T-1336-03

Technical Memorandum 04
Second Quarterly Groundwater Sampling Activities
2301 Lincoln Avenue
Tacoma, Washington

January 1993

Mr. Ron Kline, President
Northwest Wire Rope and Equipment, Inc.
2301 Lincoln Avenue
P.O. Box 1806
Tacoma, Washington 98401

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
400 N. 34th St. • Suite 100
P.O. Box 300303
Seattle, Washington 98103
206•632•8020

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SEATTLE
EVERETT
KENNEWICK
FAIRBANKS
ANCHORAGE
SAINT LOUIS

January 21, 1993

Mr. Ron Kline, President
NORTHWEST Wire Rope and Equipment, Inc.
2301 Lincoln Avenue
P.O. Box 1806
Tacoma, Washington 98401

RE: TECHNICAL MEMORANDUM 04: SECOND QUARTERLY GROUNDWATER SAMPLING ACTIVITIES FOR NORTHWEST WIRE ROPE AND EQUIPMENT, INC. LOCATED AT 2301 LINCOLN AVENUE, TACOMA, WASHINGTON

Dear Mr. Kline:

Shannon & Wilson, Inc.'s (S&W) report, Technical Memorandum 04, presents second quarterly groundwater monitoring activities performed on December 18, 1992 at the above referenced site.

As stated in S&W's August 5, 1992 letter, please submit a copy of this second quarterly report to the Tacoma-Pierce County Health Department as addressed below:

Tacoma-Pierce County Health Department
Attn: John Hildenbrand, R.S., EHS II
Water Resources Section
Environmental Health Division
3629 South D Street
Tacoma, Washington 98408-6897

If you have any questions or comments, please contact us at (206) 632-8020.

Respectfully,

SHANNON & WILSON, INC.

Kimberly A. L. Fenske
Engineer

Robert Colombo
Associate

KLF:RC/klf

Enclosure: Technical Memorandum 04

TMEMO4/T1336-lkd/sb

400 NORTH 34TH STREET • SUITE 100
P.O. BOX 300303
SEATTLE, WASHINGTON 98103
206 • 632 • 8020 FAX 206 • 633 • 6777

T-1336-03

EXECUTIVE SUMMARY

Shannon & Wilson, Inc. has completed the second of four groundwater sampling activities for Northwest Wire Rope and Equipment, Inc. This work is being performed at the direction of Mr. John Hildenbrand of the Tacoma-Pierce County Health Department as stated in their department letter dated June 12, 1992.

Analytical results for benzene, toluene, ethylbenzene, and total xylene (BTE&X) concentrations in the three monitoring wells (MW001, MW002, and MW003) were below the state of Washington's Model Toxics Control Act (MTCA) Method A regulatory levels (2/91) as presented in Table 1 entitled " Second Quarterly Groundwater Samples: Analyses and Results." Total petroleum hydrocarbons (as) gasoline (WTPH-G) concentrations occurred at an elevated level of 1800 parts per billion (ppb) in MW001 compared to the MTCA regulatory level of 1000 ppb. Total lead concentrations exceeded the regulatory level of 0.005 ppm in MW001 (0.028 ppm), MW002 (0.012 ppm), and MW003 (0.008 ppm).

A summary of the first and second quarterly groundwater sample results is presented for your convenience in Table 2. This executive summary is a limited synopsis of our own study and should only be used in conjunction with the full report.

As stated in John Hildenbrand's letter dated June 12, 1992, a re-evaluation by the Tacoma-Pierce County Health Department of the conditions at the site will be made at the end of this monitoring period (summer 1993).

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TECHNICAL MEMORANDUM 04
SECOND QUARTERLY GROUNDWATER MONITORING
AT 2301 LINCOLN AVENUE, TACOMA, WASHINGTON

1.0 INTRODUCTION

Shannon & Wilson, Inc. has completed the second of four groundwater sampling activities for Northwest Wire Rope and Equipment, Inc. This work is being performed at the direction of Mr. John Hildenbrand of the Tacoma-Pierce County Health Department as stated in their department letter dated June 12, 1992.

2.0 AUTHORIZATION

Shannon & Wilson, Inc. performed this work in accordance with the contract dated August 5, 1992 and authorized by Mr. Ron Kline, owner of Northwest Wire Rope and Equipment, Inc. on August 6, 1992.

3.0 SITE LOCATION

The facility is located at 2301 Lincoln Avenue, Tacoma, Washington. The geographical location of the property is illustrated in Figure 1, Vicinity Map. A U.S. Oil Company storage facility borders this property to the east and other industrial businesses exist in the surrounding area.

4.0 GROUNDWATER SAMPLING ACTIVITIES

4.1 Groundwater Quality Assessment

The second of four groundwater sampling events occurred on December 18, 1992 to characterize groundwater samples for benzene, toluene, ethylbenzene, total xylenes (BTE&X), total petroleum hydrocarbons (as) gasoline (WTPH-G), and total lead concentrations in compliance with the Model Toxics Control Act (MTCA) Method A regulatory levels.

Groundwater results quantified by Alden Analytical Laboratories, Inc. (Alden) of Seattle, Washington determined BTE&X in MW001, 002, and 003 below MTCA regulatory levels. Laboratory analytical results reported by Alden are in Appendix A, attached. Results are listed in Table 1 entitled "Second Quarterly Groundwater Samples : Analyses and Results."

WTPH-G concentrations occurred at an elevated level of 1800 ppb in MW001 (MW001's duplicate concentration was 1700 ppb) exceeding the MTCA regulatory level of 1000 ppb. Groundwater sample concentrations in MW002 and MW003 were below the MTCA regulatory level for WTPH-G. Total lead concentrations exceeded the regulatory level of 0.005 ppm in MW001 (0.028 ppm), MW002 (0.012 ppm), and MW003 (0.008 ppm).

4.2 Groundwater Elevations

In addition, a MCC oil/water interface detection probe was used to measure the depth to groundwater. All well casings were referenced to a previously established benchmark of 100.00 feet. Measurements were made from the north side of the well casing. Depth to the groundwater ranged from approximately seven and one-half to nine feet from the top of the well casing. Groundwater elevation contours are delineated in Figure 3.

4.3 Data Interpretation

Groundwater data and associated petroleum compounds reported in Table 1 have been geostatistically contoured utilizing the GOLDEN software package SURFER[R]. Concentrations of WTPH-G, benzene, ethylbenzene, total xylenes, and total lead are contoured in Figures 4 through 8. Since the analytical results for toluene were below the reporting limit of 1.0 ppb in MW001, 002, and 003, toluene concentrations were not contoured with SURFER[R]. Caution should be exercised when interpreting these figures due to the limited amount of data used in their construction.

Groundwater flow was inferred to be in a northeasterly direction. However, the flow is dependant on tidal mechanisms and therefore the limited data available may not be fully representative of the actual conditions throughout the year.

Contours of regulated compounds display decreasing concentrations with distance from the UST excavation area. Concentrations of all the tested petroleum hydrocarbon constituents have continually decreased in comparison to the concentrations quantified for the initial groundwater sampling event in May 1992.

5.0 SUMMARY

The second of four groundwater sample results were below MTCA regulatory concentrations for BTE&X in the three monitoring wells located on site. WTPH-G concentrations occurred at an elevated level of 1800 ppb in MW001 compared to the MTCA regulatory level of 1000

ppb. Total lead concentrations exceeded the regulatory level of 0.005 ppm in MW001 (0.028 ppm), MW002 (0.012 ppm), and MW003 (0.008 ppm).

6.0 CLOSURE

The findings we have presented within this technical memorandum are based on limited research at the facility. They should not be construed as a definite statement regarding reported conditions. Shannon & Wilson, Inc. performed this work phase within our best judgment to adequately describe site conditions at the facility.

The data presented in this technical memorandum should be considered representative at the time of our observations. Changes in the conditions of the property can occur with time from both natural processes and human activities. In addition, changes in governmental codes, regulations, or law may occur. Due to such changes, our observations and recommendations applicable to this facility may need to be revised wholly or in part, due to changes beyond our control.

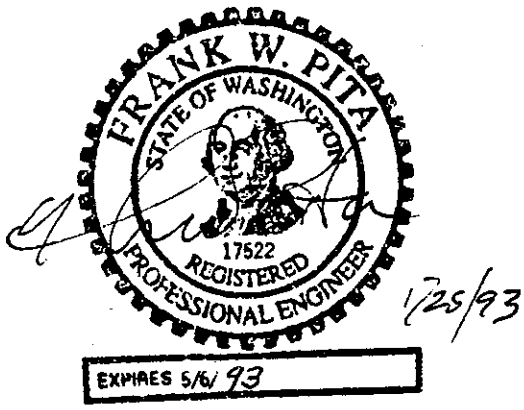
Shannon & Wilson, Inc. has prepared the attachment in Appendix B, "Important Information About Your Subsurface Waste Management (Remediation) Report", to assist you in understanding the use and limitations of our reports.

This technical memorandum was prepared for the exclusive use of Mr. Ron Kline in the study of their facility in Tacoma, Washington, and in no way guarantees that an agency or its staff will reach the same conclusions as Shannon & Wilson, Inc.

SHANNON & WILSON, INC.

Kimberly A. L. Fenske
Engineer

Robert Colombo
Associate



Frank W. Pita, P.E., P.G.
Vice President - Environmental Services

KLF:RC:FWP/klf

Table 1. Second Quarterly Groundwater Samples : Analyses and Results (1)
Northwest Wire Rope and Equipment, Inc. - Tacoma, Washington
Date Sampled : December 18, 1992

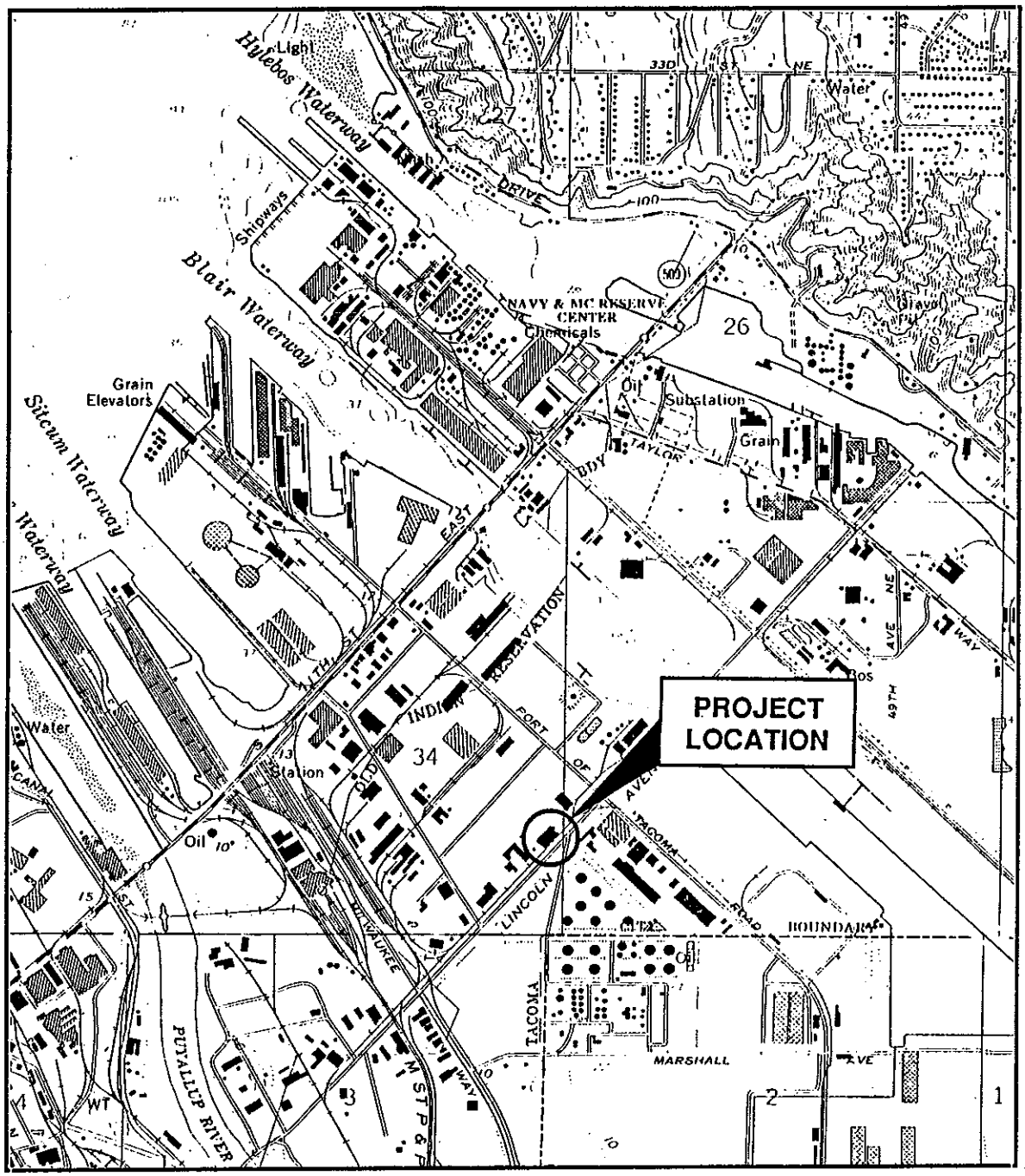
Sample Identification	WTPH-G (ppb), (2)	BTE&X (EPA 8240) Benzene (ppb)	Ethylbenzene (ppb)	Toluene (ppb)	Xylenes (ppb)	Total Lead (EPA 7421) (ppm), (3)
NWR-MW001-026-GW-0	1800	1.1	2.0	<1.0	14.7	0.023
NWR-MW001-027-GW-1, (4)	1700	1.3	2.3	<1.0	16.8	0.028
NWR-MW002-024-GW-0	<250	<1.0	<1.0	<1.0	<1.0	0.012
NWR-MW003-025-GW-0	740	1.3	1.4	<1.0	6.5	0.008
NWR-TB002--027-GW-0, (5)		<1.0	<1.0	<1.0	<1.0	
Cleanup Levels for Groundwater (6)	1000	5.0	30.0	40.0	20.0	0.005

(1) As reported by Alden Analytical Laboratories, Inc.
(2) Parts per billion, ppb.
(3) Parts per million, ppm.
(4) Duplicate of sample labeled "NWR-MW001-026-GW-0."
(5) QA/QC Trip Blank.
(6) Washington Model Toxics Control Act (MTCA), Method A, February 1991
< = Below reporting limit.

Table 2. Summary of Quarterly Groundwater Samples : Analyses and Results (1)
First and Second Quarterly Groundwater Sampling Events
Northwest Wire Rope and Equipment, Inc. - Tacoma, Washington

Sample Identification	Quarter Sampled (7), (8)	WTPH-G (ppb), (2)	BTE&X				Total Lead (ppm), (3)
			Benzene (ppb)	Ethylbenzene (ppb)	Toluene (ppb)	Xylenes (ppb)	
NWR-MW001-021-GW-0	1st	<100	<1	<1	<1	<2	0.022
NWR-MW001-022-GW-2, (4)	1st	<200	<2	<2	<2	<4	0.041
NWR-MW001-026-GW-0	2nd	1800	1.1	2.0	<1.0	14.7	0.023
NWR-MW001-027-GW-1, (4)	2nd	1700	1.3	2.3	<1.0	16.8	0.028
NWR-MW002-019-GW-0	1st	<100	<1	<1	<1	<2	<0.005
NWR-MW002-024-GW-0	2nd	<250	<1.0	<1.0	<1.0	<1.0	0.012
NWR-MW003-020-GW-0	1st	400	1	<1	<1	3	<0.005
NWR-MW003-025-GW-0	2nd	740	1.3	1.4	<1.0	6.5	0.008
NWR-TB001-023-WA-4, (5)	1st		<1	<1	<1	<2	
NWR-TB002--027-GW-0, (5)	2nd		<1.0	<1.0	<1.0	<1.0	
Cleanup Levels for Groundwater (6)		1000	5.0	30.0	40.0	20.0	0.005

(1) As reported by Alden Analytical Laboratories, Inc. and Friedman and Bruya, Inc.
(2) Parts per billion, ppb.
(3) Parts per million, ppm.
(4) Duplicate of previously listed sample.
(5) QA/QC Trip Blank.
(6) Washington Model Toxics Control Act (MTCA), Method A, February 1991
(7) First Quarterly Groundwater Sampling Event on September 18, 1992.
(8) Second Quarterly Groundwater Sampling Event on December 18, 1992.
< = Below reporting limit.



0 1/4 1/2 1

Scale in Miles

NOTE

Map adapted from USGS topographic map of Tacoma North, WA. quadrangle, dated 1981.

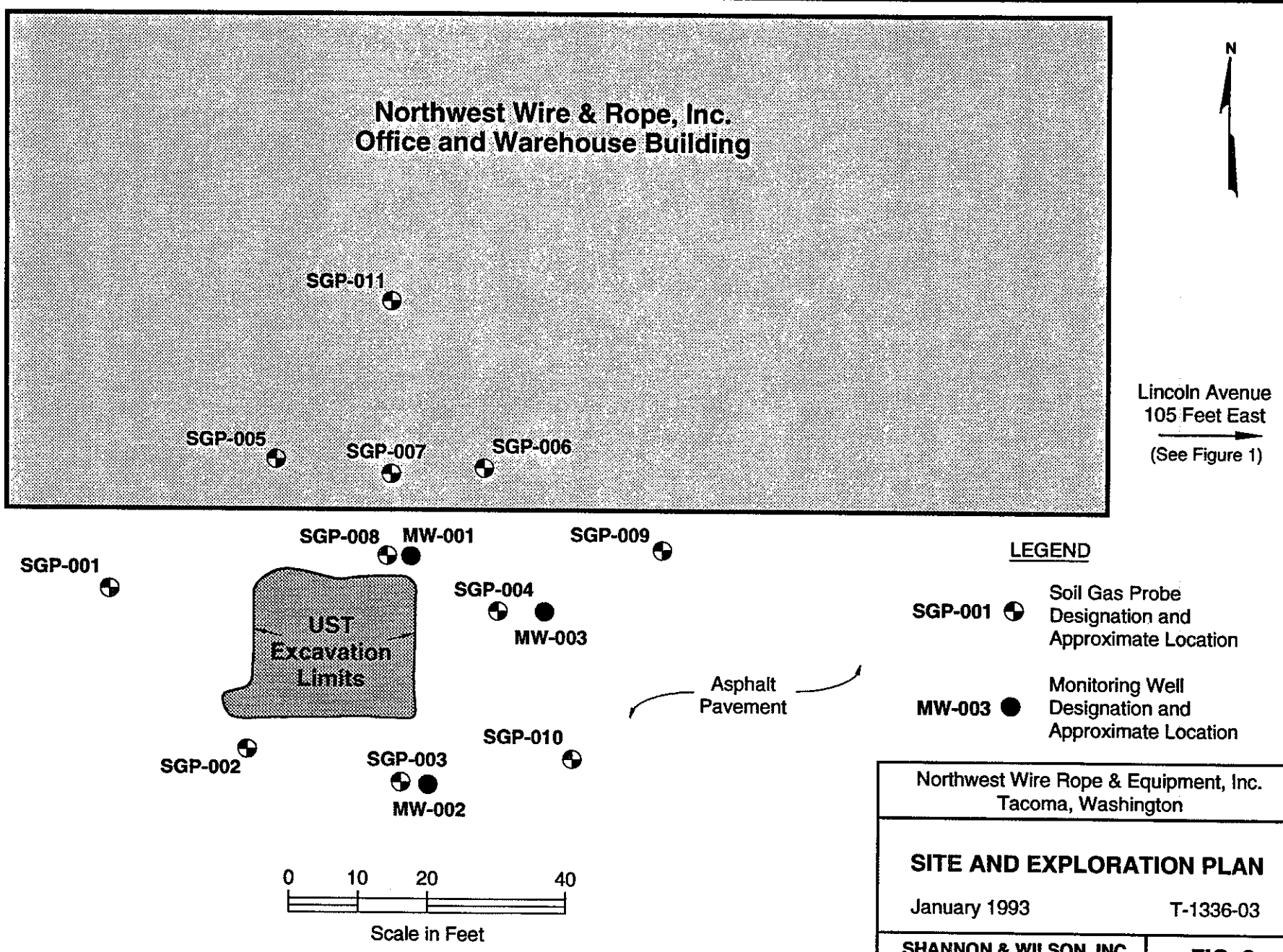
Northwest Wire Rope & Equipment, Inc.
Tacoma, Washington

VICINITY MAP

January 1993 T-1336-03

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 1



Northwest Wire Rope & Equipment, Inc.
Tacoma, Washington

SITE AND EXPLORATION PLAN

January 1993 T-1336-03

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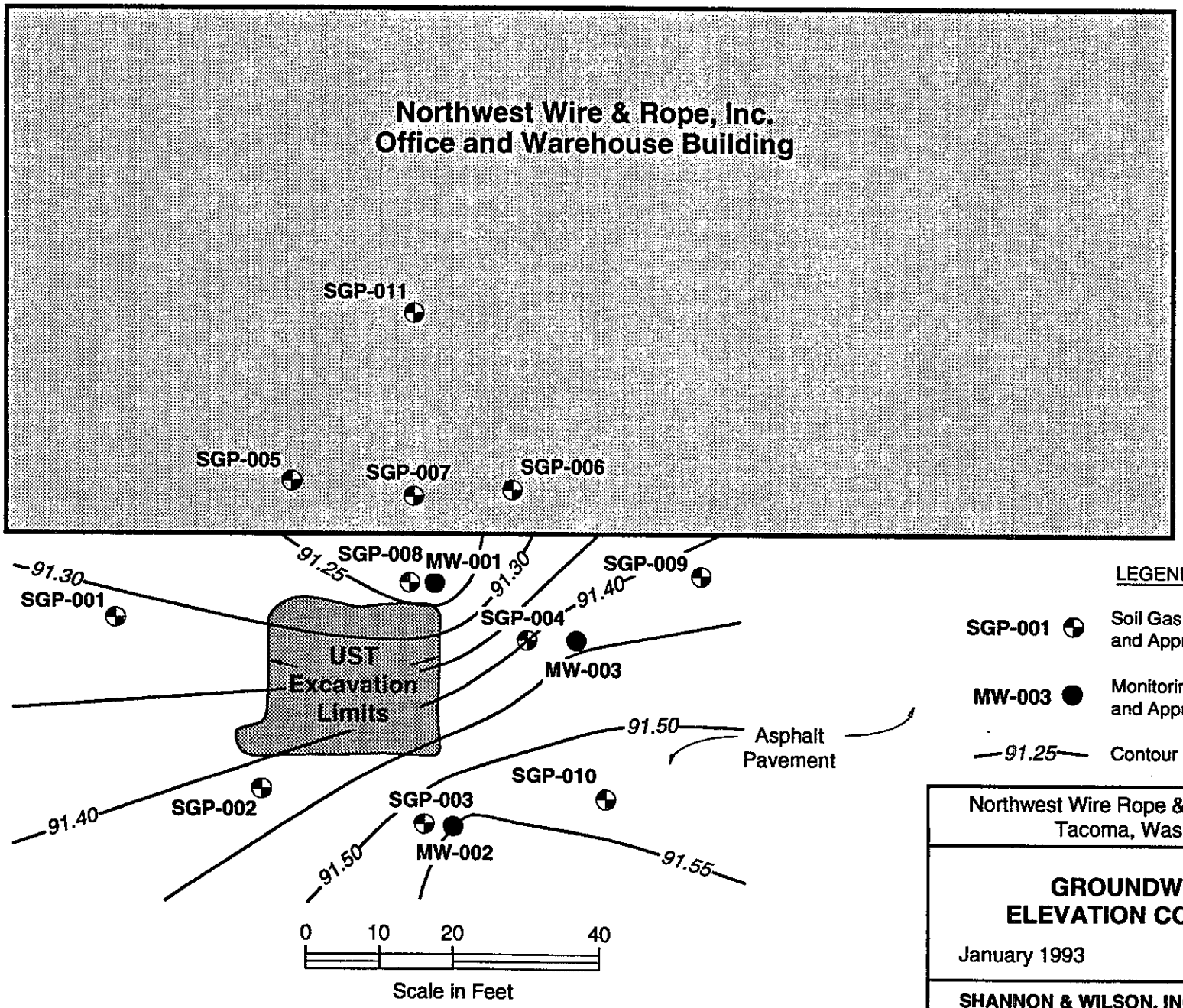
Geotechnical and Environmental Consultants

FIG. 2

FIG. 2



Northwest Wire Rope & Equipment, Inc.
Tacoma, Washington

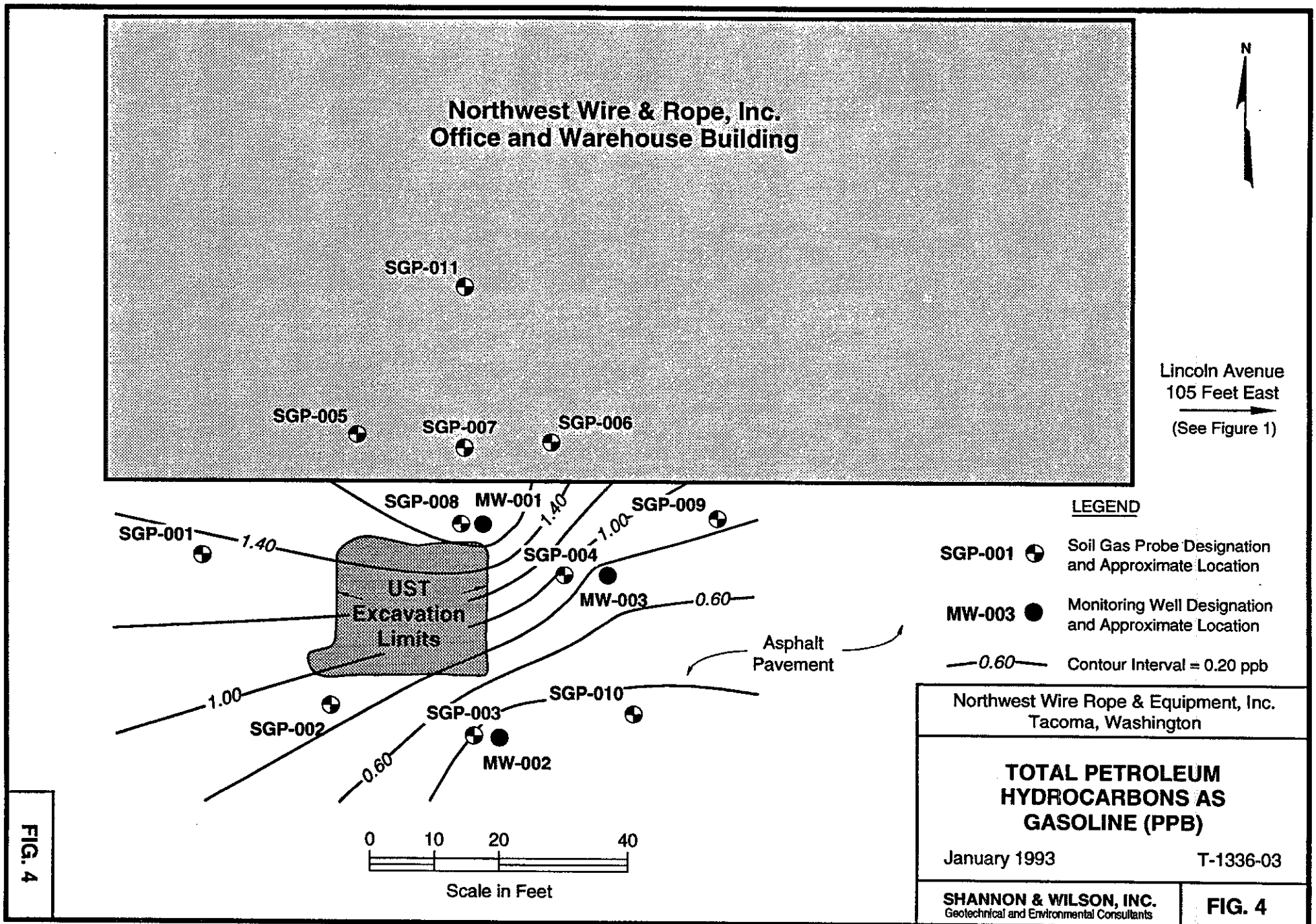
GROUNDWATER ELEVATION CONTOURS

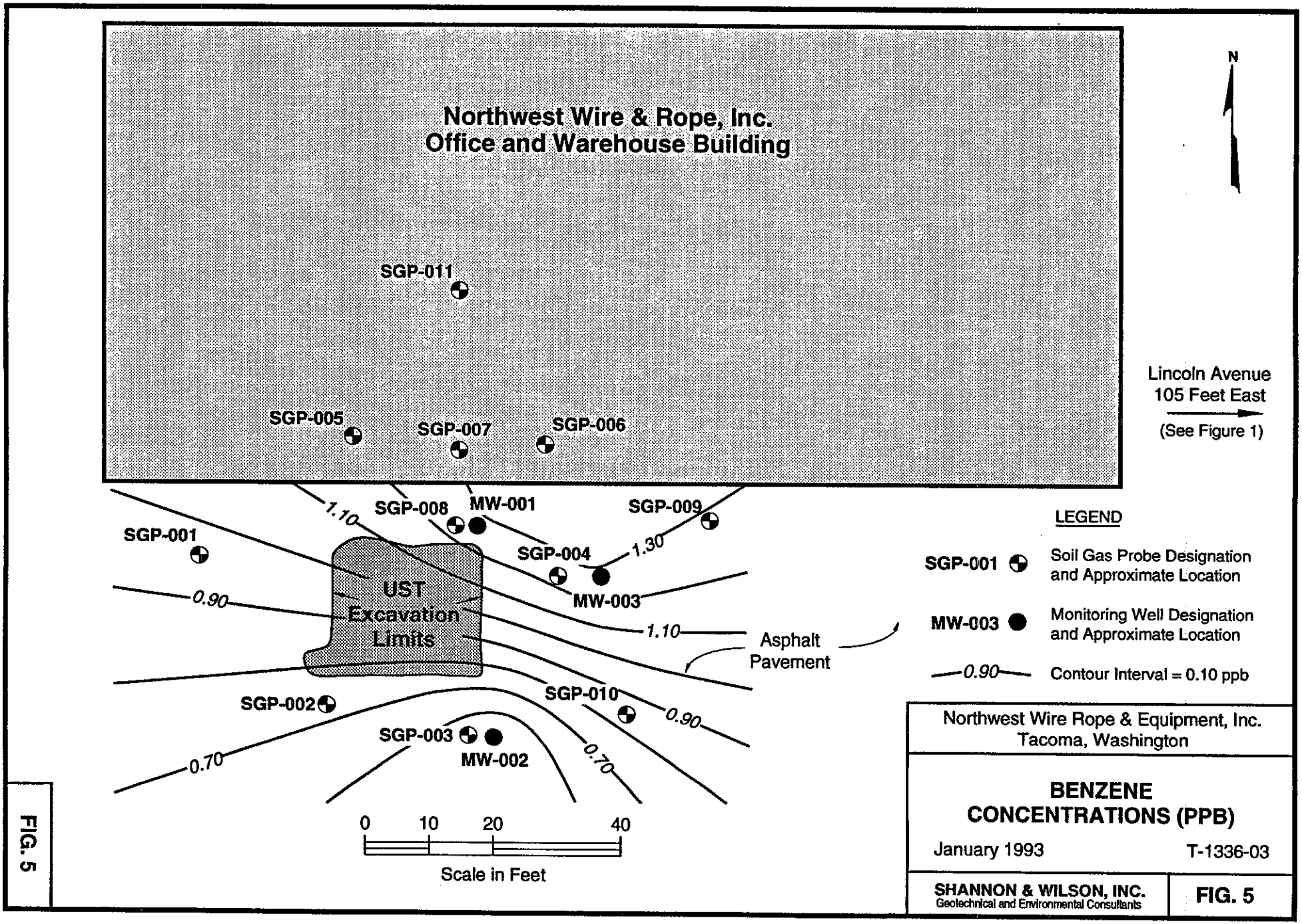
January 1993 T-1336-03

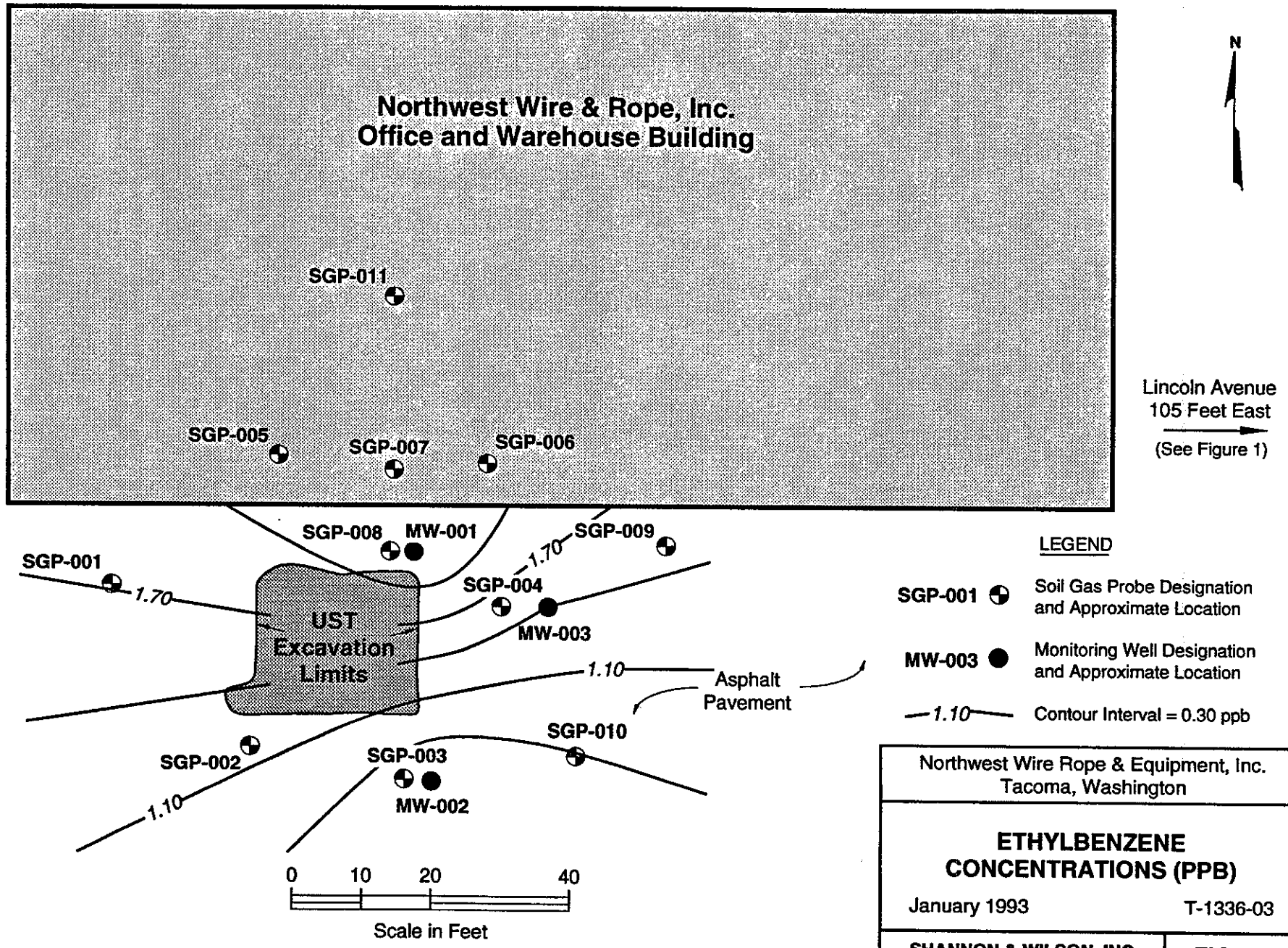
SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 3

FIG. 3


Northwest Wire & Rope, Inc.
Office and Warehouse Building
SGP-011
SGP-005
SGP-007
SGP-006
SGP-008
MW-001
SGP-009
SGP-001
1.40
1.40
1.00
SGP-004
MW-003
0.60
UST
Excavation
Limits
Asphalt
Pavement
1.00
SGP-002
SGP-003
SGP-010
MW-002
0.60
0
10
20
40
Scale in Feet
N
Lincoln Avenue
105 Feet East
(See Figure 1)
LEGEND
SGP-001
Soil Gas Probe Designation and Approximate Location
MW-003
Monitoring Well Designation and Approximate Location
0.60
Contour Interval = 0.20 ppb
Northwest Wire Rope & Equipment, Inc.
Tacoma, Washington
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE (PPB)
January 1993
T-1336-03
SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants
FIG. 4
FIG. 4


Northwest Wire & Rope, Inc.
Office and Warehouse Building
N
SGP-011
SGP-005
SGP-007
SGP-006
Lincoln Avenue
105 Feet East
(See Figure 1)
SGP-008
MW-001
SGP-009
SGP-001
SGP-004
1.30
1.10
0.90
MW-003
UST
Excavation
Limits
1.10
Asphalt
Pavement
SGP-010
SGP-002
0.90
SGP-003
MW-002
0.70
0.70
0
10
20
40
Scale in Feet
LEGEND
SGP-001
Soil Gas Probe Designation and Approximate Location
MW-003
Monitoring Well Designation and Approximate Location
0.90
Contour Interval = 0.10 ppb
Northwest Wire Rope & Equipment, Inc.
Tacoma, Washington
BENZENE
CONCENTRATIONS (PPB)
January 1993
T-1336-03
SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants
FIG. 5
FIG. 5



Northwest Wire Rope & Equipment, Inc.
Tacoma, Washington

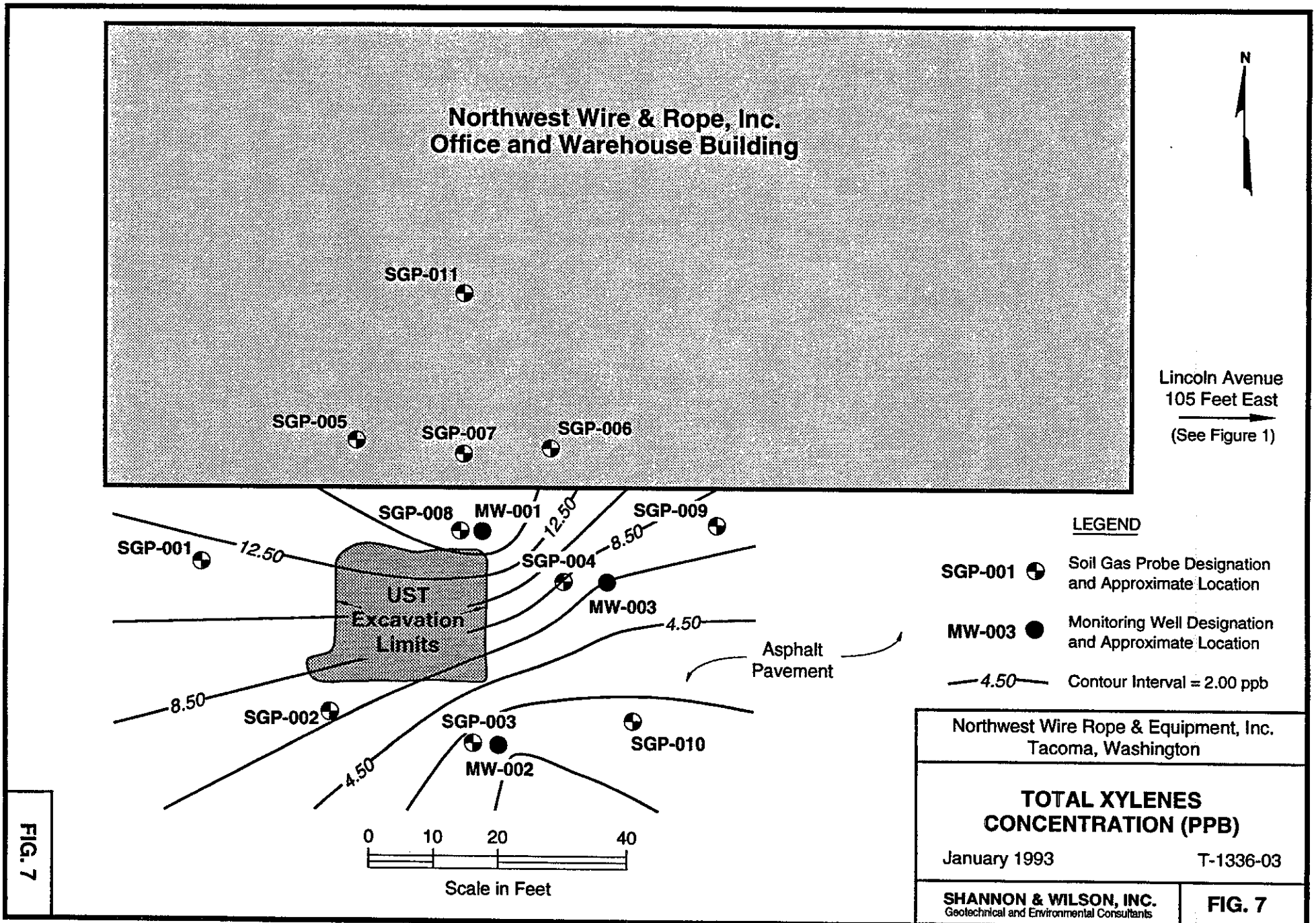
ETHYLBENZENE CONCENTRATIONS (PPB)

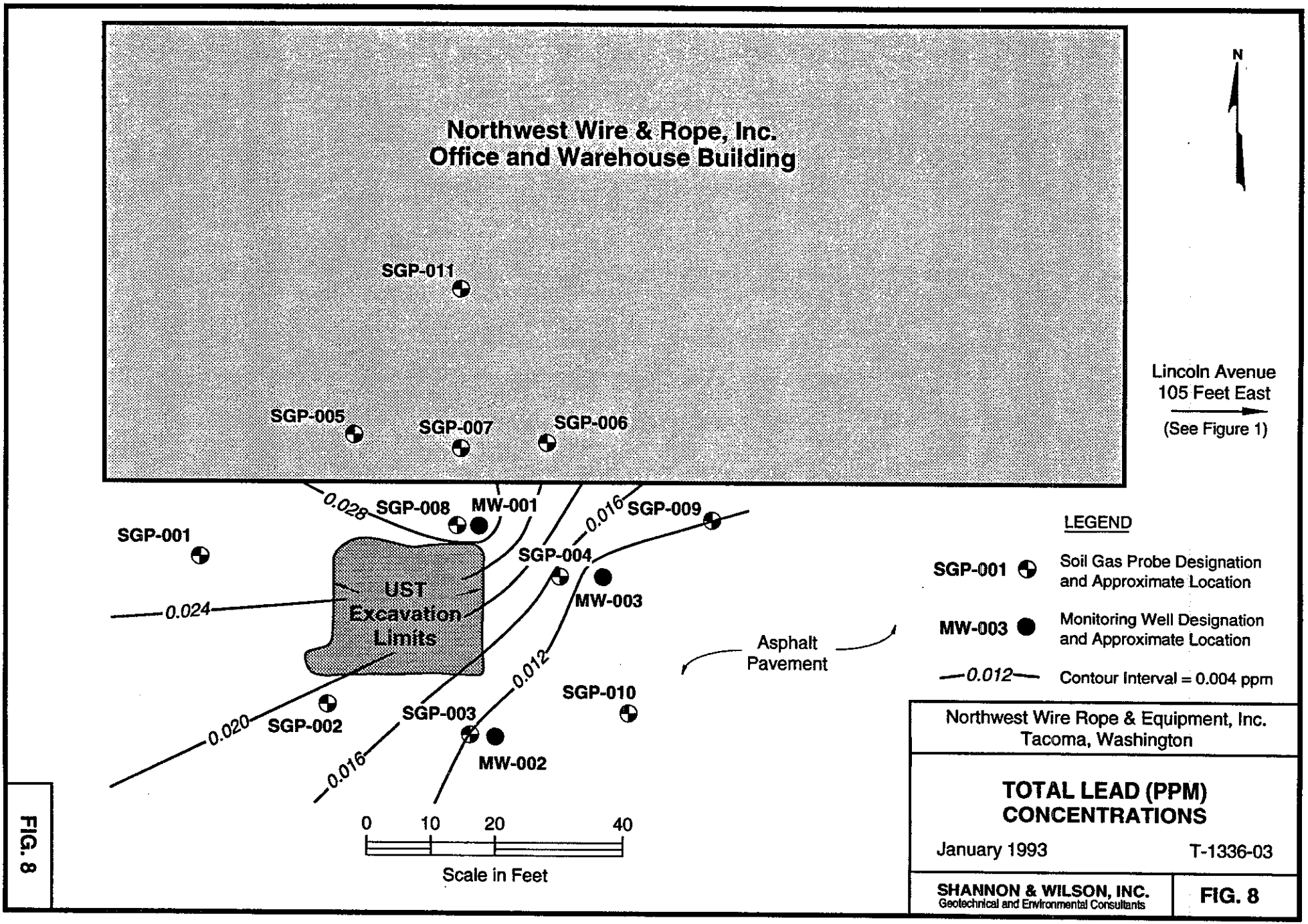
January 1993 T-1336-03

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 6

FIG. 6


Northwest Wire & Rope, Inc.
Office and Warehouse Building
SGP-011
SGP-005
SGP-007
SGP-006
N
Lincoln Avenue
105 Feet East
(See Figure 1)
SGP-008
MW-001
SGP-009
SGP-001
12.50
8.50
SGP-004
MW-003
UST
Excavation
Limits
4.50
Asphalt
Pavement
8.50
SGP-002
SGP-003
SGP-010
MW-002
4.50
0
10
20
40
Scale in Feet
LEGEND
SGP-001
Soil Gas Probe Designation and Approximate Location
MW-003
Monitoring Well Designation and Approximate Location
4.50
Contour Interval = 2.00 ppb
Northwest Wire Rope & Equipment, Inc.
Tacoma, Washington
TOTAL XYLENES
CONCENTRATION (PPB)
January 1993
T-1336-03
SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants
FIG. 7
FIG. 7


Northwest Wire & Rope, Inc.
Office and Warehouse Building
N
SGP-011
SGP-005
SGP-007
SGP-006
Lincoln Avenue
105 Feet East
(See Figure 1)
0.028
SGP-008
MW-001
0.016
SGP-009
SGP-001
SGP-004
UST
Excavation
Limits
MW-003
0.024
Asphalt
Pavement
0.012
SGP-010
0.020
SGP-002
SGP-003
0.016
MW-002
0
10
20
40
Scale in Feet
LEGEND
SGP-001
Soil Gas Probe Designation and Approximate Location
MW-003
Monitoring Well Designation and Approximate Location
0.012
Contour Interval = 0.004 ppm
Northwest Wire Rope & Equipment, Inc.
Tacoma, Washington
TOTAL LEAD (PPM)
CONCENTRATIONS
January 1993
T-1336-03
SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants
FIG. 8
FIG. 8

APPENDIX A

LABORATORY DOCUMENTATION

Alden Analytical
Laboratories, Inc.

January 12, 1993

Shannon & Wilson
Attn: Kim Fenske
P.O. Box 300303
Seattle, WA 98103

RE: ALDEN PROJECT NUMBER 9212022/1

Dear Kim:

Enclosed are the analytical results for the soil and water samples submitted to Alden Labs December 21, 1992. The samples were analyzed for TPH using Method WTPH-G with BTEX Distinction, BTEX using Method 8240, and Total Lead using Method 7421.

All samples met Alden's internal QA/QC criteria.

It is Alden's policy to dispose of all samples and extracts after the expiration of their hold time unless notified otherwise. If you have any questions, please do not hesitate to call me at the number below.

Sincerely,

John A. Weakland
Project Manager

Enclosures

1001 SW Klickitat Way
Seattle, WA 98134
Telephone (206) 623-3660
Facsimile (206) 624-8778

Alden Analytical
Laboratories, Inc.

REPORT OF ANALYTICAL RESULTS

Client: Shannon & Wilson	*Alden Job Number: 9212022/1*
Client Sample Number: N/A	*Alden Sample Number: Blank*
Date of Sample Receipt: N/A	*Analysis Method: WTPH-G*
Date of Sample Extraction: N/A	*Matrix: Water*
Date of Sample Analysis: 12/22/92	*Reporting Units: ug/L*

Compound Name	*CAS Number*	*Reporting Limit*	*Result*
Total Petroleum Hydrocarbons	N/A	250	< RL

Surrogate	*Percent Recovery*
Trifluorotoluene	89
Bromofluorobenzene	85

* m-Xylene and p-xylene cannot be separated and are reported here as a total of the two isomers.

Alden Analytical
Laboratories, Inc.

REPORT OF ANALYTICAL RESULTS

Client: Shannon & Wilson	*Alden Job Number: 9212022/1*
Client Sample Number: NWR-MW002-024-GW-0	*Alden Sample Number: 2024*
Date of Sample Receipt: 12/21/92	*Analysis Method: WTPH-G*
Date of Sample Extraction: N/A	*Matrix: Water*
Date of Sample Analysis: 12/22/92	*Reporting Units: ug/L*

Compound Name	*CAS Number*	*Reporting Limit*	*Result*
Total Petroleum Hydrocarbons	N/A	250	< RL

Surrogate	*Percent Recovery*
Trifluorotoluene	90
Bromofluorobenzene	85

* m-Xylene and p-xylene cannot be separated and are reported here as a total of the two isomers.

Alden Analytical
Laboratories, Inc.

REPORT OF ANALYTICAL RESULTS

Client: Shannon & Wilson	*Alden Job Number: 9212022/1*
Client Sample Number: Duplicate	*Alden Sample Number: 2024 Dup*
Date of Sample Receipt: 12/21/92	*Analysis Method: WTPH-G*
Date of Sample Extraction: N/A	*Matrix: Water*
Date of Sample Analysis: 12/22/92	*Reporting Units: ug/L*

Compound Name	*CAS Number*	*Reporting Limit*	*Result*
Total Petroleum Hydrocarbons	N/A	250	< RL

Surrogate	*Percent Recovery*
Trifluorotoluene	81
Bromofluorobenzene	75

* m-Xylene and p-xylene cannot be separated and are reported here as a total of the two isomers.

Alden Analytical
Laboratories, Inc.

REPORT OF ANALYTICAL RESULTS

Client: Shannon & Wilson	*Alden Job Number: 9212022/1*
Client Sample Number: NWR-MW003-025-GW-0	*Alden Sample Number: 2025*
Date of Sample Receipt: 12/21/92	*Analysis Method: WTPH-G*
Date of Sample Extraction: N/A	*Matrix: Water*
Date of Sample Analysis: 12/22/92	*Reporting Units: ug/L*

Compound Name	*CAS Number*	*Reporting Limit*	*Result*
Total Petroleum Hydrocarbons	N/A	250	740

Surrogate	*Percent Recovery*
Trifluorotoluene	75
Bromofluorobenzene	70

* m-Xylene and p-xylene cannot be separated and are reported here as a total of the two isomers.

Alden Analytical
Laboratories, Inc.

REPORT OF ANALYTICAL RESULTS

Client: Shannon & Wilson	*Alden Job Number: 9212022/1*
Client Sample Number: NWR-MW001-026-GW-0	*Alden Sample Number: 2026*
Date of Sample Receipt: 12/21/92	*Analysis Method: WTPH-G*
Date of Sample Extraction: N/A	*Matrix: Water*
Date of Sample Analysis: 12/22/92	*Reporting Units: ug/L*

Compound Name	*CAS Number*	*Reporting Limit*	*Result*
Total Petroleum Hydrocarbons	N/A	250	1800

Surrogate	*Percent Recovery*
Trifluorotoluene	83
Bromofluorobenzene	78

* m-Xylene and p-xylene cannot be separated and are reported here as a total of the two isomers.

Alden Analytical
Laboratories, Inc.

REPORT OF ANALYTICAL RESULTS

Client: Shannon & Wilson	*Alden Job Number: 9212022/1*
Client Sample Number: NWR-MW001-027-GW-1	*Alden Sample Number: 2027*
Date of Sample Receipt: 12/21/92	*Analysis Method: WTPH-G*
Date of Sample Extraction: N/A	*Matrix: Water*
Date of Sample Analysis: 12/22/92	*Reporting Units: ug/L*

Compound Name	*CAS Number*	*Reporting Limit*	*Result*
Total Petroleum Hydrocarbons	N/A	250	1700

Surrogate	*Percent Recovery*
Trifluorotoluene	79
Bromofluorobenzene	73

* m-Xylene and p-xylene cannot be separated and are reported here as a total of the two isomers.

Alden Analytical
Laboratories, Inc.

REPORT OF ANALYTICAL RESULTS

Client: Shannon & Wilson	*Alden Job Number: 9212022/1*
Client Sample Number: N/A	*Alden Sample Number: Blank*
Date of Sample Receipt: N/A	*Analysis Method: EPA 8240*
Date of Sample Extraction: N/A	*Matrix: Water*
Date of Sample Analysis: 12/21/92	*Reporting Units: ug/L*

Compound Name	*CAS Number*	*Reporting Limit*	*Result*
Benzene	71-43-2	1.0	< RL
Ethylbenzene	100-41-4	1.0	< RL
Toluene	108-88-3	1.0	< RL
o-Xylene	1330-20-7	1.0	< RL
m,p-Xylene*	1330-20-7	1.0	< RL

Surrogate	*Percent Recovery*	*Advisory Limits*
1,2-Dichloroethane-d4	103	76 - 114
Toluene-d8	102	88 - 110
Bromofluorobenzene	104	86 - 115

* m-Xylene and p-xylene cannot be separated and are reported here as a total of the two isomers.

Alden Analytical
Laboratories, Inc.

REPORT OF ANALYTICAL RESULTS

Client: Shannon & Wilson	*Alden Job Number: 9212022/1*
Client Sample Number: N/A	*Alden Sample Number: Blank2*
Date of Sample Receipt: N/A	*Analysis Method: EPA 8240*
Date of Sample Extraction: N/A	*Matrix: Water*
Date of Sample Analysis: 12/22/92	*Reporting Units: ug/L*

Compound Name	*CAS Number*	*Reporting Limit*	*Result*
Benzene	71-43-2	1.0	< RL
Ethylbenzene	100-41-4	1.0	< RL
Toluene	108-88-3	1.0	< RL
o-Xylene	1330-20-7	1.0	< RL
m,p-Xylene*	1330-20-7	1.0	< RL

Surrogate	*Percent Recovery*	*Advisory Limits*
1,2-Dichloroethane-d4	99	76 - 114
Toluene-d8	101	88 - 110
Bromofluorobenzene	99	86 - 115

* m-Xylene and p-xylene cannot be separated and are reported here as a total of the two isomers.

Alden Analytical
Laboratories, Inc.

REPORT OF ANALYTICAL RESULTS

Volatile Matrix Spike/Matrix Spike Duplicate Recovery

Client: Shannon & Wilson
Client Sample Number: N/A
Date of Sample Receipt: N/A
Date of Sample Extraction: N/A
Date of Sample Analysis: 12/21/92

Alden Job Number: 9212022/1
Alden Sample Number: 2000
Analysis Method: EPA 8240
Matrix: Water
Reporting Units: ug/L

Compound	*Spike Added (ug/L)*	*Sample Concentration (ug/L)*	*MS Concentration (ug/L)*	*MS % Rec.*	*QC Limits Rec.*
1,1-Dichloroethene	50	0	47.06	94	61 - 145
Trichloroethene	50	0	48.61	97	71 - 120
Benzene	50	0	46.10	92	76 - 127
Toluene	50	0	50.02	100	76 - 125
Chlorobenzene	50	0	47.56	95	75 - 130

Compound	*Spike Added (ug/L)*	*MSD Concentration (ug/L)*	*MSD % Rec.*	*% RPD*	*QC Limits RPD*	*QC Limits REC.*
1,1-Dichloroethene	50	41.84	84	12	14	61 - 145
Trichloroethene	50	49.00	98	1	14	71 - 120
Benzene	50	48.12	96	4	11	76 - 127
Toluene	50	48.98	98	2	13	76 - 125
Chlorobenzene	50	48.85	98	3	13	75 - 130

Alden Analytical
Laboratories, Inc.

REPORT OF ANALYTICAL RESULTS

Client: Shannon & Wilson
Client Sample Number: NWR-MW002-024-GW-0
Date of Sample Receipt: 12/21/92
Date of Sample Extraction: N/A
Date of Sample Analysis: 12/21/92

Alden Job Number: 9212022/1
Alden Sample Number: 2024
Analysis Method: EPA 8240
Matrix: Water
Reporting Units: ug/L

Compound Name	*CAS Number*	*Reporting Limit*	*Result*
Benzene	71-43-2	1.0	< RL
Ethylbenzene	100-41-4	1.0	< RL
Toluene	108-88-3	1.0	< RL
o-Xylene	1330-20-7	1.0	< RL
m,p-Xylene*	1330-20-7	1.0	< RL

Surrogate	*Percent Recovery*	*Advisory Limits*
1,2-Dichloroethane-d4	114	76 - 114
Toluene-d8	104	88 - 110
Bromofluorobenzene	111	86 - 115

* m-Xylene and p-xylene cannot be separated and are reported here as a total of the two isomers.

Alden Analytical
Laboratories, Inc.

REPORT OF ANALYTICAL RESULTS

Client: Shannon & Wilson	*Alden Job Number: 9212022/1*
Client Sample Number: NWR-MW003-025-GW-0	*Alden Sample Number: 2025*
Date of Sample Receipt: 12/21/92	*Analysis Method: EPA 8240*
Date of Sample Extraction: N/A	*Matrix: Water*
Date of Sample Analysis: 12/21/92	*Reporting Units: ug/L*

Compound Name	*CAS Number*	*Reporting Limit*	*Result*
Benzene	71-43-2	1.0	1.3
Ethylbenzene	100-41-4	1.0	1.4
Toluene	108-88-3	1.0	< RL
o-Xylene	1330-20-7	1.0	< RL
m,p-Xylene*	1330-20-7	1.0	6.5

Surrogate	*Percent Recovery*	*Advisory Limits*
1,2-Dichloroethane-d4	114	76 - 114
Toluene-d8	102	88 - 110
Bromofluorobenzene	105	86 - 115

* m-Xylene and p-xylene cannot be separated and are reported here as a total of the two isomers.

Alden Analytical Laboratories, Inc.

REPORT OF ANALYTICAL RESULTS

Client: Shannon & Wilson
Client Sample Number: NWR-MW001-026-GW-0
Date of Sample Receipt: 12/21/92
Date of Sample Extraction: N/A
Date of Sample Analysis: 12/22/92

Alden Job Number: 9212022/1
Alden Sample Number: 2026
Analysis Method: EPA 8240
Matrix: Water
Reporting Units: ug/L

Compound Name	*CAS Number*	*Reporting Limit*	*Result*
Benzene	71-43-2	1.0	1.1
Ethylbenzene	100-41-4	1.0	2.0
Toluene	108-88-3	1.0	< RL
o-Xylene	1330-20-7	1.0	3.7
m,p-Xylene*	1330-20-7	1.0	11

Surrogate	*Percent Recovery*	*Advisory Limits*
1,2-Dichloroethane-d4	102	76 - 114
Toluene-d8	103	88 - 110
Bromofluorobenzene	102	86 - 115

* m-Xylene and p-xylene cannot be separated and are reported here as a total of the two isomers.

Alden Analytical
Laboratories, Inc.

REPORT OF ANALYTICAL RESULTS

Client: Shannon & Wilson
Client Sample Number: NWR-MW001-027-GW-1
Date of Sample Receipt: 12/21/92
Date of Sample Extraction: N/A
Date of Sample Analysis: 12/22/92

Alden Job Number: 9212022/1
Alden Sample Number: 2027
Analysis Method: EPA 8240
Matrix: Water
Reporting Units: ug/L

Compound Name	*CAS Number*	*Reporting Limit*	*Result*
Benzene	71-43-2	1.0	1.3
Ethylbenzene	100-41-4	1.0	2.3
Toluene	108-88-3	1.0	< RL
o-Xylene	1330-20-7	1.0	4.8
m,p-Xylene*	1330-20-7	1.0	12

Surrogate	*Percent Recovery*	*Advisory Limits*
1,2-Dichloroethane-d4	107	76 - 114
Toluene-d8	108	88 - 110
Bromofluorobenzene	110	86 - 115

* m-Xylene and p-xylene cannot be separated and are reported here as a total of the two isomers.

Alden Analytical
Laboratories, Inc.

REPORT OF ANALYTICAL RESULTS

Client: Shannon & Wilson
Client Sample Number: NWR-TB002-028-WA-0
Date of Sample Receipt: 12/21/92
Date of Sample Extraction: N/A
Date of Sample Analysis: 12/22/92

Alden Job Number: 9212022/1
Alden Sample Number: 2028
Analysis Method: EPA 8240
Matrix: Water
Reporting Units: ug/L

Compound Name	*CAS Number*	*Reporting Limit*	*Result*
Benzene	71-43-2	1.0	< RL
Ethylbenzene	100-41-4	1.0	< RL
Toluene	108-88-3	1.0	< RL
o-Xylene	1330-20-7	1.0	< RL
m,p-Xylene*	1330-20-7	1.0	< RL

Surrogate	*Percent Recovery*	*Advisory Limits*
1,2-Dichloroethane-d4	102	76 - 114
Toluene-d8	103	88 - 110
Bromofluorobenzene	102	86 - 115

* m-Xylene and p-xylene cannot be separated and are reported here as a total of the two isomers.

Alden Analytical
Laboratories, Inc.

REPORT OF ANALYTICAL RESULTS

Client: Shannon & Wilson
Client Sample Number: See below
Date of Sample Receipt: 12/21/92
Matrix: Water

Alden Job Number: 9212022/1
Alden Sample Number: See below
Analysis Method: Lead 7421
Reporting Units: mg/L

Client Sample ID	*Alden* Sample Number	Digestion Date	Analysis Date	Reporting Limit	Total Lead
N/A	Blank	12/29/92	12/29/92	0.002	< RL
NWR-MW002-024-GW-0	2024	12/29/92	12/29/92	0.002	0.012
NWR-MW003-025-GW-0	2025	12/29/92	12/29/92	0.002	0.008
NWR-MW001-026-GW-0	2026	12/29/92	12/29/92	0.002	0.023
NWR-MW001-027-GW-1	2027	12/29/92	12/29/92	0.002	0.028

Note: Results are reported to two significant figures.

Alden Analytical
Laboratories, Inc.

REPORT OF ANALYTICAL RESULTS

Metals Blank Spike/Matrix Spike Recoveries

Client: Shannon & Wilson	*Alden Job Number: 9212022/1*
Client Sample Number: N/A	*Alden Sample Number: 2042*
Date of Sample Receipt: N/A	*Analysis Method: EPA 7421*
Date of Sample Digestion: 12/29/92	*Matrix: Water*
Date of Sample Analysis: 12/29/92	*Reporting Units: mg/L*

Compound	*Spike Added (mg/L)*	*Blank Spike Concentration (mg/L)*	*Blank Spike % Rec.*	*QC Limits Rec.*
Lead	2.00	2.45	122	50 - 135

Compound	*Duplicate Concentration (mg/L)*	*% RPD*	*Spike Added (mg/L)*	*Matrix Spike Concentration (mg/L)*	*Matrix Spike % Rec.*	*QC Limits RPD*	*QC Limits REC.*
Lead	0.038	8	2.00	1.76	86	20	50 - 135

Alden Analytical Laboratories, Inc.

1001 S.W. Klickitat way Suite 108 Seattle, WA 98134 (206) 623-3660 Fax (206) 624-8778

Date: 12/21/92 Page 1 of 1

Project/PO Number T1336-03

Contact: KIM FENSKE

Company/Address SHANNON AND WILSON

Phone: 632-8020 Fax:

Samplers: T. FORKER

Alden Project Number: 9212022.1

Sample Date/Time	Sample ID #	Matrix	# Containers	BETX 8240	NTPH-G	TOTAL LEAD	NTPH-G w/ BETX	TAT	Lab ID #	Remarks
12/18/92	NWR-MW002-024-GW-0	WATER	3	X	X	X		A	2024 A-C	
	NWR-MW003-025-GW-0		3	X	X	X			2025 A-C	
	NWR-MW001-026-GW-0		3	X	X	X			2026 A-C	
	NWR-MW001-027-GW-		3	X	X	X			2027 A-C	
	NWR-TB002-028-WA-0		1	X					2028	
	NWR-WP-NE-029-SL-0	SOIL	2			X	X		2029 AB	
	NWR-WP-SE-030-SL-0		2			X	X		2030 AB	

Analyses Requested

Relinquished By:

Signature

Date Time

Received By:

Signature

Date Time

Relinquished By:

Signature

Date Time

Received By:

Signature

Date Time

Please note that samples received after 3PM are considered received 8AM the following business day.

Special Instructions/Comments:

TAT Codes

(A Standard) B 24hr

C 48 hr D 72hr

E 1 Week F Other:

Chain of Custody Record

Shannon & Wilson, Inc.

400 N. 34th Street, Suite 100
Seattle, WA 98103
(206) 632-8020

11500 Olive Blvd., Suite 276
St. Louis, MO 63141
(314) 872-8170

2055 Hill Road
Fairbanks, AK 99707
(907) 479-0600

5430 Fairbanks Street, Suite 3
Anchorage, AK 99518
(907) 561-2120

Page 1 of 1
Laboratory Alten
Attn: J.C.

Analysis Parameters/Sample Container Description
(include preservative if used)

Sample Identity	Lab No.	Time	Date Sampled	Comp.	Grab	BTEX	WTPH-G	Total Lead	TPH-G/BTEX			Total Number of Containers	Remarks/Matrix
NWR-MW002-024-GW-0		1515	12/18		X	+	+	+					WATER
-MW003-025-GW-0		1555											
-MW001-026-GW-0		1610											
-MW001-027-GW-0		1610											
-TP002-028-WA-0		1615			X	+							
-WP-NE-029-SL-0		1626		X				+	+				SOIL
-WP-SE-030-SL-0		1645		X				+	+				

Project Information		Sample Receipt	
Project Number:	T1336-03	Total Number of Containers	17
Project Name:	N.W.R.	COC Seals/Intact? Y/N/NA	Y
Contact:	Kim Fenske	Received Good Cond./Cold	Y
Ongoing Project?	Yes ☑ No ☐	Delivery Method:	
Sampler:	Toll, Fox, Kerr	(attach shipping bill, if any)	HAND

Instructions

Requested Turn Around Time: Normal

Special Instructions:

Call w/ Prelim.

Distribution: White - w/shipment - returned to Shannon & Wilson w/ Laboratory report
Yellow - w/shipment - for consignee files
Pink - Shannon & Wilson - Job File

Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.
Signature: Toll Fox Time: 1130	Signature: Time:	Signature: Time:
Printed Name: Tollifox Date: 12/21	Printed Name: Date:	Printed Name: Date:
Company: Shannon Wilson	Company:	Company:
Received By: 1.	**Received By: 2.**	**Received By: 3.**
Signature: Time: 1130	Signature: Time:	Signature: Time:
Printed Name: Date: 12/21 PAUL PANKEN	Printed Name: Date:	Printed Name: Date:
Company: Alten Analytical	Company:	Company:

F-19-91/UR

No. 11533

APPENDIX B

IMPORTANT INFORMATION ABOUT YOUR SUBSURFACE WASTE MANAGEMENT (REMEDIATION) REPORT

Important Information About Your Geotechnical Engineering/ Subsurface Waste Management (Remediation) Report

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS.

Consulting geotechnical engineers prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer/geoscientist.

AN ENGINEERING REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical engineering/subsurface waste management (remediation) report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, have the consulting engineer(s)/scientist(s) evaluate how any factors which change subsequent to the date of the report, may affect the recommendations. Unless your consulting geotechnical/ civil engineer and/or scientist indicates otherwise, your report should not be used: 1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); 2) when the size, elevation, or configuration of the proposed project is altered; 3) when the location or orientation of the proposed project is modified; 4) when there is a change of ownership; or 5) for application to an adjacent site. Geotechnical/civil engineers and/or scientists cannot accept responsibility for problems which may occur if they are not consulted after factors which were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural changes or human influence. Because a geotechnical/waste management engineering report is based on conditions which existed at the time of subsurface exploration, construction decisions should not be based on an engineering report whose adequacy may have been affected by time. Ask the geotechnical/waste management consultant to advise if additional tests are desirable before construction starts. For example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/waste management report. The geotechnical/civil engineer and/or scientist should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST GEOTECHNICAL RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help minimize their impact. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your geotechnical engineer's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Because actual

subsurface conditions can be discerned only during earthwork, you should retain your geotechnical engineer to observe actual conditions and to finalize conclusions. Only the geotechnical engineer who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The geotechnical engineer who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE GEOTECHNICAL ENGINEERING/SUBSURFACE WASTE MANAGEMENT (REMEDIATION) REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical engineering/subsurface management (remediation) report. To help avoid these problems, the geotechnical/civil engineer and/or scientist should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological and waste management findings and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE ENGINEERING/WASTE MANAGEMENT REPORT.

Final boring logs developed by the geotechnical/civil engineer and/or scientist are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical engineering/waste management reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To minimize the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/waste management report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes which aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical engineering/subsurface waste management (remediation) is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical/ waste management consultants. To help prevent this problem, geotechnical/civil engineers and/or scientists have developed a number of clauses for use in their contracts, reports and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the engineer's or scientist's liabilities to other parties; rather, they are definitive clauses which identify where the engineer's or scientist's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your engineer/scientist will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland