



7001 396th Southeast
Snoqualmie, Washington 98065
Tel (206) 888 2511

April 22, 1991

RECEIVED

APR 26 1991

DEPT. OF ECOLOGY

Mr. Joseph Hickey
Contaminated Site Inspector
Washington State Department of Ecology
Northwest Regional Office
3190 160th Avenue S.E.
Bellevue, WA 98008-5452

RE: Snoqualmie Petroleum Contamination

Dear Mr. Hickey:

The attached Technical Memorandum 07 is an additional follow-up report to the initial release report sent to you on September 6, 1989, and the memorandum forwarded on February 27, 1990.

Weyerhaeuser will continue with the on going monitoring in both areas, No. 1 and No. 2, to further assess the effectiveness of remedial actions completed to date.

Very truly yours,

WEYERHAEUSER COMPANY
Cascade Operations

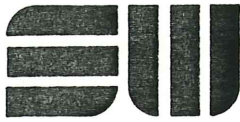
A handwritten signature in blue ink that reads 'Obe M Healea Jr'.

Obe M. Healea, Jr.
Environmental/Project Manager

OH:cs

xc: Mr. K. Tjaden, Olympus Environmental, Inc.
Mr. Ken Johnson CH1K3

Attachments



SHANNON & WILSON, INC.

Geotechnical Consultants
Engineering and Applied Geosciences

*Interim report
Soil & Groundwater
5/2/91*

*Over
35 Years of
Excellence*

400 North 34th Street, Suite 100 • P.O. Box C-30313 • Seattle, WA 98103 • (206) 632-8020 • Fax: (206) 547-0386

The Weyerhaeuser Company
7001 396th Southeast
Snoqualmie, Washington 98065

March 7, 1991

Attention: Mr. Obe M. Helea, Jr.
Area Engineer

Subject: Technical Memorandum 07
Executive Summary of Subsurface Groundwater Conditions at Area No. 1
and No. 2.

Reference: Former Underground Storage Tank and Above Ground Road Oil Storage
Tank Facilities
Technical Memorandum 01, 02, 03, 04, 05 & 06
Weyerhaeuser's Snoqualmie Falls Sawmill Facility
Snoqualmie, WA.

Enclosed you will find Shannon and Wilson's, Inc. (S&W's) Technical Memorandum 07 which contains an executive summary of the results from the continued groundwater investigation at Area No. 1 during November 16 - 19, 1990. This Technical Memorandum contains the analytical results of soil samples collected during our investigation as well as the groundwater sampling conducted on December 7, 1991 at Area No. 1 and No. 2.

If you have any questions or comments regarding this material, please contact Mr. Tjaden at (206) 854-5094 or myself at (206) 632-8020.

Respectfully,

SHANNON AND WILSON, INC.

Robert Colombo
Project Manager

Seattle • Everett • Fairbanks • Anchorage • St. Louis

PRESIDENT: Earl A. Sibley, P.E.
SR. VICE PRESIDENT: Atef A. Azzam; Raymond P. Miller, P.E.; Harvey W. Parker, P.E.; George Yamane, P.E.
VICE PRESIDENT: Herman H. (Tex) Druebert, P.E.; Richard H. Gates, P.E.; W. Paul Grant, P.E.; Leland B. Jones, P.E.;
Thomas E. Kirkland, P.E.; Gerry Millar, R.G.; Frank W. Pita, P.E., P.G.; Ming-Jiun (Jim) Wu, P.E.
CONSULTANT: William L. Shannon, P.E.

enclosures:

Figure 1, Site Plan

Figure 2, Area No. 1

Tables 1, 2, and 3; Analytical Results

cc: K. Tjaden, Olympus Environmental, Inc.

TECHNICAL MEMORANDUM 07**CONTINUED GROUNDWATER INVESTIGATION AND ANALYSIS AT AREA****No. 1 AND No. 2****CASCADE DIVISION'S SNOQUALMIE SAWMILL FACILITY****SNOQUALMIE, WASHINGTON**INTRODUCTION

The purpose of Technical Memorandum 07 is to transmit the details and results of the continued groundwater investigation conducted at Area No. 1. This services was requested by The Weyerhaeuser Company in response to elevated levels of benzene, toluene, ethylbenzene and xylenes in MW-001-03 at Area No.1. Area No.1 was the former underground storage tank location within the Snoqualmie Sawmill Facility.

Additional reference to activities at these location can be found in Technical Memorandum 01, 02, 03, 04, 05 & 06.

GROUNDWATER CONDITIONSArea No.1: March 1990

As described in Technical Memorandum 04 (Dated May 15, 1990), four of the 13 soil borings at Area No. 1 were converted into permanent groundwater monitoring wells which comply with Federal Environmental Protection Agency (EPA) and Washington State Department of Ecology (WDOE) leaking Underground Storage Tank (UST) guidelines.

Groundwater measurements taken on March 19, 1990 indicated that the apparent groundwater direction at Area No. 1 was in a southeasterly direction with an approximate gradient of 1.5%. Groundwater samples obtained on March 21 through 23, 1990 and analyzed from the four permanent wells at Area No. 1 (i.e. MW-001-01, 02, 03, & 04) indicated that MW-001-03, located hydraulically down gradient of Area No. 1 contained benzene, toluene, ethyl benzene and xylene (BTE&X) in excess of current WDOE regulations

(Table 2; Tech. Memo. 04). MW-001-04, also located hydraulically downgradient of Area No. 1 did not contain BTE&X in excess of WDOE regulation as did MW-001-01 and 02.

The data suggested that groundwater with BTE&X concentrations in excess of WDOE regulations was confined to the southern portion of Area No. 1. All wells sampled during this period at Area No. 1 contained petroleum hydrocarbons as diesel and lubricating weight oils below current WDOE action levels for groundwater.

Area No. 2: March 1990

As stated in Technical Memorandum 04 (Dated May 15, 1990), four of the 10 soil borings at Area No. 2 were converted into permanent groundwater monitoring wells. Groundwater measurements taken on March 19, 1990 indicated that the apparent groundwater direction is in a northeasterly direction with an approximate gradient of 2%. Groundwater samples obtained on March 21 through 23, 1990 and analyzed from the four permanent wells located at Area No. 2 indicated that groundwater did not contain BTE&X or petroleum hydrocarbons as lubricating oils in excess of current WDOE regulations.

Area No.1: September 1990

In response to the elevated levels of BTE&X as noted during the sampling event of March 1990 at MW-001-03, the Weyerhaeuser Company requested that MW-001-03 be re-sampled. MW-001-03 was re-sampled on September 7, 1990 and results of analysis of groundwater from this location indicated levels of benzene at 280 parts per billion (ppb), toluene at 28 ppb, ethylbenzene at 2 ppb and total xylenes at 130 ppb. At this time, concentrations of benzene in groundwater from MW-001-03 was in excess of the 5 ppb DRAFT WDOE Model Toxics Control Act (MTCA) Method A Cleanup Levels - Groundwater as well as total xylenes which are in excess of the 20 ppb WDOE MTCA.

CONTINUED GROUNDWATER INVESTIGATION RESULTS

As authorized by The Weyerhaeuser Company, Olympus Environmental, Inc. (OEI) and Shannon and Wilson, Inc. (S&W) completed the scope of services as specified in S&W's Technical Memorandum 05 (Dated August 24, 1990). These services were completed during November 16 - 19, 1990 at Area No. 1 and included the installation and sampling of three additional groundwater monitoring wells at the southern portion of Area No. 1 in the vicinity of MW-001-03.

The purpose of the additional groundwater monitoring wells at Area No. 1 was to further quantify the areal extent of BTE&X in site soil and groundwater in the vicinity of MW-001-03.

To accomplish these goals, one of the three proposed permanent groundwater monitoring wells was placed to the south and west (i.e. upgradient) of MW-001-03, the second well was placed downgradient of MW-001-03 and as far south of MW-001-03 as possible (i.e. permanent structures restricted access) and the third well was placed as far east and downgradient of MW-001-03 as possible in close proximity to Area No. 1. Figure 2 illustrates the location of all wells and soil borings completed to date at Area No. 1.

During soil drilling activities, 14 soil samples were collected and analyzed by EPA Modified Method 8015 at the Weyerhaeuser Technical Center (WTC) as shown in Table 3. Soil collected from BH-061 at 5 to 6.5 feet below grade (bg) contained 1400 parts per million (ppm) of petroleum hydrocarbons identified as lubrication grade oil(s) and 650 ppm as gasoline as well as soil from 7.5 to 9 feet bg in BH-061 which contained 120 ppm of petroleum hydrocarbon as lubricating oil and 36 ppm as gasoline. Soil from BH-061 at 12.5 to 14 feet bg contained less than 10 ppm of petroleum hydrocarbon.

All soil samples collected and analyzed from BH-060 & BH-062 contained less than 10 ppm of petroleum hydrocarbons as presented in Table 3.

GROUNDWATER CONDITIONS

Each of the three soil borings drilled and sampled during November 16 - 19, 1990 were completed as permanent groundwater monitoring wells in accordance with applicable WDOE regulations. Groundwater samples were obtained from these wells as well as the other eight wells located in Area No. 1 & 2 on December 6 & 7, 1990 for analysis by EPA Method 624 and EPA Method 418.1. Results from this sampling event is shown in Tables 1 & 2, attached.

Table 1 illustrates the detected concentration of BTE&X in all of the wells at Areas No. 1 & 2, as well as detected concentrations of Total Petroleum Hydrocarbons (TPH). With the exception of MW-001-03, all groundwater samples contained BTE&X concentrations below current WDOE MTCA Method A Cleanup Levels - Groundwater (02-28-91). Groundwater from MW-001-03 contains 420 ppb benzene, 100 ppb toluene, 5< ethyl-benzene and 260 ppb total xylenes. Maximum concentration of BTE&X are described in Table 1 notes.

Groundwater from MW-001-06 contains 2 ppm which is in excess of the 1 ppm WDOE MTCA Method A Cleanup Levels - Groundwater in MW-001-06; this is where soil has been noted to contain elevated levels of petroleum hydrocarbons. Groundwater from MW-001-03 contains 18 ppm which is in excess of the 1 ppm WDOE MTCA Method A Cleanup Levels - Groundwater.

Table 2 illustrates the detected concentration of Volatile Organic Compounds (VOCs) in groundwater at Area No. 2. Detected concentrations of VOCs in groundwater at Area No. 2 are below WDOE MTCA guidelines. An elevated concentration of acetone noted in the field trip blank (i.e. distilled water placed in a laboratory glassware for quality assurance/quality control) WEY-MW002-01-340-W-4 is most likely due to laboratory cleaning fluids and was not found in the actual groundwater samples obtained from these locations.

CONCLUSIONS

From the data generated thus far, the elevated concentration of BTE&X observed in MW-001-03 at Area No. 1 has been demonstrated to be a segregated occurrence which is not significantly contributing to the degradation of groundwater quality at Area No. 1. The other six permanent groundwater monitoring wells at Area No. 1 did not contain BTE&X concentrations in excess of WDOE limits as shown by the data in Table 1. TPH present in groundwater at MW-001-03 appears also to be the result of residual petroleum hydrocarbon in soil.

A slightly elevated TPH concentration of 2 ppm in groundwater at MW-001-06 is most likely a result of leaching petroleum hydrocarbons which originate from the mechanical operations at this location and not from the USTs which were located in Area No. 1. The extent of petroleum hydrocarbon in soil at BH-061 is restricted to soils above 12.5 feet bg as demonstrated by the lowered concentration of TPH in soil at 12.5 to 14 feet bg in sample BH-062.

Results of analysis for VOCs and TPH in groundwater at Area No. 2 indicate that all concentrations reported are well below current concentrations permitted by the WDOE. Degradation of groundwater at Area No. 1 & No. 2 seems to be minimal as would be expected by the level of effort expended by The Weyerhaeuser Company during remedial response actions as well as the notable availability of indigenous petroleum hydrocarbon degrading bacteria as established during the treatability study conducted for soil from these

areas (See Tech, Memo. 03, Dated May 2, 1989 and 04, Dated May 15, 1990).

RECOMMENDATIONS

The Weyerhaeuser Company should review this Technical Memorandum and submit a Weyerhaeuser approved copy to the UST Division of the WDOE in order to continue compliance with reporting requirements as established in the MTCA. It would be prudent of The Weyerhaeuser Company to implement an annual monitoring program at Area No. 1 & No. 2 in an effort to further assess the effectiveness of remedial actions completed to date.

COAXIAL CABLE TO ABOVE GROUND FUEL STORAGE FACILITY

TRUCK WASH AREA

OIL/WATER SEPARATOR

STEAM CLEANER

BM-1

6" WATER LINE
14-29-801

LOGS

AREA NO.1

TRUCK WASH AREA

STACKS OF CUT LUMBER

TRAILER LOADERS

COAXIAL CABLE

ELECTRIC LINE

FIRE SERVICE









SCALE: 1"=60'

FIRE SERVICE

STORAGE

LEGEND

-  CREEK
-  ROAD EDGE
-  VEGETATION
-  FENCE
-  TELEPHONE POLE
-  BENCHMARK

TRUCK SHOP

STEAM, WATER, & ELEC. CORRIDOR

AREA NO.2

WEYERHAEUSER SNOQUALMIE MILLSITE

SITE PLAN

FIG.NO.1

SW
SHANNON & WILSON, INC.
Geotechnical Consultants

BH-001 ● ● MW-001-01/BH-002

● BH- 022

LIMITS OF FORMER UST AREA

○ TP

● BH-003

● BH-007

MW-001-02/BH-008

● BH-004

GROUND WATER
GRADIENT

ELECTRIC SERVICE

● MW-001-04/BH-019

● BH-005

● BH-006

COAXIAL CABLE

MW-001-07 / BH-062 ●

● BH-021

● MW-001-03/BH-010

LEGEND



TELEPHONE POLE



● BH-009

SCALE: 1"=30'

● MW-001-05 / BH-060

MW-001-06 / BH-061 ●



SHANNON & WILSON, INC.
Geotechnical Consultants

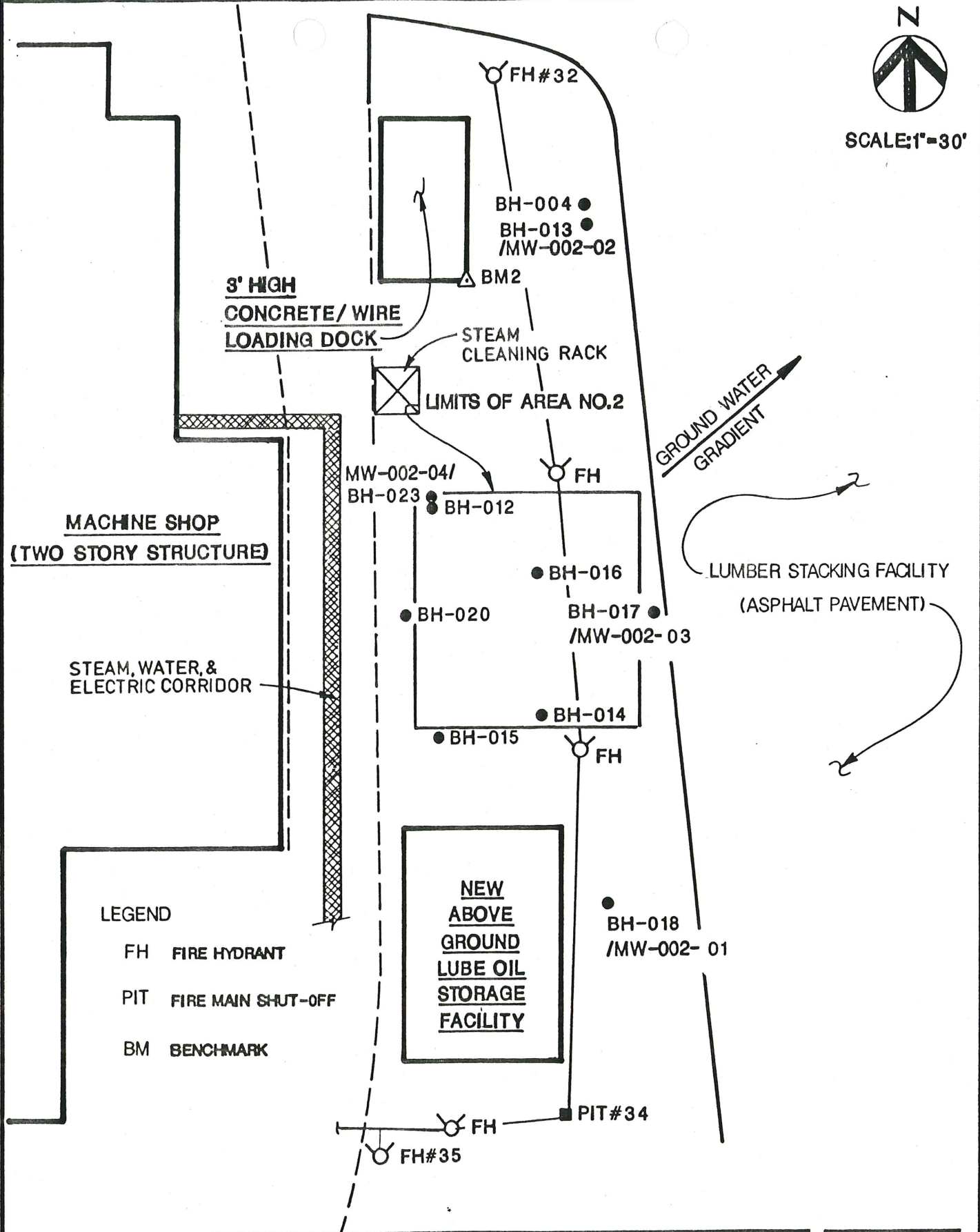
WEYERHAEUSER SNOQUALMIE MILLSITE

AREA NO.1

FIG. 2



SCALE: 1"=30'



LEGEND

- FH FIRE HYDRANT
- PIT FIRE MAIN SHUT-OFF
- BM BENCHMARK

WEYERHAEUSER SNOQUALMIE MILLSITE

AREA NO.2

FIG.NO.3



SHANNON & WILSON, INC.
Geotechnical Consultants

TABLE 1 OF 3, Page 1 of 5.
 SNOQUALMIE FORMER UNDERGROUND FUEL AND ABOVE GROUND ROAD OIL STORAGE FACILITIES
 GROUNDWATER SAMPLE RESULTS (1)

SAMPLE NUMBER Sampled 12-05-90	BENZENE (ppb) (2)	TOLUENE (ppb)	ETHYL BENZENE (ppb)	TOTAL XYLENE (3) (ppb)	TPH METHOD 418.1 (ppm) (4)	QA RELATIONSHIP
WEY-MW001-01-318-W-0	1<	5<	5<	5<		
WEY-MW001-02-321-W-0	1<	5<	5<	5<		
WEY-MW001-03-330-W-0 (5)	420 E	100	5<	260		
WEY-MW001-04-324-W-0	1<	5<	5<	5<		
WEY-MW001-05-327-W-0	1<	5<	5<	5<		
WEY-MW001-06-333-W-0	1<	5<	5<	5<		
WEY-MW001-07-336-W-0	1<	5<	5<	5<		
WEY-MW001-07-338-W-2	1<	5<	5<	5<		Duplicate of WEY-MW001-07-336-W-0
WEY-MW001-01-317-W-0					<1	
WEY-MW001-02-320-W-0					<1	
WEY-MW001-03-329-W-0					18	
WEY-MW001-04-323-W-0					<1	
WEY-MW001-05-326-W-0					<1	
WEY-MW001-06-332-W-0					2	
WEY-MW001-07-335-W-0					<1	
WEY-MW002-01-342-W-0					<1	
WEY-MW002-01-343-W-0	5<	5<	5<	5<		
WEY-MW002-02-348-W-0					<1	
WEY-MW002-02-349-W-0	5<	5<	5<	5<		
WEY-MW002-03-351-W-0					1	
WEY-MW002-03-352-W-0						
WEY-MW002-04-345-W-0					<1	
WEY-MW002-04-346-W-0	5<	5<	5<	5<		
WEY-MW002-01-340-W-4	5<	5<	5<	5<		Field Trip Blank

< = Below detection limit, detection limit reported.
 E = Compound concentration exceeded the calibration range of the instrument.

Notes: See page 2 of 5.

NOTES FOR TABLE 1 OF 3; Page 2 of 5.
SNOQUALMIE FORMER UNDERGROUND FUEL AND ABOVE GROUND ROAD OIL STORAGE FACILITIES
GROUNDWATER SAMPLE RESULTS (1)

- 1) As reported by Weyerhaeuser Technical Center (WTC) on 01-03-91.
- 2) Parts Per Billion (ppb).
- 3) Xylene reported as m,p &o isomers; reported here as total xylenes.
- 4) Parts Per Million (ppm).
- 5) Sample was separated into a top oily water sample and a middel water sample.
In the middel water sample, all parameters were below quantification limits.
- 6) Original laboratory report and correspondence available at the Shannon and Wilson (S&W) Seattle office.
- 7) Benzene maximum concentrations in water is 5 ppb; (WDOE, Model Toxics Control Act (MTCa), Chapter 173-340 WAC, 02-28-91, Method A - Cleanup Levels - Groundwater).
- 8) Toluene maximum concentrations in water is 40 ppb; (WDOE, MTCa Method A Cleanup Levels - Groundwater).
- 9) Ethylbenzene maximum concentrations in water is 30 ppb; (WDOE, MTCa Method A Cleanup Level - Groundwater).
- 10) Xylenes maximum concentrations in water is 20 ppb; (WDOE, MTCa Method A Cleanup Level - Groundwater).
- 11) Benzene, toluene, ethylbenzene and xylene concentrations determined by EPA Method 624.
- 12) TPH is the abbreviation for total petroleum hydrocarbons as determined by EPA Method 418.1.
- 13) TPH maximum concentrations in water is 1 ppm; (WDOE, MTCa Method A Cleanup Level - Groundwater).

TABLE 2 OF 3 VOLATILE ORGANIC ANALYSIS
SNOQUALMIE FORMER UNDERGROUND FUEL AND ABOVE GROUND ROAD OIL STORAGE FACILITIES
GROUNDWATER SAMPLE RESULTS (1)
Page 3 of 5.

PARAMETER Sampled 12-07-90	WEY-MW002-01-343-W-0 (ppb) (2)	WEY-MW002-02-349-W-0 (ppb)	WEY-MW002-03-352-W-0 (ppb)	WEY-MW002-04-346-W-0 (ppb)	WEY-MW002-01-340-W-4 (ppb) (3)
chloromethane	10<	10<	10<	10<	10<
bromomethane	10<	10<	10<	10<	10<
vinyl chloride	10<	10<	10<	10<	10<
chloroethane	10<	10<	10<	10<	10<
methylene chloride	5<	5<	5<	5<	5<
acetone	10<	10<	10<	10<	130
carbon disulfide	5<	5<	5<	5<	5<
1,1-dichloroethene	5<	5<	5<	5<	5<
1,1-dichloroethane	5<	5<	5<	5<	5<
1,2-dichloroethene - total	5<	5<	5<	5<	5<
chloroform	5<	5<	5<	5<	5<
1,2-dichloroethane	5<	5<	5<	5<	8
2-butanone	10<	10<	10<	10<	10<
1,1,1-trichloroethane	5<	5<	5<	5<	5<
carbon tetrachloride	5<	5<	5<	5<	5<
vinyl acetate	10<	10<	10<	10<	10<
bromodichloromethane	5<	5<	5<	5<	5<
1,2-dichloropropane	5<	5<	5<	5<	5<
cis-1,3-dichloropropene	5<	5<	5<	5<	5<
trichloroethene	5<	5<	5<	5<	5<
dibromochloromethane	5<	5<	5<	5<	5<
1,1,2-trichloroethane	5<	5<	5<	5<	5<
benzene	5<	5<	5<	5<	5<
trans-1,3-dichloropropene	5<	5<	5<	5<	5<
bromoform	5<	5<	5<	5<	5<
4-methyl-2-pentanone	10<	10<	10<	10<	10<
2-hexanone	10<	10<	10<	10<	10<
tetrachloroethene	5<	5<	5<	5<	5<
1,1,2,2-tetrachloroethane	5<	5<	5<	5<	5<
toluene	5<	5<	5<	5<	5<
chlorobenzene	5<	5<	5<	5<	5<
ethylbenzene	5<	5<	5<	5<	5<
styrene	5<	5<	5<	5<	5<
xylenes -total	5<	5<	5<	5<	5<

< = Below quantitation limit, quantitation limit reported.

Notes:

- 1) As reported by Weyerhaeuser Technical Center (WTC) on 01-03-91.
- 2) Parts Per Billion (ppb).
- 3) Quality Assurance/Quality Control (QA/QC) Sample: Field Trip Blank.
- 4) Original laboratory report and correspondence available at the Shannon and Wilson (S&W) Seattle office.
- 5) Concentrations determined by EPA Method 624.

TABLE 3 OF 3: Page 4 of 5.

**SNOQUALMIE FORMER UNDERGROUND FUEL AND ABOVE GROUND ROAD OIL STORAGE FACILITIES
SOIL SAMPLE RESULTS (1)**

SAMPLE NUMBER Sampled 11-16-90	TPH METHOD 8015 (ppm) (2)	QA RELATIONSHIP
WEY-BH060-300-SL-0 WEY-BH060-301-SL-0 WEY-BH060-302-SL-0 WEY-BH060-303-SL-0 WEY-BH060-304-SL-1 WEY-BH060-305-SL-0	<10 <10 <10 <10 <10 <10	Duplicate of WEY-BH060-303-SL-0
WEY-BH061-306-SL-0	1400 as Lubrication oil(s) (5) 650 as Gasoline (6)	
WEY-BH061-307-SL-0	120 as Lubrication oil(s) (5) 36 as Gasoline (6)	
WEY-BH061-308-SL-0 WEY-BH061-309-SL-1 Sampled 11-19-90	<10 <10	Duplicate of WEY-BH061-308-SL-0
WEY-BH062-310-SL-0 WEY-BH062-311-SL-0 WEY-BH062-312-SL-1 WEY-BH062-313-SL-0	<10 <10 <10 <10	Duplicate of WEY-BH062-311-SL-0

< = Below detection limit, detection limit reported.

Notes: See page 5 of 5.