Corporation

100 50 0 100 Feet

Legend

- CU1 Monitoring Well
- Shepard Springs Sample
- TGA Monitoring Well
- TGA Wells to be Decommissioned
- CU1 Truncation
- Bioremediation Treatment Wall
- **Cascade Corporation Property Boundary**

TGA Wells to be Decommissioned
East Multnomah County

East Multnomah County

Geosyntec consultants

PNG0564G | February 2015

Figure 1

SantaBarbara-01\Data P:\GIS\PNG0564 - Cascade\Projects\2015\Fig01_TGA_Well_Decmission.mxd STM 20150209

Table 1
TGA Wells to be Decommissioned
Cascade Corporation, Fairview, Oregon

Well Identification	Location*	Year Installed	Total Depth (feet bgs)	Screen Length (feet)	Boring Diameter (inches)	Well Diameter (inches)	Screen Material	Monument Type	Decommissioning Method**
B-5	2525	1993	17	5	6	2	PVC	above ground + bollards	Overdrill
EX-1	2201	1994	27.4	15	8	4	SS - V-wire screen	flush monument	Grout in place
MW-31s	2525	1995	22	10	7	2	PVC	above ground + bollards	Overdrill
MW-32s	2525	1995	18.9	10	7	2	PVC	above ground + bollards	Overdrill
MW-33s	2525	1995	24.9	14	7	2	PVC	above ground + bollards	Overdrill
MW-35s	2525	1995	17.6	9	7	2	PVC	above ground + bollards	Overdrill
MW-42	2525	2001	29	10	10	4	PVC	flush monument	Overdrill
MW-43	2525	2001	29	10	7	2	PVC	flush monument	Overdrill
MW-47a	2525	2011	14	5	6	2	PVC	above ground	Grout in Place
MW-47b	2525	2011	20	5	6	2	PVC	above ground	Overdrill
MW-48a	2525	2011	14	5	6	2	PVC	above ground	Overdrill
MW-48b	2525	2011	18	2	6	2	PVC	above ground	Overdrill
MW-49	ROW next to 2525	2013	17	10	8	4	PVC	vault	Overdrill

*The location indicated is either the Cascade Corporation facility at 2201 NE 201st Ave, or the TGA "Off-site" remediation area, located at 2525 NE 201st Ave. The right-of-way (ROW) indicated is adjacent to the off-site remediation property.

**Preliminary decommissioning method is indicated based on a discussion with Kris Byrd at OWRD on 12/09/14. The driller will need to do the necessary filing of paperwork to get official OWRD decision on the type of abandonment method for each well.

bgs = below ground surface
PVC = polyvinyl chloride
SS = stainless steel

ATTACHMENT A

Boring and Well Construction Logs

Geosyntec consultants
621 SW Morrison Street, Suite 600
Portland, Oregon 97205
Phone: 503.222.9518

GS FORM: CORE3 10/00

BOREHOLE LOG

BORING MW-49 **SHEET** 1 OF 1
START DATE 8/26/2013 **Elevation** FT. MSL
FINISH DATE 8/26/2013
PROJECT Cascade Corporation
LOCATION 2525 NE 201st Avenue
PROJECT NUMBER PNG0564G

DEPTH (ft)	MATERIAL DESCRIPTION	WELL CONSTRUCTION MATERIAL	SAMPLES NUMBER	SAMPLES TYPE	RECOVERY (%)	PID READING (ppm)	USCS Classification	COMMENTS
	Brown, loose, dry, sandy SILT	Well completed in a concrete vault (30"x30")					SM	
	mottled brown and light gray					0.5		
	Brown, dense, moist, silty, sandy, well-graded GRAVELS and COBBLES, subrounded to rounded	Bentonite 3/8" chips - 2 bags, hydrated.			100	0.6	GM	
5		4-inch Sch 40 PVC						
	Cobbles 6"+ in size							
	Brown, med. dense, moist, silty well-graded SAND with some subrounded, subangular gravel.					0.1	SM	
					100	0.2		
10	Grades to brown and gray, wet, with some consolidated sand lenses	4-inch Sch 40 PVC 0.010" slotted well screen with 10/20 silica sand filter pack (7 bags).						
	Brown and gray, very dense, moist to dry consolidated SANDSTONE with trace silt						SANDSTONE	
					100			
15								
	Gray, dense, dry SILTSTONE						SILTSTONE	
		Backfilled bottom of well with 1 bag hydrated bentonite chips			100			
20	End of boring - install monitoring well							

CONTRACTOR Cascade Drilling **NORTHING**
EQUIPMENT Track Sonic (spider) **EASTING**
DRILL MTHD Sonic **ANGLE** Vertical
DIAMETER 8 inch **BEARING** ------
LOGGER B. Lary **REVIEWER** C. Bartlett **PRINTED** 09/19/13

REMARKS: Start Card: 1020816 Tag ID: L110950

COORDINATE SYSTEM:
SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

BORING LOG W/WELL SONIC (PORTLAND) PNG0564G.GPJ SAN DIEGO GINT LIBRARY.GLB 9/19/13

TGA MW-48b Well Log

LITHOLOGIC LOG – MW-48b

Project: Cascade Corporation, TGA Remedy

Well Location: 2525 NE 201st Avenue, Fairview, OR

Drilling Contractor:	Boart Longyear, LLC	Ground Surf Elevation:	114.44 ft MSL
Drilling Method:	Rotosonic truck-mounted rig	Top of PVC Elevation:	117.16 ft. MSL
Drill End Date:	August 30, 2011	Logged by:	S. Prowell, R.G.

DEPTH BELOW SURFACE (ft)	GRAIN SIZE SAMPLES % GRAVEL	% SAND	% SILT	% CLAY	TOC (mg/kg)	SYMBOLIC LOG	SOIL DESCRIPTION Soil name, group symbol, color, moisture, relative density or consistency, soil structure, minerals	COMMENTS Borehole diameter, depth to groundwater, rig response, etc.
0	NA	NA	NA	NA	NA	FILL	**0.0 - 3.0 ft:** Silt (ML), red-brown, dry loose. (Topsoil).	FILL 6-in. diam. borehole with continuous core to 21.0 ft
						ML	**3.0 - 6.8 ft: Silt (ML)**, light brown, dry to moist, stiff, laminar texture.	UPPER TGA SAND AND SILT
5						GW-GM	**6.8 - 8.6 ft: Well-Graded Gravel with Silt, Sand, and Cobbles (GW-GM)**, dark brown, moist, loose, 40% well-graded matrix, fine to coarse sand with silt, 60% fine to coarse gravel and cobbles to 4 in., subrounded to subangular basalt.	UPPER TGA GRAVEL
						SW-SM	**8.6 - 13.0 ft: Well -Graded Silty Sand with Silt (SW-SM)**, med. to dark brown, moist, becoming WET at 10 ft, loose to dense, 70% med. to coarse-grained sand, subrounded basalt and quartzite, 30% v. fine sand and silt.	LOWER TGA SAND AND SILT Groundwater encountered @ 10 ft. MW-48b water level @ 10.65 ft bgs on 11/8/2011.
10						SM-ML	**13.0 - 15.0 ft: Silty Sand to Sandy Silt (SM-ML),** light brown, wet, med. dense to stiff, some laminar silt horizons.	
15								

NOTE: See page 2 of 2 for well construction information. See MW-48a lithologic log for grain size distribution data.

LITHOLOGIC LOG – MW-48b

Project: Cascade Corporation, TGA Remedy

Well Location: 2525 NE 201st Avenue, Fairview, OR

Drilling Contractor:	Boart Longyear, LLC	Ground Surf Elevation:	114.44 ft MSL
Drilling Method:	Rotosonic truck-mounted rig	Top of PVC Elevation:	117.16 ft. MSL
Drill End Date:	August 30, 2011	Logged by:	S. Prowell, R.G.

DEPTH BELOW SURFACE (ft)	GRAIN SIZE SAMPLES: % GRAVEL	% SAND	% SILT	% CLAY	TOC (mg/kg)	SYMBOLIC LOG	SOIL DESCRIPTION: Soil name, group symbol, color, moisture, relative density or consistency, soil structure, minerals	COMMENTS: Borehole diameter, depth to groundwater, rig response, etc.
15	NA	NA	NA	NA	NA	SM	**15.0 - 17.0 ft: Silty Sand with Gravel (SM),** med. brown, WET, loose.	LOWER TGA SAND AND SILT *MW-48b screened from 15.2 to 17.2 ft bgs.*
						ML/CL	**17.0 - 21.0: Clayey Siltstone to Silty Claystone,** light brown, moist, v. stiff, laminar, homogeneous, good core integrity.	CU1 SILTSTONE AND CLAYSTONE (yellow-brown)
20								6-in. diam. borehole with continuous core to 21.0 ft
25								

Total Drill Depth: 21.0 ft bgs

Borehole Diameter: 6 inches

Total Well Depth: 17.2 ft bgs

Well Casing and Screen Material: 2-inch I.D. Schedule 40 flush-threaded PVC

Well Screen Slot Size: 0.02 inch

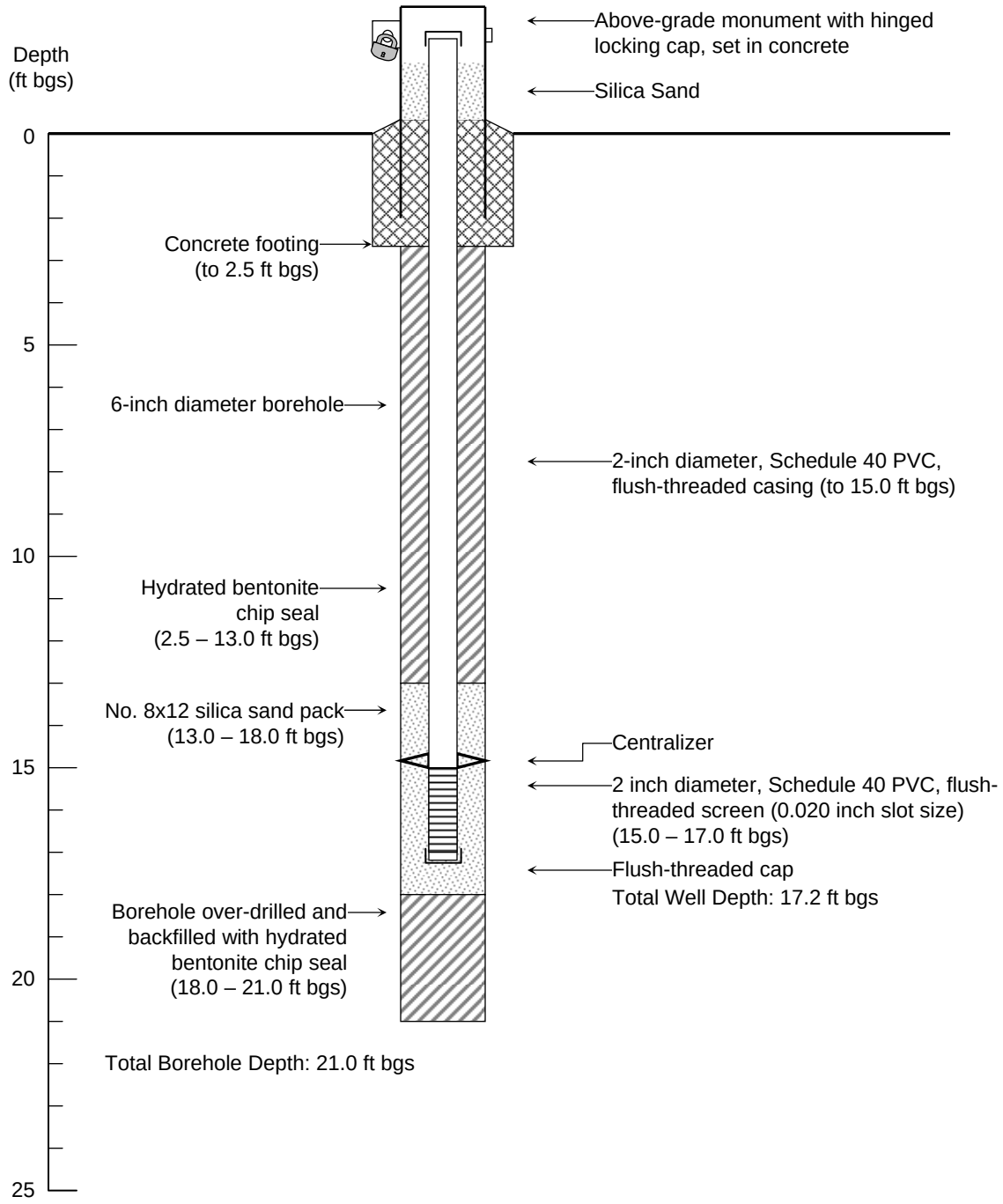
Well Screen Interval: 15.2 - 17.2 ft bgs

Filter Sand Pack Material & Size: 8 X 12 clean silica sand

Filter Sand Pack Interval: 13.0 - 18.0 ft bgs

Well Seal: Hydrated Bentonite Chips from 2.5 to 13.0 bgs

Overdrill backfill Seal: Hydrated Bentonite Chips from 18.0 to 21.0 ft bgs



Well Completion Date: 8/30/11
Drilling Contractor/Method: Boart Longyear / Rotosonic
Ground Surface Elevation: 114.44 ft MSL
Top of Casing Elevation: 117.16 ft MSL

Prowell Environmental, Inc., Portland, Oregon.

MW-48b Well Details
Cascade Corporation, TGA Remedy

MULT 107506 AMENDED 9.30.11

MULT 107506

09-13-2011

Page 1 of ~~2~~ 3

STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OAR 690-240-0395)

WELL LABEL # L 105123

START CARD # 1014759

(1) LAND OWNER

Owner Well I.D. MW-48b

First Name _____ Last Name _____

Company CASCADE CORPORATION

Address 2201 NE 201ST AVE

City GRESHAM State OR Zip 97024

(2) TYPE OF WORK

☒ New ☐ Deepening ☐ Conversion ☐ Alteration (repair/recondition) ☐ Abandonment

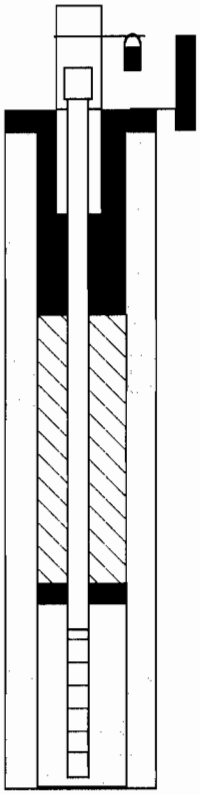
(3) DRILL METHOD

☐ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Hollow Stem Auger ☐ Cable Mud ☐ Reverse Rotary ☒ Other sonic

(4) CONSTRUCTION

Piezometer Well ☐

Depth of Completed Well ~~18~~ 17.2 ft. Special Standard ☐



MONUMENT/VAULT Above Ground
From 0 To ~~X~~ 3

BORE HOLE
Diameter 6 From 0 To ~~18~~ 17.2

CASING
Dia. 2 From ☐ 0 To ~~16~~ 15
Gauge SCH 40 Wld ☐ Thrd ☒
Material ○ Steel ◉ Plastic

LINER
Dia. _____ From ☐ _____ To _____
Gauge _____ Wld ☐ Thrd ☐
Material ○ Steel ○ Plastic

SEAL
From ~~1~~ 2.5 To 13
Material Bentonite
Amount 3.00 S Grout weight _____

SCREEN
Casing/Liner _____ Material PVC
Diameter 2 From ~~16~~ 15 To ~~18~~ 17
Slot Size .020

FILTER
From 13 To 18 Material SAND Size of pack 8/12

(5) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Temperature 53 °F Lab analysis ☐ Yes By _____

Supervising Geologist/Engineer _____

Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(6) LOCATION OF WELL (legal description)

County Multnomah Twp 1.00 N N/S Range 3.00 E E/W WM
Sec 29 SE 1/4 of the NE 1/4 Tax Lot 1
Tax Map Number _____ Lot _____
Lat ° 0 ' " or _____ DMS or DD
Long ° 0 ' " or _____ DMS or DD
◉ Street address of well ○ Nearest address

2525 NE 201ST AVE GRESHAM

(7) STATIC WATER LEVEL

	Date	SWL(psi)	+ SWL(ft)
Existing Well / Predeepening			
Completed Well	08-30-2011		10

Flowing Artesian? ☐ Dry Hole? ☐

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL(psi)	+ SWL(ft)

(8) WELL LOG

Ground Elevation _____

Material	From	To
FILL	0	3
~~GRAVEL COBBLES BOULDERS~~ siltstone	3	~~8~~ 6.10
~~SILTY~~ SAND W/GRAVEL Sandy gravel	~~8~~ 6.10	~~10~~ 8.6
~~MED~~ COARSE SAND	~~10~~ 8.6	~~15~~ 13
~~SILTY GRAVEL~~ Light Brown Siltsone	~~15~~ 13	~~17~~ 15
~~SILT STONE~~ silty gravel	~~17~~ 15	~~18~~ 17
Light Brown Siltstone	17	21

RECEIVED
OCT 07 2011
WATER RESOURCES DEPT
SALEM, OREGON

Date Started 08-30-2011 Completed 08-30-2011

(unbonded) Monitor Well Constructor Certification

I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon monitoring well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

License Number 10574 Date 09-13-2011

Electronically Submitted
Signed JEFFREY L KARCHER (E-filed)

(bonded) Monitor Well Constructor Certification

I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon monitoring well construction standards. This report is true to the best of my knowledge and belief.

License Number 10306 Date 09-13-2011

Electronically Submitted
Signed J TRENT CASTNER (E-filed)
Contact Info (optional) _____

ORIGINAL - WATER RESOURCES DEPARTMENT
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

Form Version: 0.95

MULT 107506

MONITORING WELL REPORT - continuation page

WELL I.D. # L 0 105123

START CARD # 0 1014759

(4) CONSTRUCTION

BORE HOLE

Dia	From	To

FILTER PACK

From	To	Material	Size

SEAL

Material	From	To	Amt	sacks/ lbs	grout weight

CASING/LINER

Casing	Liner	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd

SCREENS

Perf/Screen	Casing/Liner	Screen Dia	From	To	Scrn size/slot width	Slot length	# of slots	Tele/ pipe size

(5) WELL TESTS

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Water Quality Concerns

From	To	Description	Amount	Units

(7) STATIC WATER LEVEL

Water Bearing Zones

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)

(8) WELL LOG

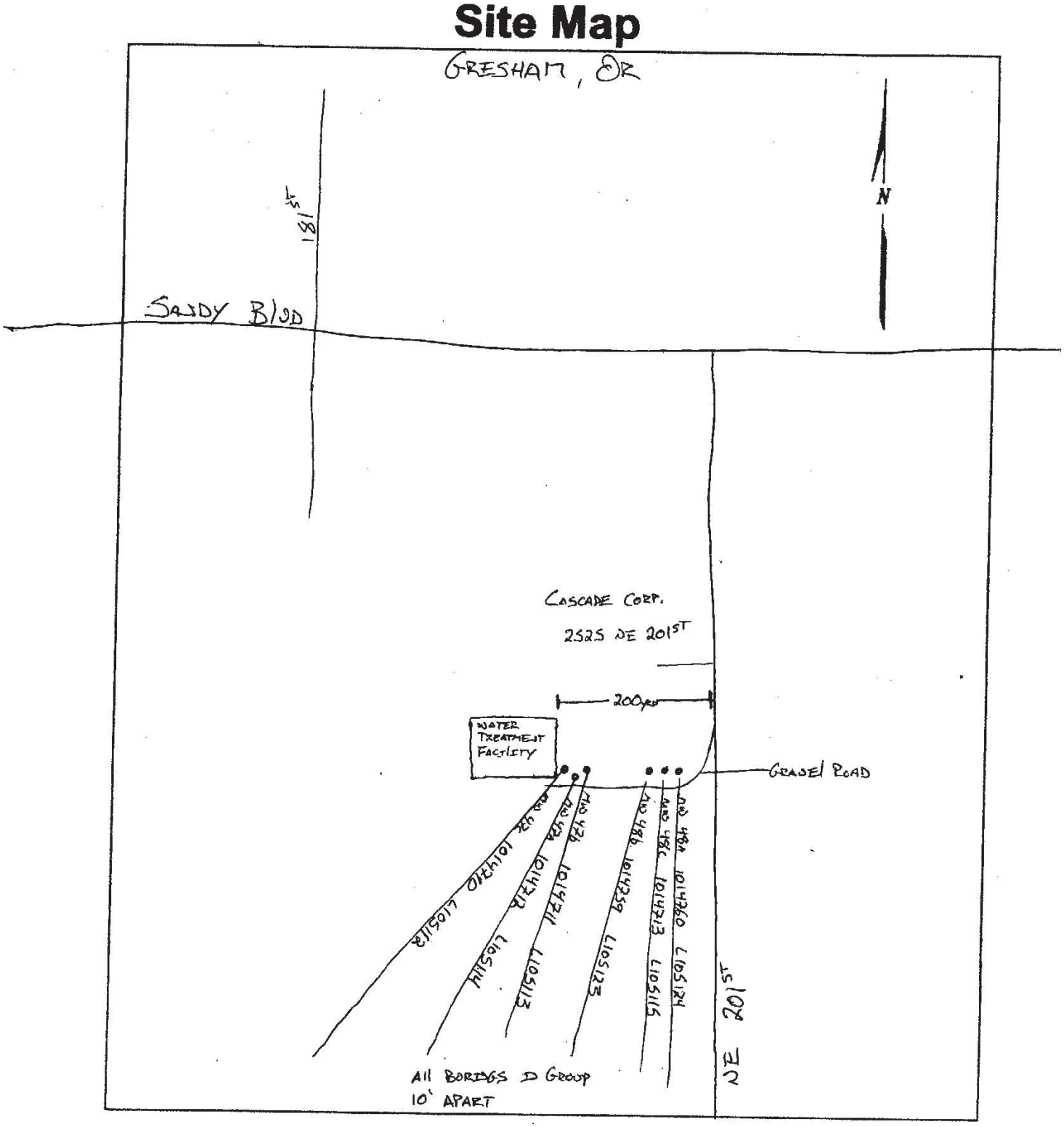
Material	From	To

RECEIVED
OCT 07 2011
WATER RESOURCES DEPT
SALEM, OREGON

Comments/Remarks

Hole drilled to 21'
back filled w/chips to
bottom of filterpack

Map of well


Site Map
GRESHAM, OR
181ST
SANDY BLVD
N
CASCADE CORP.
2525 NE 201ST
200 yd
WATER TREATMENT FACILITY
GRAVEL ROAD
All BORINGS IN GROUP 10' APART
NE 201ST

TGA MW-48a Well Log

LITHOLOGIC LOG – MW-48a

Project: Cascade Corporation, TGA Remedy

Well Location: 2525 NE 201st Avenue, Fairview, OR

Drilling Contractor:	Boart Longyear, LLC	Ground Surf Elevation:	113.38 ft MSL
Drilling Method:	Rotosonic truck-mounted rig	Top of PVC Elevation:	116.35 ft. MSL
Drill End Date:	August 31, 2011	Logged by:	S. Prowell, R.G.

DEPTH BELOW SURFACE (ft)	GRAIN SIZE SAMPLES % GRAVEL	% SAND	% SILT	% CLAY	TOC (mg/kg)	SYMBOLIC LOG	SOIL DESCRIPTION	COMMENTS
							Soil name, group symbol, color, moisture, relative density or consistency, soil structure, minerals	Borehole diameter, depth to groundwater, rig response, etc.
0						FILL	**0.0 - 3.0 ft:** 3/4-minus **Gravel (GW)** underlain by **Silt (ML)**, med. brown to 1.5 ft; light brown with orange oxidized motteling to 3.0 ft, dry, soft (FILL).	FILL 6-in. diam. borehole with continuous core to 25.0 ft
						SM	**3.0 - 7.5 ft: Silty Sand (SM)**, light brown, some orange oxidation, dry, dense to locally friable.	UPPER TGA SAND AND SILT
5						GW -GM	**7.5 - 9.0 ft: Well-Graded Gravel with Silt, Sand, and Cobbles (GW-GM)**, gray to med-brown; to 8.0 ft is dry, loose, 40% matrix of fine sand, some silt, coarse gravel and cobbles to 3 in., subrounded to rounded basalt and quartzite, trace rhyolite and gneiss. From 8.0 to 9.0 ft, moist, dense, partially to strongly cemented, well-graded gravel to 1/2 in., rounded basalt, quartz, quartzite, 40% matrix, coarse sand, some silt.	UPPER TGA GRAVEL
	55	32	12	2	550			
								LOWER TGA SAND AND SILT
	2	84	12	3.0	<200			
10								Groundwater encountered @ 9 ft.
	10	79	9	2	<200			
						SW -SM	**9.0 - 13.2 ft: Well-Graded Sand with Silt (SW-SM)**, dark brown to dark gray brown, WET, loose to dense, med. to coarse sand, basalt and quartz/quarzite, subrounded, some silt.	*MW-48a screened from 8.0 to 13.0 ft bgs.*
	2	88	8	2	<200			
								MW-48a water level @ 9.70 ft bgs on 11/8/2011.
	0	71	18	11	320	SM	**13.2 - 16.0 ft: Silty Sand (SM),** med. brown, orange mottling below 14.5 ft, WET, coarse sand, subrounded quartz, quartzite, basalt. Silt lense from 13.2 to 13.5 ft.	
15	0	84	13	4	400			

NOTE: See page 2 of 2 for well construction and physical sample analysis information.
Grain size percentages rounded to nearest whole number. See Apex Amended Laboratory Report No. A11l238, 1/30/12.

LITHOLOGIC LOG – MW-48a

Project: Cascade Corporation, TGA Remedy

Well Location: 2525 NE 201st Avenue, Fairview, OR

Drilling Contractor:	Boart Longyear, LLC	Ground Surf Elevation:	113.38 ft MSL
Drilling Method:	Rotosonic truck-mounted rig	Top of PVC Elevation:	116.35 ft. MSL
Drill End Date:	August 31, 2011	Logged by:	S. Prowell, R.G.

DEPTH BELOW SURFACE (ft)	GRAIN SIZE SAMPLES % GRAVEL	% SAND	% SILT	% CLAY	TOC (mg/kg)	SYMBOLIC LOG	SOIL DESCRIPTION	COMMENTS
							Soil name, group symbol, color, moisture, relative density or consistency, soil structure, minerals	Borehole diameter, depth to groundwater, rig response, etc.
15							**13.2 - 16.0 ft:** Silty Sand (SM), cont'd.	LOWER TGA SAND AND SILT
	0	72	17	11	230			
						ML	**16.0 - 18.0 ft: Sandy Siltstone with Clay,** light brown to tan, localized orange coloration, moist, v. stiff, laminar texture, homogeneous, good core integrity.	6-in. diam. borehole with continuous core to 25.0 ft
	0	35	42	23	280			CU1 SILTSTONE AND CLAYSTONE (yellow-brown)
	0	3	33	64	1100	CL	**18.0 - 19.5 ft: Silty Claystone,** light brown to tan, moist, v, stiff, same as above, good core integrity, gradational contact.	
	0	3	57	40	630	ML	**19.5 - 20.0 ft: Clayey Siltstone,** light brown to tan, moist, v. stiff, good core integrity, gradational contact.	
20	0	1	53	45	860	ML	**20.0 - 23.0 ft: Clayey Siltstone**, color change to blue-gray, moist, hard, texture change to massive non-laminar, homogeneous, good core integrity.	CU1 SILTSTONE AND CLAYSTONE (blue-gray to dark brn)
	0	1	62	37	720			
	0	1	59	40	1200			
	0	7	29	65	3300	CL	**23.0 - 25.0 ft: Claystone with Silt**, change to dark brown color, moist, v.hard, massive, homogeneous, good core integrity.	
25	0	11	27	62	2700			

Total Drill Depth: 25.0 ft bgs

Borehole Diameter: 6 inches

Total Well Depth: 13.0 ft bgs

Well Casing and Screen Material: 2-inch I.D. Schedule 40 flush-threaded PVC

Well Screen Slot Size: 0.02 inch

Well Screen Interval: 8.0 - 13.0 ft bgs

Filter Sand Pack Material & Size: 8 X 12 clean silica sand

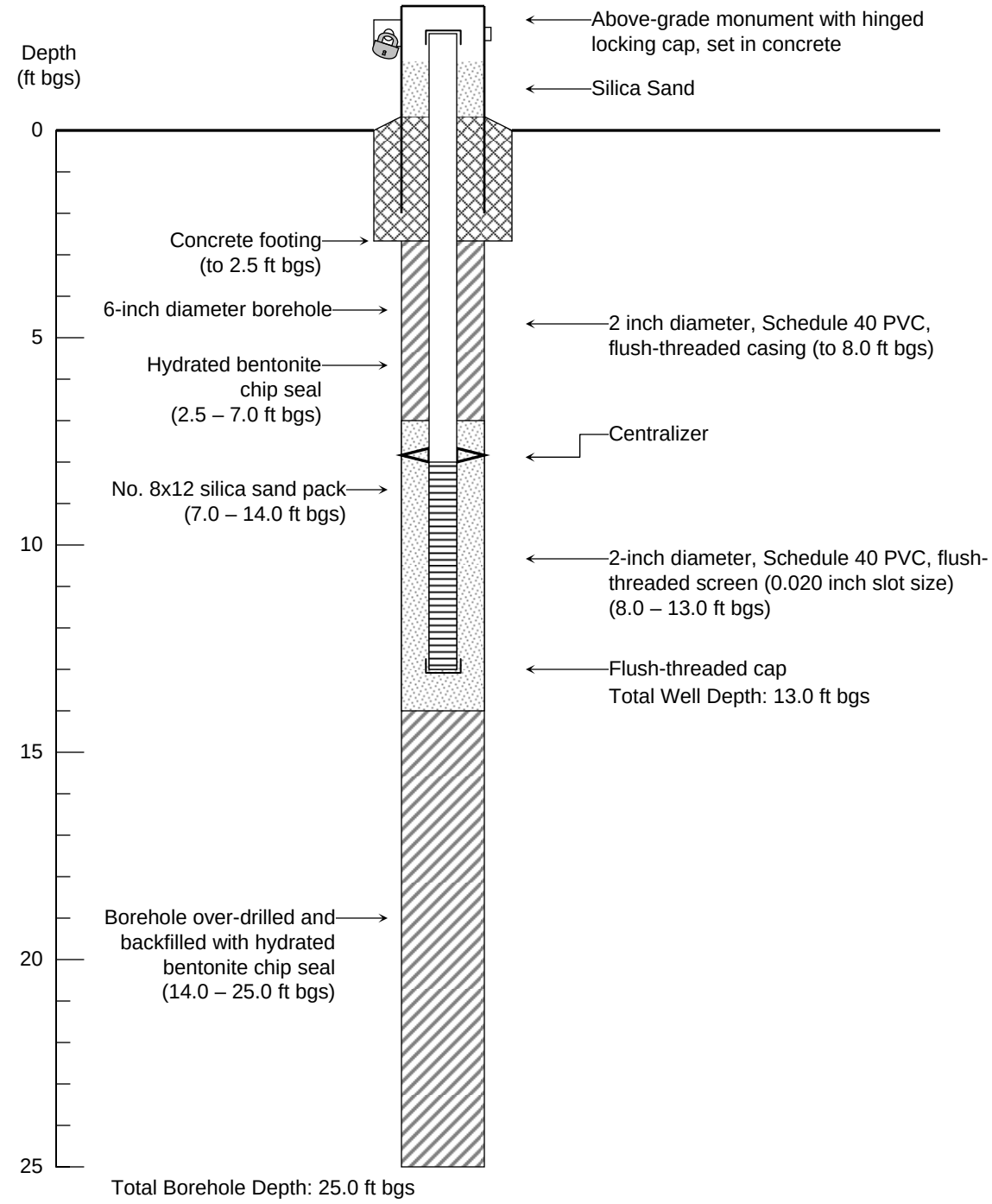
Filter Sand Pack Interval: 7.0 - 14.0 ft bgs

Well Seal: Hydrated Bentonite Chips from 2.5 to 7.0 ft bgs

Overdrill backfill Seal: Hydrated Bentonite Chips from 14.0 to 25.0 ft bgs

NOTES:

Grain size analytical method = ASTM D 422; Total organic carbon (TOC) analytical method = SM 5310 MOD by Apex Laboratory. TOC analysis of rock material is guide only. Gravel and sand fractions may not be representative, as sample prep. tamping may reduce grain size for those fractions. Calculated silt and clay fractions are more representative for above rock materials.



Well Completion Date: 8/31/11
Drilling Contractor/Method: Boart Longyear / Rotosonic
Ground Surface Elevation: 113.38 ft MSL
Top of Casing Elevation: 116.35 ft MSL

Prowell Environmental, Inc., Portland, Oregon.

MW-48a Well Details
Cascade Corporation, TGA Remedy

MULT 107505

MULT 107505 AMENDED 9.30.11

09-13-2011

STATE OF OREGON
MONITORING WELL REPORT

(as required by ORS 537.765 & OAR 690-240-0395)

WELL LABEL # L 105124

START CARD # 1014760

(1) LAND OWNER

Owner Well I.D. MW-48a

First Name _____ Last Name _____

Company CASCADE CORPORATION

Address 2201 NE 201ST AVE

City GRESHAM State OR Zip 97024

(2) TYPE OF WORK

☒ New ☐ Deepening ☐ Conversion ☐ Alteration (repair/recondition) ☐ Abandonment

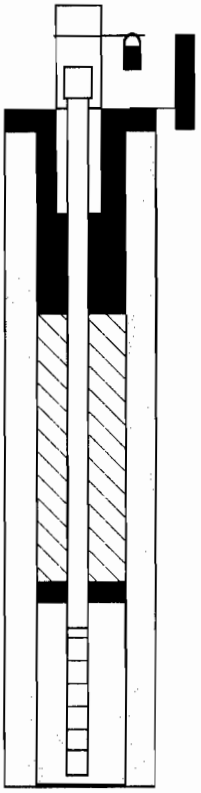
(3) DRILL METHOD

☐ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Hollow Stem Auger ☐ Cable Mud ☐ Reverse Rotary ☒ Other sonic

(4) CONSTRUCTION

Piezometer Well ☐

Depth of Completed Well ~~14~~ 13 ft. Special Standard ☐



MONUMENT/VAULT Above Ground From 0 To ~~3~~ 3

BORE HOLE Diameter 6 From 0 To ~~14~~ 13

CASING Dia. 2 From 0 To ~~8~~

Gauge SCH 40 Wld Thrd

Material ○ Steel ◉ Plastic ☐ ☒

LINER Dia. _____ From ☐ _____ To _____

Gauge _____ Wld Thrd

Material ○ Steel ○ Plastic ☐ ☐

SEAL From ~~2~~ 2.5 To 7

Material Bentonite

Amount 3.00 S Grout weight _____

SCREEN Casing/Liner _____ Material PVC

Diameter 2 From ~~8~~ To ~~14~~

Slot Size .020 8 13

FILTER From 7 To 14 Material SAND Size of pack 8/12

(5) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Temperature 53 °F Lab analysis ☐ Yes By _____

Supervising Geologist/Engineer _____

Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(6) LOCATION OF WELL (legal description)

County Multnomah Twp 1.00 N N/S Range 3.00 E E/W WM

Sec 29 SE 1/4 of the NE 1/4 Tax Lot 1

Tax Map Number _____ Lot _____

Lat ° 0 ' " or _____ DMS or DD

Long ° 0 ' " or _____ DMS or DD

◉ Street address of well ○ Nearest address

2525 NE 201ST AVE GRESHAM

(7) STATIC WATER LEVEL

	Date	SWL(psi)	+ SWL(ft)
Existing Well / Predeepening			
Completed Well	08-31-2011		10

Flowing Artesian? ☐ Dry Hole? ☐

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL(psi)	+ SWL(ft)

(8) WELL LOG

Ground Elevation _____

Material	From	To
FILL	0	3
~~GRAVEL COBBLES BOULDERS~~ silt stone	3	~~8~~ 7
~~SILTY SAND W~~/GRAVEL cemented	~~8~~ 7	~~10~~ 9
~~MED COARSE~~ SAND cemented	~~10~~ 9	~~14~~ 13.2
Sandy silt	13.2	16
Light Brown siltstone	16	20
Blue Gray Claystone	20	25

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OCT 07 2011
WATER RESOURCES DEPT
SALEM, OREGON

Date Started 08-31-2011 Completed 08-31-2011

(unbonded) Monitor Well Constructor Certification

I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon monitoring well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

License Number 10574 Date 09-13-2011

Electronically Submitted

Signed JEFFREY L KARCHER (E-filed)

(bonded) Monitor Well Constructor Certification

I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon monitoring well construction standards. This report is true to the best of my knowledge and belief.

License Number 10306 Date 09-13-2011

Electronically Submitted

Signed J TRENT CASTNER (E-filed)

Contact Info (optional) _____

ORIGINAL - WATER RESOURCES DEPARTMENT

THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

Form Version: 0.95

MULT 107505

MONITORING WELL REPORT -
continuation page

WELL I.D. # L 0 105124

START CARD # 0 1014760

(4) CONSTRUCTION

BORE HOLE

Dia	From	To

FILTER PACK

From	To	Material	Size

SEAL

Material	From	To	Amt	sacks/ lbs	grout weight

CASING/LINER

Casing	Liner	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd

SCREENS

Perf/Screen	Casing/ Liner	Screen Dia	From	To	Scrn size/slot width	Slot length	# of slots	Tele/ pipe size

(5) WELL TESTS

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Water Quality Concerns

From	To	Description	Amount	Units

(7) STATIC WATER LEVEL

Water Bearing Zones

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)

(8) WELL LOG

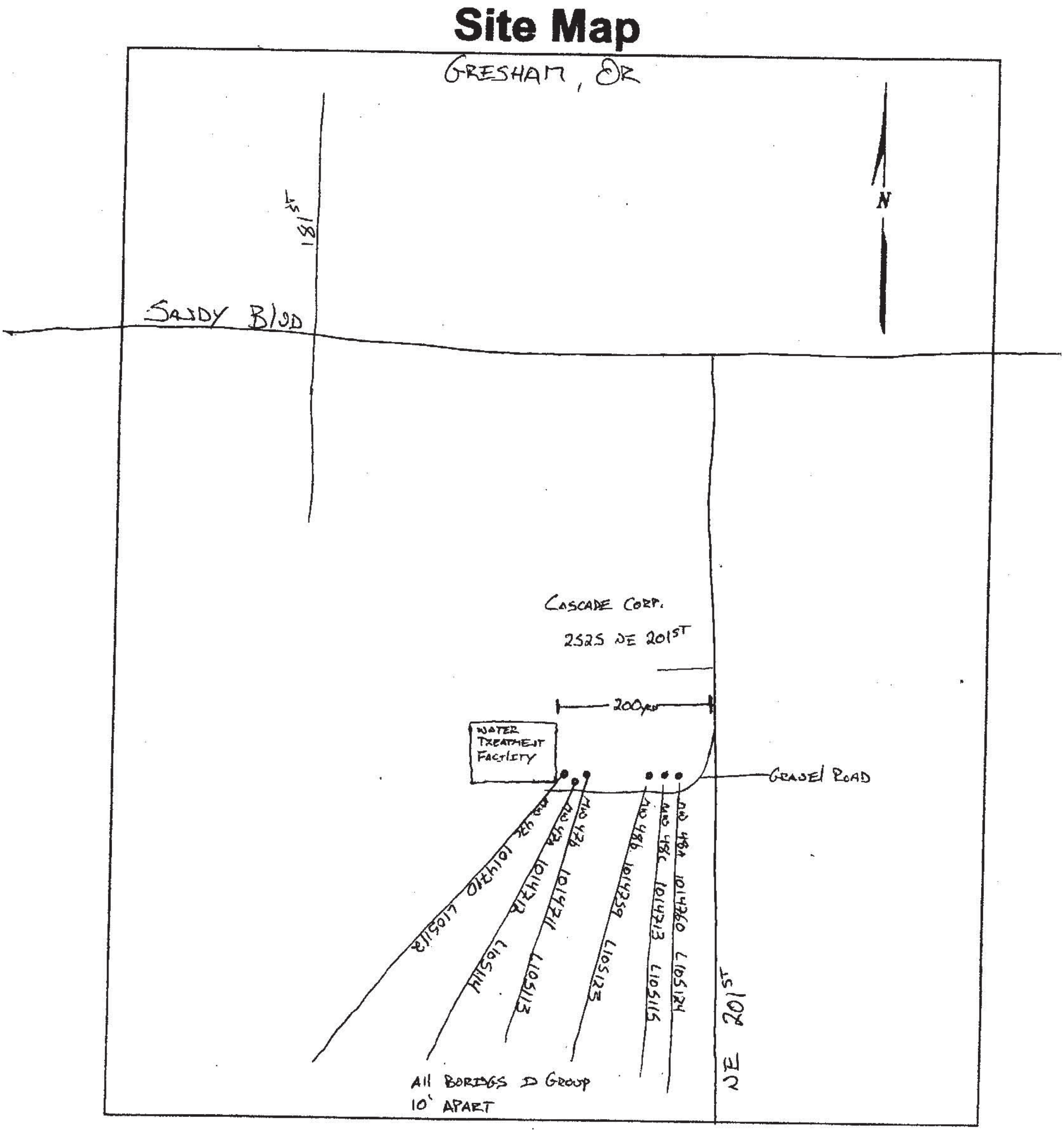
Material	From	To

RECEIVED
OCT 07 2011
WATER RESOURCES DEPT
SALEM, OREGON

Comments/Remarks

hole drilled to 25'
backfilled w/chips
to bottom of filter pack

Map of well


Site Map
GRESHAM, OR
181st
N
SANDY BLVD
CASCADE CORP.
2525 NE 201ST
200yd
WATER TREATMENT FACILITY
GRAVEL ROAD
MW 48A 1014760 L105124
NE 201ST
All BORINGS IN GROUP
10' APART

TGA MW-47b Well Log

LITHOLOGIC LOG – MW-47b

Project: Cascade Corporation, TGA Remedy

Well Location: 2525 NE 201st Avenue, Fairview, OR

Drilling Contractor:	Boart Longyear, LLC	Ground Surf Elevation:	117.24 ft. MSL
Drilling Method:	Rotosonic truck-mounted rig	Top of PVC Elevation:	120.16 ft. MSL
Drill End Date:	August 29, 2011	Logged by:	S. Prowell, R.G.

DEPTH BELOW SURFACE (ft)	GRAIN SIZE SAMPLES % GRAVEL	% SAND	% SILT	% CLAY	TOC (mg/kg)	SYMBOLIC LOG	SOIL DESCRIPTION	COMMENTS
							Soil name, group symbol, color, moisture, relative density or consistency, soil structure, minerals	Borehole diameter, depth to groundwater, rig response, etc.
0	NA	NA	NA	NA	NA	FILL	**0.0 - 2.0 ft:** 3/4-minus gravel and silt with sand, dry, loose (FILL).	FILL 6-in. diam. borehole with continuous core to 26.3 ft
						GW -GM	**2.0 - 8.0 ft: Well-Graded Gravel with Silt, Sand, Cobbles, and Boulders (GW-GM)**, gray to med-brown, dry to moist, loose. Basaltic boulders up to 2.5 ft, dense, unweathered, non-vesicular, gravel coarse, cobbles to 3-inches, subangular to subrounded.	UPPER TGA GRAVEL
5								
						SM	**8.0 - 10.0 ft: Silty Sand with Gravel (SM)**, red-brown, dry to moist, stiff, partially-cemented, fine to med-grained sand, subangular medium gravel.	LOWER TGA SAND
10						SP	**10.0 - 14.5 ft: Poorly-Graded Sand (SP)**, med. brown, moist, changing to WET at 13 ft, loose, med- to coarse-grained.	Groundwater encountered @ 13 ft bgs MW-47b water level @ 13.13 ft bgs on 11/8/2011.
15						SW-SM	**14.5 - 15.0 ft: Well-Graded Sand with Silt and Gravel (SW-SM)**, med. brown, WET, partially-cemented, med-dense, some fine gravel.	

NOTE: See page 2 of 2 for well construction and physical sample analysis information. See MW-47c lithologic log for grain size distribution data.

LITHOLOGIC LOG – MW-47b

Project: Cascade Corporation, TGA Remedy

Well Location: 2525 NE 201st Avenue, Fairview, OR

Drilling Contractor:	Boart Longyear, LLC	Ground Surf Elevation:	117.24 ft. MSL
Drilling Method:	Rotosonic truck-mounted rig	Top of PVC Elevation:	120.16 ft. MSL
Drill End Date:	August 29, 2011	Logged by:	S. Prowell, R.G.

DEPTH BELOW SURFACE (ft)	GRAIN SIZE SAMPLES: % GRAVEL	% SAND	% SILT	% CLAY	TOC (mg/kg)	SYMBOLIC LOG	SOIL DESCRIPTION: Soil name, group symbol, color, moisture, relative density or consistency, soil structure, minerals	COMMENTS: Borehole diameter, depth to groundwater, rig response, etc.
15	NA	NA	NA	NA	NA	SW -SM	**15.0 - 20.0 ft: Well-Graded Sand with Silt (SW-SM),** light brown, moist to WET, ranging from partially-cemented and dense to loose; some laminar silt horizons.	LOWER TGA SAND AND SILT *MW-47b screened from 16.4 to 19.4 ft bgs.* 6-in. diam. borehole with continuous core to 26.3 ft
20						ML-CL	**20.0 - 23.0 ft: Siltstone and Claystone,** light yellow-brown, moist, v. stiff to hard, laminar, homogeneous, good core integrity.	CU1 SILTSTONE AND CLAYSTONE (yellow-brown)
25						CL-ML	**23.0 - 26.3 ft: Claystone and Siltstone**, blue-gray, moist, v. hard, massive, homogeneous, good core integrity.	CU1 CLAYSTONE and SILTSTONE (blue-gray)

Total Drill Depth: 19.4 ft bgs

Borehole Diameter: 6 inches

Total Well Depth: 26.3 ft bgs

Well Casing and Screen Material: 2-inch I.D. Schedule 40 flush-threaded PVC

Well Screen Slot Size: 0.01 inch

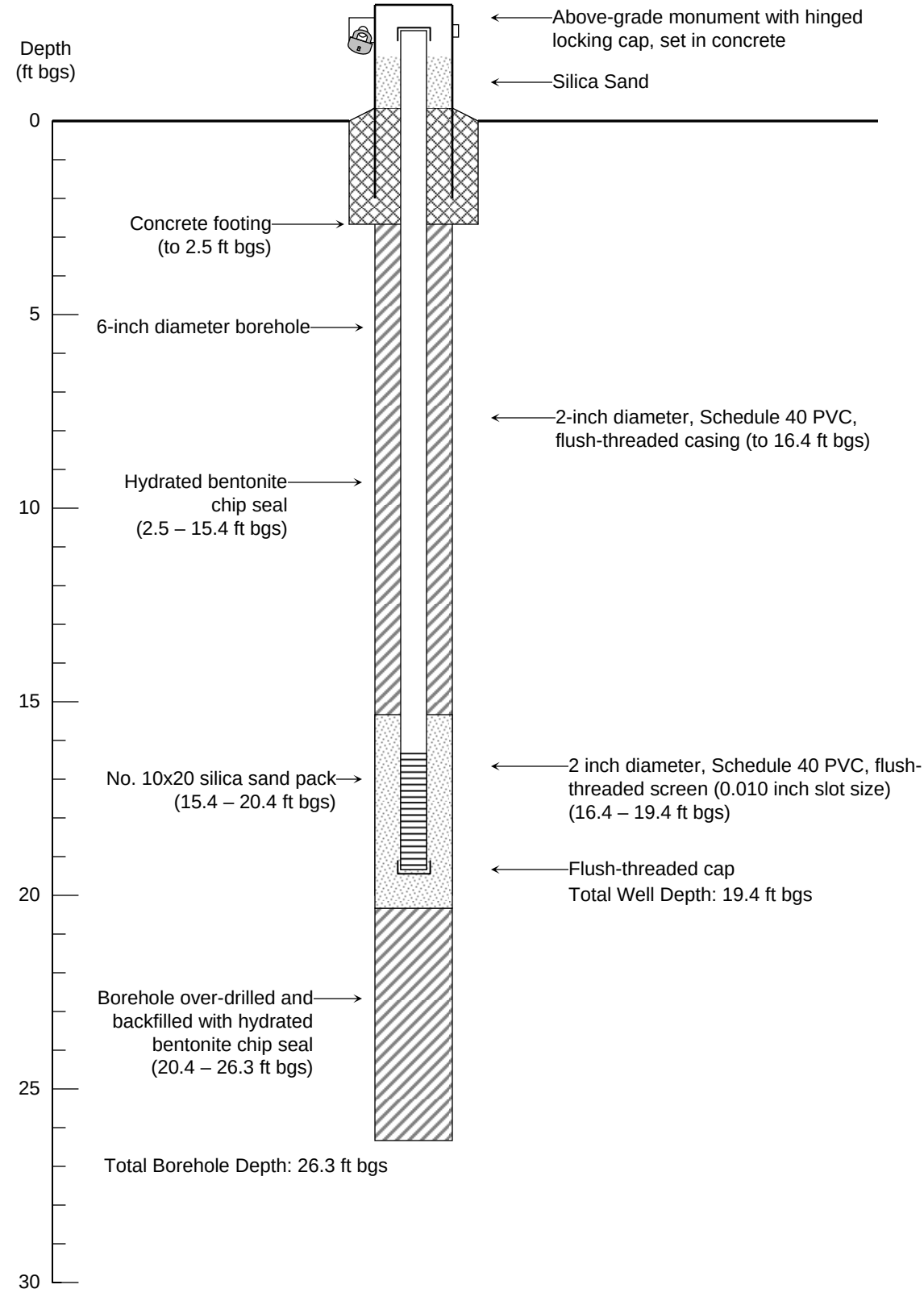
Well Screen Interval: 16.4 - 19.4 ft bgs

Filter Sand Pack Material & Size: 10 X 20 clean silica sand

Filter Sand Pack Interval: 15.4 - 20.4 ft bgs

Well Seal: Hydrated Bentonite Chips from 2.5 to 15.4 ft bgs

Overdrill backfill Seal: Hydrated Bentonite Chips from 20.4 to 26.3 ft bgs



Well Completion Date: 8/29/11
Drilling Contractor/Method: Boart Longyear / Rotosonic
Ground Surface Elevation: 117.24 ft MSL
Top of Casing Elevation: 120.16 ft MSL

Prowell Environmental, Inc., Portland, Oregon.

MW-47b Well Details
Cascade Corporation, TGA Remedy

MULT 107503

MULT 107503 AMENDED 9.30.11

09-13-2011

STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OAR 690-240-0395)

WELL LABEL # L 105113

START CARD # 1014711

(1) LAND OWNER

Owner Well I.D. MW-47b

First Name _____ Last Name _____

Company CASCADE CORPORATION

Address 2201 NE 201ST AVE

City GRESHAM State OR Zip 97024

(2) TYPE OF WORK

☒ New ☐ Deepening ☐ Conversion ☐ Alteration (repair/recondition) ☐ Abandonment

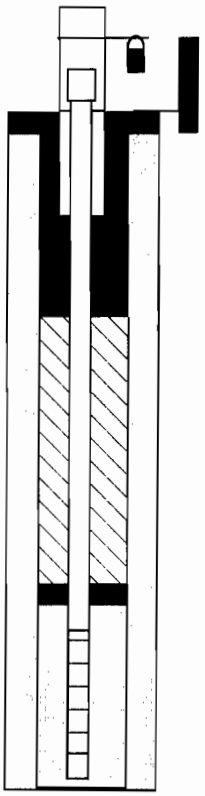
(3) DRILL METHOD

☐ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Hollow Stem Auger ☐ Cable Mud ☐ Reverse Rotary ☒ Other sonic

(4) CONSTRUCTION

Piezometer Well ☐

Depth of Completed Well 19.4 ~~20.4~~ ft. Special Standard ☐



MONUMENT/VAULT Above Ground From 0 To ~~3~~

BORE HOLE Diameter 6 From 0 To 19.4 ~~20.4~~

CASING Dia. 2 From 0 To 16.4 ~~17.4~~
Gauge SCH 40 Wld ☐ Thrd ☒
Material ○ Steel ◉ Plastic

LINER Dia. _____ From _____ To _____
Gauge _____ Wld ☐ Thrd ☐
Material ○ Steel ○ Plastic

SEAL From ~~0~~ 2.5 To 15.4
Material Bentonite
Amount 3.00 S Grout weight _____

SCREEN Casing/Liner _____ Material PVC
Diameter 2 From ~~17.4~~ 16.4 To ~~20.4~~ 19.4
Slot Size ~~.020~~ .010

FILTER From 15.4 To 20.4 Material SAND Size of pack 10/20

(5) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Temperature 53 °F Lab analysis ☐ Yes By _____

Supervising Geologist/Engineer _____

Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(6) LOCATION OF WELL (legal description)

County Multnomah Twp 1.00 N N/S Range 3.00 E E/W WM
Sec 29 SE 1/4 of the NE 1/4 Tax Lot 1
Tax Map Number _____ Lot _____
Lat ° 0 ' " or _____ DMS or DD
Long ° 0 ' " or _____ DMS or DD
◉ Street address of well ○ Nearest address

2525 NE 201ST AVE GRESHAM

(7) STATIC WATER LEVEL

	Date	SWL(psi)	+ SWL(ft)
Existing Well / Predeepening			
Completed Well	08-29-2011		13

Flowing Artesian? ☐ Dry Hole? ☐

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL(psi)	+ SWL(ft)

(8) WELL LOG

Ground Elevation _____

Material	From	To
FILL	0	3
GRAVEL COBBLES BOULDERS	3	8
SILTY SAND W/GRAVEL	8	10
MED COARSE SAND	10	15
SANDY GRAVEL	15	16
SILT STONE WITH SAND	16	~~20~~ 20
Yellow Brown Siltstone	20	23
Blue Gray Clay Stone	23	26.3

RECEIVED
OCT 07 2011
WATER RESOURCES DEPT
SALEM, OREGON

Date Started 08-29-2011 Completed 08-29-2011

(unbonded) Monitor Well Constructor Certification

I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon monitoring well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

License Number 10574 Date 09-13-2011

Electronically Submitted
Signed JEFFREY L KARCHER (E-filed)

(bonded) Monitor Well Constructor Certification

I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon monitoring well construction standards. This report is true to the best of my knowledge and belief.

License Number 10306 Date 09-13-2011

Electronically Submitted
Signed J TRENT CASTNER (E-filed)

Contact Info (optional) _____

ORIGINAL - WATER RESOURCES DEPARTMENT

THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

Form Version: 0.95

MULT 107503

MONITORING WELL REPORT - continuation page

WELL I.D. # L 0 105113

START CARD # 0 1014711

(4) CONSTRUCTION

BORE HOLE

Dia	From	To

FILTER PACK

From	To	Material	Size

SEAL

Material	From	To	Amt	sacks/ lbs	grout weight

CASING/LINER

Casing	Liner	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd

SCREENS

Perf/Screen	Casing/ Liner	Screen Dia	From	To	Scrn size/slot width	Slot length	# of slots	Tele/ pipe size

(5) WELL TESTS

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Water Quality Concerns

From	To	Description	Amount	Units

(7) STATIC WATER LEVEL

Water Bearing Zones

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)

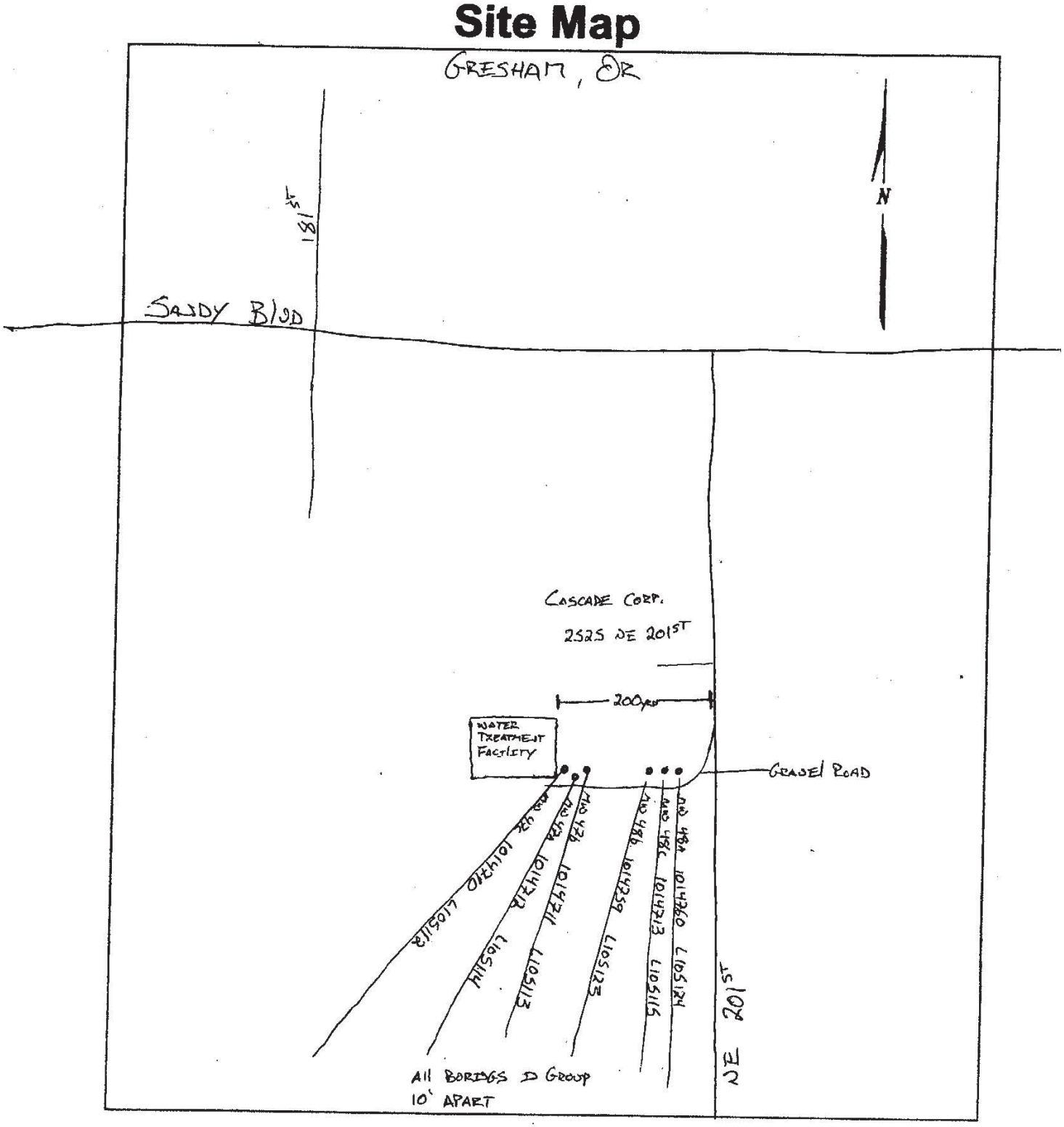
(8) WELL LOG

Material	From	To

Comments/Remarks

Hole drilled to 26.3
back filled w/chips
to bottom of filter pack

Map of well


Site Map
GRESHAM, OR
181ST
SANDY BLVD
N
CASCADE CORP.
2525 NE 201ST
200 yd
WATER TREATMENT FACILITY
GRAVEL ROAD
NE 201ST
ALL BORINGS IN GROUP 10' APART

TGA MW-47a Well Log

LITHOLOGIC LOG – MW-47a

Project: Cascade Corporation, TGA Remedy

Well Location: 2525 NE 201st Avenue, Fairview, OR

Drilling Contractor:	Boart Longyear, LLC	Ground Surf Elevation:	117.32 ft MSL
Drilling Method:	Rotosonic truck-mounted rig	Top of PVC Elevation:	120.33 ft MSL
Drill End Date:	August 30, 2011	Logged by:	S. Prowell, R.G.

DEPTH BELOW SURFACE (ft)	GRAIN SIZE SAMPLES % GRAVEL	% SAND	% SILT	% CLAY	TOC (mg/kg)	SYMBOLIC LOG	SOIL DESCRIPTION	COMMENTS
							Soil name, group symbol, color, moisture, relative density or consistency, soil structure, minerals	Borehole diameter, depth to groundwater, rig response, etc.
0	NA	NA	NA	NA	NA	FILL	**0.0 - 3.0 ft: Silty Gravel (GM**) 3/4-minus fill, grading to **Silt (ML**), med. brown, dry (FILL).	FILL 6-in. diam. borehole with continuous core to 20.0 ft
5						BOULDERS with SM	**3.0 - 7.5 ft: BOULDERS** (90%), gray, dense, unweathered, non-vesicular, basalt up to 3.5 ft (with rock flour due to drill action), <5% coarse gravel, <10%) silty sand matrix (SM) between boulders at 6.5 ft.	UPPER TGA GRAVEL
10						SM	**7.5 - 11.5 ft: Silty Sand with Gravel (SM)**, red-brown, moist, varies from loose to dense and partially-cemented, fine to med-grained sand, some gravel (15%) up to 1.5 inch. Sand size increases with depth; becomes loose.	LOWER TGA SAND *MW-47a screened from 9.1 to 14.1 ft bgs.*
						SP	**11.5 - 14.6 ft: Poorly-Graded Sand (SP)**, med. brown, moist, changing to WET at 13 ft, loose, predominantly coarse-grained, trace gravel.	Groundwater encountered @ 13 ft bgs MW-47a water level @ 13.05 ft bgs on 11/8/2011.
15						ML-SM	**14.6 - 19.5 ft: Sandy Silt to Silty Sand (ML-SM),** light brown, moist to wet, trace gravel, varies from soft to v. stiff and partially-cemented, laminar texture.	

NOTES: See page 2 of 2 for well construction information. See MW-47c lithologic log for grain size distribution data.

LITHOLOGIC LOG – MW-47a

Project: Cascade Corporation, TGA Remedy

Well Location: 2525 NE 201st Avenue, Fairview, OR

Drilling Contractor:	Boart Longyear, LLC	Ground Surf Elevation:	117.32 ft MSL
Drilling Method:	Rotosonic truck-mounted rig	Top of PVC Elevation:	120.33 ft MSL
Drill End Date:	August 30, 2011	Logged by:	S. Prowell, R.G.

DEPTH BELOW SURFACE (ft)	GRAIN SIZE SAMPLES % GRAVEL	% SAND	% SILT	% CLAY	TOC (mg/kg)	SYMBOLIC LOG	SOIL DESCRIPTION Soil name, group symbol, color, moisture, relative density or consistency, soil structure, minerals	COMMENTS Borehole diameter, depth to groundwater, rig response, etc.
15	NA	NA	NA	NA	NA	ML-SM	**14.6 - 19.5 ft: Sandy Silt to Silty Sand (ML-SM),** light brown, moist to wet, trace gravel, varies from soft to v. stiff and partially-cemented, laminar texture.	LOWER TGA SAND AND SILT 6-in. diam. borehole with continuous core to 20.0 ft
20						ML-CL	**19.5 - 20.0 ft: Siltstone and Claystone,** light yellow-brown, moist, v. hard, low plasticity, homogeneous, in-tact core	CU 1 SILTSTONE AND CLAYSTONE (yellow-brown)
25								

Total Drill Depth: 20.0 ft bgs

Borehole Diameter: 6 inches

Total Well Depth: 14.5 ft bgs

Well Casing and Screen Material: 2-inch I.D. Schedule 40 flush-threaded PVC

Well Screen Slot Size: 0.02 inch

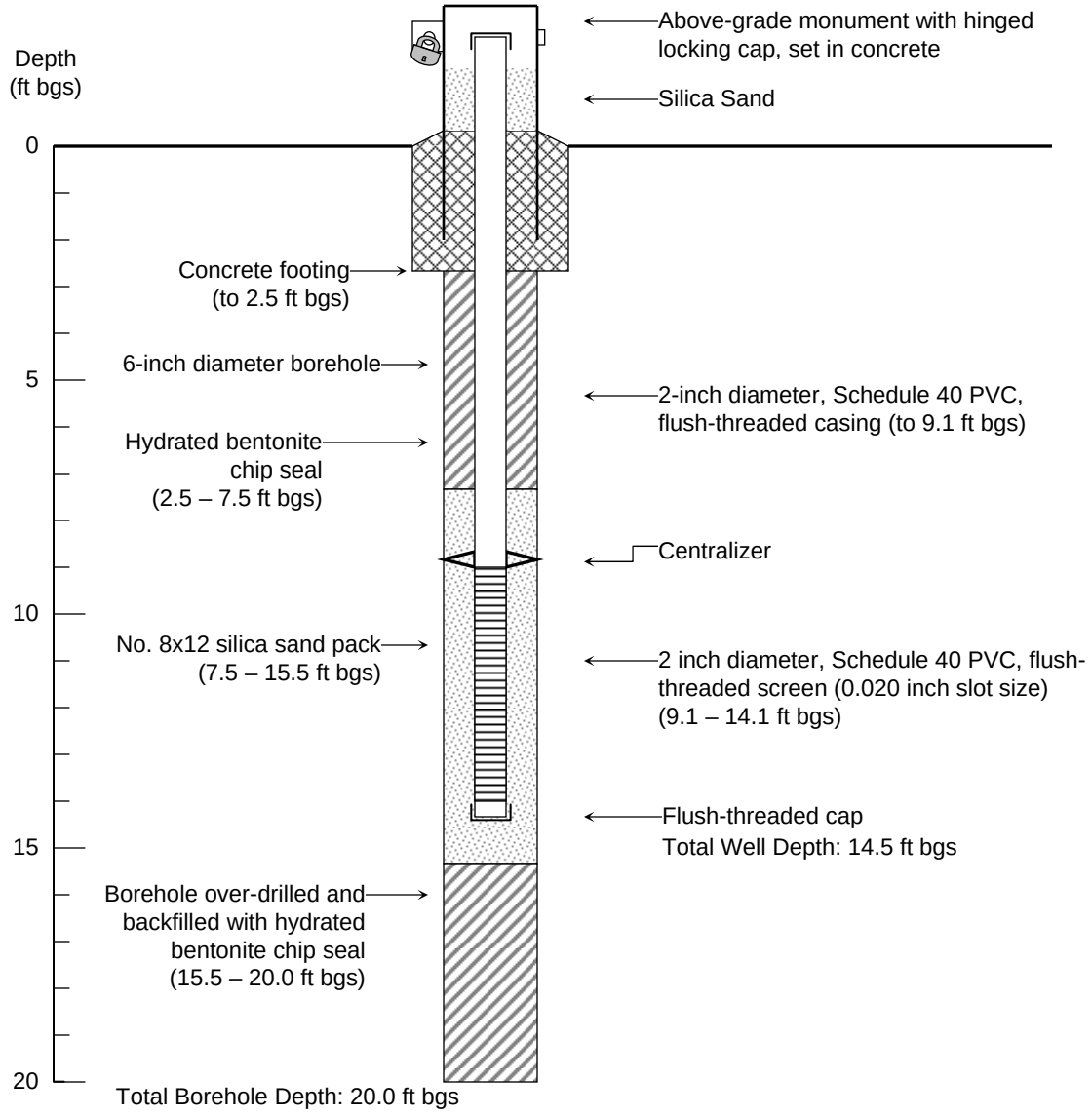
Well Screen Interval: 9.1 - 14.1 ft bgs

Filter Sand Pack Material & Size: 8 X 12 clean silica sand

Filter Sand Pack Interval: 7.5 - 15.5 ft bgs

Well Seal: Hydrated Bentonite Chips from 2.5 to 7.5 ft bgs

Overdrill backfill Seal: Hydrated Bentonite Chips from 15.5 to 20.0 ft bgs



Well Completion Date:	8/30/11
Drilling Contractor/Method:	Boart Longyear / Rotosonic
Ground Surface Elevation:	117.32 ft MSL
Top of Casing Elevation:	120.33 ft MSL

Prowell Environmental, Inc., Portland, Oregon.

MW-47a Well Details
Cascade Corporation, TGA Remedy

MULT 107502

MULT 107502 AMENDED 9.30.11

09-13-2011

Page 1 of 3

STATE OF OREGON
MONITORING WELL REPORT

(as required by ORS 537.765 & OAR 690-240-0395)

WELL LABEL # L 105114

START CARD # 1014712

(1) LAND OWNER

Owner Well I.D. MW-47a

First Name _____ Last Name _____

Company CASCADE CORPORATION

Address 2201 NE 201ST AVE

City GRESHAM State OR Zip 97024

(2) TYPE OF WORK

☒ New ☐ Deepening ☐ Conversion ☐ Alteration (repair/recondition) ☐ Abandonment

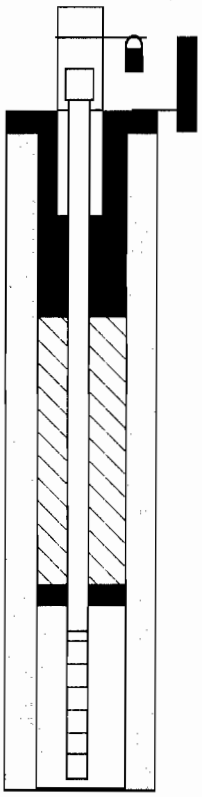
(3) DRILL METHOD

☐ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Hollow Stem Auger ☐ Cable Mud ☐ Reverse Rotary ☒ Other sonic

(4) CONSTRUCTION

Piezometer Well ☐

Depth of Completed Well 14.5 (15.5) ft. Special Standard ☐



MONUMENT/VAULT Above Ground From 0 To ~~3~~

BORE HOLE Diameter 6 From 0 To 14.5 (15.5)

CASING Dia. 2 From 0 To 9.1 (10.5)
Gauge SCH 40 Wld ☐ Thrd ☒
Material ○ Steel ◉ Plastic

LINER Dia. _____ From _____ To _____
Gauge _____ Wld ☐ Thrd ☐
Material ○ Steel ○ Plastic

SEAL From ~~2.5~~ To 7.5
Material Bentonite
Amount 3.00 S Grout weight _____

SCREEN Casing/Liner _____ Material PVC
Diameter 2 From 10.5 (9.1) To 15.5 (14.1)
Slot Size .020

FILTER From 7.5 To 15.5 Material SAND Size of pack 8/12

(5) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Temperature 53 °F Lab analysis ☐ Yes By _____

Supervising Geologist/Engineer _____

Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(6) LOCATION OF WELL (legal description)

County Multnomah Twp 1.00 N N/S Range 3.00 E E/W WM

Sec 29 SE 1/4 of the NE 1/4 Tax Lot 1

Tax Map Number _____ Lot _____

Lat ° 0 ' " or _____ DMS or DD

Long ° 0 ' " or _____ DMS or DD

◉ Street address of well ○ Nearest address

2525 NE 201ST AVE GRESHAM

(7) STATIC WATER LEVEL

	Date	SWL(psi)	+ SWL(ft)
Existing Well / Predeepening			
Completed Well	08-30-2011		13

Flowing Artesian? ☐ Dry Hole? ☐

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL(psi)	+ SWL(ft)

(8) WELL LOG

Ground Elevation _____

Material	From	To
FILL	0	3
GRAVEL COBBLES BOULDERS	3	8
SILTY SAND W/GRAVEL	8	10
MED COARSE SAND	10	15
Sandy Gravel	15	16
Siltstone w/some (Sand	16	19.5
Yellow Brown siltstone	19.5	20

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OCT 07 2011
WATER RESOURCES DEPT
SALEM, OREGON

Date Started 08-29-2011 Completed 08-30-2011

(unbonded) Monitor Well Constructor Certification

I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon monitoring well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

License Number 10574 Date 09-13-2011

Electronically Submitted
Signed JEFFREY L KARCHER (E-filed)

(bonded) Monitor Well Constructor Certification

I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon monitoring well construction standards. This report is true to the best of my knowledge and belief.

License Number 10306 Date 09-13-2011

Electronically Submitted
Signed I TRENT CASTNER (E-filed)

Contact Info (optional) _____

ORIGINAL - WATER RESOURCES DEPARTMENT

THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

Form Version: 0.95

MULT 107502

MONITORING WELL REPORT - continuation page

WELL I.D. # L 0 105114

START CARD # 0 1014712

(4) CONSTRUCTION

BORE HOLE

Dia	From	To

FILTER PACK

From	To	Material	Size

SEAL

Material	From	To	Amt	sacks/ lbs	grout weight

CASING/LINER

Casing	Liner	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
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○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐

SCREENS

Perf/Screen	Casing/Liner	Screen Dia	From	To	Scrn size/slot width	Slot length	# of slots	Tele/ pipe size

(5) WELL TESTS

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Water Quality Concerns

From	To	Description	Amount	Units

(7) STATIC WATER LEVEL

Water Bearing Zones

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	

(8) WELL LOG

Material	From	To

RECEIVED

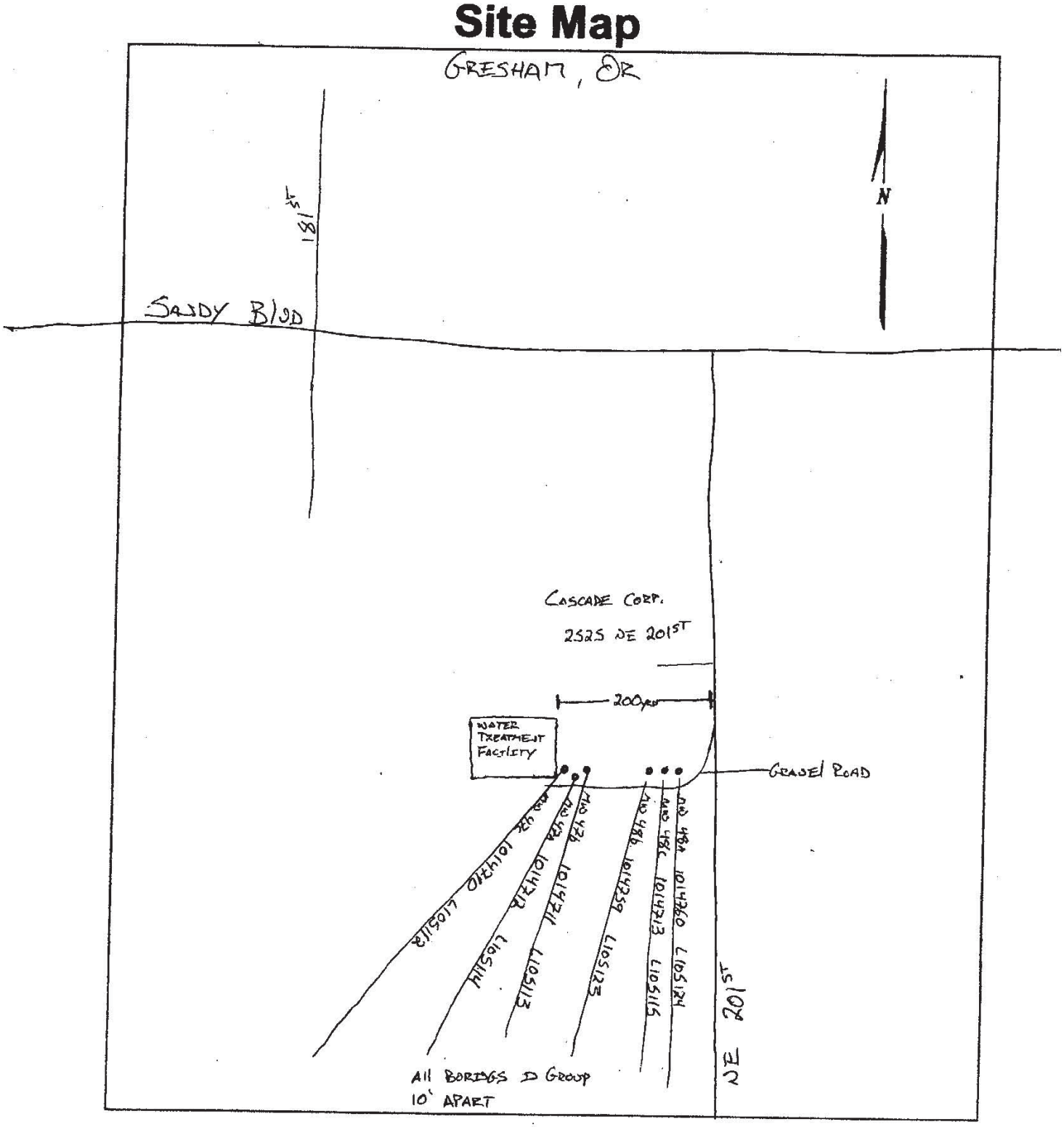
OCT 07 2011

WATER RESOURCES DEPT
SALEM, OREGON

Comments/Remarks

Hole drilled to 20'
backfilled w/chips
to bottom of filter pack

Map of well

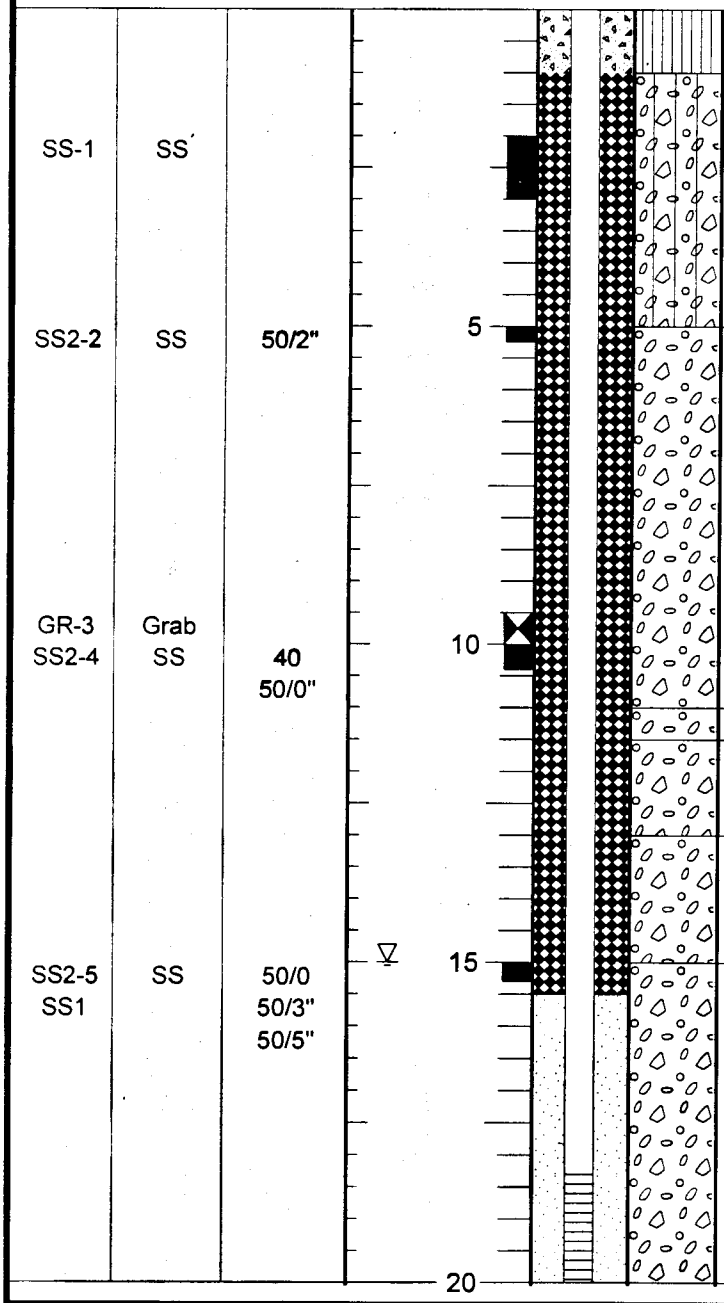

Site Map
GRESHAM, OR
181ST
SANDY BLVD
N
CASCADE CORP.
2525 NE 201ST
200 yd
WATER TREATMENT FACILITY
GRAVEL ROAD
All BORINGS IN GROUP 10' APART
NE 201ST

TGA MW-43 Well Log

LOG OF EXPLORATORY BORING

PROJECT NAME	**Cascade Corporation, TGA Remedy**	BORING NO.	**MW-43**
LOCATION	**Fairview, Oregon**	PAGE	**1 OF 2**
DRILLED BY	**Geo-Tech Explorations, Inc.**	GROUND ELEV.	**126.21**
DRILL METHOD	**Air Rotary**	TOTAL DEPTH	**32.7'**
LOGGED BY	**Craig D. Fanshier, RG**	DATE COMPLETED	**4/27/01**

SAMPLE NUMBER	SAMPLE TYPE	BLOWS PER 6 INCHES (RECOVERY)	LITHOLOGIC DESCRIPTION
			0 to 1.0 foot: SILT (ML), dark brown (10YR 3/8); 90 percent low plastic fines; 5 percent very fine sand; 5 percent fine gravel; damp. (TOPSOIL)
SS-1	SS		**1.0 to 5.0 feet: SILTY GRAVEL (GM)**, dark brown (10YR 3/8); 20 percent silt (low plasticity); 30 percent fine to medium sand, angular (F:M:C=1:5:2); 50 percent fine rounded gravel; very dense; damp.
SS2-2	SS	50/2"	**5.0 to 11.0 feet: SANDY GRAVEL (GP)**; olive brown; <5 percent fines; 40 percent fine to medium sand (mostly 0.2 to 0.7 mm), subrounded; 60 percent fine to coarse gravel (F:M:C=1:5:2); very dense; damp.
			@ 7.5 to 8.8 feet: **small basaltic boulder** (1 to 1.3-inch diameter) causes drive casing too kick off to the side.
GR-3	Grab		
SS2-4	SS	40 50/0"	
			11.0 to 11.5 feet: GRAVELLY SANDY (GP); olive brown; 5 to 75 percent fine to angular sand; 25 to 35 percent fine subrounded gravel; very dense; damp.
			11.5 to 13.0 feet: SANDY GRAVEL (GP); dark olive brown (2.5Y 3/3); 25 to 35 percent fine sand; 65 to 75 percent fine to medium gravel; dense; moist.
			13.0 to 15.0 feet: SANDY GRAVEL (GP); <5 percent fines; 40 percent fine to medium sand (mostly 0.2 to 0.7 mm), subrounded; 60 percent fine to coarse gravel (F:M:C=1:5:2); very dense; moist.
SS2-5	SS	50/0	
SS1		50/3" 50/5"	**15.0 to 20.0 feet: SANDY GRAVEL (GP)**; 5 percent non to low plasticity fines; 35 percent fine to medium sand (mostly 0.2 to 0.7 mm), subrounded; 60 percent fine gravel; very dense; wet.
			Note: **Groundwater encountered** at 15 feet during drilling. Very little (<0.5 gpm) produced from air rotary discharge at 17 to 19 feet.



REMARKS

Drilled with 7 inch O.D. threaded casing (5- and 10-foot lengths). Soil samples collected with 1.5-inch split barrel sampler (SS1) and 4-inch split-barrel sampler (SS2) driven with a 300-pound wireline hammer or from grab samples (GR) of cuttings discharged from the cyclone. Core collected with Longyear PQ triple tube core system (CC). F:M:C = ratio of fine to medium to coarse grain size.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Cascade Corporation, TGA Remedy**	BORING NO.	**MW-43**
LOCATION	**Fairview, Oregon**	PAGE	**2 OF 2**
DRILLED BY	**Geo-Tech Explorations, Inc.**	GROUND ELEV.	**126.21**
DRILL METHOD	**Air Rotary**	TOTAL DEPTH	**32.7'**
LOGGED BY	**Craig D. Fanshier, RG**	DATE COMPLETED	**4/27/01**

SAMPLE NUMBER	SAMPLE TYPE	BLOWS PER 6 INCHES (RECOVERY)	LITHOLOGIC DESCRIPTION
SS1-7	SS	50/3"	**20.0 to 23.0 feet: GRAVELLY SAND (SP)**; very dark grayish brown (2.5Y 3/2) with yellowish brown fines; approximately 5 percent medium to low plasticity fines; 70 percent fine to medium (0.1-2.0 mm), subangular, poorly sorted sand, sand slightly cemented or compacted; 25 percent fine (approximately 3/8 to 1/2 inch) rounded gravels; wet; very dense.
			23.0 to 25.5 feet: SILTY SAND (SM); olive brown (2.5Y 4/3); 20 to 25 percent low plasticity fines; 40 to 50 percent fine subangular sand (sand is composed of sandstone fragments, basaltic grains and quartz grains); 25 percent fine rounded gravel; wet.
SS1-8	SS	35	**25.5 to 27.5 feet: SANDSTONE**; dark brown (10Y 3/8); 5 percent low plasticity fines; 95 percent medium fine to medium (0.2 to 0.6 mm), subangular sand; soft, weakly cemented; wet.
		50/4"	
SS1-9	SS	40	
CC-10	CC	RQD= 100%	Note: sandstone at 27.0 and 28.0 feet is damp to dry.
			@ 26.3 to 27.0 feet: grain size analysis classified as SM.
			27.5 to 30.0 feet: SILTSTONE; light to dark olive brown (2.5Y 3/4-4/4) with mottling; 70 to 80 percent silt; 20 to 30 percent very fine sand; hard; damp.
			@ 29.1 feet: changes to dark olive gray (5Y 3/2). Possible paleohorizon, small areas (0.5 mm) are dark gray to black.
			@ 29.0 to 29.4 feet: grain size analysis classified as ML.
			30.0 to 32.7 feet: CLAYSTONE; dark greenish gray to olive gray, 70 to 80 percent low plasticity fines, cubic soil ped fractures; 20 to 30 percent very fine sand; hard; damp.
			Bottom of boring = 32.7 feet.

GROUND WATER LEVEL | DEPTH IN FEET | SAMPLES | WELL DETAILS | LITHO-LOGIC COLUMN

25

30

35

40

REMARKS

Drilled with 7 inch O.D. threaded casing (5- and 10-foot lengths). Soil samples collected with 1.5-inch split barrel sampler (SS1) and 4-inch split-barrel sampler (SS2) driven with a 300-pound wireline hammer or from grab samples (GR) of cuttings discharged from the cyclone. Core collected with Longyear PQ triple tube core system (CC). F:M:C = ratio of fine to medium to coarse grain size.

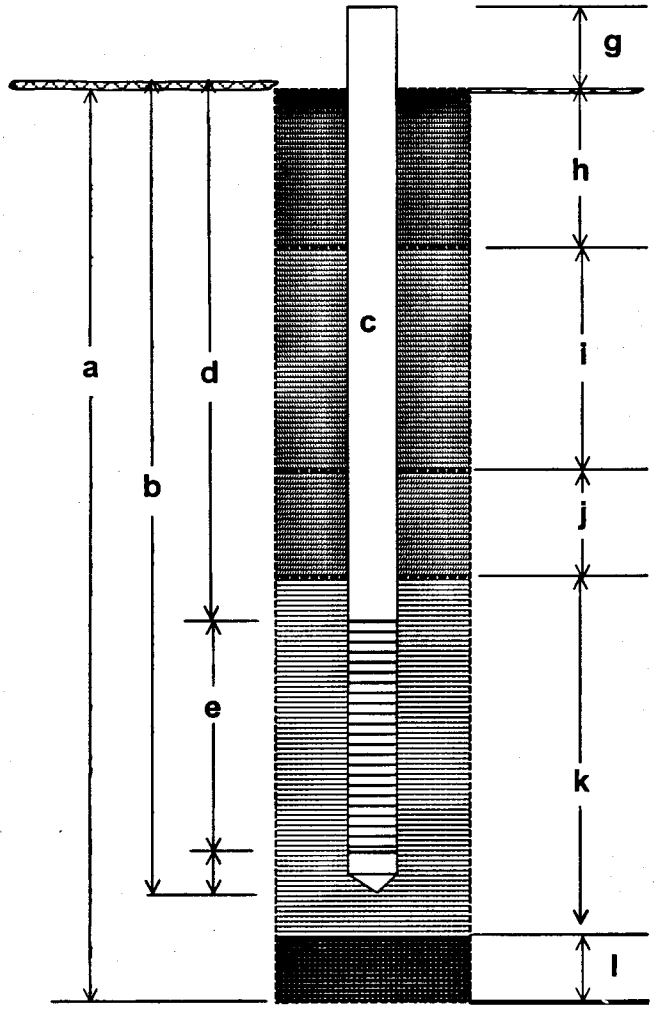
WELL CONSTRUCTION DETAILS

Natural Resource Management Group

3025 SW Canby Street, Portland, OR 97219 (503) 293-3895

Well Number: MW-43

Project Location	Cascade Corp, TGA Remedy
Project Name	Portland, Oregon
Project Number	NRMG # 2001E-52.01
Start Card Number	134971
WRD Well Number	L43844
Well Construction Contractor	Geo-Tech Explorations, Inc. Joe Staloch
Top of casing elev.	128.79 ft msl
Ground surface elev.	126.21 ft msl
Datum	MSL 1929 NVGD
Installation Date	4/27/01
Construction Inspector	Craig D. Fanshier, R.G.
Site Coordinates	Northings: 1498643.73 Eastings: 689295.33



Centralizers At bottom and top of screen

Other comments

Exploratory Boring

a	Total depth	32.7 ft bgs
	Borehole diameter	7-inches
	Drilling method	Air rotary, Ingersol Rand T3W with downhole hammer

Well Construction Materials

	Material	Schedule 40 PVC, factory wrapped
	Joints	Flush threaded joints with o-rings

Well Construction Specifications

b	Total casing length	30.66 feet long (2 to 28.6 ft bgs)
c	Well and casing diameter	2-inches
d	Depth to top of perforations	18.3 ft bgs
e	Perforated length	9.7 ft
	Perforated interval	18.3 to 28.0 ft bgs
	Perforation type	machine slotted
	Perforation slot size	20-slot (0.020 inches)
f	Sump legnth	0.6 foot (28.0 to 28.6 ft bgs)
g	Stick-up	2.6 ft bgs
h	Surface seal	Concrete 0 to 1 feet bgs
I	Backfill	None
	Backfill material	na
	Volume used	na
j	Well Seal	1 to 15.5 ft bgs
	Seal material	3/4-inch bentonite chips
	Volume used	7-50# bags
k	Gravel Pack	15.5 to 29.0 ft bgs
	Gravel pack material	8-12 graded *Colorado Silica Sand™*
	Volume used	6-50# bags
l	Bottom Seal	29.0 to 32.7 ft bgs
	Backfill material	3/4-inch bentonite chips
	Volume used	1.5-50# bags

STATE OF OREGON

MONITORING WELL REPORT

(as required by ORS 537.765 & OR 690-240-095)

MULT 63887

L 43844

Start Card # 134971

Instructions for completing this report are on the last page of this form.

(1) OWNER/PROJECT: WELL NO. MW-43

Name Cascade Corporation

Address PO Box 20187

City Portland State OR Zip 97220

(2) TYPE OF WORK:

[✓] New construction [ ] Alteration (Repair/Recondition)

[ ] Conversion [ ] Deepening [ ] Abandonment

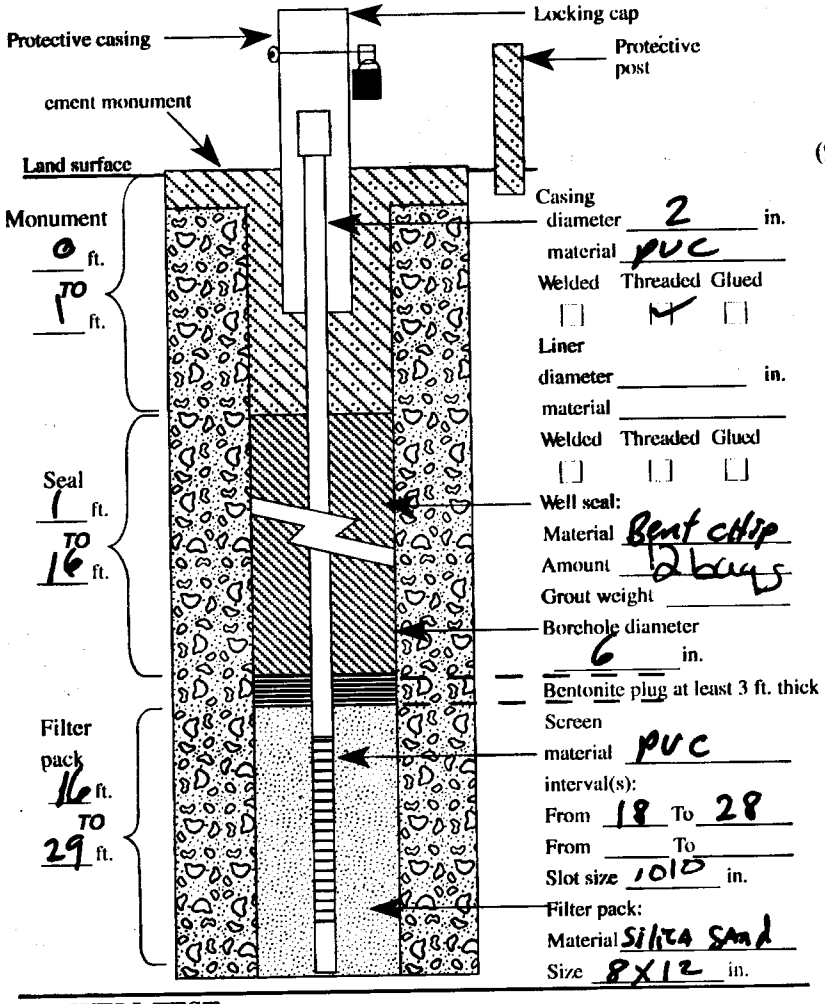
(3) DRILLING METHOD

[✓] Rotary Air [ ] Rotary Mud [ ] Cable

[ ] Hollow Stem Auger [ ] Other

(4) BORE HOLE CONSTRUCTION

Special Standards Yes [ ] No [✓] Depth of completed well 29 ft.



Casing diameter 2 in. material PVC

Welded [ ] Threaded [✓] Glued [ ]

Liner diameter ____ in. material ____

Welded [ ] Threaded [ ] Glued [ ]

Well seal: Material Bent chip Amount 2 bags Grout weight ____

Borehole diameter 6 in.

[ ] Bentonite plug at least 3 ft. thick

Screen material PVC interval(s): From 18 To 28 From ____ To ____

Slot size .010 in.

Filter pack: Material Silica Sand Size 8X12 in.

(5) WELL TEST:

[ ] Pump [ ] Bailer [ ] Air [ ] Flowing Artesian

Permeability ____ Yield ____ GPM

Conductivity ____ PH ____

Temperature of water 51 °F/C Depth artesian flow found ____ ft.

Was water analysis done? [ ] Yes [X] No

By whom? ____

Depth of strata to be analyzed. From ____ ft. to ____ ft.

Remarks: ____

Name of supervising Geologist/Engineer ____

(6) LOCATION OF WELL By legal description

Well Location: County Multnomah

Township 1 (N or S) Range 3 (E or W) Section 29

1. NE 1/4 of SE 1/4 of above section.

2. Either Street address of well location 2201 NE 201st Ave, Troutdale

or Tax lot number of well location 2300

3. ATTACH MAP WITH LOCATION IDENTIFIED. Map shall include approximate scale and north arrow.

(7) STATIC WATER LEVEL:

12 Ft. below land surface. Date 4/27/01

Artesian Pressure ____ lb/sq. in. Date ____

(8) WATER BEARING ZONES: Depth at which water was first found 12

From	To	Est. Flow Rate	SWL
12	32	½ gpm	12.3

(9) WELL LOG: Ground elevation ____

Material	From	To	SWL
Grass			
Brn silt & gravel	0	10	
Brn Sand + gravel lrg	10	23	12.3
Brn silt & gravel	23	25	
Brn Sandstone	25	30	
Gray Clay Stone	30	32	
Abandond bottom of Hole with 1 bg of Bent. chips			

RECEIVED

MAY 24 2001

WATER RESOURCES DEPT
SALEM, OREGON

Date started 4.26.1 Completed 4.27.1

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

MWC Number 104

Signed ____ Date 4.27.1

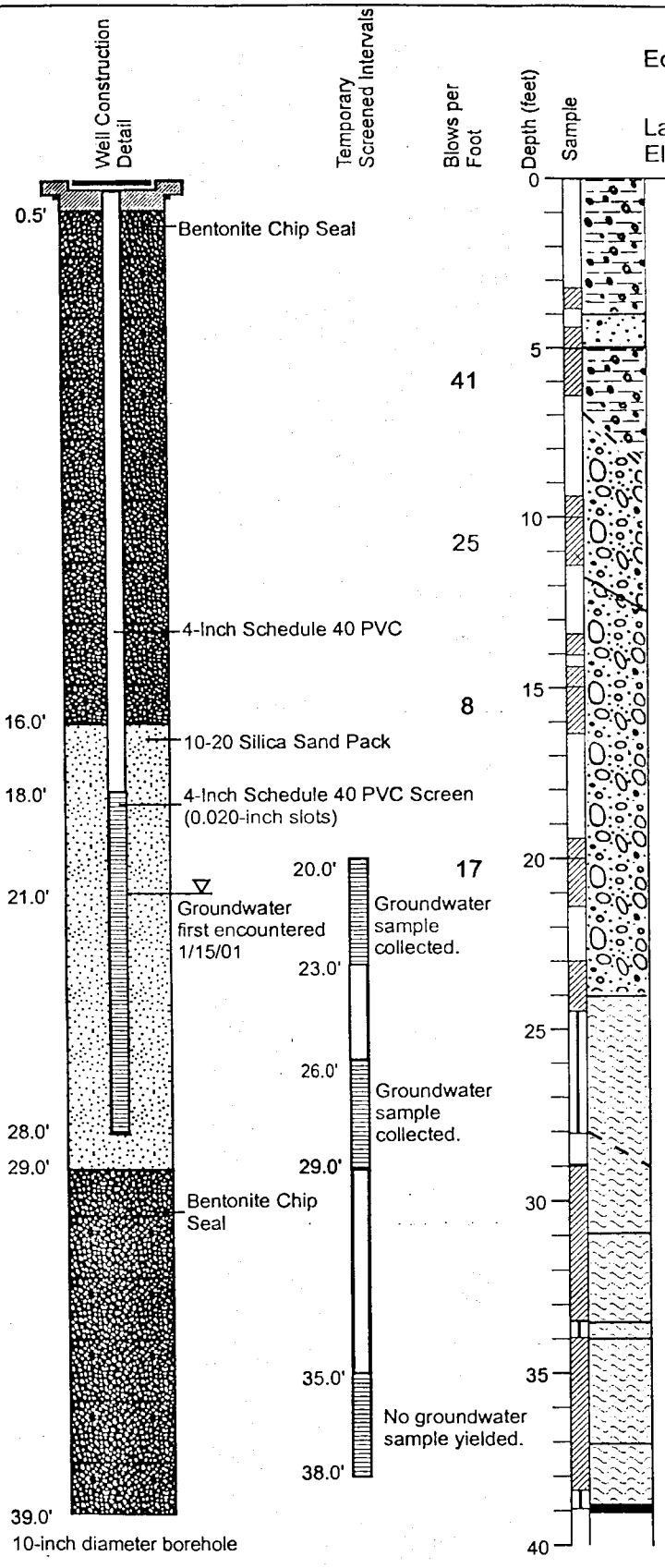
(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

MWC Number 1011

Signed ____ Date 5/23/01

TGA MW-42 Well Log



Equipment Air Rotary - Geo-Tech

Land Surface Elevation

Date 01/15-18/01

Logged by P. Gerbic

DARK BROWN SILTY GRAVEL (GM) dense, damp; gravel is rounded and fine, trace rootlets.

Grades to more gravel.

BROWN WELL GRADED SAND (SW) damp; fine to coarse grained, angular.

BROWN SILTY GRAVEL (GM) dense, dry; gravel is angular and up to 1-inch-diameter, trace fine sand.

BROWN WELL-GRADED GRAVEL (GW) up to 2-inch diameter.

Few thin layers of fine sandy silt at ~8.5 feet bgs.

Grades to fine to coarse gravel, trace silt, trace fine sand at ~ 9.5 feet bgs.

BROWN WELL-GRADED GRAVEL (GW) interbedded with BROWN SILT (ML) damp.

Brown silt layers.

Trace siltstone.

YELLOW-BROWN SANDSTONE, moist, hard, moderately well cemented, fine- to medium-grained sand, >15% fine-grained matrix.

BLACK-GRAY SILTSTONE, moist, hard, partially indurated, >30% very fine sand.

GRAY MUDSTONE, damp, stiff, slightly weathered.

GREEN-GRAY SILTSTONE lense, damp, stiff, some clay.

RED-BROWN CLAYSTONE, damp, stiff, very little silt.

OLIVE-GRAY SILTY CLAYSTONE, damp, firm to soft.

Boring terminated at 39.0 feet bgs.

Groundwater encountered at 21 feet bgs.

Monitoring Well MW-42 Log and Construction Detail

Cascade Corporation - TGA Remedy

Fairview, Oregon

Figure 3

CDM Camp Dresser & McKee Inc.

PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
32502lg.cdr 20155-32502-Task 1	PJS	03/09/01			

MULT 63339

STATE OF OREGON

MONITORING WELL REPORT

(as required by ORS 537.765 & OAR 690-240-095)

L 45671

Start Card # 134716

Instructions for completing this report are on the last page of this form.

(1) OWNER/PROJECT: WELL NO. MW-42

Name Cascade Corporation

Address 2201 NE 201st Ave

City Fairview State OR Zip 97024

(2) TYPE OF WORK:

[X] New construction [ ] Alteration (Repair/Recondition)

[ ] Conversion [ ] Deepening [ ] Abandonment

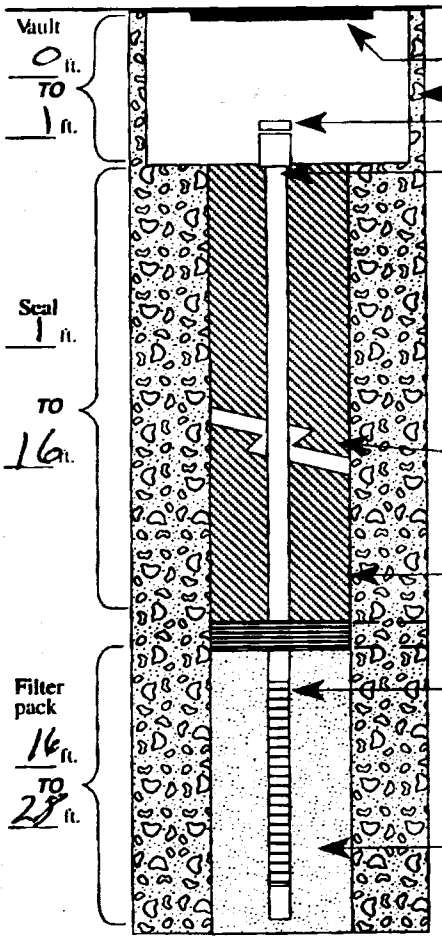
(3) DRILLING METHOD

[X] Rotary Air [ ] Rotary Mud [ ] Cable

[ ] Hollow Stem Auger [ ] Other

(4) BORE HOLE CONSTRUCTION

Special Standards Yes [ ] No [X] Depth of completed well 28 ft.



(5) WELL TEST:

[ ] Pump [ ] Bailer [ ] Air [ ] Flowing Artesian

Permeability ____ Yield ____ GPM

Conductivity ____ PH ____

Temperature of water 51 °F/C Depth artesian flow found ____ ft.

Was water analysis done? [ ] Yes [ ] No

By whom? CDM

Depth of strata to be analyzed. From ____ ft. to ____ ft.

Remarks: ____

Name of supervising Geologist/Engineer ____

(6) LOCATION OF WELL By legal description

Well Location: County Multnomah

Township 1 (N or S) Range 3 (E or W) Section 29

1. NW 1/4 of NE 1/4 of above section.

2. Either Street address of well location 2901 NE 201st

or Tax lot number of well location 1000

3. ATTACH MAP WITH LOCATION IDENTIFIED. Map shall include approximate scale and north arrow.

(7) STATIC WATER LEVEL:

20 Ft. below land surface. Date 1-16-1

Artesian Pressure ____ lb/sq. in. Date ____

(8) WATER BEARING ZONES:

Depth at which water was first found 20

From	To	Est. Flow Rate	SWL
20	33	1/2 gpm	20

(9) WELL LOG: Ground elevation ____

Material	From	To	SWL
Brn Silt & Gravel	0	5	
Brn Sand & Gravel	5	23	23'
cemented gravels	23	24	
Sandstone	24	33	
brn clay	33	34	
Aqua Blue clay	34	36	
Brn clay	36	39	
BACK Fill to 28' with Bent CHIPS			
		8 bags	

RECEIVED

FEB 14 2001

WATER RESOURCES DEPT
SALEM, OREGON

Date started 1-15-1 Completed 1-19-1

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

MWC Number 1047

Signed ____ Date 1-19-1

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

MWC Number 1001

Signed ____ Date 2/12

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

TGA MW-35s Well Log

LOG OF EXPLORATORY BORING

PROJECT NAME	Cascade Corporation	BORING NO.	MW-35S
LOCATION	Troutdale, Oregon	PAGE	1 OF 2
DRILLED BY	Staco Well Services	GROUND ELEV.	118.50'
DRILL METHOD	Air Rotary - Failing Speedstar 30K	TOTAL DEPTH	24.80'
LOGGED BY	A. St. John	DATE COMPLETED	08/17/95

SAMPLE METHOD AND NUMBER	RECOVERY PERCENT FID (ppm)	BLOWS PER 6 INCHES	LITHOLOGIC DESCRIPTION
G-1	0 --		**0 to 2.5 feet: SILT (ML);** yellowish brown (10YR 5/6-5/8); low plasticity fines; dry; trace roots. (TOPSOIL)
G-2	0 --		**2.5 to 7.0 feet: SANDY GRAVEL (GW);** yellowish brown (10YR 5/6-5/8); 70 percent fine to coarse gravel, subangular, primarily mafic; 30 percent fine to coarse sand; 5 percent yellowish brown (10YR 5/6) fines; dry. (TROUTDALE GRAVEL AQUIFER)
G-3	0 --		
G-4	0 --		**7.0 to 10.0 feet: SAND WITH SILT (SP-SM);** yellowish brown (10YR 5/6); 85 percent fine sand; 5 to 10 percent nonplastic fines; 5 percent fine gravel, subangular; dry. (TROUTDALE GRAVEL AQUIFER)
G-5	0 --		**10.0 to 12.5 feet: CLAYEY GRAVEL (GC);** yellowish brown (10YR 5/6-5/8); 50 to 60 percent fine gravel, subangular to well rounded, mafic; 20 to 25 percent fine to coarse sand; 20 to 25 percent light yellowish brown (10YR 6/4) medium plasticity fines; damp. (TROUTDALE GRAVEL AQUIFER)
G-6	0 --	8	**12.5 to 17.5 feet: SANDY GRAVEL WITH CLAY (GP-GC);** brown (10YR 5/3-4/3); 50 percent fine gravel, subangular to subrounded; 20 to 25 percent light yellowish brown fines; moist; sand and fines coat gravel fragments. (TROUTDALE GRAVEL AQUIFER)
G-7	0 --	30	
G-8	0 --	50	**17.5 to 23.8 feet: SILTSTONE (SLT);** pale brown (10YR 6/3); low to medium plasticity; hard; dry; massive; homogeneous. (~~CONFINING UNIT 1~~) SU1A -8P2/00

GROUND WATER LEVELS: 8/17/95 13:57; 8/17/95 10:53

DEPTH IN FEET: 5, 10, 15, 20

SAMPLES

WELL DETAILS: TSA; SU1A

LITHOLOGIC COLUMN

REMARKS

(1) Grab samples (G) collected at 1.0-foot-intervals from the cyclone of the drill rig. Split barrel samples (SB) collected by driving a 2-inch-diameter sampler over a 1.5-foot-interval using a 300 pound hammer with a 30-inch stroke. (2) 7-inch-diameter hole was drilled with a down-hole hammer and threaded casing was driven. (3) Top of PVC casing elevation = 120.20 feet msl. (4) White triangle = approximate depth at which water was encountered during drilling. Black triangle = static water level in completed wells. (5) Organic vapor readings collected with a flame ionization detector calibrated with 98 percent methane.

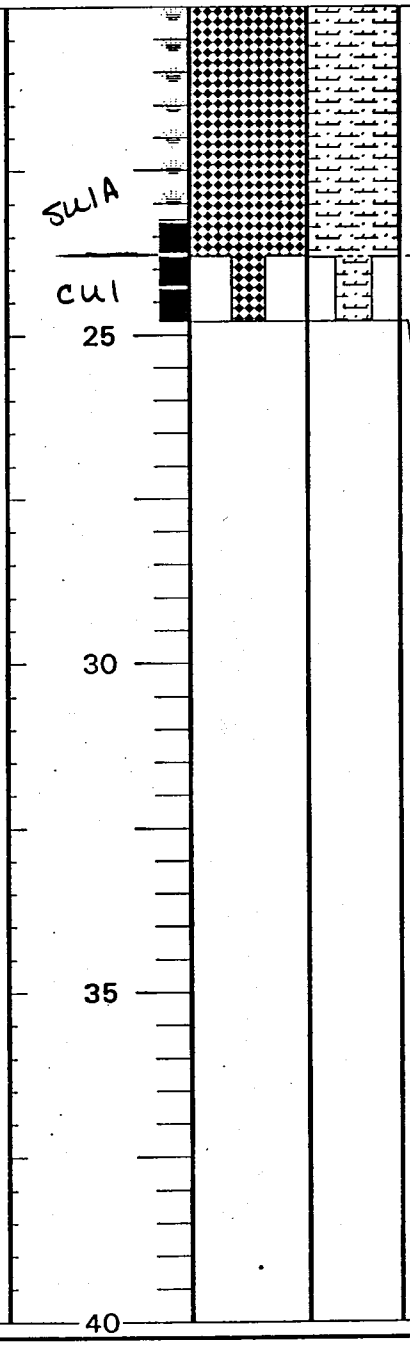
EMCON

LOG OF EXPLORATORY BORING

PROJECT NAME	Cascade Corporation	BORING NO.	MW-35S
LOCATION	Troutdale, Oregon	PAGE	2 OF 2
DRILLED BY	Staco Well Services	GROUND ELEV.	118.50'
DRILL METHOD	Air Rotary - Failing Speedstar 30K	TOTAL DEPTH	24.80'
LOGGED BY	A. St. John	DATE COMPLETED	08/17/95

SAMPLE METHOD AND NUMBER	RECOVERY PERCENT FID (ppm)	BLOWS PER 6 INCHES
G-9	0	
	--	
SB-10	--	10
SB-11	100	27
SB-12	--	45
	100	
	--	
	100	

GROUND WATER LEVELS | DEPTH IN FEET | SAMPLES | WELL DETAILS | LITHOLOGIC COLUMN



LITHOLOGIC DESCRIPTION

17.5 to 23.8 feet: SILTSTONE (SLT); continued.
@ 20.0 to 21.0 feet: color change to brownish yellow (10YR 6/8) to yellowish brown (10YR 5/8).

23.8 to 24.8 feet: CLAYEY SILTSTONE (SLT); greenish gray (5GY 6/1); medium plasticity; hard; micaceous; damp; homogeneous. (CONFINING UNIT 1)

Total depth drilled = 23.3 feet.
Total depth sampled = 24.8 feet.

WELL COMPLETION DETAILS:
+1.7 to 7.8 feet: 2-inch-diameter, flush-threaded (with o-rings), Schedule 40 PVC blank riser pipe.
7.8 to 17.0 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots.
17.0 to 17.6 feet: 2-inch-diameter, flush-threaded, Schedule 40 sump.
17.1 feet: Stainless steel centralizer.

0 to 2.0 feet: Above-ground security casing set in 2 x 2 foot concrete pad.
2.0 to 5.5 feet: Holeplug 3/4 bentonite chips hydrated with potable water.
5.5 to 17.5 feet: CSSI 8 - 12 washed silica sand.
17.5 to 24.8 feet: Holeplug 3/4 bentonite chips.

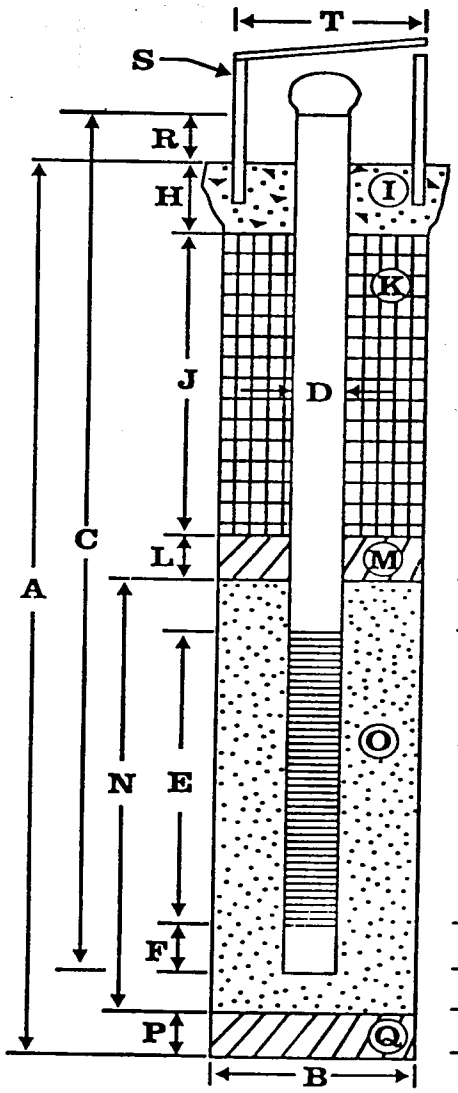
REMARKS

(1) Grab samples (G) collected at 1.0-foot-intervals from the cyclone of the drill rig. Split barrel samples (SB) collected by driving a 2-inch-diameter sampler over a 1.5-foot-interval using a 300 pound hammer with a 30-inch stroke. (2) 7-inch-diameter hole was drilled with a down-hole hammer and threaded casing was driven. (3) Top of PVC casing elevation = 120.20 feet msl. (4) White triangle = approximate depth at which water was encountered during drilling. Black triangle = static water level in completed wells. (5) Organic vapor readings collected with a flame ionization detector calibrated with 98 percent methane.

EMCON

WELL DETAILS

Project Number:	40683-003.012/7	Boring/Well No.:	MW-35S
Client Name:	Cascade Corporation	Top of Casing Elev.:	120.20
Project Name:	TGA Control Trench	Ground Surface Elev.:	118.50
Location:	Troutdale, Oregon	Installation Date:	8/17/95
Driller:	Staco Well Services	Permit/Start Card No.:	



	Depth (feet)	Elev. (ft, msl)
+2.03		120.5
+1.70		120.2
0		118.5
NA		NA
5.5		113.0
7.8		110.7
17.0		101.5
17.6		100.9
17.6		100.9
24.8		93.7

EXPLORATORY BORING

A. Total depth:	24.8	ft.
B. Diameter	7	in.
Drilling method:	Air Rotary	

WELL CONSTRUCTION

C. Well casing length:	19.3	ft.
Well casing material:	PVC	
D. Well casing diameter:	2	in.
E. Well screen length:	9.2	ft.
Well screen type:	machined slots	
Well screen slot size:	0.020	
F. Well sump/end cap length:	0.6	ft.
G. Well casing height (stickup):	+1.7	ft.
H. Surface seal thickness:	2	ft.
I. Surface seal material:	Concrete	
J. Annular seal thickness:	3.5	ft.
K. Annular seal material:	3/4-inch bentonite chips	
L. Filter pack seal thickness:	NA	ft.
M. Filter pack seal material:	NA	
N. Sand pack thickness:	12.0	ft.
O. Sand pack material:	CSSI 8-12 silica sand	
P. Bottom material thickness:	7.3	ft.
Q. Bottom material:	bentonite chips	
R. Well casing hgt (stickup):	1.70	ft.
S. Protective casing material:	Steel	
Well centralizer depths:	17.1	ft.
T. Protective casing diameter:	6	in.

NOTES:

Installed by: Anna St. John

Reviewed by: Calin Teodoru

Date: 1/30/96

PJ:\GEOLOGY\CASCADE\0683-003.012\MW35WLDT.DOC\AMS

STATE OF OREGON
ITORING WELL REPORT
(...ired by ORS 537.765 & OAR 690-240-095)

MULT 4985

1N/3E/29AD

Start Card # 82035

(1) OWNER/PROJECT: WELL NO. MW-355

Name: Cascade Corporation

Address: PO Box 20187

City: Portland State: OR Zip: 97220

(2) TYPE OF WORK:

☒ New construction ☐ Repair ☐ Recondition
☐ Conversion ☐ Deepening ☐ Abandonment

(3) DRILLING METHOD

☒ Rotary Air ☐ Rotary Mud ☐ Cable
☐ Hollow Stem Auger ☐ Other

(4) BORE HOLE CONSTRUCTION

Special Standards: Yes ☐ No ☒ Depth of completed well 17.6 ft.

Locking cap
Protective casing
Protective post
Land surface
Monument 0 ft. TO 2 ft.
Seal 2 ft. TO 5.5 ft.
Filter pack 5.5 ft. TO 17.5 ft.

Cement monument
Casing diameter 2 in. material SCH 40 PVC
Welded ☐ Threaded ☒ Glued ☐
Casing diameter ___ in. material ___
Welded ☐ Threaded ☐ Glued ☐
Well seal: Material Hole plug all bent Amount 15lbs Chips
Borehole diameter 7 in.
Bentonite plug at least 2 ft. thick
Screen material SCH 40 PVC
interval(s): From 7.8 To 17.5
From ___ To ___
Slot size .020 in.
Filter pack: Material CSI Sand
Size 8-12 in.

(5) WELL TEST: N/A

☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Permeability ___ Yield ___ GPM
Conductivity ___ PH ___
Temperature of water 57 °F Depth artesian flow found ___ ft.
Was water analysis done? ☐ Yes ☐ No
By whom? ___
Depth of strata to be analyzed. From ___ ft. to ___ ft.
Remarks: ___

Name of supervising Geologist/Engineer Anna St. John

(6) LOCATION OF WELL By legal description

Well Location County: Multnomah
Township 1N (N or S) Range 3E (E or W) Section 29
1. SE 1/4 of NE 1/4 of above section.
2. Street address of well location 2220 NE 201st Troutdale, OR
3. Tax lot number of well location 1000
4. ATTACH MAP WITH LOCATION IDENTIFIED.

(7) STATIC WATER LEVEL:

10.64 ft. below land surface. Date: 8/17/95
Artesian Pressure ___ lb/sq. in. Date ___

(8) WATER BEARING ZONES:

Depth at which water was first found 10.64

From	To	Est. Flow Rate	SWL
10.64	21	< 1 GPM	10.64

(9) WELL LOG: Ground elevation ___

Material	From	To	SWL
Silt (ML)	0	2.5	
Sandy gravel (GP)	2.5	7	
Sand (SP)	7	8	
Sandy gravel (GP)	8	10	
Clayey gravel (GC)	10	12.5	
Sandy gravel (GP-GC)	12.5	17.5	
Silt (ML)	17.5	21	
Clay stone pale brown	21	23.8	
Clay stone green gray	23.8	24.8	

RECEIVED SEP 19 1995 WATER RESOURCES DEPT. SALEM, OREGON

RECEIVED JAN - 9 1996 WATER RESOURCES DEPT. SALEM, OREGON

Date started 8/16/95 Completed 8/17/95

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

MWC Number 10330
Signed Steven C. Zimmerman Date 8/29/95

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

MWC Number 10096
Signed John K. Stahl Date 9-18-95

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

TGA MW-33s Well Log

LOG OF EXPLORATORY BORING

PROJECT NAME	Cascade Corporation	BORING NO.	MW-33S
LOCATION	Troutdale, Oregon	PAGE	1 OF 2
DRILLED BY	Staco Well Services	GROUND ELEV.	127.10'
DRILL METHOD	Air Rotary - Failing Speedstar 30K	TOTAL DEPTH	26.20'
LOGGED BY	A. St. John	DATE COMPLETED	08/16/95

SAMPLE METHOD AND NUMBER	RECOVERY PERCENT FID (ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION
G-1	-- 0							0 to 3.0 feet: SILT (ML); brown (7.5YR 5/3) to strong brown (7.5YR 4/6); 70 percent low plasticity fines; 30 percent fine sand; multicolored; dry. (TOPSOIL)
G-2	-- 0							3.0 to 7.5 feet: SANDY GRAVEL WITH SILT (GW-GM); dark brown (7.5YR 3/2); 60 percent fine to coarse gravel, subangular to rounded, primarily mafic; 25 percent fine to coarse sand, multicolored; 15 percent light yellowish brown (10YR 6/4) fines; dry. (TROUTDALE GRAVEL AQUIFER)
G-3	-- 0			5				
G-4	-- 0							7.5 to 16.0 feet: SANDY GRAVEL (GP); gray (10YR 5/1); 60 percent fine gravel, subangular to rounded, mafic; 40 percent fine to coarse sand, micaceous, multicolored; dry. (TROUTDALE GRAVEL AQUIFER)
G-5	-- 0			10				@ 10.0 to 12.5 feet: increase in percentage of sand; dry.
G-6	-- 0		▼ 8/16/95 8:11					
G-7	-- 0			15				16.0 to 24.7 feet: GRAVELLY SAND WITH SILT (SW-SM); dark grayish brown (2.5Y 4/2); 50 to 55 percent fine to coarse sand, micaceous, multicolored; 35 percent fine gravel, primarily mafic, trace quartzite; 10 percent nonplastic light yellowish brown (10YR 6/4) fines; wet. (TROUTDALE GRAVEL AQUIFER)
G-8	-- 0		8/15/95 ▽ 13:50					@ 17.5 to 20.0 feet: increase in percentage of
				20				

REMARKS

(1) Grab samples (G) collected at 1.0-foot-intervals from the cyclone of the drill rig. Split barrel samples (SB) collected by driving a 2-inch-diameter sampler over a 1.5-foot-interval using a 300 pound hammer with a 30-inch stroke. (2) 7-inch-diameter hole was drilled with a down-hole hammer and threaded casing was driven. (3) Top of PVC casing elevation = 128.64 feet msl. (4) White triangle = approximate depth at which water was encountered during drilling. Black triangle = static water level in completed wells. (5) Organic vapor readings collected with a flame ionization detector calibrated with 98 percent methane.

EMCON

LOG OF EXPLORATORY BORING

PROJECT NAME	Cascade Corporation	BORING NO.	MW-33S
LOCATION	Troutdale, Oregon	PAGE	2 OF 2
DRILLED BY	Staco Well Services	GROUND ELEV.	127.10'
DRILL METHOD	Air Rotary - Failing Speedstar 30K	TOTAL DEPTH	26.20'
LOGGED BY	A. St. John	DATE COMPLETED	08/16/95

SAMPLE METHOD AND NUMBER	RECOVERY PERCENT FID (ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION
G-9	-- 0							gravel. **16.0 to 24.7 feet: GRAVELLY SAND WITH SILT (SW-SM);** continued. @ 20.0 to 24.7 feet: hard drilling.
			▼ 8/15/95 14:28					
G-10	-- 0							@ 23.0 feet: increase in percentage of fines.
SB-11	100	27		25				**24.7 to 26.2 feet: SANDY SILTSTONE (SLT);** grayish brown (10YR 5/2) to brown (10YR 5/3); low to medium plasticity fines; 10 percent fine sand, micaceous; hard; dry to damp. (CONFINING UNIT 1)
SB-12	--	44						
SB-13	100 -- 100 --	53						
								Total depth drilled = 26.2 feet. Total depth sampled = 26.2 feet.
								WELL COMPLETION DETAILS: +1.54 to 10.0 feet: 2-inch-diameter, flush-threaded (with o-rings), Schedule 40 PVC blank riser pipe. 10.0 to 24.3 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots. 24.3 to 24.9 feet: 2-inch-diameter, flush-threaded, Schedule 40 sump.
				30				0 to 2.0 feet: Above-ground security casing set in 2 x 2 foot concrete pad. 2.0 to 7.4 feet: Holeplug 3/4 bentonite chips hydrated with potable water. 7.4 to 24.9 feet: CSSI 8 - 12 washed silica sand. 24.9 to 26.2 feet: Holeplug 3/4 bentonite chips.
				35				
				40				

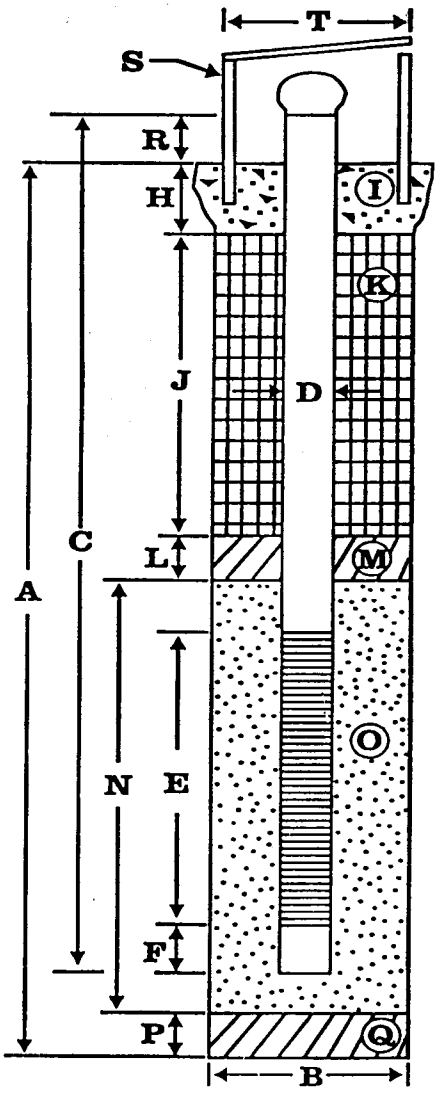
REMARKS

(1) Grab samples (G) collected at 1.0-foot-intervals from the cyclone of the drill rig. Split barrel samples (SB) collected by driving a 2-inch-diameter sampler over a 1.5-foot-interval using a 300 pound hammer with a 30-inch stroke. (2) 7-inch-diameter hole was drilled with a down-hole hammer and threaded casing was driven. (3) Top of PVC casing elevation = 128.64 feet msl. (4) White triangle = approximate depth at which water was encountered during drilling. Black triangle = static water level in completed wells. (5) Organic vapor readings collected with a flame ionization detector calibrated with 98 percent methane.

EMCON

WELL DETAILS

Project Number:	40683-003.012/7	Boring/Well No.:	MW-33S
Client Name:	Cascade Corporation	Top of Casing Elev.:	128.64
Project Name:	TGA Control Trench	Ground Surface Elev.:	127.10
Location:	Troutdale, Oregon	Installation Date:	8/16/95
Driller:	Staco Well Services	Permit/Start Card No.:	



	Depth (feet)	Elev. (ft, msl)
	+1.87	129.0
	+1.54	128.6
	0	127.1
	NA	NA
	7.4	119.7
	10.0	117.1
	24.3	102.8
	24.9	102.2
	24.9	102.2
	26.2	100.9

EXPLORATORY BORING

A.	Total depth:	26.20	ft.
B.	Diameter	7	in.
	Drilling method:	Air Rotary	

WELL CONSTRUCTION

C.	Well casing length:	26.44	ft.
	Well casing material:	PVC	
D.	Well casing diameter:	2	in.
E.	Well screen length:	14.3	ft.
	Well screen type:	machined slots	
	Well screen slot size:	0.020	
F.	Well sump/end cap length:	0.6	ft.
G.	Well casing height (stickup):	1.54	ft.
H.	Surface seal thickness:	2	ft.
I.	Surface seal material:	Concrete	
J.	Annular seal thickness:	5.4	ft.
K.	Annular seal material:	3/4-inch bentonite chips	
L.	Filter pack seal thickness:	NA	ft.
M.	Filter pack seal material:	NA	
N.	Sand pack thickness:	17.5	ft.
O.	Sand pack material:	CSSI 8-12 silica sand	
P.	Bottom material thickness:	1.3	ft.
Q.	Bottom material:	bentonite chips	
R.	Well casing hgt (stickup):	1.73	ft.
S.	Protective casing material:	Steel	
	Well centralizer depths:	24.3	ft.
T.	Protective casing diameter:	6	in.

NOTES:

Installed by: Anna St. John

Reviewed by: Colin Teodory

Date: 1/30/96

STATE OF OREGON
ORING WELL REPORT
d by ORS 537.765 & OAR 690-240-095)

MULT 4983

01N/03E/29AD

Start Card # 82033

WNER/PROJECT: WELL NO. MW-338
Cascade Corporation
PO Box 20187
City Portland State OR Zip 97220

(2) TYPE OF WORK:
☒ New construction ☐ Repair ☐ Recondition
☐ Conversion ☐ Deepening ☐ Abandonment

(3) DRILLING METHOD
☒ Rotary Air ☐ Rotary Mud ☐ Cable
☐ Hollow Stem Auger ☐ Other

(4) BORE HOLE CONSTRUCTION
Special Standards ☐ Yes ☒ No Depth of completed well 24.9 ft.

Monument 0 ft. TO 2 ft.
Seal 2 ft. TO 7.4 ft.
Filter pack 7.4 ft. TO 24.9 ft.

Locking cap
Protective casing
Protective post
Land surface
Cement monument
Casing: diameter 2 in. material SCH 40 PVC
Welded ☐ Threaded ☒ Glued ☐
Casing: diameter ____ in. material ____
Welded ☐ Threaded ☐ Glued ☐
Well seal: Material Hoedug 3/4 Chips Amount 3 bags
Borehole diameter 7 in.
Bentonite plug at least 2 ft. thick
Screen material SCH 40 PVC interval(s): From 10.2 To 24.3
From ____ To ____
Slot size .020 in.
Filter pack: Material CSI Sand Size 8-12 in.

(5) WELL TEST: N/A
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian
Permeability ____ Yield ____ GPM
Conductivity ____ PH ____
Temperature of water 57 °F °C Depth artesian flow found ____ ft.
Was water analysis done? ☐ Yes ☐ No
By whom? ____
Depth of strata to be analyzed. From ____ ft. to ____ ft.
Remarks: ____

Name of supervising Geologist/Engineer Anna St. John

(6) LOCATION OF WELL By legal description
Well Location County Multnomah
Township 1N (N or S) Range 3E (E or W) Section 29
1. SE 1/4 of NE 1/4 of above section
2. Street address of well location 2301 NE 201st Troutdale, OR
3. Tax lot number of well location 1000
4. ATTACH MAP WITH LOCATION IDENTIFIED.

(7) STATIC WATER LEVEL:
11.93 ft. below land surface. Date 8-11-95
Artesian Pressure ____ lb/sq. in. Date ____

(8) WATER BEARING ZONES:
Depth at which water was first found 16

Flow	To	Est. Flow Rate	SWL
16	24.7	5 gpm	11.93

(9) WELL LOG: Ground elevation ____

Material	From	To	SWL
Silt (ML)	0	3	
Silty gravel (GM)	3	7.5	
Sandy gravel (GP)	7.5	16	
Gravel with Silt	16	24.7	11.93
Sandy Siltstone	24.7	26.2	

RECEIVED SEP 19 1995 WATER RESOURCES DEPT. SALEM, OREGON
RECEIVED JAN - 9 1996 WATER RESOURCES DEPT. SALEM, OREGON

Date started 8/15/95 Completed 8/16/95

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.
Signed ____ MWC Number 0330 Date 8/29/95

(bonded) Monitor Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.
Signed John R. Skeen MWC Number 10076 Date 9-18-95

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

TGA MW-32s Well Log

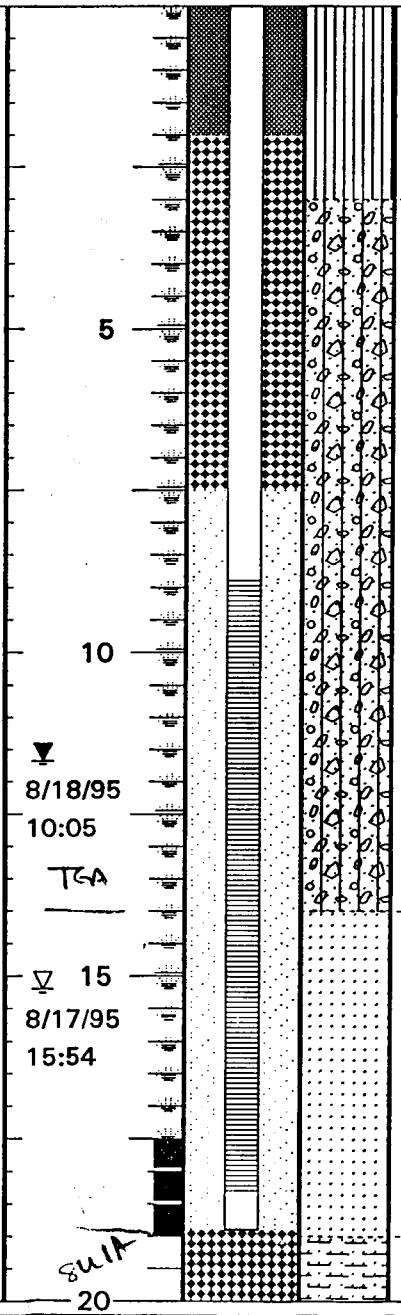
LOG OF EXPLORATORY BORING

PROJECT NAME	Cascade Corporation	BORING NO.	MW-32S
LOCATION	Troutdale, Oregon	PAGE	1 OF 2
DRILLED BY	Staco Well Services	GROUND ELEV.	122.00'
DRILL METHOD	Air Rotary	TOTAL DEPTH	24.00'
LOGGED BY	A. St. John	DATE COMPLETED	08/18/95

SAMPLE METHOD AND NUMBER	RECOVERY PERCENT / FID (ppm)	BLOWS PER 6 INCHES	LITHOLOGIC DESCRIPTION
G-1	-- / 0		**0 to 3.0 feet: SILT (ML),** dark yellowish brown (10YR 4/4); low plasticity; dry; trace roots and fine gravel. (TOPSOIL)
G-2	-- / 0		**3.0 to 14.0 feet: SANDY GRAVEL WITH SILT (GW-GM);** very dark grayish brown (10YR 3/2); 70 to 75 percent fine to coarse gravel, angular to subrounded; 15 to 20 percent fine to coarse sand; 10 to 15 percent nonplastic fines; damp; clast-supported. (TROUTDALE GRAVEL AQUIFER)
G-3	-- / 0		
G-4	-- / 0		
G-5	-- / 0		
G-6	-- / 0		
G-7	-- / 0		**14.0 to 19.0 feet: SANDSTONE (SS);** gray to brownish gray (10YR 3/1 to 4/3); fine to medium, subangular, tuffaceous, quartzose; moist to wet. (TROUTDALE GRAVEL AQUIFER)
SB-8	NR	18	@ 16.0 feet: water in the hole.
SB-9	--	50	
SB-10	100 / -- / 100	>50	**19.0 to 24.0 feet: CLAYEY SILTSTONE (SLT);** pale brown (10YR 6/3); medium plasticity; hard;

GROUND WATER LEVELS: ▼ 8/18/95 10:05 TGA; ▽ 15 8/17/95 15:54

DEPTH IN FEET: 5, 10, 15, 20

SAMPLES / WELL DETAILS / LITHOLOGIC COLUMN: 

REMARKS

(1) Grab samples (G) collected at 1.0-foot-intervals from the cyclone of the drill rig. Split barrel samples (SB) collected by driving a 2-inch-diameter sampler over a 1.5-foot-interval using a 300 pound hammer with a 30-inch stroke. (2) 7-inch-diameter hole was drilled with a down-hole hammer and threaded casing was driven. (3) Top of PVC casing elevation = 123.59 feet msl. (4) White triangle = approximate depth at which water was encountered during drilling. Black triangle = static water level in completed wells. (5) Organic vapor readings collected with a flame ionization detector calibrated with 98 percent methane.

EMCON

LOG OF EXPLORATORY BORING

PROJECT NAME	Cascade Corporation	BORING NO.	MW-32S
LOCATION	Troutdale, Oregon	PAGE	2 OF 2
DRILLED BY	Staco Well Services	GROUND ELEV.	122.00'
DRILL METHOD	Air Rotary	TOTAL DEPTH	24.00'
LOGGED BY	A. St. John	DATE COMPLETED	08/18/95

SAMPLE METHOD AND NUMBER	RECOVERY PERCENT FID (ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION
	--							fragments are damp. @ 19.0 feet: hole not producing water.
				25				Total depth drilled = 24.0 feet. Total depth sampled = 19.0 feet.
				30				**WELL COMPLETION DETAILS:** +1.59 to 8.9 feet: 2-inch-diameter, flush-threaded (with o-rings), Schedule 40 PVC blank riser pipe. 8.9 to 18.3 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots. 18.3 to 18.9 feet: 2-inch-diameter, flush-threaded, Schedule 40 sump. 18.4 feet: Stainless steel centralizer. 0 to 2.0 feet: Above-ground security casing set in 2 x 2 foot concrete pad. 2.0 to 7.5 feet: Holeplug 3/4 bentonite chips hydrated with potable water. 7.5 to 18.9 feet: CSSI 8 - 12 washed silica sand. 18.9 to 24.0 feet: Holeplug 3/4 bentonite chips.
				35				
				40				

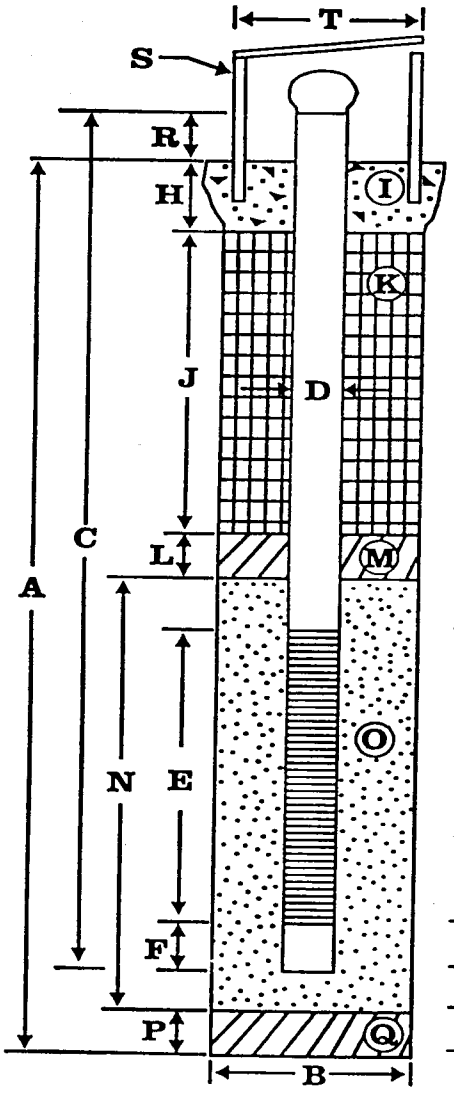
REMARKS

(1) Grab samples (G) collected at 1.0-foot-intervals from the cyclone of the drill rig. Split barrel samples (SB) collected by driving a 2-inch-diameter sampler over a 1.5-foot-interval using a 300 pound hammer with a 30-inch stroke. (2) 7-inch-diameter hole was drilled with a down-hole hammer and threaded casing was driven. (3) Top of PVC casing elevation = 123.59 feet msl. (4) White triangle = approximate depth at which water was encountered during drilling. Black triangle = static water level in completed wells. (5) Organic vapor readings collected with a flame ionization detector calibrated with 98 percent methane.

EMCON

WELL DETAILS

Project Number:	40683-003.012/7	Boring/Well No.:	MW-32S
Client Name:	Cascade Corporation	Top of Casing Elev.:	123.59
Project Name:	TGA Control Trench	Ground Surface Elev.:	122.00
Location:	Troutdale, Oregon	Installation Date:	8/18/95
Driller:	Staco Well Services	Permit/Start Card No.:	



	Depth (feet)	Elev. (ft, msl)
	+2.00	124.0
	+1.59	123.6
	0	122.0
	NA	NA
	7.5	114.5
	8.9	113.1
	18.3	103.7
	18.9	103.1
	18.9	103.1
	24.0	98.0

EXPLORATORY BORING

A.	Total depth:	24.00	ft.
B.	Diameter	7	in.
	Drilling method:	Air Rotary	

WELL CONSTRUCTION

C.	Well casing length:	20.49	ft.
	Well casing material:	PVC	
D.	Well casing diameter:	2	in.
E.	Well screen length:	9.4	ft.
	Well screen type:	machined slots	
	Well screen slot size:	0.020	
F.	Well sump/end cap length:	0.6	ft.
G.	Well casing height (stickup):	1.59	ft.
H.	Surface seal thickness:	2	ft.
I.	Surface seal material:	Concrete	
J.	Annular seal thickness:	5.5	ft.
K.	Annular seal material:	3/4-inch bentonite chips	
L.	Filter pack seal thickness:	NA	ft.
M.	Filter pack seal material:	NA	
N.	Sand pack thickness:	11.4	ft.
O.	Sand pack material:	CSSI 8-12 silica sand	
P.	Bottom material thickness:	5.1	ft.
Q.	Bottom material:	bentonite chips	
R.	Well casing hgt (stickup):	1.59	ft.
S.	Protective casing material:	Steel	
	Well centralizer depths:	18.4	ft.
T.	Protective casing diameter:	6	in.

NOTES:

Installed by: Anna St. John

Reviewed by: Colin Teodoru

Date: 1/30/96

PJ:\GEOLOGY\CASCADE\0683-003.012\MW32WLDT.DOC\AMS

STATE OF OREGON
MONITORING WELL REPORT
(As required by ORS 537.765 & OAR 690-240-095)

MULT 4982

01N/03E/29AD

Start Card # 82032

(1) OWNER/PROJECT: WELL NO. MW-3RS

Name Cascade Corporation

Address P.O. Box 20187

City Portland State OR Zip 97220

(2) TYPE OF WORK:

☒ New construction ☐ Repair ☐ Recondition
☐ Conversion ☐ Deepening ☐ Abandonment

(3) DRILLING METHOD

☒ Rotary Air ☐ Rotary Mud ☐ Cable
☐ Hollow Stem Auger ☐ Other

(4) BORE HOLE CONSTRUCTION

Special Standards Yes ☐ No ☒ Depth of completed well 18.9 ft.

Monument 0 ft. TO 2 ft.
Seal 2 ft. TO 7.5 ft.
Filter pack 7.5 ft. TO 18.9 ft.

Locking cap
Protective casing
Protective post
Land surface
Cement grout
Casing: diameter 2 in. material SCH40 PVC
Welded ☐ Threaded ☒ Glued ☐
Liner: diameter ____ in. material ____
Welded ☐ Threaded ☐ Glued ☐
Well seal: Material Hydrated Bentonite Chips Amount 25 lbs
Borehole diameter ____ in.
Bentonite plug at least 2 ft. thick
Screen material SCH40 PVC
interval(s): From 8.9 To 18.3
Perfs ____ To ____
Slot size .020 in.
Filter pack: Material CSST Sand Size 8/12 in.

(5) WELL TEST: N/A

☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Permeability ____ Yield ____ GPM
Conductivity ____ PH ____
Temperature of water 57 °F °C Depth artesian flow found ____ ft.
Was water analysis done? ☐ Yes ☐ No
By whom? ____
Depth of strata to be analyzed. From ____ ft. to ____ ft.
Remarks: ____

Name of supervising Geologist/Engineer Anna St. John

(6) LOCATION OF WELL By legal description

Well Location: County Multnomah
Township 1N (N or S) Range 3E (E or W) Section 29
1. SE 1/4 of NE 1/4 of above section
2. Street address of well location 3801 NE 201st Troutdale, OR
3. Tax lot number of well location 1005
4. ATTACH MAP WITH LOCATION IDENTIFIED.

(7) STATIC WATER LEVEL:

11.67 ft. below land surface. Date 8/18/95
Artesian Pressure ____ lb/sq. in. Date ____

(8) WATER BEARING ZONES:

Depth at which water was first found 14

From	To	Est. Flow Rate	SWL
14	19	< 1 gpm	11.67

(9) WELL LOG: Ground elevation ____

Material	From	To	SWL
Silt (ML)	0	3	
Sandy gravel (GW)	3	14	
Sand (SP)	14	16	
Sandy clay (CL)	16	19	
Clayey Siltstone	19	24	

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SEP 19 1995
WATER RESOURCES DEPT.
SALEM, OREGON

RECEIVED
JAN - 8 1996
WATER RESOURCES DEPT.
SALEM, OREGON

Date started 8/17/95 Completed 8/18/95

(unbonded) Monitor Well Constructor Certification:
I certify that all work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

Signed [signature] MWC Number 10226 Date 8/29/95

(bonded) Monitor Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

Signed [signature] MWC Number 10096 Date 9-18-95

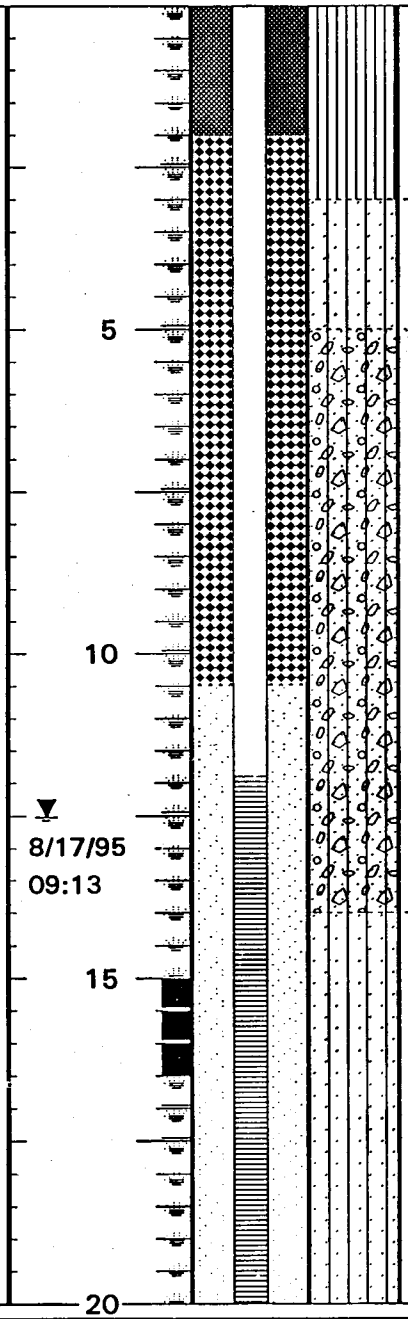
ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

TGA MW-31s Well Log

LOG OF EXPLORATORY BORING

PROJECT NAME	Cascade Corporation	BORING NO.	MW-31S
LOCATION	Troutdale, Oregon	PAGE	1 OF 2
DRILLED BY	Staco Well Services	GROUND ELEV.	122.00'
DRILL METHOD	Air Rotary	TOTAL DEPTH	24.00'
LOGGED BY	A. St. John	DATE COMPLETED	08/17/95

SAMPLE METHOD AND NUMBER	RECOVERY PERCENT FID (ppm)	BLOWS PER 6 INCHES
G-1	-- / 0	
G-2	-- / 0	
G-3	-- / 0	
G-4	-- / 0	
G-5	-- / 0	
G-6	-- / 0	
SB-7	NR	
SB-8	--	
SB-9	NR / -- / NR	>50
G-10	-- / -- / 0	



LITHOLOGIC DESCRIPTION

0 to 3.0 feet: SILT (ML); brown (7.5YR 5/3) to strong brown (7.5YR 4/6); low to medium plasticity fines; dry; trace coarse sand; trace roots. (TOPSOIL)

3.0 to 5.0 feet: SILTY SAND (SM); dark brown (7.5YR 3/2); 70 percent fine to coarse (70:20:10) sand, primarily mafic; 20 percent low plasticity fines; 10 percent fine gravel, subrounded; dry.

5.0 to 14.0 feet: SANDY GRAVEL WITH SILT (GW-GM); very dark grayish brown (10YR 3/2); 65 to 70 percent fine to coarse gravel, subangular to subrounded, primarily mafic; 15 to 20 percent fine to coarse (50:30:20) sand, micaceous; 5 to 10 percent nonplastic fines; dry; massive; clast supported. (TROUTDALE GRAVEL AQUIFER)

@ 6.5 feet: drilling through cobble or boulder.

@ 10.0 feet: cuttings are moist.

14.0 to 22.0 feet: GRAVELLY SAND WITH SILT (SP-SM); light olive brown (2.5Y 5/3-5/4); 75 percent fine to medium sand, primarily quartz; 20 percent fine gravel, subrounded; 10 to 15 percent medium plasticity fines coating gravel; moist to wet. (TROUTDALE GRAVEL AQUIFER)

@ 17.5 feet: fines increase to 20 percent.

REMARKS

(1) Greb samples (G) collected at 1.0-foot-intervals from the cyclone of the drill rig. Split barrel samples (SB) collected by driving a 2-inch-diameter sampler over a 1.5-foot-interval using a 300 pound hammer with a 30-inch stroke. (2) 7-inch-diameter hole was drilled with a down-hole hammer and threaded casing was driven. (3) Top of PVC casing elevation = 123.73 feet msl. (4) White triangle = approximate depth at which water was encountered during drilling. Black triangle = static water level in completed wells. (5) Organic vapor readings collected with a flame ionization detector calibrated with 98 percent methane.

EMCON

LOG OF EXPLORATORY BORING

PROJECT NAME	Cascade Corporation	BORING NO.	MW-31S
LOCATION	Troutdale, Oregon	PAGE	2 OF 2
DRILLED BY	Staco Well Services	GROUND ELEV.	122.00'
DRILL METHOD	Air Rotary	TOTAL DEPTH	24.00'
LOGGED BY	A. St. John	DATE COMPLETED	08/17/95

SAMPLE METHOD AND NUMBER	RECOVERY PERCENT FID (ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION
SB-11 SB-12 SB-13	100 -- 100 -- 100 --	26 50 36	▽ 8/16/95 17:08	25 30 35 40	TGA Cu1			**14.0 to 22.0 feet: GRAVELLY SAND WITH SILT (SP-SM);** continued. - Cu1 @ 22 ft in Sump 4 - Trench

Total depth drilled = 24.0 feet.
Total depth sampled = 21.5 feet.

WELL COMPLETION DETAILS:

+1.73 to 11.9 feet: 2-inch-diameter, flush-threaded (with o-rings), Schedule 40 PVC blank riser pipe.
11.9 to 21.1 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots.
21.1 to 21.7 feet: 2-inch-diameter, flush-threaded, Schedule 40 sump.
21.2 feet: Stainless steel centralizer.

0 to 2.0 feet: Above-ground security casing set in 2 x 2 foot concrete pad.
2.0 to 10.5 feet: Holeplug 3/4 bentonite chips hydrated with potable water.
10.5 to 21.7 feet: CSSI 8 - 12 washed silica sand.
21.7 to 24.0 feet: Holeplug 3/4 bentonite chips.

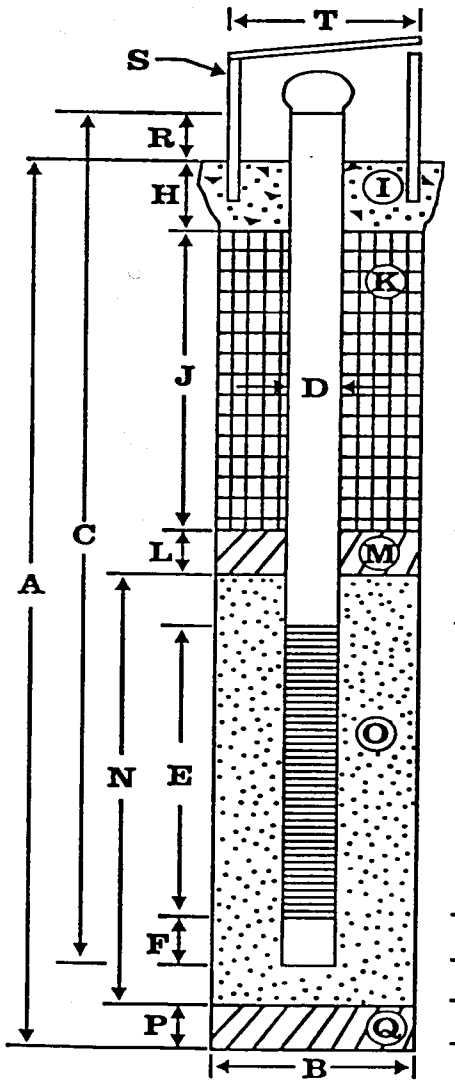
REMARKS

(1) Grab samples (G) collected at 1.0-foot-intervals from the cyclone of the drill rig. Split barrel samples (SB) collected by driving a 2-inch-diameter sampler over a 1.5-foot-interval using a 300 pound hammer with a 30-inch stroke. (2) 7-inch-diameter hole was drilled with a down-hole hammer and threaded casing was driven. (3) Top of PVC casing elevation = 123.73 feet msl. (4) White triangle = approximate depth at which water was encountered during drilling. Black triangle = static water level in completed wells. (5) Organic vapor readings collected with a flame ionization detector calibrated with 98 percent methane.

EMCON

WELL DETAILS

Project Number:	40683-003.012/7	Boring/Well No.:	MW-31S
Client Name:	Cascade Corporation	Top of Casing Elev.:	123.73
Project Name:	TGA Control Trench	Ground Surface Elev.:	122.00
Location:	Troutdale, Oregon	Installation Date:	8/17/95
Driller:	Staco Well Services	Permit/Start Card No.:	



	Depth (feet)	Elev. (ft, msl)
	+2.04	124.0
	+1.73	123.7
	0	122.0
	NA	NA
	10.5	111.5
	11.9	110.1
	21.1	100.9
	21.7	100.3
	21.7	100.3
	24.0	98.0

EXPLORATORY BORING

A. Total depth:	24.00	ft.
B. Diameter	7	in.
Drilling method:	Air Rotary	

WELL CONSTRUCTION

C. Well casing length:	23.43	ft.
Well casing material:	PVC	
D. Well casing diameter:	2	in.
E. Well screen length:	9.2	ft.
Well screen type:	machined slots	
Well screen slot size:	0.020	
F. Well sump/end cap length:	0.6	ft.
G. Well casing height (stickup):	1.73	ft.
H. Surface seal thickness:	2	ft.
I. Surface seal material:	Concrete	
J. Annular seal thickness:	8.5	ft.
K. Annular seal material:	3/4-inch bentonite chips	
L. Filter pack seal thickness:	NA	ft.
M. Filter pack seal material:	NA	
N. Sand pack thickness:	11.2	ft.
O. Sand pack material:	CSSI 8-12 silica sand	
P. Bottom material thickness:	2.3	ft.
Q. Bottom material:	bentonite chips	
R. Well casing hgt (stickup):	1.73	ft.
S. Protective casing material:	Steel	
Well centralizer depths:	21.2	ft.
T. Protective casing diameter:	6	in.

NOTES:

Installed by: Anna St. John

Reviewed by: Colin Teodoru

Date: 1/29/96

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STATE OF OREGON
MONITORING WELL REPORT
(As required by ORS 537.765 & OAR 690-240-095)

MULT 4981

1N1038129AD

Start Card # 82031

(1) OWNER/PROJECT:

WELL NO. MW-31S

Name Cascade Corporation

Address PO Box 20187

City Portland State OR Zip 97220

(2) TYPE OF WORK:

✓ [X] New construction [ ] Repair [ ] Recondition
[ ] Conversion [ ] Deepening [ ] Abandonment

(3) DRILLING METHOD

[X] Rotary Air [ ] Rotary Mud [ ] Cable
[ ] Hollow Stem Auger [ ] Other

(4) BORE HOLE CONSTRUCTION

Special Standards: Yes [ ] No [X]

Depth of completed well 21.7 ft.

Protective casing — Locking cap — Protective post — Land surface

Monument: 0 ft. TO 2 ft.

Seal: 2 ft. TO 10.5 ft.

Filter pack: 10.5 ft. TO 21.7 ft.

Cement monument

Casing: diameter 2 in. material SCH40 PVC
Welded [ ] Threaded [X] Glued [ ]

Liner: diameter ____ in. material ____
Welded [ ] Threaded [ ] Glued [ ]

Well seal: Material Hole plug 3/4 bent. Amount 3 bags

Borehole diameter 7 in.

Bentonite plug at least 2 ft. thick

Screen: material SCH40 PVC interval(s): From 11.7 To 21.7
From ____ To ____
Slot size .020 in.

Filter pack: Material CSST Sand Size 8-12 in.

(5) WELL TEST: N/A

[ ] Pump [ ] Bailer [ ] Air [ ] Flowing Artesian

Permeability ____ Yield ____ GPM

Conductivity ____ PH ____

Temperature of water 57 °F Depth artesian flow found ____ ft.

Was water analysis done? [ ] Yes [ ] No

By whom? ____

Depth of strata to be analyzed. From ____ ft. to ____ ft.

Remarks: ____

Name of supervising Geologist/Engineer Anna St. John

(6) LOCATION OF WELL By legal description

Well Location: County Multnomah

Township 1N (N or S) Range 3E (E or W) Section 29

1. SE 1/4 of NE 1/4 of above section.
2. Street address of well location 2501 NE 201st Troutdale, OR
3. Tax lot number of well location 1800
4. ATTACH MAP WITH LOCATION IDENTIFIED.

(7) STATIC WATER LEVEL:

12.52 ft. below land surface. Date 8/17/95

Artesian Pressure ____ lb/sq. in. Date ____

(8) WATER BEARING ZONES:

Depth at which water was first found: ____

From	To	Est. Flow Rate	SWL
14	22	5+ gpm	12.52

(9) WELL LOG:

Ground elevation ____

Material	From	To	SWL
Silt (ML)	0	3	
Silty sand (SM)	3	5	
Sandy gravel (GW)	5	14	
Sandy clay	14		12.52
sand (SC)		22	
Sandy clay (CL)	22	24	

RECEIVED
SEP 19 1995
WATER RESOURCES DEPT.
SALEM, OREGON

RECEIVED
JAN 9 1996
WATER RESOURCES DEPT.
SALEM, OREGON

Date started 8/16/95 Completed 8/17/95

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

MWC Number 1082C

Signed ____ Date 9/29/95

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

MWC Number 1096

Signed ____ Date 9-18-95

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

TGA EX-1 Well Log

EX-1 use to be MW-28s

LOG OF EXPLORATORY BORING

EX-1

PROJECT NAME CASCADE CORPORATION
LOCATION Troutdale, Oregon
DRILLED BY Tacoma Pump and Drilling
DRILL METHOD Air Rotary
LOGGED BY Karin Haderly

BORING NO. MW-28S
PAGE 1 OF 2
REFERENCE ELEV. 142.57'
TOTAL DEPTH 27.40'
DATE COMPLETED 9/16/94

SAMPLE NUMBER SAMPLE TYPE	RECOVERY PERCENT	BLOW COUNTS	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHO LOGIC COLUMN	LITHOLOGIC DESCRIPTION
Grab				5				0-0.3 feet: ASPHALT.
Grab				10				0.3-17.5 feet: WELL GRADED GRAVEL WITH SILT (GW-GM), dark gray with brownish coating of silt, subrounded to well rounded gravels, predominantly basalt, trace quartzite, some non-plastic fines, few fine to coarse sand, damp to wet with depth. (UNCONSOLIDATED GRAVEL)
Grab				15				
			▽ 17.0' 9/16/94					17.5-24.0 feet: WELL GRADED GRAVEL WITH SAND (GW), dark gray, rounded to subrounded gravels, predominantly basalt with trace quartzite, little well graded sand, trace fines, wet. (TROUTDALE GRAVEL AQUIFER)
Grab				20				
Grab				25				24.0-27.4 feet: SANDY GRAVEL (GW), dark gray brown, fine to coarse subrounded to rounded gravels, some fine to coarse sand, trace fines, wet.
				30				Bottom of boring at 27.4 feet below ground surface.
				35				
				40				

WELL COMPLETION DETAILS:

0 to 10.4 feet: 4-inch-diameter, stainless steel blank casing.
10.4 to 25.0 feet: 4-inch-diameter, stainless steel screen with 0.010-inch continuous V-wire screen.
25.0 to 25.4 feet: 4-inch-diameter stainless steel sump.
0 to 2.0 feet: Concrete.

REMARKS

1)Top of stainless steel casing elevation = 142.10' NGVD. 3)Reference elevation is ground elevation.

EMCON

LOG OF EXPLORATORY BORING

EX-1

PROJECT NAME **CASCADE CORPORATION**
LOCATION **Troutdale, Oregon**
DRILLED BY **Tacoma Pump and Drilling**
DRILL METHOD **Air Rotary**
LOGGED BY **Karin Haderly**

BORING NO. **MW-28S**
PAGE **2 OF 2**
REFERENCE ELEV. **142.57'**
TOTAL DEPTH **27.40'**
DATE COMPLETED **9/16/94**

SAMPLE NUMBER SAMPLE TYPE	RECOVERY PERCENT	BLOW COUNTS	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHO LOGIC COLUMN	LITHOLOGIC DESCRIPTION
				45				2.0 to 8.3 feet: Bentonite chips hydrated with potable water. 8.3 to 27.4 feet: 8x12 Colorado silica sand. 10.4 & 25.0 feet: Stainless steel centralizers.
				50				
				55				
				60				
				65				
				70				
				75				
				80				

REMARKS

1)Top of stainless steel casing elevation = 142.10' NGVD. 3)Reference elevation is ground elevation.

EMCON

STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OAR 690-240-095)

NOV 03 1994

MULT 44115

1N/3E/28BC

Start Card # 60363

(1) OWNER/PROJECT:

WELL NO. MW-8

WATER RESOURCES DEPT. SALEM, OREGON

Name CASCADE CORPORATION

Address PO BOX 20187

City PORTLAND State ORE Zip 97220

(2) TYPE OF WORK:

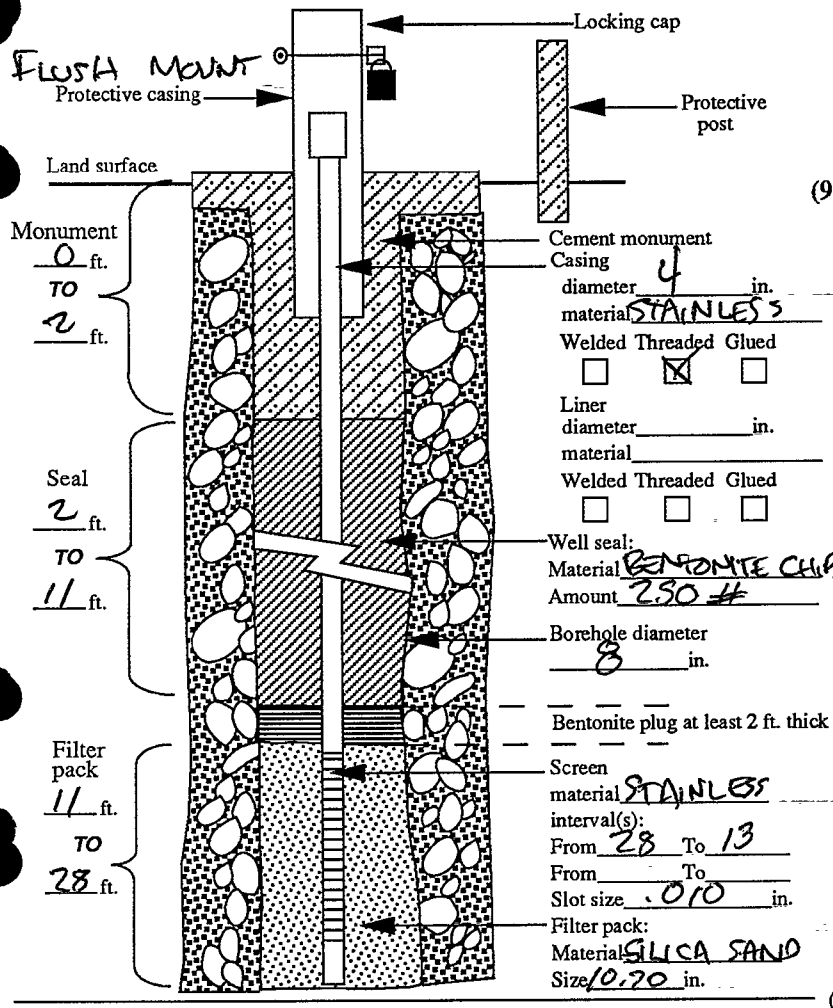
- [X] New construction
- [ ] Repair
- [ ] Recondition
- [ ] Conversion
- [ ] Deepening
- [ ] Abandonment

(3) DRILLING METHOD

- [X] Rotary Air
- [ ] Rotary Mud
- [ ] Cable
- [ ] Hollow Stem Auger
- [ ] Other

(4) BORE HOLE CONSTRUCTION

Special Standards Yes [ ] No [X] Depth of completed well 28 ft.



(5) WELL TEST:

- [ ] Pump
- [ ] Bailer
- [ ] Air
- [ ] Flowing Artesian

Permeability Yield GPM

Conductivity PH

Temperature of water 51 (F)/C Depth artesian flow found ft.

Was water analysis done? [X] Yes [ ] No

By whom? EMCON NW

Depth of strata to be analyzed. From ft. to ft.

Remarks:

Name of supervising Geologist/Engineer KAREN HATFIELD/EMCON

(6) LOCATION OF WELL By legal description

Well Location: County MULTNOMAH

Township 1 (N) or S) Range 3 (E) or W) Section 28

1. SW 1/4 of NW 1/4 of above section.
2. Street address of well location 201ST & I-84 2201 NE 201ST AVE TROUTDALE, OR.
3. Tax lot number of well location
4. ATTACH MAP WITH LOCATION IDENTIFIED.

(7) STATIC WATER LEVEL:

18 Ft. below land surface. Date

Artesian Pressure lb/sq. in. Date

(8) WATER BEARING ZONES:

Depth at which water was first found 18'

From	To	Est. Flow Rate	SWL

(9) WELL LOG:

Ground elevation

Material	From	To	SWL
ASPHALT	0	1'	
SILTY SAND FINE TO	1		
MED. GRAVELS			
TRACE COBBLES		28	
WET @ 18'			

RECEIVED
JAN 20 1995
WATER RESOURCES DEPT.
SALEM, OREGON

Date started 9.16.94 Completed 9.16.94

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

MWC Number

Signed Date

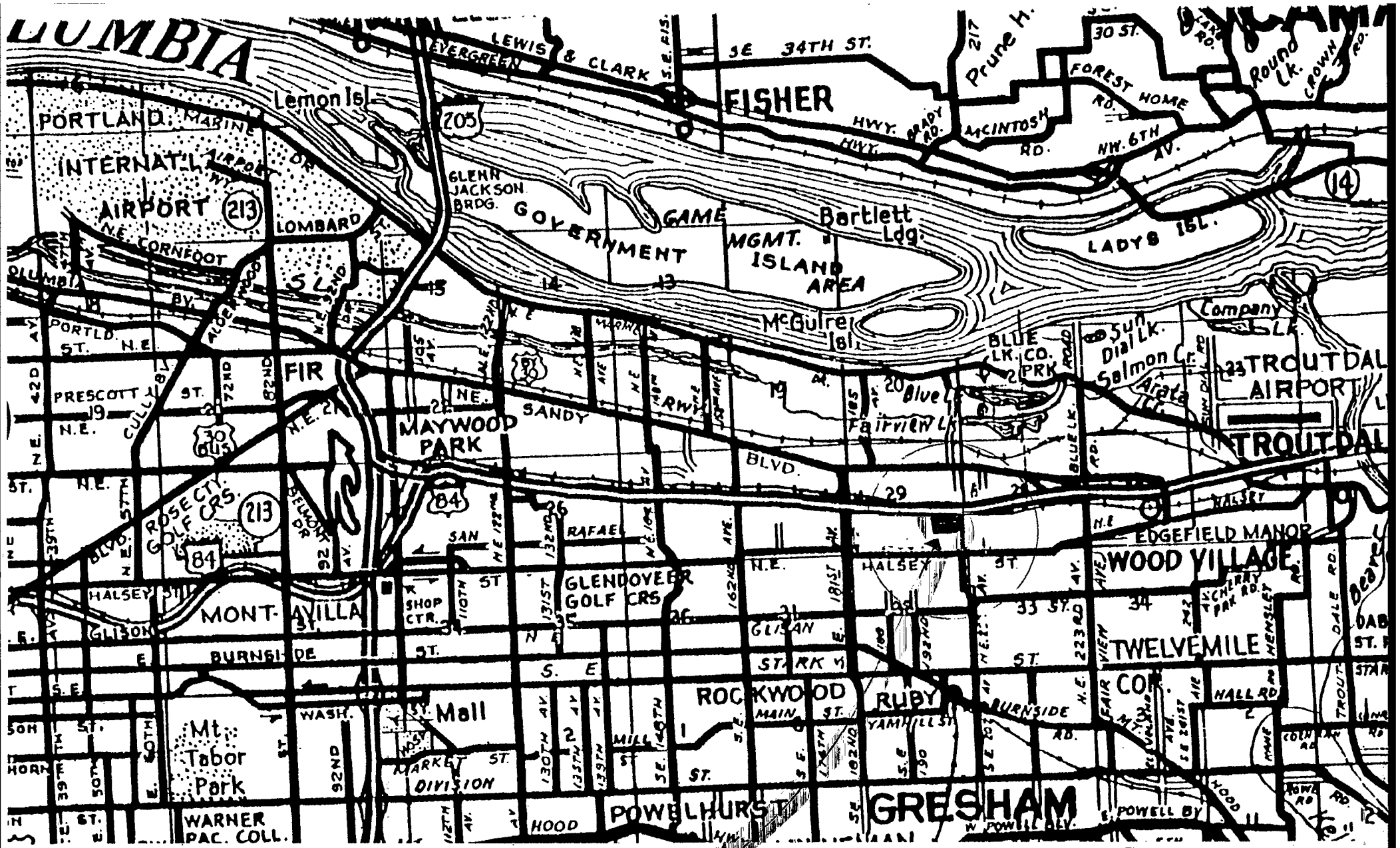
(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

MWC Number 1006.7

Signed Date 11.1.94

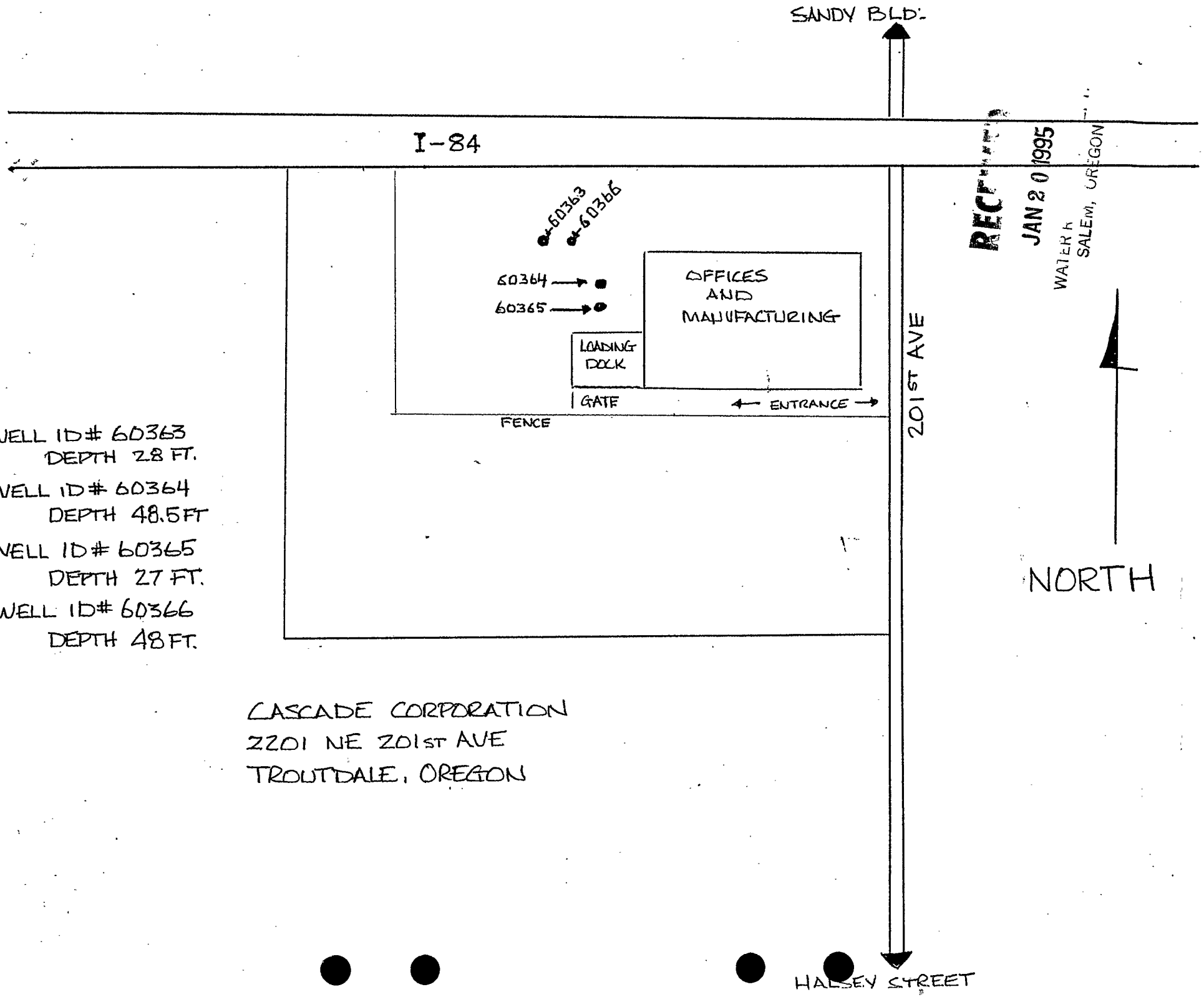
ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER



CASCADE CORPORATION
2201 NE. 201 ST AVE
TROUTDALE, OREGON

NORTH

RECEIVED
JAN 20 1995
WATER RESOURCES
SALEM, OREGON



1. WELL ID# 60363
   DEPTH 28 FT.
2. WELL ID# 60364
   DEPTH 48.5 FT
3. WELL ID# 60365
   DEPTH 27 FT.
4. WELL ID# 60366
   DEPTH 48 FT.

CASCADE CORPORATION
2201 NE 201ST AVE
TROUTDALE, OREGON

TGA B-5 Well Log

DM 6/13/95

LOG OF EXPLORATORY BORING

PROJECT NAME Cascade RI/FS
LOCATION Troutdale, Oregon
DRILLED BY Staco Well Services
DRILL METHOD Air Rotary - TUBEX
LOGGED BY Greg Eiche

BORING NO. B-5
PAGE 1 OF 2
119.7 — GROUND ELEV. 116.10'
(Jan '96 Resurvey) TOTAL DEPTH 17.00'
DATE COMPLETED 09/09/93

SAMPLE NUMBER	SAMPLE TYPE	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	LITHOLOGIC COLUMN	PIEZOMETER DETAILS	LITHOLOGIC DESCRIPTION
							0 to 4.5 feet: SILTY SAND (SM), light brown, some gravel, dry. (TOPSOIL)
							@ 2.0 feet: boulder.
1	C		5				4.5 to 8.0 feet: GRAVEL (GP), black to brown with white grains, fine, subrounded. Predominantly basalt and quartzite. (TROUTDALE GRAVEL AQUIFER)
		▽ 9/13/93					
2	C						8.0 to 14.0 feet: SAND (SP), grayish brown, medium to coarse, subangular to subrounded. Predominantly sandstone fragments with trace red and amber grains.
3	C		10				@ 10.0 feet: color change to dark olive gray, trace fine gravel.
							@ 13.0 feet: increasing gravel content.
4	C						14.0 to 15.0 feet: GRAVELLY SAND (SP), dark olive gray, medium to coarse, fine gravel.
			15				15.0 to 16.5 feet: SANDY GRAVEL (GP), olive gray, fine, medium to coarse sand. Predominantly sandstone with some siltstone.
TGA CUT SAMPLE		▽ 9/9/93					16.5 to 17.0 feet: SILTSTONE, pale yellow, some medium to coarse sand. (CONFINING UNIT 1)
							Total depth drilled = 17.0 feet.
							Total depth sampled = 17.0 feet.
							See Page 2 of 2 for Piezometer Completion Details.
			20				

REMARKS

(1) Boring was drilled with a 6-inch diameter TUBEX bit and casing. (2) Samples were collected with a fine mesh sieve from drill cuttings at cyclone discharge. (3) Water was added to borehole during drilling. (4) Boring backfilled to surface with bentonite chips which were hydrated with potable water from driller's support truck. (5) Top of casing elevation = 118.56 ft. MSL.

EMCON Northwest, Inc.

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51324267

LOG OF EXPLORATORY BORING

PROJECT NAME Cascade RI/FS
LOCATION Troutdale, Oregon
DRILLED BY Staco Well Services
DRILL METHOD Air Rotary - TUBEX
LOGGED BY Greg Eiche

BORING NO. B- 5
PAGE 2 OF 2
119.7 (Jan '00 Resurvey) — GROUND ELEV. 116.10'
TOTAL DEPTH 17.00'
DATE COMPLETED 09/09/93

SAMPLE NUMBER	SAMPLE TYPE	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	LITHOLOGIC COLUMN	PIEZOMETER DETAILS	LITHOLOGIC DESCRIPTION
			25				PIEZOMETER COMPLETION DETAILS: +2.4 to 12.0 feet: Schedule 40 PVC blank casing. 12.0 to 17.0 feet: Schedule 40 PVC screen with 0.020-inch machined slots. 0 to 0.5 foot: Concrete. 0.5 to 10.5 feet: Hydrated bentonite chips. 10.5 to 17.0 feet: 8 - 12 Colorado Silica Sand.
			30				
			35				
			40				

REMARKS

(1) Boring was drilled with a 6-inch diameter TUBEX bit and casing. (2) Samples were collected with a fine mesh sieve from drill cuttings at cyclone discharge. (3) Water was added to borehole during drilling. (4) Boring backfilled tosurface with bentonite chips which were hydrated with potable water from driller's support truck. (5) Top of casing elevation = 118.58 ft. MSL.

STATE OF OREGON

MONITORING WELL REPORT

(as required by ORS 537.765 & OR 690-240-095)

MULT 54767

N/A

Start Card # 58110

Instructions for completing this report are on the last page of this form.

(1) OWNER/PROJECT:

WELL NO. B-5

Name Cascade Corporation

Address PO. box 20187

City Portland State OR Zip 97220

(2) TYPE OF WORK:

☒ New construction ☐ Alteration (Repair/Recondition)

☐ Conversion ☐ Deepening ☐ Abandonment

(3) DRILLING METHOD

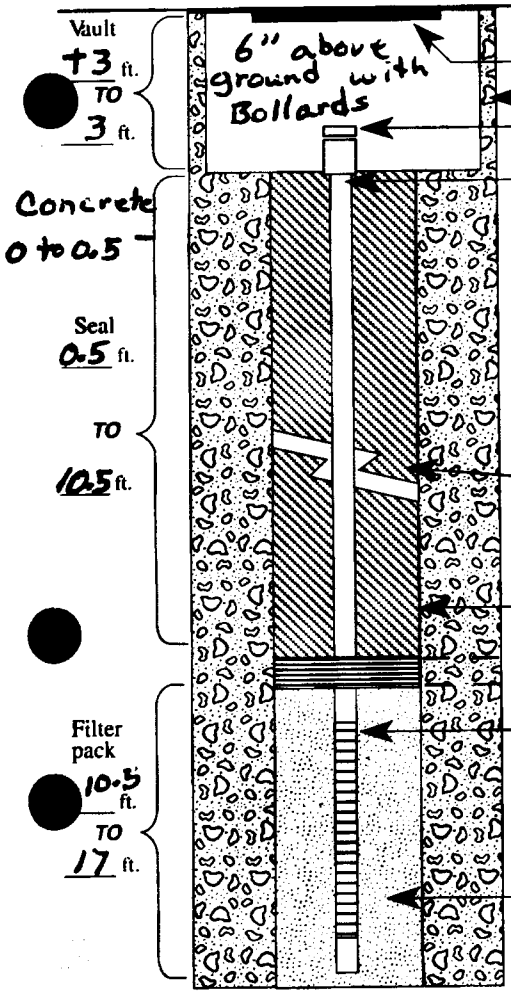
☒ Rotary Air ☐ Rotary Mud ☐ Cable

☐ Hollow Stem Auger ☐ Other

(4) BORE HOLE CONSTRUCTION

Special Standards ☐ Yes ☒ No

Depth of completed well 17 ft.



Casing diameter 2 in.

material sch 40 PVC

Welded ☐ Threaded ☒ Glued ☐

Liner diameter N/A in.

material

Welded ☐ Threaded ☐ Glued ☐

Well seal:

Material bent chips

Amount 4 sacks

Grout weight N/A

Borehole diameter 7 in.

Bentonite plug at least 3 ft. thick

Screen material sch 40 PVC

interval(s): From 12 To 17

From To

Slot size 0.020 in.

Filter pack: Material CSSI

Size 8-12 in.

(5) WELL TEST: N/A

☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Permeability Yield GPM

Conductivity PH

Temperature of water 56 °F/C Depth artesian flow found ft.

Was water analysis done? ☐ Yes ☒ No

By whom?

Depth of strata to be analyzed. From ft. to ft.

Remarks:

(6) LOCATION OF WELL By legal description

Well Location: County Multnomah

Township 1N (N or S) Range 3E (E or W) Section 29

1. NE 1/4 of SE 1/4 of above section.

2. Either Street address of well location 2 blks south of sandy blvd on 201st

or Tax lot number of well location 35

3. ATTACH MAP WITH LOCATION IDENTIFIED. Map shall include approximate scale and north arrow.

(7) STATIC WATER LEVEL:

9 Ft. below land surface. Date 9-13-93

Artesian Pressure lb/sq. in. Date

(8) WATER BEARING ZONES:

Depth at which water was first found 9

From	To	Est. Flow Rate	SWL
9	17	N/A	9

(9) WELL LOG:

Ground elevation 116.10'

Material	From	To	SWL
Silty sand lt brwn	0	4.5	
gravel blk/brwn	4.5	8	
Sand grayish brwn	8	14	9
gravelly sand drk	14		
olive gray		15	
Sandy gravel olive gray	15	16.5	
Siltstone pale yellow	16.5	17	

RECEIVED

FEB 17 1998

WATER RESOURCES DEPT.

SALEM, OREGON

Date started 9-9-93 Completed 9-9-93

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief. MWC Number 1030

Signed Curtis Allen Date

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well constructio standards. This report is true to the best of my knowledge and belief. MWC Number 1009