SEATAC NW AIRLINES FRONT HANGAR
SeaTac Airport LUST # 2053

SR. 6/13/91 Interim soil

RECEIVED
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DEPT. OF ECOLOGY

RZA

RITTENHOUSE-ZEMAN & ASSOCIATES, INC.
Geotechnical & Environmental Consultants
1400 140th Avenue N.E.
Bellevue, Washington 98005-4594
(206) 746-8020/FAX (206) 746-6364

16 April 1991

W-7165

Northwest Airlines, Inc.
Mail Stop A 11-30
Minneapolis-St. Paul International Airport
St. Paul, Minnesota 55111

Attention: Mr. Jim Nelson

Subject: Addendum to 24 January 1991 Underground Storage Tank Removal Report
Sea-Tac International Airport Facilities hangar area / flight kitchen
Seattle, Washington

Dear Mr. Nelson:

This letter is an addendum to Rittenhouse-Zeman and Associates, Inc. (RZA) Underground Storage Tank Removal Report dated 24 January 1991. Shortly after this report was issued to you, the Northwest Airlines Flight Kitchen fuel oil tank was removed. This letter summarizes our observations and the results of the removal of this tank. Tables 1, 2 and 3 of the original report have been amended to include the results of this fifth tank removal. An additional table (Table 8), figure (Figure 5) and Appendix A page (Photographs I and J) are also included with this letter.

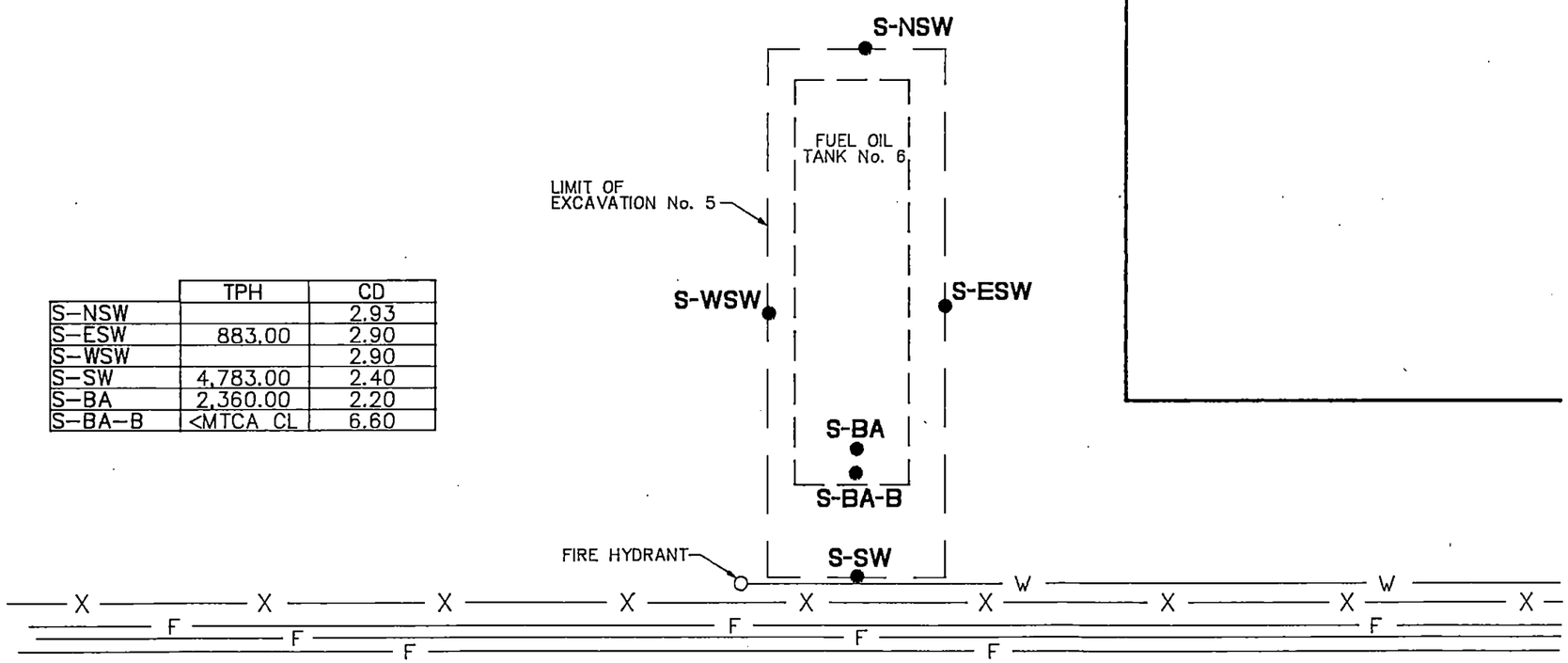
SUMMARY

The main body of this letter should be consulted for a detailed discussion of our findings. A brief summary of our observations and conclusions are presented below:

- A 10,000 gallon underground storage tank next to the flight kitchen was removed. This tank contained fuel oil during usage;

- Approximately 125 cubic yards of petroleum hydrocarbon impacted soil were removed from the site for disposal at the Woodworth Asphalt Company, Tacoma, Washington;

	TPH	CD
S-NSW		2.93
S-ESW	883.00	2.90
S-WSW		2.90
S-SW	4,783.00	2.40
S-BA	2,360.00	2.20
S-BA-B	<MTCA CL	6.60

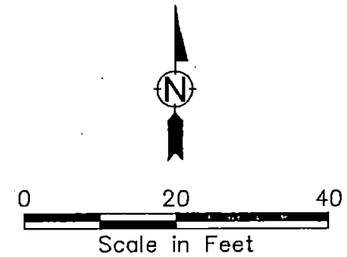


DELTA AIRLINES
FUEL FARM

NORTHWEST AIRLINES
FLIGHT KITCHEN

LEGEND

S-NSW ●	SOIIL SAMPLE NUMBER AND LOCATION
TPH	TOTAL PETROLEUM HYDROCARBONS CONCENTRATION IN PPM
CD	CADMIUM CONCENTRATION IN PPM
<MTCA CL	BELOW MTCA CLEAN UP LEVELS
-X——X-	FENCE
——F——	12" I.D. JET FUEL LINE
——W——	12" I.D. WATER LINE



NORTHWEST AIRLINES
SEA-TAC, WASHINGTON

SITE AND EXPLORATION PLAN

FIGURE 5

W.O. W-7165
BY WRV
DATE MARCH 1991
SCALE 1"=10'

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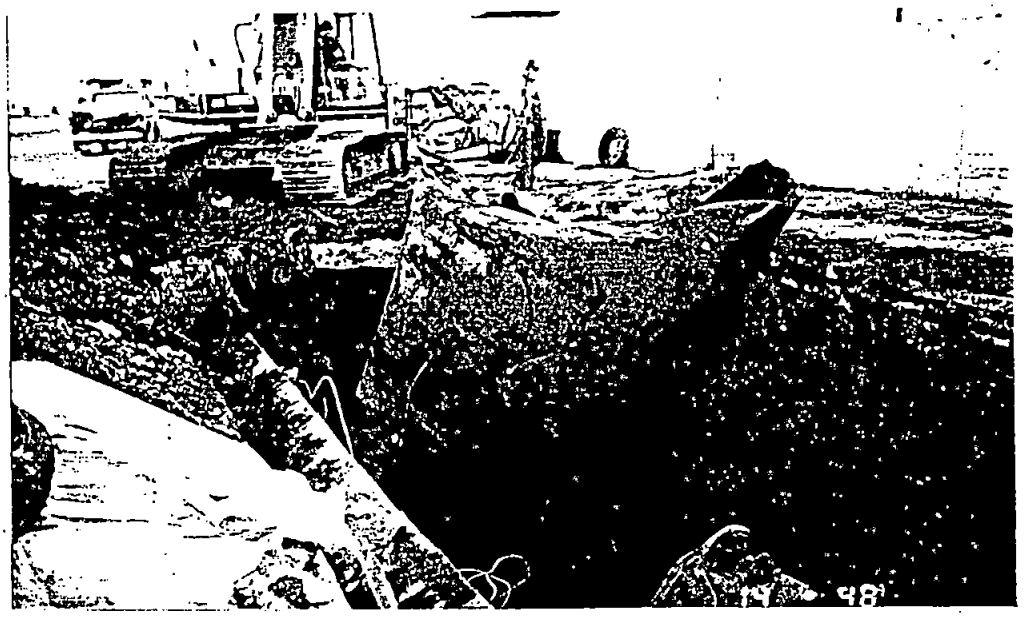
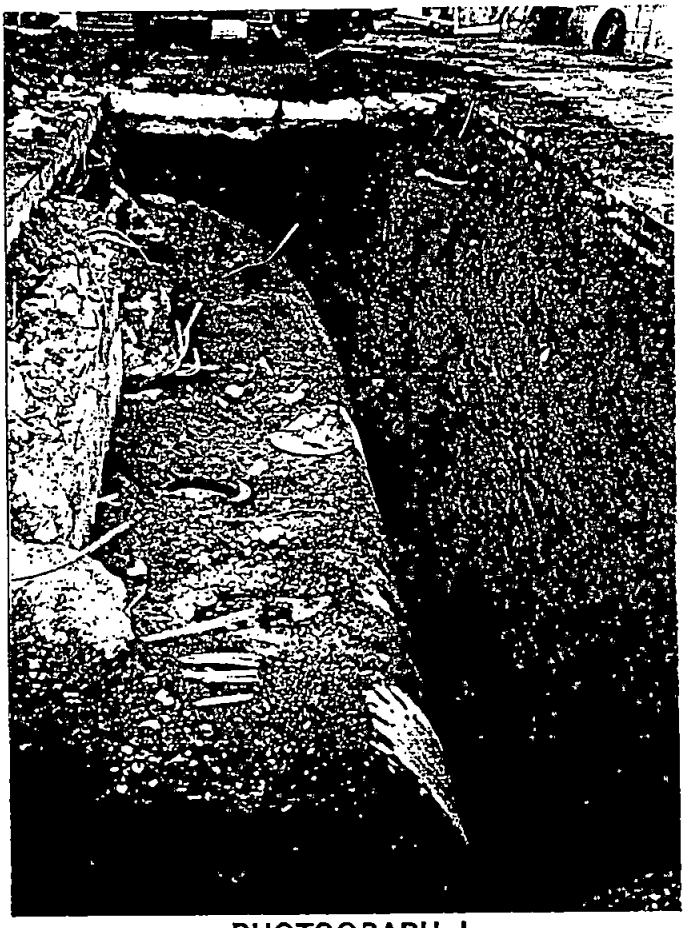
Bellevue, WA 98005



PHOTOGRAPH I
FLIGHT KITCHEN FUEL OIL TANK AND
EXCAVATION DURING REMOVAL



PHOTOGRAPH J
EXCAVATION No.5 PRIOR TO TANK REMOVAL
(LOOKING NORTH)

NORTHWEST AIRLINES
SEA-TAC, WASHINGTON
SITE PHOTOGRAPHS

W.O.	W-7165
BY	WRV
DATE	MAR 1991
SCALE	N.T.S.

RITTENHOUSE-ZEMAN & ASSOCIATES, INC.
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RZA

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS
4630 PACIFIC HIGHWAY EAST, SUITE B-14, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Rittenhouse-Zeman Date: March 7, 1990

Report On: Analysis of Water Lab No.: 10146

IDENTIFICATION:
Samples Received on 3-5-90
Project: W-6702 Northwest

ANALYSIS:

Lab Sample No.	Client Identification	Total Petroleum Hydrocarbons, ppm by EPA Method 418.1
1	MW-1	8.0
2	MW-2	7.0
3	MW-3	7.0
4	MW-4	8.0

Lab Sample No. 5 Client ID: B-4 Water

Purgeable Aromatics per Method 602, 40 CFR, Part 136

Contaminant	Concentration (ppm)
Benzene	< 0.001
Toluene	< 0.001
Ethyl benzene	< 0.001
Xylenes	< 0.001

Total Petroleum Fuel Hydrocarbons by EPA SW-846 Modified Method 8015	< 10

SOUND ANALYTICAL SERVICES

STAN P. PALMQUIST

- Petroleum hydrocarbon impacted soils remain in the vicinity of the excavation. Analyses of the soils identify the petroleum hydrocarbons as being mineral spirits/jet fuel based. The tank was located adjacent to three 12-inch jet fuel lines and a tank farm operated by Delta Airlines, Inc.

EXCAVATION AND TANK REMOVAL OBSERVATIONS - EXCAVATION NO. 5

The underground storage tank was removed as per the procedures outlined in RZA's 24 January 1991 report. The 10,000 gallon tank was removed on 5 February 1991. As the tank was being removed from the excavation, the tank tore and was removed in pieces. The excavation and removed tank are shown in photos I and J.

The soils observed in the excavation were dense, gray, moist to saturated gravelly silty medium sands. Groundwater was encountered in the excavation at an approximate depth of 12 feet.

The tank was constructed of uncoated steel. Upon removal, the tank was inspected for scaling, pitting and holes by an RZA field representative. Minor to no scaling or pitting were observed on the surfaces of the tank. No holes in the tank surface, other than those created during removal, were observed.

The excavation was inspected for visible staining after the tank was removed. Staining of the soils was observed in the southern half of the excavation. Hydrocarbon odors were observed during excavation activities. The final depth of the original excavation was approximately 13.5 feet below existing site grade.

On 8 February 1991, the base of the excavation was lowered to approximately 18 feet below existing site grade to remove as much of the impacted soils as possible. At a depth of 18 feet, the soils in the base of the excavation no longer exhibited staining or hydrocarbon-like odors. The final excavation is shown on Figure 5. Monitoring well MW-4 was destroyed during the excavation deepening activity.

QUANTITATIVE LABORATORY ANALYSES

Five soil samples were collected from the original excavation sidewalls and base for analysis of total petroleum hydrocarbons (TPH) by EPA Method 8015 Modified, BTEX (benzene, toluene, ethylbenzene and xylenes) by EPA Method 8020, barium, cadmium, chromium and lead. After the excavation was extended in depth, a second excavation base soil sample

was collected along with a sample from the soil stockpile for analysis of the same constituents. The location of the soil samples is shown on Figure 5. A summary of the results is presented in Table 8.

Xylenes were measured in soil samples collected from the south sidewall (S-SW) and the original excavation base (S-BA) at levels below the Washington Model Toxics Control Act (MTCA) cleanup criteria for xylenes of 20 parts per million (ppm). All other volatile aromatic hydrocarbon analytes were non-detectable. Ethylbenzene was also measured in the original base sample at a concentration of 0.13 ppm. The MTCA cleanup for ethylbenzene is 20 ppm. All other volatile aromatic hydrocarbon analytes were nondetectable.

TPH concentrations above the MTCA cleanup criteria of 200 ppm were measured in soil samples collected from the east sidewall (S-ESW), south sidewall (S-SW), the original excavation base (S-BA) and the soil pile (S-WP1). The TPH concentrations measured ranged from 237 ppm in the soil pile sample to 4,783 ppm in the south sidewall sample. The concentrations were non-detectable in the soil sample collected from the final base of the excavation at a depth of about 18 feet below the existing site grade. The TPH measured in the excavation samples was identified as mineral spirits/jet fuel. The TPH measured in the soil pile sample was identified as diesel fuel.

Barium, cadmium and chromium concentrations were measured in all seven soil samples. MTCA cleanup criteria exist for cadmium and chromium. No MTCA cleanup standards have been developed for barium. The barium concentrations measured ranged from 20.9 ppm in the original excavation base sample to 62.2 ppm in the second excavation base sample (S-BA(B)). The cadmium concentration measured in the seven soil samples were above the MTCA residential cleanup level (CCL) of 2 ppm, but below the MTCA industrial cleanup level (ICL) of 10 ppm. These cadmium concentrations ranged from 2.2 ppm in the original excavation base sample to 6.6 ppm in the second excavation base sample. The chromium concentrations measured were below the MTCA cleanup standards and ranged from 12.9 ppm in the north sidewall sample to 48.8 ppm in the second excavation base sample.

DISPOSAL OF EXCAVATED SOILS

The soils excavated from excavation No. 5 were stockpiled on site until characterization of these soils could be completed. Once the stockpiled soils (approximately 125 cubic yards) were characterized, they were transported to the Woodworth and Company asphalt facility in Tacoma, Washington for treatment and disposal.

CONCLUSIONS

Based upon the data collected during tank removal and excavation activities, the following conclusions have been made concerning the flight kitchen fuel oil tank:

- Mineral spirits/jet fuel impacted soils remain in the vicinity of the tank excavation;
- These impacted soils most likely are the result of previous releases from the adjacent tank farm and 12-inch jet fuel lines. No fuel oil impacted soils were detected in the excavation;
- Upon removal, the fuel oil tank exhibited good structural integrity based on visual observation of both tank halves.

We appreciate this opportunity to be of continued service to Northwest Airlines, Inc. Should you have any questions regarding this report, please call at your earliest convenience.

Respectfully submitted,

RITTENHOUSE-ZEMAN & ASSOCIATES, INC.

Wendre R. Vaughan

Wendre R. Vaughan
Environmental Geologist

Jon N. Sondergaard, P.G., R.E.A.
Senior Environmental Geologist

cc: Mr. Mike McKinley/Northwest Airlines

Enclosures: Table 1 - Summary of Underground Storage Tank Details
Table 2 - Summary of Field Screening of Soils
Table 8 - Summary of Chemistry Analyses - Excavation No. 5
Figure 5 - Site Exploration Plan - February 1991
Appendix A - Photographs I and J

Table 1: Summary of Underground Storage Tank Details
Northwest Airlines - SEATAC
RZA Job No. 7165

Tank No.	Construction Material	Capacity (gallons)	Contents	Observations
Tank 1	Steel	500	Used Mineral Spirits	Bottom and Sides of Excavation Stained
Tank 2	Steel	500	Used Oils	Bottom and Sides of Excavation Stained
Tank 3	Steel	6,000	Fuel Oil	Tank Moderately scaled and pitted. No observed staining in excavation.
Tank 4	Steel	10,000	Mineral Spirits	Stains in bottom and top of sides of excavation.
Tank 5	Steel	200	Fuel Oil	Tank heavily scaled and pitted. No observed staining in excavation.
Tank 6	Steel	10,000	Fuel Oil	Tank minorly scaled and pitted. South part of excavation stained.

Table 2: Summary of Field Screening of Soils
Northwest Airlines - SEATAC
RZA Job No. 7165

Date	Excavation	Sample Location	Reading (ppm)
08-Oct-90	Excavation No. 2	Supply Lines, Southwest Sidewall	20
		Southwest Sidewall, 5-6 feet	0
		Northeast Sidewall, 5-6 feet	0
18-Oct-90	Excavation No. 3	Gas Line Backfill, Southwest Sidewall	134
		Excavation Bottom, Northwest Portion	102
30-Nov-90	Excavation No. 4	Southeast Sidewall, 2-3 feet	21
		Northwest Sidewall, 2-3 feet	2.4
		Southeast Sidewall, 2-3 feet	2.2
		Northwest Sidewall, 2-3 feet	2.2
		Excavation Bottom, 4-5 feet	2.0
05-Feb-91	Excavation No. 5	East Sidewall, 8 feet	3.2
		North Sidewall, 8 feet	0
		West Sidewall, 8 feet	14
		South Sidewall, 8 feet	261
		Excavation Bottom, 13.5 feet	62.5
		Soil Stockpile	70

Notes: ppm - parts per million

Headspace readings measured using a HNu P101 Photolonization detector with a 10.2 eV lamp.

Table 3: Summary of Analytical Methods Used
Northwest Airlines - SEATAC
RZA Job No. 7165

Analysis Method	SITE CHARACTERIZATION			TANK REMOVAL				
	First Hand Auger Borings	Second Hand Auger Borings	Deep Borings	Excavation No. 1	Excavation No. 2	Excavation No. 3	Excavation No. 4	Excavation No. 5
EPA 8020	---	All	---	---	All	---	All	All
EPA 418.1	---	---	---	All	---	---	All	---
EPA 8015 MOD	All	---	All	---	All	All	All	All
EPA 8010	---	All	---	---	All	---	All	---
EPA 8240	---	---	---	All	---	All	---	---
Barium	---	---	---	Bottom Only	---	All	All	All
Cadmium	---	---	---	Bottom Only	---	All	All	All
Chromium	---	HB-5-B Only	---	Bottom Only	---	All	All	All
Lead	---	HB-5-B Only	---	Bottom Only	All	All	All	All
PCBs	---	HB-5-B Only	---	Bottom Only	---	---	---	---

Notes: --- Method Not Used

First Hand Auger Borings are HB-1 through HB-5.
Second Hand Auger Borings are HB-1-A and HB-5-B.
Deep Borings are monitoring wells MW-1 and MW-2 and boring B-3.

Table 8: Summary of Soil Chemistry Analyses
Excavations No. 5
Flight Kitchen Fuel Oil Tank Excavation
Northwest Airlines - SEATAC
RZA Job No. 7165

PARAMETER	MTCA ICL/CCL (PPM)	Excavation No. 5 S-ESW 8.0' 02/05/91	S-WSW 8.0' 02/05/91	S-SW 8.0' 02/05/91	S-NSW 8.0' 02/05/91	S-BA 13.5' 02/05/91	S-BA(B) 18.0' 02/08/91	S-WP1 soil pile 02/08/91
Benzene	0.5/0.5	ND	ND	ND	ND	ND	ND	ND
Toluene	40/40	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	20/20	ND	ND	ND	ND	0.13	ND	ND
Xylenes	20/20	ND	ND	1.92	ND	1.14	ND	ND
Total BTEX	--	ND	ND	1.92	ND	1.27	ND	ND
Total Petroleum Hydrocarbons (418.1)		---	---	---	---	---	---	---
Total Petroleum Hydrocarbons (8015)	200/200*	883	ND	4,783	ND	2,360	ND	237
Type of TPH	--	MS/JET	ND	MS/JET	ND	MS/JET	ND	DIESEL
Barium	--	42.6	23.0	28.4	28.2	20.9	62.2	34.9
Cadmium	10/2	2.9	2.9	2.4	2.93	2.2	6.6	3.7
Chromium	500/100	23.9	25.5	20.7	12.9	16.3	48.8	43.5
Lead	1,000/250	ND	ND	ND	ND	ND	ND	ND

NOTES:
ND - Not Detected
-- - MTCA cleanup levels not set
--- - Not Analyzed
MS - Mineral Spirits
ICL/CCL - Industrial Cleanup Level/ Compliance Cleanup Level
* - ICL/CCL values for gasoline are 100 ppm. All others are 200 ppm.
Above MTCA cleanup levels.

All results reported in parts per million (ppm).

Analysis methods and detection limits vary. See laboratory reports in Appendix B for specific methods and detection limits.