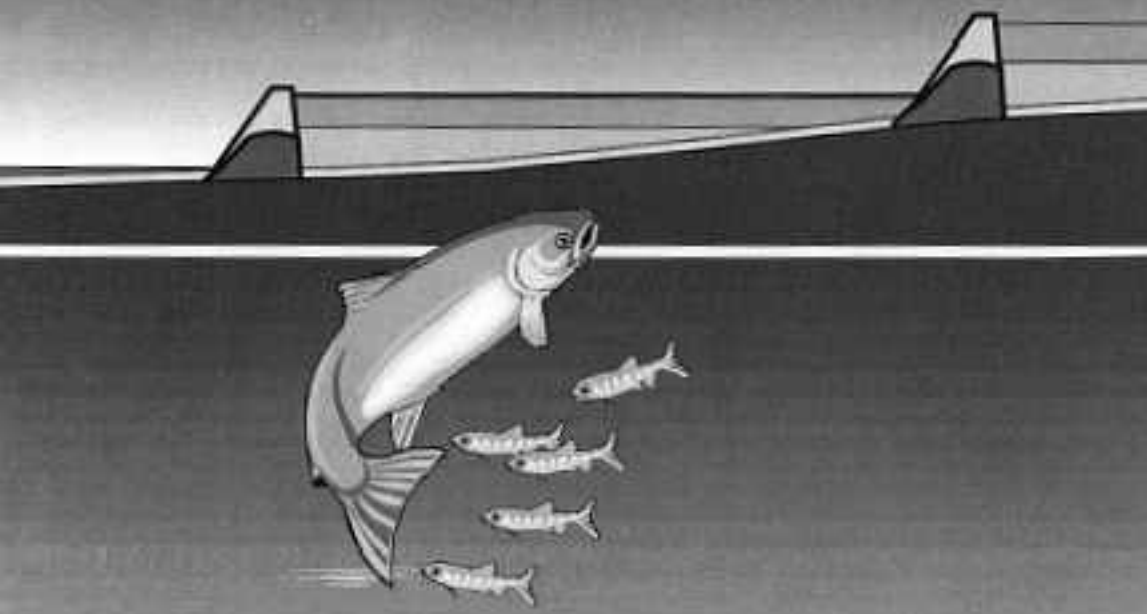
US Army Corps
of Engineers
Walla Walla District

1992 Reservoir Drawdown Test

Lower Granite and Little Goose Dams

Appendix K

Lewiston Levee Waste Area Volume 1 of 3



December 1993

APPENDIX K

LEWISTON LEVEE WASTE AREA

VOLUME 1 of 3

1992 Reservoir Drawdown Test

Lower Granite and Little Goose Dams

Andrea L. Shoulders
Walla Walla District
U.S. Army Corps of Engineers

APPENDIX K

TEST DRAWDOWN 1992 OF
LITTLE GOOSE AND LOWER GRANITE DAMS
LEWISTON LEVEE WASTE AREA

1. INTRODUCTION.

In accordance with recommendations contained in the Record of Decision for the 1992 Options Analysis Document/Environmental Impact Statement for the Columbia River Salmon Flow Measures, a test drawdown of Little Goose and Lower Granite Reservoirs was conducted during the period of 1 to 31 March 1992. The drawdown test enabled the Corps of Engineers to evaluate the effects and feasibility of conducting reduced reservoir water levels on a regular basis. The lowering of water levels within the reservoirs theoretically would increase instream velocities that would potentially move salmon smolts downstream at a faster rate, which would theoretically increase their survival.

During the construction of the Lewiston levees, a considerable amount of hazardous wastes and unsuitable construction materials were placed in a landfill. The landfill is located on the north bank of the Snake River at the mouth of the Clearwater River as shown on plate 1. Effects of the Lower Granite reservoir drawdown on groundwater flow, and contaminant transport from the encapsulated fill, was identified as a potential problem during the planning stages of the drawdown.

2. SITE HISTORY.

The Lewiston levee waste area was originally used as a borrow source during the construction of the levees in the early 1970s. Borrow materials were excavated to a maximum elevation of 717 feet above mean sea level (fmsl). During construction of the levees, unusable materials excavated from property previously used by the Potlatch Corporation, the Camas Prairie Railroad Company, the old City of Lewiston dump, other businesses adjacent to the river, or other areas within the levee system, were disposed of at the Lewiston levee waste area. Inert materials such as asphalt, concrete, scrap metals, brick, glass, plastic, and unsuitable fill materials were placed on the riverward side of the site and armored with riprap. Hazardous and organic materials such as municipal dump wastes, paper mill wastes, oil-saturated soil, and bentonite slurry were placed in an encapsulated fill on the landward side of the site. Plate 2 shows a plan and section of the site.

The design of the encapsulated fill was coordinated with the Idaho Department of Environmental Protection and Health, the Environmental Protection Agency Region X, and the Washington State Department of Ecology. The encapsulated portion of the waste area was constructed by lining a trench with three feet of impervious materials (compacted silt) and placing a two-foot

impervious layer on top of the hazardous and organic materials. Our correspondence to these agencies indicated that 1,000,000 cubic yards of inert, hazardous, and organic wastes were placed at the site. These values may not reflect the actual quantities placed. Construction documents are only kept for a period of five years after a project is complete, and therefore, were not available for reference.

The Port of Lewiston presently owns the site. Terms of the title transfer include adequate restrictions to prevent any type of action which may endanger the integrity of the encapsulated fill. Currently the site is leased by Mountain Fir Lumber Company, Inc. and is used for the storage and chipping of timber.

2. WELL INSTALLATION.

In order to monitor the effects of lowering the Lower Granite reservoir on the encapsulated fill, monitoring wells were installed around the perimeter of the Lewiston levee waste area. Installation of five monitoring wells was completed by the firm of Shannon & Wilson, Inc. on 3 February 1992. The scope of work for the installation and development of the wells, the installation and development plan submitted by Shannon & Wilson, and the final report on monitoring well drilling and installation prepared by Shannon & Wilson are contained in Appendix K1.

Table 1 shows the screened intervals of the monitoring wells. Detailed as-builts of the wells can be found in the final report of the monitoring well drilling and installation.

TABLE 1

LEWISTON LEVEE WASTE AREA MONITORING WELLS

Well Number	Screened Interval (msl)
Upgradient Wells:	
MW-4	718.0 to 708.5
MW-5	728.0 to 718.4
Downgradient Wells:	
MW-1	718.0 to 708.5
MW-2	728.0 to 718.4
MW-3	738.0 to 728.6

3. MONITORING WELL SAMPLING AND ANALYSIS.

Groundwater samples were collected during three separate sampling activities by the firm of Shannon & Wilson, Inc. The scope of work and the sampling and analysis plan are contained in Appendix K2. The first round of samples were collected on February 24 and 25, 1992 for background analysis prior the drawdown. The second round of samples were collected on March 17, 1992 for analysis at the maximum drawdown level. One upgradient and one downgradient well was sampled at that time. The third round of

samples were collected on April 21 and 22, 1992 for analysis after the drawdown.

a. Background Analysis Results. Drummed drill cuttings and water samples were analyzed along with the monitoring wells samples for the background analysis. Drummed materials were analyzed in order to determined disposal requirements of the wastes collected during the installation of the monitoring wells. Samples were collected and analyzed for volatile organics, semi-volatile organics, organochlorine pesticides and PCBs, total metals (target analyte list), petroleum hydrocarbons, common anions (sulfate and nitrate), cyanide, dioxins and furans, and oil and grease.

Project samples were analyzed by ARDL, Inc., Mt. Vernon, Illinois. Quality assurance samples were analyzed by NET Pacific, Inc., Santa Rosa, California. The quality assurance report was written by the Division Materials Laboratory, Troutdale, Oregon. Appendix K3 shows all laboratory data results, and contains the quality assurance report. Table 2 summarizes the chemical analyses.

TABLE 2

SUMMARY OF GROUNDWATER ANALYSIS
FOR SAMPLES TAKEN 24 AND 25 FEBRUARY 1992

Sample Number	CAS Number	Detected (ppm)	MCL (ppm)	Contaminant
MW1001	7429-90-5	0.42	*	Aluminum
	7440-36-0	0.025	*	Antimony
	7440-38-2	<0.0045	0.05	Arsenic
	7440-39-3	0.15	1.0	Barium
		75	*	Calcium
	7440-47-3	0.007	0.04	Chromium
		0.01	*	Cobalt
	7439-89-6	4.8	*	Iron
		25	*	Magnesium
	7439-96-5	2.4	*	Manganese
		5.2	*	Potassium
	7782-49-2	<0.0045	0.01	Selenium
		11	*	Sodium
	7440-66-6	0.014	*	Zinc
		0.006	*	Cyanide
		<0.2		TRPH
		0.55	10	Nitrate
		2.3	*	Sulfate
		0.86	*	Oil & Grease
MW2001	57103	0.014	*	Hexadecanoic acid
	7429-90-5	4.1	*	Aluminum
	7440-38-2	0.043	0.05	Arsenic
	7440-39-3	0.67	1.0	Barium

Sample Number	CAS Number	Detected (ppm)	MCL (ppm)	Contaminant
MW2001	7440-41-7	0.0030	*	Beryllium
		310	*	Calcium
	7440-47-3	**0.040**	0.04	Chromium
		0.038	*	Cobalt
	7439-89-6	120	*	Iron
	7439-92-1	0.0029	0.05	Lead
		88	*	Magnesium
	7439-96-5	5.7	*	Manganese
		14	*	Potassium
	7782-49-2	<0.0045	0.01	Selenium
		36	*	Sodium
		0.016	*	Vanadium
	7440-66-6	0.039	*	Zinc
		0.0090	*	Cyanide
		1.4	10	Nitrate
		1.9	*	Sulfate
		1.4	*	Oil & Grease
MW3001	57103	0.023	*	Hexadecanoic acid
	7429-90-5	12	*	Aluminum
	7440-38-2	0.046	0.05	Arsenic
	7440-39-3	0.82	1.0	Barium
	7440-41-7	0.0030	*	Beryllium
		320	*	Calcium
	7440-47-3	**0.062**	0.05	Chromium
		0.043	*	Cobalt
	7440-50-8	0.024	*	Copper
	7439-89-6	110	*	Iron
	7439-92-1	0.0083	0.05	Lead
		91	*	Magnesium
	7439-96-5	7.9	*	Manganese
	7440-02-0	0.021	*	Nickel
		17	*	Potassium
	7782-49-2	<0.0045	0.01	Selenium
		49	*	Sodium
		0.047	*	Vanadium
	7440-66-6	0.10	*	Zinc
		<0.55	10	Nitrate
		<1.3	*	Sulfate
		0.40	*	Oil & Grease
MW4001	71-43-2	**0.005**	0.005	Benzene
	100-41-4	0.007	0.7	Ethylbenzene
	1330-20-7	0.030	*	Xylene (total)
	7429-90-5	0.10	*	Aluminum
	7440-38-2	<0.0045	0.05	Arsenic
	7440-39-3	0.21	1.0	Barium
		130	*	Calcium

	7439-89-6	0.29	*	Iron
		42	*	Magnesium
	7439-96-5	3.9	*	Manganese

Sample Number	CAS Number	Detected (ppm)	MCL (ppm)	Contaminant
MW4001	7439-97-6	0.0011	0.2	Mercury
MW4001		8.9	*	Potassium
	7782-49-2	<0.0045	0.01	Selenium
		30	*	Sodium
	7440-66-6	0.011	*	Zinc
		<0.1		TRPH
		1.1	10	Nitrate
		26	*	Sulfate
		4.9	*	Oil & Grease
MW5001	78-93-3	0.011	*	2-Butanone
	319-84-6	0.00003	*	alpha-BHC
	7429-90-5	8.0	*	Aluminum
	7440-38-2	<0.0045	0.05	Arsenic
	7440-39-3	0.21	1.0	Barium
		91	*	Calcium
	7440-47-3	0.027	0.04	Chromium
		0.005	*	Cobalt
	7440-50-8	0.015	*	Copper
	7439-89-6	9.2	*	Iron
	7439-92-1	0.0048	0.05	Lead
		32	*	Magnesium
	7439-96-5	0.24	*	Manganese
	7440-02-0	0.021	*	Nickel
		13	*	Potassium
	7782-49-2	<0.0045	0.01	Selenium
		74	*	Sodium
		0.042	*	Vanadium
	7440-66-6	0.031	*	Zinc
		<0.2		TRPH
		11	10	Nitrate
		97	*	Sulfate
		1.0	*	Oil & Grease

Sample Number	CAS Number	Detected (ppm)	Action Level (ppm)	Contaminant
COMP02	121335	0.250	*	Benzaldehyde
	57103	0.560	*	Hexadecanoic acid
	117-81-7	1.2	*	bis(2-Ethylhexyl)phthalate
	7429-90-5	16000	*	Aluminum
	7440-36-0	<3.8	*	Antimony
	7440-38-2	2.0	5	Arsenic
	7440-39-3	**120**	100	Barium
	7440-41-7	<0.15	*	Beryllium
	7440-43-9	0.62	1	Cadmium

		9200	*	Calcium
	7440-47-3	12	5	Chromium
		12	*	Cobalt
	7440-50-8	24	*	Copper

Sample Number	CAS Number	Detected (ppm)	Action Level (ppm)	Contaminant
COMP02	7439-89-6	26000	*	Iron
	7439-92-1	7.6	5	Lead
		4600	*	Magnesium
	7439-96-5	320	*	Manganese
	7439-97-6	<0.10	0.2	Mercury
	7440-02-0	11	*	Nickel
		2100	*	Potassium
COMP02	7782-49-2	<0.14	1	Selenium
	7440-22-4	<1.3	5	Silver
		<680	*	Sodium
	7440-28-0	<0.76	*	Thallium
		75	*	Vanadium
	7440-66-6	60	*	Zinc
		180		TRPH
COMP03	57103	0.580	*	Hexadecanoic acid
	76131	0.007	*	Ethane
	117-81-7	0.610	*	Bis(2-Ethylhexyl)phthalate
	7429-90-5	11000	*	Aluminum
	7440-36-0	<3.1	*	Antimony
	7440-38-2	2.2	5	Arsenic
	7440-39-3	97	100	Barium
	7440-41-7	<0.12	*	Beryllium
	7440-43-9	<0.31	1	Cadmium
		2800	*	Calcium
	7440-47-3	11	5	Chromium
		8.4	*	Cobalt
	7440-50-8	12	*	Copper
	7439-89-6	19000	*	Iron
	7439-92-1	8.0	5	Lead
		3700	*	Magnesium
	7439-96-5	200	*	Manganese
	7439-97-6	<0.082	0.2	Mercury
	7440-02-0	9.2	*	Nickel
		2100	*	Potassium
	7782-49-2	<0.55	1	Selenium
	7440-22-4	<1.1	5	Silver
		<550	*	Sodium
	7440-28-0	<0.62	*	Thallium
		43	*	Vanadium
	7440-66-6	40	*	Zinc
		31		TRPH

* - No MCL or Action Level

COMP02 is composite sample from MW4 and MW5 drill cuttings.
COMP03 is composite sample from MW1, MW2, and MW3 drill cuttings.

b. Maximum Drawdown Analysis Results. Samples were collected from monitoring well MW-1 and MW-4 for analysis. All other wells at the time the samples were collected were dry. Samples were analyzed for volatile organics, semivolatile organics, organochlorine pesticides and PCBs, total metals (target analyte list), petroleum hydrocarbons, common anions (sulfate and nitrate), cyanide, dioxins and furans, and oil and grease.

Project samples were analyzed by Columbia Analytical Services, Inc., (CAS), Kelso, Washington. Quality assurance samples were analyzed by ARDL, Inc., Mt. Vernon, Illinois and the Division Materials Laboratory, Troutdale, Oregon. The quality assurance report was written by the Division Materials Laboratory, Troutdale, Oregon. Appendix K4 shows the laboratory data results and contains the quality assurance report. Table 3 summarizes the chemical analyses.

TABLE 3

SUMMARY OF GROUNDWATER ANALYSIS
FOR SAMPLES TAKEN 17 MARCH 1992

Sample Number	CAS Number	Detected (ppm)	MCL (ppm)	Contaminant
MW1002	143077	0.006	*	Dodecanoic acid
	7429-90-5	2.16	*	Aluminum
	7440-38-2	0.029	0.05	Arsenic
	7440-39-3	0.716	1.0	Barium
		316	*	Calcium
		0.046	*	Cobalt
	7439-89-6	130	*	Iron
		92.6	*	Magnesium
	7439-96-5	6.39	*	Manganese
		11	*	Potassium
		29.1	*	Sodium
		0.017	*	Vanadium
	7440-66-6	0.036	*	Zinc
MW4002	7429-90-5	11.7	*	Aluminum
	7440-39-3	0.338	1.0	Barium
		148	*	Calcium
	7440-47-3	0.008	0.04	Chromium
	7440-50-8	0.018	*	Copper
	7439-89-6	15	*	Iron
	7439-92-1	0.002	0.05	Lead
		50.9	*	Magnesium
	7439-96-5	1.22	*	Manganese
		12	*	Potassium
		41	*	Sodium

	0.036	*	Vanadium
7440-66-6	0.032	*	Zinc
	30	*	Sulfate

* - No MCL or Action Level

c. Post Drawdown Analysis Results. Samples were collected from all monitoring wells for analysis. Samples were analyzed for volatile organics, semivolatile organics, organochlorine pesticides and PCBs, total metals (target analyte list), petroleum hydrocarbons, common anions (sulfate and nitrate), cyanide, dioxins and furans, and oil and grease.

Project samples were analyzed by Columbia Analytical Services, Inc., (CAS), Kelso, Washington. Quality assurance samples were analyzed by NET Pacific, Inc., Santa Rosa, California. The quality assurance report was written by the Division Materials Laboratory, Troutdale, Oregon. Appendix K5 shows the laboratory data results and contains the quality assurance report. Table 4 summarizes the chemical analyses.

TABLE 4

SUMMARY OF GROUNDWATER ANALYSIS
FOR SAMPLES TAKEN 21, 22 APRIL 1992

Sample Number	CAS Number	Detected (ppm)	MCL (ppm)	Contaminant
MW1003	629629	0.006	*	Pentadecane
	544763	0.014	*	Hexadecane
	629787	0.005	*	Heptadecane
	7429-90-5	1.62	*	Aluminum
	7440-38-2	0.018	0.05	Arsenic
	7440-39-3	0.419	1.0	Barium
		188	*	Calcium
		0.029	*	Cobalt
	7439-89-6	53	*	Iron
		58.9	*	Magnesium
	7439-96-5	6.29	*	Manganese
		7.2	*	Potassium
		36.4	*	Sodium
	7440-66-6	0.029	*	Zinc
		47	*	Sulfate
MW2003	544763	0.005	*	Hexadecane
	629787	0.005	*	Heptadecane
	7429-90-5	3.12	*	Aluminum
	7440-38-2	0.048	0.05	Arsenic
	7440-39-3	0.636	1.0	Barium
		308	*	Calcium
		0.035	*	Cobalt

	7439-89-6	130	*	Iron
		80.8	*	Magnesium
	7439-96-5	5.76	*	Manganese
		13.0	*	Potassium
		35.6	*	Sodium
		0.016	*	Vanadium

Sample Number	CAS Number	Detected (ppm)	MCL (ppm)	Contaminant
MW2003	7440-66-6	0.033	*	Zinc
		0.4	*	Sulfate
MW3003	7429-90-5	33.1	*	Aluminum
	7440-38-2	0.012	0.05	Arsenic
	7440-39-3	**1.01**	1.0	Barium
		188	*	Calcium
	7440-47-3	**0.046**	0.04	Chromium
		0.041	*	Cobalt
	7440-50-8	0.048	*	Copper
	7439-89-6	63.8	*	Iron
	7439-92-1	0.017	0.05	Lead
		70.7	*	Magnesium
	7439-96-5	6.5	*	Manganese
	7240.02-0	0.031	*	Nickel
		19	*	Potassium
		70.4	*	Sodium
		0.116	*	Vanadium
	7440-66-6	0.204	*	Zinc
		2.2	*	Sulfate
		0.6	*	Oil and Grease
MW4003	117-81-7	0.012	*	Bis(2-ethlyhexyl) Phthalate
	7429-90-5	0.074	*	Aluminum
	7440-39-3	0.208	1.0	Barium
		118	*	Calcium
	7439-89-6	0.141	*	Iron
		40.9	*	Magnesium
	7439-96-5	4.11	*	Manganese
		7.7	*	Potassium
		50.1	*	Sodium
	7440-66-6	0.019	*	Zinc
		46	*	Sulfate
		0.5	10	Nitrate
		1.2	*	Oil and Grease
	1330-20-7	0.001	*	Xylene (total)
MW5003	629629	0.005	*	Pentadecane
	544763	0.011	*	Hexadecane
	629787	0.010	*	Heptadecane
	7429-90-5	6.96	*	Aluminum
	7440-39-3	0.178	1.0	Barium

		75.4	*	Calcium
	7440-47-3	0.021	0.04	Chromium
	7440-50-8	0.010	*	Copper
	7439-89-6	8.67	*	Iron
	7439-92-1	0.004	0.05	Lead
		29.4	*	Magnesium
	7439-96-5	0.172	*	Manganese
		12	*	Potassium
Sample Number	CAS Number	Detected (ppm)	MCL (ppm)	Contaminant
MW5003		83.6	*	Sodium
		0.027	*	Vanadium
	7440-66-6	0.022	*	Zinc
		51	*	Sulfate
		4.6	10	Nitrate
		1.1	*	Oil and Grease

* - No MCL or Action Level

4. CONCLUSIONS.

By letter, dated 14 July 1992, from the Idaho Department of Health and Welfare, Division of Environmental Quality, the results of the pre-drawdown sampling indicated that the waste was below regulatory levels (see Appendix K3). The same conclusion can be drawn from Table 2. Chromium and nitrate were above the maximum contaminate levels by 0.012 and 1 parts per million respectively for the groundwater samples. Barium, chromium, and lead were above action levels by 20, 7, and 3 parts per million respectively for the composite soil samples respectively. Although these values are above limits, they were not considered significant with respect to regulated hazardous wastes. Both the drummed groundwater and drill cuttings will be disposed of on site by Shannon & Wilson, Inc.

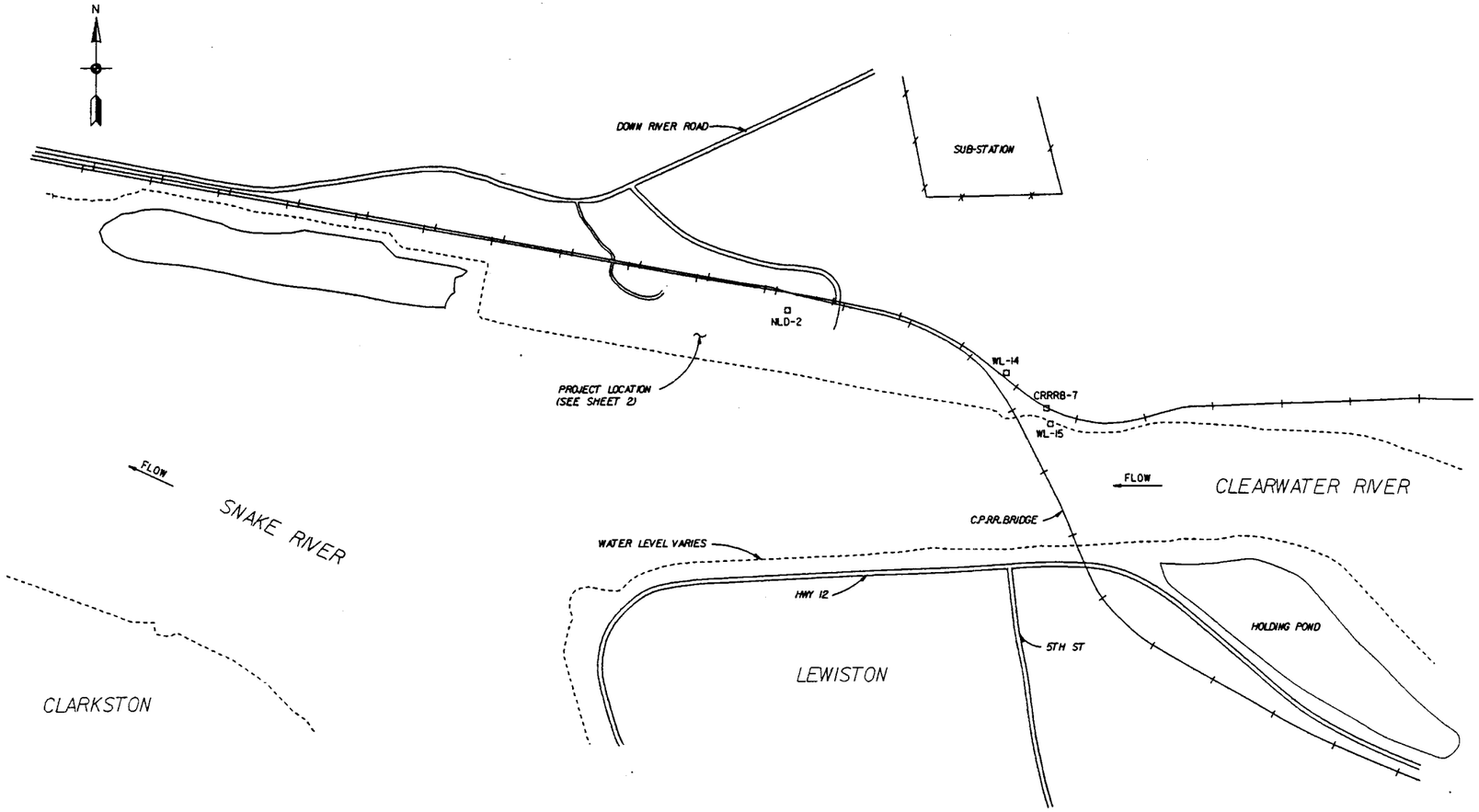
Analytical results from the second round of samples taken at the maximum drawdown level showed no concentrations above regulated levels.

For the final round of samples taken after conditions had stabilized, barium and chromium were 0.01 and 0.006 parts per million above regulated levels. These metals were found above regulated levels during the first round of sampling and therefore reflect background levels.

In conclusion, the encapsulated fill is confining contaminants, even under extreme fluctuations in hydraulic gradients.

A final summary report on analytical findings is being prepared by Shannon & Wilson. Recommendations on future monitoring for the site will be presented. The Division of Environmental

Quality will also inform us of their recommended monitoring frequency for the encapsulated fill after reviewing the final round of sampling analytical results. Their involvement on this site evaluation is in response to assistance by their hazardous waste compliance supervisor in Lewiston, Idaho. Normally, they would only become involved in the review of data in response to compliance requirements for regulated wastes.



PLAN

SCALE IN FEET

400' 0 400'

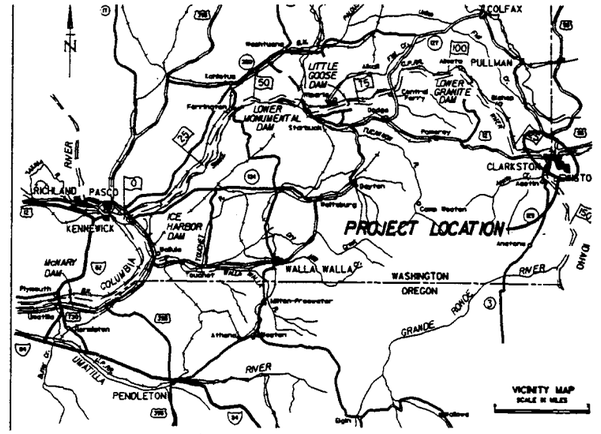
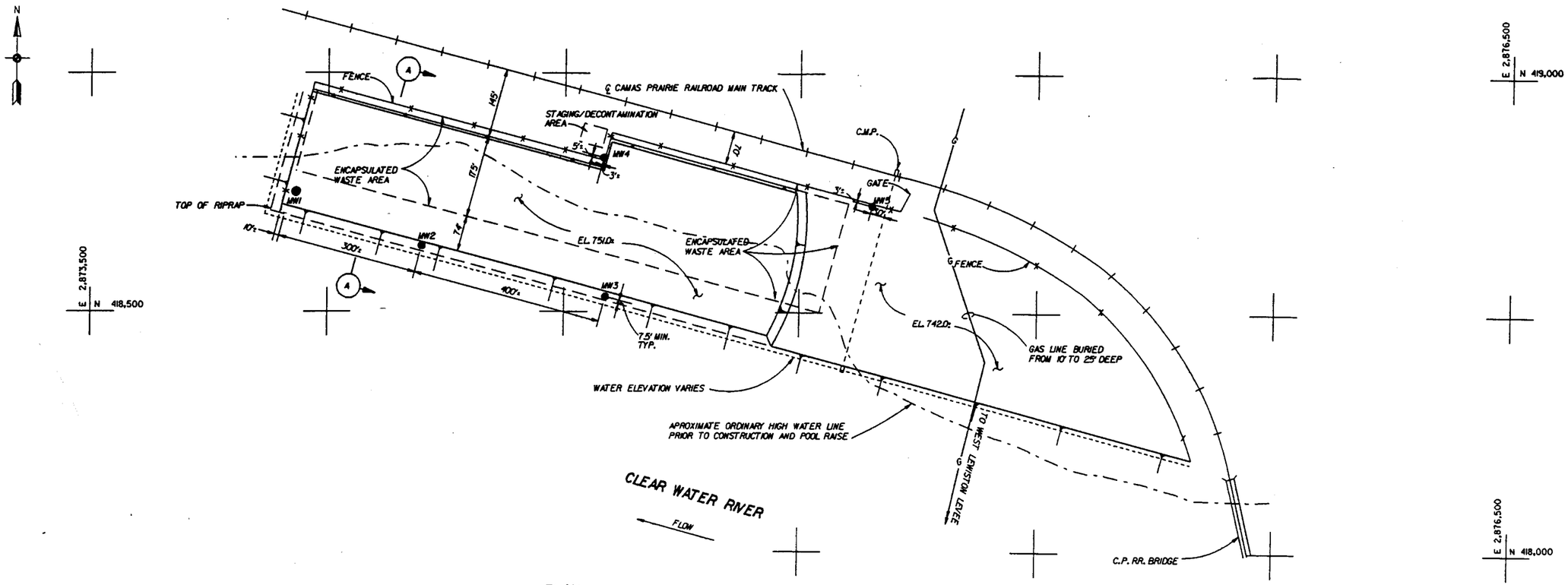
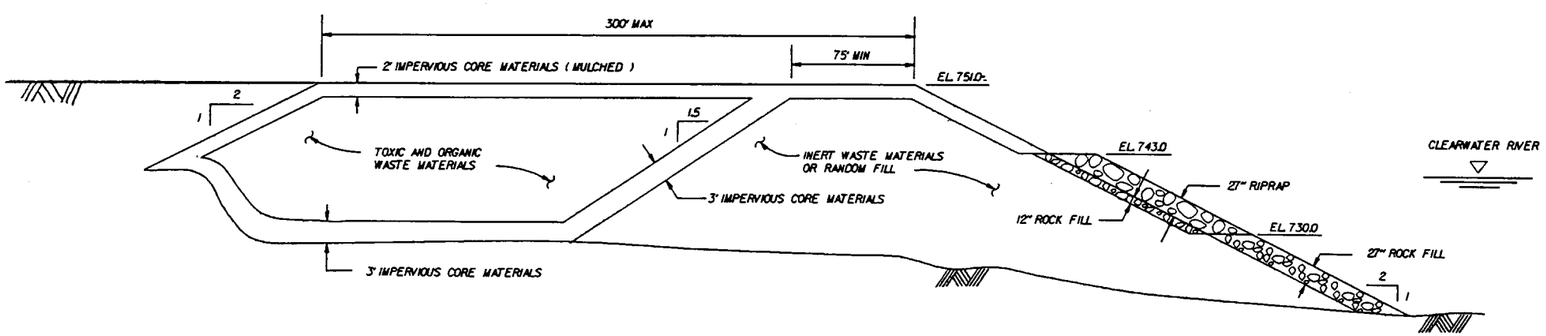


PLATE 1



PLAN

SCALE IN FEET
100' 0 100'



TYPICAL SECTION A
NTS

NOTES:

1. DRAWING COMPILED FROM AS BUILT DRAWING 73-C-196-24.

LEGEND:

ENCAPSULATED WASTE AREA (INERT MATERIALS) BELOW ORDINARY HIGH WATER LINE PRIOR TO LEVEE CONSTRUCTION AND POOL RAISE.

ENCAPSULATED WASTE AREA (TOXIC AND ORGANIC MATERIALS) BELOW ORDINARY HIGH WATER LINE PRIOR TO LEVEE CONSTRUCTION AND POOL RAISE.

● MW4 MONITORING WELL

PLATE 2

APPENDIX K-1

SCOPE OF WORK FOR MONITORING WELL INSTALLATIONS

DRILLING AND WELL INSTALLATION AND DEVELOPMENT PLAN

MONITORING WELL DRILLING AND INSTALLATION FINAL REPORT

SCOPE OF WORK

PART 1 - GENERAL

1.1 SCOPE.

Work for this contract will be located near the confluence of the Snake and Clearwater Rivers at Lewiston, Idaho (sheet 1). Work includes drilling, sampling and testing, and installation of monitoring wells. The monitoring wells are located around the perimeter of an encapsulated waste area (sheet 2). The waste area contains oil saturated soil, organic wastes, paper mill chemical wastes, and bentonite slurry. The wells will be used to establish a detective monitoring program for contaminate migration from the encapsulated area. The Contractor is strongly urged to visit the site to determine drilling equipment accessibility for the monitoring well locations.

1.2 APPLICABLE PUBLICATIONS.

The publications listed below form a part of the specification to the extent referenced. The publications are referred to in the test by the basic designation only.

1.2.1 American National Standards Institute (ANSI).

Z53.1-1979	Safety Color Code for Marking Physical Hazards

1.2.2 American Society for Testing and Materials (ASTM).

A 53 REV A-90	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
C 150-89	Portland Cement
D 422-63 (1990)	Standard Test Method for Particle Size Analysis of Soils
D 1140-54 (1990)	Amount of Material in Soils Finer Than the No. 200 (75-um) Sieve
D 2487-90	Classification of Soils for Engineering Purposes
D 2488-90	Description and Identification of Soils (Visual-Manual Procedure)
F 480-89	Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80

1.2.3 Idaho Department of Water Resources.

Rules and Regulations	Well Construction Standards

1.2.4 Federal Specification.

TT-P-645	Primer for Metal Parts
TT-E-389F, Class A	Finish Enamel

1.2.5 Occupational Safety and Health Administration (OSHA).

OSHA 29 CFR 1910.120	Hazardous Waste Site Operations and Emergency Response

1.2.6 U.S. Army Corps of Engineers Manuals.

EM 385-1-1	Safety and Health Requirements

1.3 GENERAL REQUIREMENTS.

Monitoring wells shall be drilled at the locations and to the depths as shown on the drawings. Monitoring wells shall be 2-inch I.D. with 10-foot screen lengths. All depth measurements will be taken from the existing ground surface at the well locations. Work consists of furnishing and installing monitoring wells, including the costs for screen, casing, filter pack, seals, grout, well development, waste disposal, and sampling and testing during installation. Work includes:

(a) Provide a Site Safety and Health Plan, and a Drilling and Well Installation and Development Plan, implement and ensure these plans comply with Idaho Department of Water Resources Well Construction Standards, U.S. Army Corps of Engineers Safety and Health Manual EM 385-1-1, and OSHA 29 CFR 1910.120.

(b) Drill monitoring wells to the depth specified and furnish, install, and remove temporary casing to prevent caving. Although no recent samples have been taken it is anticipated that materials consist of unconsolidated clay, silt, sand, gravel, cobbles, and boulders based on preconstruction explorations and as built drawings of the encapsulated waste area.

(c) Conduct overburden and groundwater sampling and testing during well drilling and development.

(d) Determine correct screen size with respect to the surrounding stratum and install screen.

(e) Furnish and place filter pack, bentonite and fine sand seals, grout, and mortar collar while withdrawing temporary casing.

(f) Furnish and place monitoring well surface protective measures.

(g) Survey final monitoring well locations.

(h) Restore all work areas to a physical condition equivalent to that of preinstallation, as near as practical. This includes the staging/decontamination area and rut removal.

1.3.1 Measurement and Datum.

The Government shall mark and flag each well site in the field with a survey lath and provide the Contractor with existing ground elevations. Each monitoring well shall be surveyed by the Government upon completion of all the wells to determine map coordinates referenced to the State Plane Coordinate System (SPCS) and the National Geodetic Vertical Datum (NGVD). All measurements shall be made from the same point on the well as permanently marked surveyed by the Government for horizontal and vertical control. The depths to groundwater shall be converted to elevations (msl). Static water levels for all the wells shall be made during the same time frame with an additional measurement made for the Clearwater River.

1.4 PERSONNEL REQUIREMENTS.

1.4.1 Site Geologist.

A site geologist (geologist or geotechnical engineer) experienced in the installation of groundwater monitoring wells, and soil and groundwater sampling methods, shall be on-site and directly responsible for all well drilling, installation, development, and sampling and testing activities. The site geologist shall have on site sufficient tools and professional equipment in operable condition to efficiently perform his/her duties as defined herein. Items in the possession of the site geologist should include: a copy of the Drilling and Well Installation and Development Plan, and the Site Safety and Heath Plan; a 10X hand lens (minimum); an electronic water level detector; tools and equipment necessary to prepare samples for shipment or storage; a pH, conductivity and temperature measuring device; and instruments for measuring oxygen, explosive or toxic gases and organic vapors.

1.4.2 Drill Crew.

The minimum acceptable crew for each drill rig shall be a qualified driller experienced in the installation of monitoring wells and an experienced and qualified helper. The driller shall possess all licenses and permits required to drill monitoring wells in the state of Idaho.

1.5 SUBMITTALS.

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only.

1.5.1 Site Safety and Health Plan (SSHP) (GA).

A written plan, developed by qualified occupational health/industrial hygiene/safety personnel shall be submitted and approved prior to mobilization. The plan shall prescribe all actions for the health and safety protection of the field personnel at the site during implementation of drilling and well installation. This plan shall be specific to the site and shall meet the requirements of OSHA standard 29 CFR 1910.120.

1.5.2 Permits or Licenses (FIO).

State and local drilling permits or licenses shall be the responsibility of the Contractor. A copy of the well driller's State of Idaho drillers license and related drilling permits shall be submitted. Permits are to include digging permits for locating existing utilities.

1.5.3 State of Idaho Progress Reports, Completion Reports, and Other Data (FIO).

The State of Idaho, Department of Water Resources may require progress reports, completion reports, and other data. Copies of reports required by the State shall be submitted to the Contracting Officer.

1.5.4 Well Records (FIO).

Submit record of drilling operation, copy of boring log, sieve analysis and screen slot size within 24 hours of completion of each monitoring well installation. Soil logging shall be completed on Government furnished ENG Forms 1836 and NPW Form 62 (attached). Submit an as built well diagram and well development records within 24 hours of well development.

1.5.5 Catalog Data (FIO).

Submit catalog data for monitoring well screens, riser pipe, filter pack, fine sand, bentonite, cement, centralizers, surface protective devices and joint lubricants for drill rods.

1.5.6 Drilling and Well Installation and Development Plan (GA).

Submit a Drilling and Well Installation and Development Plan that includes the following information:

(a) Type and model of drilling equipment including bit size

and model.

(b) Method of well development and equipment type and model.

(c) Method of equipment decontamination.

(d) Soil and groundwater sampling and testing plan for physical and chemical analysis to include sampling methods and equipment, packaging and shipping, decontamination of equipment, and testing methods. The sampling and testing plan for chemical analysis may be included in the SSHP. Chemical sampling and testing shall follow U.S. Environmental Protection Agency (EPA) guidance documents and shall include Analytical Support Level I - Field Screening and Level IV - Contract Laboratory Program (CLP) Routine Analytical Services (RAS) when field screening requires additional testing.

1.5.7 Test Results (FIO).

Submit copy of chemical test results to the Contracting Officer within 48 hours of testing.

1.6 ABANDONMENT OF WELLS.

Wells abandoned by the Contractor or rejected by the Contracting Officer for any reason, not the fault of the Government (i.e. misalignment, mechanical failure of the drilling equipment, Contractor negligence, unauthorized use of explosives, blockage of well by tools or drilling equipment, etc.) will not be accepted and shall be permanently sealed by methods complying with State regulations and as approved by the Contracting Officer. A replacement well drilled, constructed, developed, and completed in accordance with these specifications shall be provided in a new location as directed by the Contracting Officer. No payment will be made for wells abandoned by the Contractor or rejected by the Contracting Officer. The Contractor will be permitted to remove and salvage the casing from rejected wells.

1.7 RIGHTS OF ENTRY

The Government shall obtain rights of entry to the site prior to drilling. The Contractor shall not access the site without a copy of the signed document permitting access in his/her possession. The Contractor shall notify the Contracting Officer a minimum of 48 hours prior to site entry.

PART 2 - PRODUCTS

2.1 MATERIALS.

Any reference to a product name or manufacturer is intended solely for the purpose of illustration and is not an endorsement

of the product or manufacturer by the U.S. Army Corps of Engineers.

2.1.1 Temporary Well Casing.

The well drive casings (temporary casing) shall be steel pipe conforming to ASTM A 53, Grade B, Sch 40. Casing shall be steamed cleaned prior to use at each monitoring well site.

2.1.2 Well Screens, Casings, and Couplings.

Well screens, casings, and couplings shall be flush threaded Schedule 40 PVC, meeting the requirements of ASTM F 480. Well screens and casing shall be 2-inch diameter. Well screens shall be commercially fabricated with screens having the largest open area per unit length that is practicable for the filter pack. The bottom section of the screen shall be sealed by means of an appropriate cap. Gaskets, pop rivets, or screws shall not be used on monitoring wells. All well screens and well casing shall be free of foreign matter (tape, labels, soil, grease, etc.) and shall be cleaned with steam or pressurized hot water. Washing may be omitted if screens and casing have been prewashed and packaged by the manufacturer and have their packaging intact up to the time of installation. Screens and casings shall be stored in plastic sheeting after washing if they are not immediately placed in the boring.

2.1.3 Lubricants.

If lubrication is needed on the threads or couplings of downhole drilling equipment, only vegetable oil/shortening, petroleum jelly, polytetrafluoroethylene (PTFE) tape, lithium grease, Dow Corning fluorosilicone grease FS-3451, Dow Corning fluorosilicone lubricant FS-33452, DuPont Krytox grease (or a technical equivalent to the Dow/DuPont products) may be used. Only PTFE tape will be allowed on the threads of well riser pipe joints if lubrication is deemed necessary.

2.1.4 Glues and Solvents.

The use of glues and solvents in monitor well installation is prohibited.

2.1.5 Water.

Only potable water shall be used in the drilling and installation of monitoring wells. This includes any water used for drilling, grouting, sealing, filter placement, well development, and tool decontamination. The Contractor shall sample and test the potable water after it has been transported to the site to assure that the water tank used in transport is not contaminating the water. Sampling shall be performed as

described in paragraph: Product Sampling.

2.1.6 Filter Pack.

Filter pack material shall be rounded to sub-rounded siliceous sand grains of the appropriate gradations for the well screen and stratum in which the screen will be set. The gradation shall be determined in the field during drilling after a particle-size analysis of the stratum in which the screen is to be set has been performed by the Site Geologist. The particle-size analysis shall be in accordance with ASTM D 422 and D 1140. No more than 10 percent of the filter pack shall be smaller than the screen-slot width and the pack's uniformity coefficient (40% retained size divided by 90% retained size, or 60% passing divided by 10% passing) shall not be greater than 2.5. The grain size distribution curve for the filter pack shall be selected by multiplying the 50 percent size, of the finest material within the stratum in the screened interval, by two; and then by plotting a gradation curve through this 50 percent point that is within the range of the above stated uniformity coefficient. The appropriate screen slot width shall then be selected as being equal to the 10 percent passing size as plotted on the filter distribution curve. More than one filter pack gradation may have to be kept on hand, so that well construction will not be delayed unnecessarily. The sand shall be packaged in bags by the supplier. The site geologist shall obtain samples of the sand for testing to assure that the sand used is chemically clean as described in paragraph: Product Sampling.

2.1.7 Grout.

The grout used to fill the annulus above the well seal shall consist of Portland cement conforming to ASTM C 150, Type II, bentonite, and water. Cement grout shall be proportioned not to exceed 6 gallons of water to a 94 pound sack of Portland cement which is fluid enough to be pumped through a small diameter pipe. To obtain a better flowing mixture, 3-5 pounds of bentonite may be added per sack of cement and the water increased to 6.5 gallons per sack of cement.

2.1.8 Paint.

The yellow color for finish coats shall be as defined in ANSI Z 53.1. Primer and paint materials shall conform to Fed. Specifications TT-P-645 and TT-E-489F, Class A.

2.1.9 Bentonite Seal.

Bentonite used for seals shall be in pellet, granular, or slurry form. Seals may not be installed dry unless in granular form and above the water table. Bentonite seals in slurry form shall be in a ratio of not less than 7 pounds of bentonite per gallon of water.

2.1.10 Protective Casing.

Protective casing shall be four-inch diameter, Schedule 40 steel pipe conforming to ASTM A 53, with a hinged cover that can be secured with a padlock. All rough edges and areas shall be ground smooth.

2.1.11 Gravel.

Coarse gravel for the gravel pad shall be 3/4-inch to 3-inch in particle size.

2.1.12 Drilling Fluids.

Air will be the only drilling fluid used; drilling foams, organic gels, oil, mud, or other additives will not be permitted.

2.1.13 Antifreeze.

The use of antifreeze shall not be used for drilling operations.

2.1.14 Agents and Additives.

The use of any materials or substances other than those recommended herein for drilling, well installation, or development is prohibited. Included in this prohibition are lead shot, lead wool, burlap, dispersing agents (i.e. phosphates), acids, explosives, disinfectants, etc.

2.1.15 Padlocks.

Padlocks shall be Government furnished.

2.1.16 Mortar.

The mortar mix shall be (by weight) one part cement to two parts sand, or a commercial prepackaged mortar mix, with minimal water necessary for placement.

PART 3 - EXECUTION

3.1 EQUIPMENT CONDITION.

All drilling, sampling and support equipment brought to the site shall be in operable condition and free of leaks in the hydraulic, lubrication, fuel, and other fluid systems that would or could be detrimental to the project effort. All switches (to include safety switches), gages, and other electrical, mechanical, hydraulic, and pneumatic systems shall be in a safe and operable condition prior to arrival on site.

3.2 EQUIPMENT CLEANING AND DECONTAMINATION.

After arrival to the site and prior to drilling, all equipment to include the drill rig, support vehicles, water tanks (inside and out), drill casings, rods, samplers, tools, etc., shall be cleaned with steam or pressurized hot water. A similar cleaning shall also be performed between each monitoring well site for equipment used or soiled at the previous installation site. All equipment shall be decontaminated before leaving the site. A temporary decontamination pad shall be constructed on site, in the area shown on sheet 2, to contain all decontamination water and soils. The pad shall be bermed and inclined towards a sump located in one corner of the pad. Plastic sheeting (10 millimeter) shall line the pad and berms to contain decontamination water. Plywood shall be placed over the plastic in areas where the drill rig and support equipment travel over to protect the plastic. The dimensions of the pad shall be a minimum of the dimensions of the largest piece of equipment plus four feet per side to allow for access and cleaning. Water collected in the sump shall be pumped into steel drums and labeled "Decontamination Pad Water". Solid wastes shall be placed in separate steel drums and labeled "Decontamination Pad Solid Wastes". Upon completion of well drilling, installation, and development, including final decontamination, the decontamination pad shall be disassembled and leveled and graded to its original form.

3.3 DRILLING METHOD.

Air rotary with casing driver drilling methods shall be used. Air usage shall be fully described in the log to include equipment description, manufacturer, model, air pressures used, and frequency of oil filter change. Work zones around each drilling site shall be established as specified in the Site Safety and Health Plan.

3.4 WELL INSTALLATION.

3.4.1 Well Installation Through Temporary Casing.

Borings for the placement of monitoring wells shall be a minimum of four inches in diameter larger than the monitoring well casing. Temporary casing shall be used to maintain the walls of the borehole during the monitoring well installation. Monitoring wells shall be plumb, true and centered in the boring by the use of centralizers if necessary. Sealing of the monitoring well casing shall be permanent and shall prevent movement of surface, or groundwater into the annular space. All sealing materials shall be placed by tremie methods from the bottom of the annular space to be sealed to the surface in one continuous operation. The tremie pipe shall be a minimum of 2 inches in diameter. Final depths to the top of materials placed shall be directly measured. The installation of each monitor well shall begin within 48 hours of boring completion. Once

installation has begun, no breaks in the installation process shall be made until the well has been grouted and drill casing removed. Reference sheet 3 for monitoring well layout requirements.

3.4.2 Installation of Screens, Casing, and Fittings.

Bottoms of well screens shall be placed no more than three feet from the bottom of the drilled borehole. All screen bottoms shall be securely fitted with a threaded cap or plug of the same composition as the screen. The cap or plug shall be within 0.5' of the slotted portion of the screen. Blank lengths of casing attached below the screen (silt traps or sumps) shall not be permitted. The top of the casing should be level, however, if for any reason it is not, a permanent mark shall be made on the top of the casing and all measurements shall be made from that location. The top of the casing shall be capped with either an oversized cap or an undersized plug. A drainage port shall be provided on the protective casing as indicated on the drawings. Well centralizers shall be used as necessary, provided they are not fastened with glue or solvent and that they are of the same material as the casing. Centralizers shall not be attached to the well screen or to that part of the well casing exposed to the bentonite seal.

3.4.3 Filter Pack Placement.

The filter pack shall be washed with water before installation. The filter pack shall be installed from the bottom of the screen to at least three feet above the top of the screen. The theoretical amount of sand required, considering the annular volume to be filled, should be computed, recorded, and compared with the actual amount placed.

3.4.4 Bentonite Seal Placement.

A layer of bentonite at least two feet thick shall be placed on top of the filter pack. Bentonite seals placed below the water table shall be composed of pellets or slurry. Bentonite seals placed above the water table shall be in granular or slurry form. If granular bentonite is used, water shall be added for hydration of the bentonite. A one foot layer of fine sand shall be place at the top of the bentonite seal to provide a barrier to any downward migration of grout. Water shall not be added to any monitoring well once the bentonite seal is placed.

3.4.5 Grouting.

The remaining annular space, up to 6-inches from the surface, shall be grouted. Grout materials shall be combined in a rigid container on site to produce a thick, lump-free mixture throughout the mixing vessel. The mixed grout shall be recirculated through the grout pump prior to placement. Grout shall be placed using a pump and rigid pipe, with the grout pipes

having side discharge ports. The discharge end of the pipe shall be submerged at all times.

3.4.6 Internal Mortar Collar.

An internal mortar collar shall be placed in the remaining 6-inches of annular space above the grout up to the ground surface.

3.4.7 Protective Casing Placement.

The protective casing shall extend six inches above the top of the well casing and at least two feet into the ground. The well identification number shall be permanently attached or engraved on the inner and outer well casings. The outside of the protective casing shall be painted yellow. A 6-inch thick coarse gravel pad shall be placed 2' radially around the protective casing. The existing grade shall be modified to provide drainage away from the well prior to placement of the gravel pad.

3.5 WELL DEVELOPMENT.

Well development shall begin no sooner than 48 hours after, nor longer than 7 days beyond grout placement. Prior to development, sand and fines which have settled in the bottom of the well shall be removed by sand bailer or similar device. Development shall be accomplished with a pump and may be supplemented with a bottom discharge/filling bailer (for sediment removal) and surge block. Pumps may be replaced by bottom filling bailers where slow recharge rates restrict pump usage. Bailers shall not be left inside the wells after development is completed. The use of air shall be prohibited during well development. During development, washing of the entire well cap and the interior of the well casing above the water table using only water from that well shall be performed. The result of this operation is to obtain a casing free of extraneous materials (grout, bentonite, sand, etc.). Well development shall continue until the following conditions are met:

(a) The well water is clear to the unaided eye.

(b) The sediment thickness remaining within the well is 0.1' or less.

(c) The amount of groundwater removed is at least five times the standing water volume in the well (to include the screen and casing plus saturated annulus) plus five times the amount of fluids lost while drilling and the amount of water added to the well while placing the filter pack.

3.5.1 Well Development Records.

The following data shall be recorded as part of development and submitted:

(a) Monitoring well number and project name.

(b) Make and manufacturer's model designation of equipment used including size/capacity of pump and/or bailer.

(c) Description of techniques used.

(d) Date and time of well development.

(e) Static water level before and 24 hours after development.

(f) Quantity of water lost during drilling, removed prior to well insertion, or lost during thick fluid displacement.

(g) Field measurement of pH, conductivity, and temperature as a minimum before, twice during, and after development.

(h) Depth from top of well casing to bottom of well and height of well casing above the ground surface.

(i) Depth from top of well casing to top of sediment inside well, before and after development (from actual measurements at time of development).

(j) Physical character of removed water, to include changes during development in clarity, color, particulates, and any noted odor.

(k) Pumping rates and durations and quantity of water removed.

(l) Estimated recharge rate.

(m) Quantity of sediment removed.

3.5.2 Water Removed from Boring or Well.

Water removed during drilling, installation, and development shall be discharged into the river. If at anytime during drilling operations, visual observation, odors, or meter readings (photoionization detector or combustible gas meter) indicate possible contamination, water shall be contained in steel drums and storage and sampling shall be performed as described in paragraph: Chemical Analysis.

3.6 SAMPLING.

3.6.1 Physical Analysis.

Samples (drill cuttings) for physical descriptions shall be taken continuously for the first 10 feet and every 5 feet or at each change of material, whichever occurs first, thereafter.

Soil descriptions shall be in conformance with ASTM D 2488. Drill cuttings will be temporarily placed near the drill site in a containment area lined with plastic sheeting (6 millimeter thickness). During temporary storage, drill cuttings shall be covered with plastic sheeting in order to minimize spreading by wind and rain. Drill cuttings shall be visually examined and scanned with a photoionization detector and combustible gas meter. If visual observations, odors, or meter readings suggest that contamination may be present, the suspect cuttings shall be placed in a steel drum and procedures outlined in paragraph: Chemical Analysis shall be followed. Any anomalous odors, gas, or vapor readings detected from the boring or samples shall be evaluated before drilling may proceed. After the field safety representative completes this evaluation and implements any appropriate safety precautions, drilling may resume.

3.6.2 Chemical Analysis.

If visual observations, odors, or photoionization detector or combustible gas meter readings suggest that contamination may be present, a composite sample shall be collected from the steel drum and analyzed for the following parameters using EPA guidelines for collection, transport, and analysis: Volatile Organics, Semi-Volatile Organics, Organochlorine Pesticides and PCB's, Petroleum Hydrocarbons, and Total Metals (Ag, Cd, Cr, Pb, As, Hg, Se), and Dissolved Metals (Ag, Cd, Cr, Pb, As, Hg, Se). Separate drums shall be used for each borehole with suspect contaminated drill cuttings and groundwater. Each drum shall be marked with the following information: Drum Number, Site Name, Monitoring Well Number, Contents, and Date. Drums will be stored at the staging area until test results are complete. A drum inventory shall be conducted for tracking purposes. Proper disposal of the drill cuttings and groundwater shall be determined based on the results of the sample analysis. If it is determined that the cuttings or groundwater are not contaminated, the cuttings shall be disposed of by spreading them over the land surface near their corresponding well site and the groundwater disposed of by pumping into the river. If regulated concentrations of contaminants are found to be present, disposal plans shall be in accordance to EPA guidelines.

3.6.3 Sampling for Filter Pack Gradation.

Intact soil samples shall be obtain for particle-size analysis of the stratum in which the screen is to be set as outlined in paragraph: Filter Pack. Soil samples shall be collected continuously using a split-spoon sampler for the 10-foot interval where the screen is to be placed. The hammer weight and number of blows to drive the sampler shall be recorded on the boring logs.

3.6.4 Product Sampling.

Water from the water tank shall be tested to ensure that the

water has not been contaminated during transport. Testing for the parameters outlined in paragraph: Chemical Analysis shall be performed following EPA guidelines. One test for each water tank load shall be performed. Filter pack material shall be tested; however, if the supplier has a chemical analysis of the material available, and the filter material is delivered to the site in bags packaged by the supplier, testing may be waived.

3.7 BORING LOGS.

Logs shall be legible and easy to read. Field logs shall be printed in ink on ENG Form 1836 and NPW Form 62. Any mistakes or corrections shall be marked out with a single diagonal line. Complete logs shall be kept current in the field at each monitoring well site. A scale of 1 inch equals 1 foot of boring is suggested for the boring log, with a scale of 1 inch equals 10 feet of boring for the summary log. The Contractor shall keep accurate records of the depth to the top and bottom of each stratum penetrated and shall provide complete information on items listed below and any additional pertinent data obtained during drilling. Depths/heights shall be recorded in feet and tenths of feet.

(a) Monitoring well number and project name.

(b) Make and manufacturer's model designation of drilling and sampling equipment.

(c) Size and type of bit used.

(d) Dates and start and stop times when drilling and sampling are preformed. If boring is not completed in one day, the log shall show the depth at which work was stopped.

(e) Depths at which samples were recovered or attempted.

(f) Identification of the material of which each stratum is composed in accordance to ASTM 2487.

(g) Drilling penetration rate, air pressures, drillers comments on drillability, drill speed, etc.

(h) Indication of penetration resistance such as drive-hammer blows given in blows per 6 inches of driving sample spoons. Information shall include hammer weight and drop distance.

(i) Location by depth of all changes in strata. If location of strata change is approximate it should be stated.

(j) Depth at which groundwater is first encountered.

(k) Daily depth of static water level in boring prior to start of drilling and again at conclusion of days drilling or

start and end of shifts.

(l) All special problems and their resolution (i.e. hole squeezing, water losses or gains, sudden tool drops, lost casings, etc.).

(m) Depth of bottom of hole.

(n) Name of driller and name and signature of site geologist.

(o) List of any lubricants used on drilling equipment and start (by depth) of their use.

(p) Record readings of instruments used to detect organic vapors, toxic or explosive gases, and oxygen. This includes readings taken at the mouth of the borehole, or an individual sample, or at a certain depth within the borehole.

3.8 MONITORING WELL AS BUILT DIAGRAMS.

Each installed well shall be depicted in an as built diagram. The diagram shall be attached to the original boring log for each installation and graphically denote the following information:

(a) Monitoring well number, project name and location, monitoring well location by coordinates, and date of installation.

(b) Elevation of top of casing (to 0.01 foot).

(c) Depth to bottom of boring and boring diameter.

(d) Screen material, diameter, slot size and configuration, total open area per foot of screen, depth to top and bottom of screen and to end cap.

(e) Casing material, diameter, depth to top and bottom of casing, thread type and joint locations by depth, cap type, and location by depth of centralizers if used.

(f) Filter pack type/size, volume emplaced (calculated and actual), depth to top and bottom of filter pack, source and roundness, and method of emplacement.

(g) Bentonite seal type/size, volume emplaced (calculated and actual), depth to top and bottom of bentonite seal, source, and method of emplacement.

(h) Fine sand seal type/size, volume emplaced (calculated and actual), depth to top and bottom of fine sand seal, source, and method of emplacement.

(i) Grout composition, volume emplaced (calculated and actual), depth to top and bottom of grouted interval, and method of emplacement.

(j) Mortar collar type/composition, volume emplaced (calculated and actual), depth to top and bottom of mortar collar, and method of emplacement.

(k) Protective casing material, diameter, depth to top and bottom of protective casing, locking device, and location of drainage port.

(l) Well development methods, equipment, total volume of water and sediment removed, and thickness of sediment remaining in well.

(m) Stratigraphy taken from the boring logs.

(n) Gravel blanket height and extent.

(o) Water level 24 hours after completion with date and time of measurement.

(p) Special problems encountered during installation and their solutions (i.e. grout in wells, lost casing and/or screens, bridging, casing repairs or adjustments, alignment, etc.).

(q) Name of driller and name and signature of site geologist.

3.9 CLEANUP.

After completion of all work, tools, appliances, surplus materials, temporary drainage, rubbish, and debris incidental to work shall be removed from the site. All excavation and vehicular ruts shall be backfilled and dressed to conform with the existing topography. All work specified under this section shall be performed by the Contractor and shall be performed to the satisfaction of the Contracting Officer. Utilities which must be repaired or replaced due to the Contractor's negligence will be the responsibility of the Contractor and repair or replacement shall be at the Contractor's expense.

3.10 MONITORING WELL COMPLETION DATE.

All monitoring wells shall be complete by 16 February 1992.

Three oversize plates follow this page: a Project Location Map, Site Plan and Section, □ and Monitoring Well Details. Please refer to the original document for these plates.

V-100-01

SHANNON & WILSON, INC.
Geotechnical Consultants
Engineering and Applied Geosciences

Over 35 Years of Excellence

400 North 34th Street, Suite 100 • P.O. Box C-30313 • Seattle, WA 98103 • (206) 632-8020 • Fax: (206) 633-6777

January 27, 1992

Department of the Army
Walla Walla District, Corps of Engineers
Building 602, City-County Airport
Walla Walla, Washington 99362-9265

Attn: Ms. Andy Shoulders

RE: LEWISTON LEVEES WASTE AREA

The attached pages reflect changes to the Lewiston Levees Waste Area Drilling and Well Installation and Development Plan submitted to you on January 23, 1992.

Drilling is scheduled to begin on Wednesday, January 29, 1992. We look forward to working with you on this project.

Sincerely,

SHANNON & WILSON, INC.

Richard H. Gates, P.E.
Vice President

BCG:RHG/lkd

Enclosure: Pages reflecting changes

V100-01.LTR/BCG-lkd/lkd

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LIST OF FIGURES

LEWISTON LEVEES WASTE AREA
DRILLING AND WELL INSTALLATION AND DEVELOPMENT PLAN
JANUARY 1992

U.S. ARMY CORPS OF ENGINEERS
WALLA WALLA, WASHINGTON
CONTRACT NO. DACW68-91-D-0004
DELIVERY ORDER NO. 4

1.0 PROJECT DESCRIPTION

1.1 Introduction

This Drilling and Well Installation and Development Plan describes work to be conducted at the Lewiston Levees Waste Area, near the confluence of the Snake and Clearwater Rivers at Lewiston, Idaho. Figure 1 is a site vicinity map showing the general project location. The project will involve the drilling, installation, and development of five groundwater monitoring wells. The monitoring wells will be located around the perimeter of an encapsulated waste area and will be used to detect and monitor potential contaminant migration from the waste area.

1.2 Scope of Work

The scope of work for this project includes the following tasks:

- Drill and install five monitoring wells at locations specified by the Corps of Engineers. The borings will be drilled using air rotary drilling methods.
- Log and test subsurface soils to determine appropriate screen and filter pack size.
- Develop the five monitoring wells.
- Provide final boring logs and as-built well construction diagrams.

The drilling is scheduled to begin January 29, 1992. Fieldwork will be completed by February 14, 1992.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

This project will be conducted by Shannon & Wilson, Inc. for the Army Corps of Engineers, Walla Walla, Washington, under Contract No. DACW68-91-D-0004, Delivery Order No. 4. Work will be performed in accordance with the Corps of Engineer's Scope of Work for the project. Mr. Dick Kaden, lead engineer and principal, is the Corps of Engineers Contract Officer's Representative (COR). Ms. Andy Shoulders is the Corps of Engineers point of contact for this project.

Shannon & Wilson, Inc. has developed this work plan based on the Scope Of Work provided by the Army Corps of Engineers, and will conduct the field work with the assistance of subcontractors for drilling and laboratory analysis.

Dr. Richard Gates, P.E. of Shannon & Wilson, Inc. is the project manager. Dr Gates is responsible for the overall schedule, scope, and management of the project.

Donald Balmer, P.G. is the Senior Hydrogeologist who will provide technical guidance during the project and has reviewed the work plan. Mr. Balmer will assist the geologist in determining appropriate screen size and will be available to address specific technical problems which may arise.

Beth Geiger, Geologist, will be the field manager and site geologist during the fieldwork described in this Plan. She has prepared this work plan and will log and sample the borings and direct and observe well installation activities. Ms. Geiger will also be responsible for alerting the project manager to any changed conditions, and will act as the Site Health and Safety manager.

Health Risk Associates has developed the Site Health & Safety Plan included in this plan as Appendix A. Environmental West Exploration, Inc. will conduct the drilling and well installation.

3.0 MONITORING WELL DRILLING AND INSTALLATION PLAN

3.1 Overview

This Plan provides guidance for specific methods to be used during the drilling, installation, and development of the five monitoring wells which will be installed during this project. Figure 2 is a site plan showing the locations and elevations of the monitoring wells.

The lower 10 feet of each well will be screened. The approximate elevation of the ground surface, and the elevation of the top of the screen zone in each well will be as follows:

Well	Ground Surface (pre-drilling survey)	Top of Screen Zone	Total Depth (to nearest 05 foot)
MW-1(1)	743.74	718	35.5
MW-2	742.64	728	24.5
MW-3	744.81	738	17.0
MW-4	750.84	718	43.0
MW-5	750.32	728	32.5

(1) Note: MW-1 proposed location will be approximately 6' higher than pre-drill survey.

3.2 Drilling and Soil Sampling

Environmental West Exploration of Spokane, Washington will drill the borings, install the wells, and develop the wells under the direct supervision of the Shannon & Wilson geologist. Drilling will be accomplished using a 1987 Mobile B-80 Odex top drive, air rotary drill rig. The rig is equipped with an air hammer used to drive 6" temporary steel flush-threaded drive casing. Air rotary drilling uses compressed air to activate a down-hole hammer and "under-reamer". As the under-reamer advances into the formation, the casing is pulled behind it, and cuttings are lifted out of the hole by the returning air. The borehole diameter will be 6.5 inches.

As the hole is advanced, samples of the drill cuttings will be collected and logged continuously for the first 10 feet of the boring and at five foot intervals afterwards. Sample descriptions will be recorded on a boring log form (Figure 4). In addition, all samples will be screened for volatile organic compounds using a photo-ionization detector (PID) and for combustible gas using

an MSA combustible gas indicator. Action levels for increased personal protective equipment are discussed in the Site Health and Safety Plan.

In addition to drill cutting samples, continuous split spoon samples will be collected in the 10-foot interval in which the well screen will be placed. These will be analyzed for grain size as described below (Section 3.5).

3.3 Tank Water Chemical Analysis

Prior to drilling, one sample of the water to be used for well installation will be collected and submitted to an analytical laboratory. This sample will be analyzed for the following constituents, using the EPA Method indicated:

Volatile organics	Method 8240
Semi-volatile organics	Method 8270
Organochlorinated Pesticides/PCB's	Method 8080
Petroleum Hydrocarbons	Method 8015
Total Metals	7000 Series

The sample will be maintained at 4°C in a cooler lined with inert padding material while on site and during transport to the laboratory. It will be shipped to an analytical laboratory on the day of collection and will be accompanied by chain-of-custody documentation (Figure 5).

3.4 Soil Cuttings Handling

During drilling, soil cuttings will be placed in drums and the drums labeled with drum number, site name, monitoring well number, contents, and date. Separate drums will be used for each borehole. Drummed cuttings will be left on site.

3.5 Well Installation

Figure 3 shows a typical monitoring well construction diagram for this project. Actual depths and construction details for each monitoring well will be shown on an as-built diagram prepared following completion of the well.

Each monitoring well will be constructed of flush-threaded 2-inch-ID Schedule 40 PVC blank and machine-slotted screened lengths. The lower 10 feet of each well will be screened, and will be fitted with a PVC end cap.

to prevent bridging. Continuous split spoon samples will be collected in the interval in which the screen zone will be placed in each monitoring well. The geologist will conduct an on-site grain-size analysis of the sample to determine appropriate filter pack and screen size. A sample of the sand filter pack will be retained for potential future analysis.

An impervious seal consisting of bentonite pellets or slurry will be placed on top on the sand filter pack. The seal will be 2 feet thick, and placed using tremie methods to prevent bridging. A one foot layer of silica sand will be placed on top of the bentonite seal to protect the bentonite from intrusion by grout. From the top of the bentonite/sand seal, the annulus of each borehole will be backfilled with cement grout to the ground surface. The grout will be pumped into the hole through a tremie pipe.

Surface completion for MW-1, 4, and 5 will be flush-mount steel monuments. For MW-2 and MW-3, the surface completions will consist of 4-inch-diameter, Schedule 40 steel pipe extending 2 feet above ground, equipped with a hinged cover fitted for a padlock. A coarse gravel pad will be constructed around each well.

Following completion of each well, an as-built diagram will be prepared showing exact type and placement of screen, blank, backfill materials, and surface completion. The as-built diagram will also include completion date, monitoring well location, elevation, and other relevant information.

3.6 Well Development

No sooner than 48 hours following completion, the wells will be developed. Development will be performed with a Brainard-Kilman positive displacement pump. The wells will be developed to achieve clarity, remove fines, and improve hydraulic conductivity. Well development will continue until five saturated borehole volumes have been removed. Development water will be retained in drums on site. The drilling subcontractor will develop the wells under the direct supervision of Shannon & Wilson, Inc., with field parameters measured and recorded by Shannon & Wilson. Following development the wells will be sanded to ensure that no sediment remains accumulated at the bottom of the well.

3.7 Water Level Measurements

No sooner than 24 hours following well development, a round of water level measurements will be conducted. Water levels will be measured to the nearest 0.01 inch with an electronic water level indicator. Measurements will be taken from the top of the well casing. The elevation of the level of Clearwater River will also be recorded at that time.

3.8 Documentation

The geologist will record drilling activities, subsurface material description and depths of lithologic changes, water level information, PID readings, and other relevant information related to drilling activities on boring log form (Figure 4). In addition, a daily log will be maintained describing drilling, personnel, and other project activities.

Well development will be documented on a well development form (Figure 6). Information recorded will include the time and duration of development, the progressive appearance and other physical parameters (temperature, pH, conductivity) of the water removed, the total amount of water removed, and any other relevant or unusual observations.

Water level measurements will be recorded on a Water Level Measurement Form (Figure 7). Time of measurement, water level from top of casing, and any other relevant data pertaining to each well will be recorded.

3.9 Decontamination

Prior to drilling each well, all downhole equipment will be steam-cleaned using water which has been chemically analyzed (Section 3.3). The casing, under-reamer, and any other downhole equipment will be cleaned. Equipment decon will take place on a decontamination pad lined with plastic. Following completion of the project, the plastic lining will be placed in a drum, labeled, and left on-site.

During continuous split-spoon sampling, the split spoon and other re-usable sampling equipment will be decontaminated between samples. The decontamination procedures will include scrubbing with Liquinox laboratory grade detergent, rinse with fresh water, and a final rinse with deionized water.

3.10 Decontamination Rinsate

Rinsate from decontamination and steam cleaning will be contained in drums on site. Each drum will be labelled with contents, origin, and date.

3.11 Site Restoration

Following fieldwork, the project will be restored to original condition. Restoration and cleanup will include backfilling of vehicle ruts, excavations, or other damage to the pre-existing surface, and removal of debris with the exception of drummed soil or water as described above.

BCG:DKB:RHG/lkd

V-100-01

Lewiston Levees Waste Area Monitoring Well Drilling and Installation Lewiston, Idaho

February 1992

Army Corps of Engineers
Walla Walla, Washington
Contract No. DACW68-91-D-0004
Delivery Order No. 4

SHANNON & WILSON, INC.
400 N. 34th St., Suite 100
P.O. Box C-30313
Seattle, WA 98103
(206) 632-8020

SHANNON & WILSON, INC.
Geotechnical Consultants
Engineering and Applied Geosciences

V-100-01
Over 35 Years of Excellence

1313 West Clark Street • Pasco, Washington 99301 • (509) 547-9696 • Fax: (509) 547-8752

February 14, 1992

Department of the Army
Walla Walla District, Corps of Engineers
Building 602 City County Airport
Walla Walla, Washington 99362-9265

Attn: Ms. Andy Shoulders

RE: LEWISTON LEVEES WASTE AREA, DRILLING AND WELL INSTALLATION, LEWISTON, IDAHO
CONTRACT NO. DACW68-91-D-0004, DELIVERY ORDER NO. 4

This letter provides the results of work conducted by Shannon & Wilson, Inc. at the Lewiston Levees Waste Area, Lewiston, Idaho, under Contract No. DACW68-91-D-0004, Delivery Order No. 4. This project involved the drilling and installation of five groundwater monitoring wells located around the perimeter of an encapsulated waste area. Work was conducted in accordance with the Corp of Engineers Scope of Work for the project, and with the Drilling and Well Installation Plan prepared by Shannon & Wilson, Inc. (January, 1992). Site location and plan maps, boring logs, and monitoring well as-built diagrams, are attached as Figures 1-7. Analytical test results from a sample of water used for steam cleaning and grouting during drilling are also attached.

Table 1 is a summary of the monitoring wells installed during this project. The five wells were drilled from January 29 to February 1, 1992, at locations specified by the Corps of Engineers. They were developed on February 2 and 3, 1992. All drilling was conducted by Environmental West Exploration, Inc. using a Mobile B-80 air rotary drill rig, with supervision and borehole logging by Shannon & Wilson. Intact soil samples were collected from the well screen intervals using a split spoon sampler driven with a downhole hammer. Environmental West Exploration developed the wells using a Brainard-Kilman PVC pump under the supervision of Shannon & Wilson.

V-100-01

All soil cuttings were contained in drums, and development water and rinsate water were contained in a polyurethane tank. The drums and tank were left at the site, within the Mountain Fir Lumber Company fence.

Please note that the surface elevations shown are from the pre-construction survey and are therefore preliminary. Final elevations, as well as more involved hydrogeologic analyses will be provided in the final report for Delivery Order No. 7.

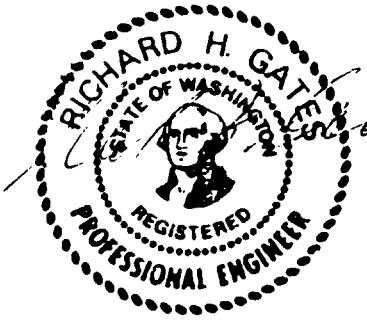
It has been our pleasure to work with you on this project, and we look forward to assisting with future projects. Please contact us if you have additional questions.

Sincerely,

SHANNON & WILSON, INC

Beth C. Geiger
Geologist

BCG:RHG/bcg



2/14/92

Richard Gates, P.E.
Vice President

Enclosures: Table 1 - Monitoring Well Summary
Figure 1 - Vicinity Map
Figure 2 - Site Plan and Monitor Well Locations
Figures 3-7 - Boring Log Forms and Monitoring Well As-Built Diagrams for MW-1 through MW-5
Friedman & Bruya, Inc. laboratory reports
Sound Analytical Services, Inc. laboratory reports

V100-01.LT2/BCG-lkd/dgw

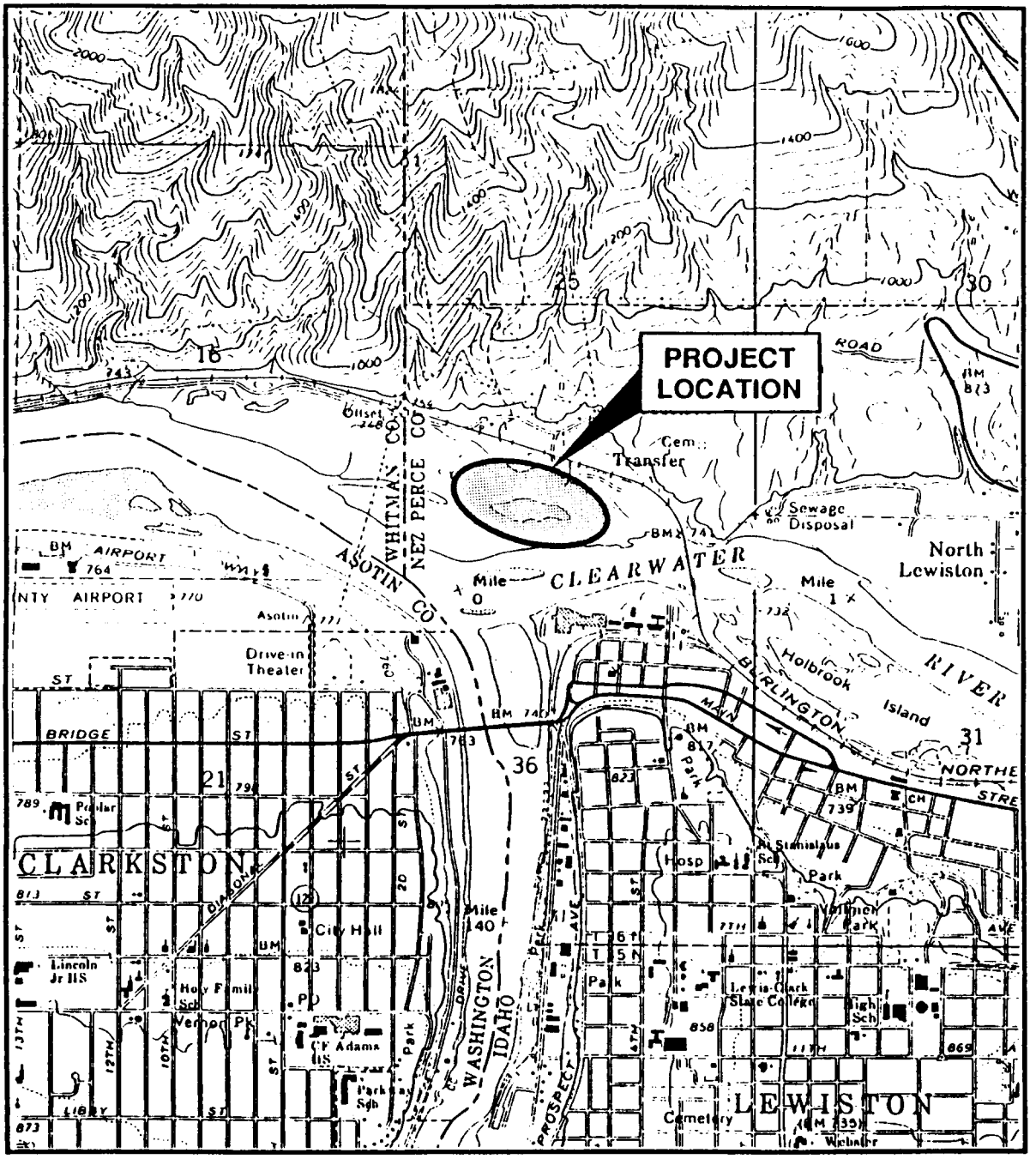
TABLE 1

LEWISTON LEVEES WASTE AREA MONITORING WELLS SUMMARY

WELL	DATE DRILLED	DATE DEVELOPED	TOTAL DEPTH DRILLED	SURFACE ELEVATION (1)	ELEVATION OF SCREEN INTERVAL	DEPTH TO WATER 2/4/92 (2)
MW-1	1/31/92	2/2/92	45'	749.94	718 - 708.5	13.73
MW-2	2/1/92	2/3/92	25'	742.64	728 - 718.4	8.39
MW-3	2/1/92	2/3/92	18'	744.81	738 - 728.6	10.01
MW-4	1/30/92	2/2/92	45'	750.84	718 - 708.51	14.06
MW-5	1/29/92	2/2/92	35'	750.32	728 - 718.4	13.70

Notes:

(1) All elevations in feet, MSL datum. Surface elevations of monitoring wells are pre-construction
(2) Depth to water from top of PVC well casing



0 1/4 1/2 1

Scale in Miles

NOTE

Map adapted from USGS topographic map of Clarkston, WA -ID quadrangle, dated 1971.

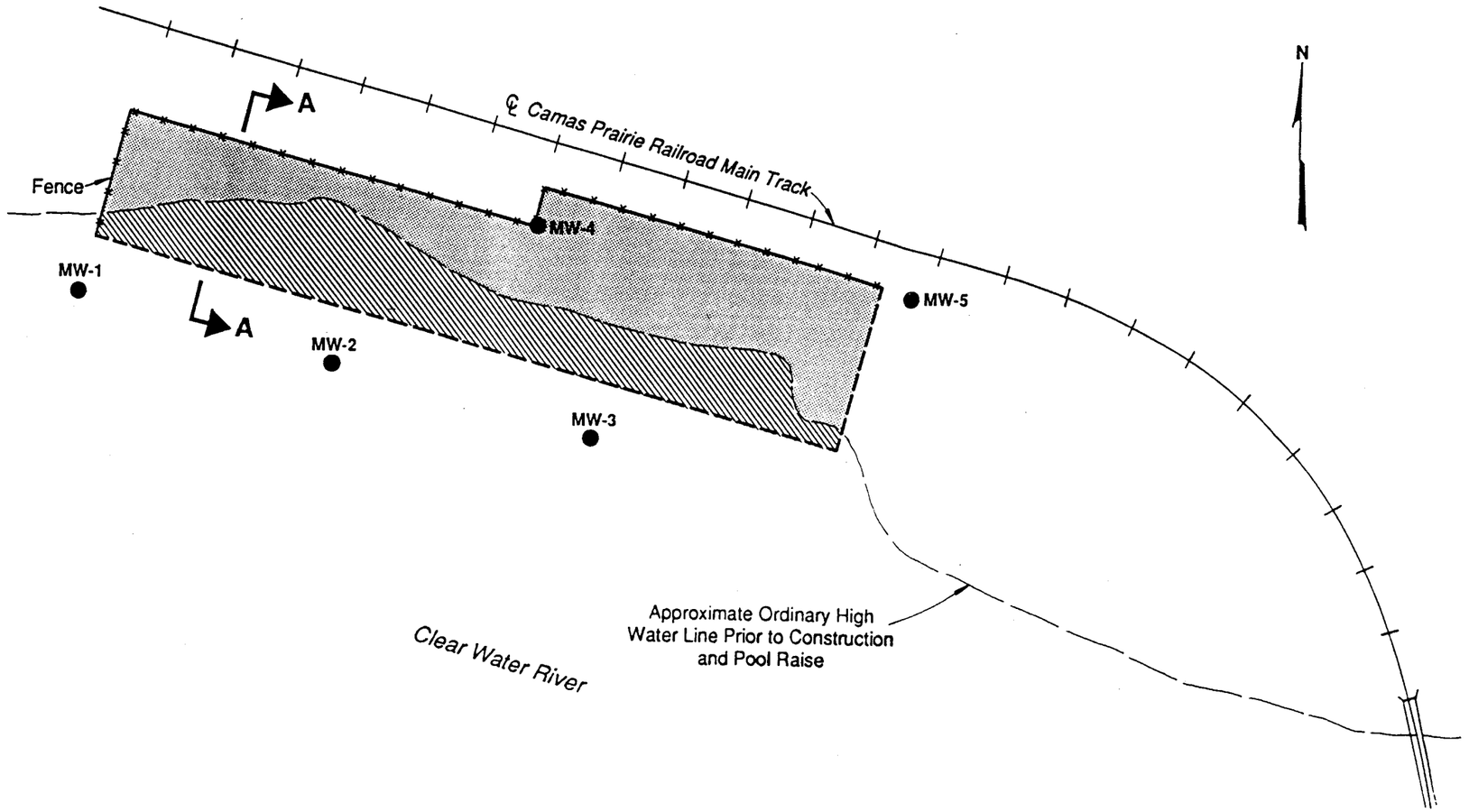
Lewiston Levees
Lewiston, Idaho

VICINITY MAP

January 1992 V-100-01

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

FIG. 1



LEGEND

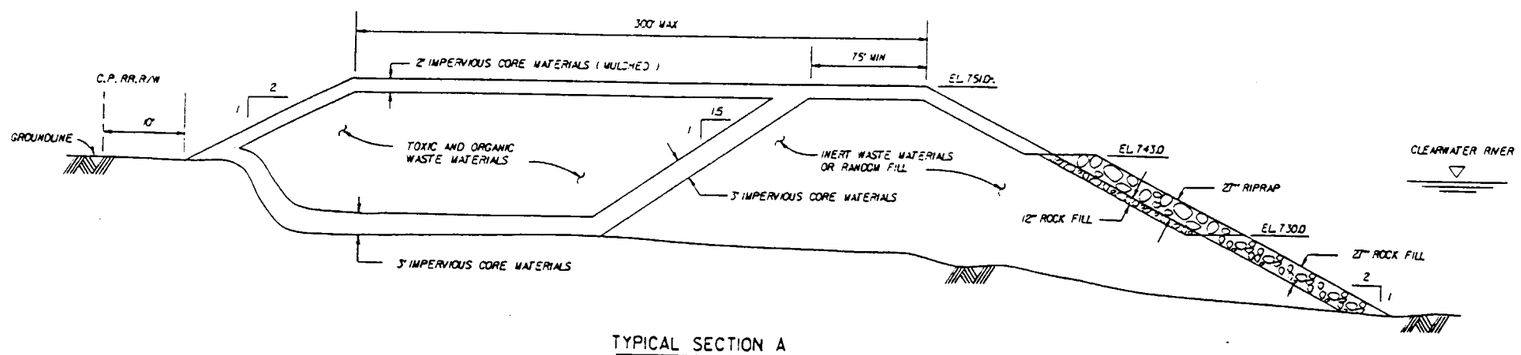
- Encapsulated Waste Area (Inert Materials)
- Encapsulated Waste Area (Toxic and Organic Materials)
- MW-4 ● Proposed Monitoring Well Locations

NOTE

Plan provided by U.S. Army Corps of Engineers, dated December 1991.

0 100 200 400

Scale in Feet

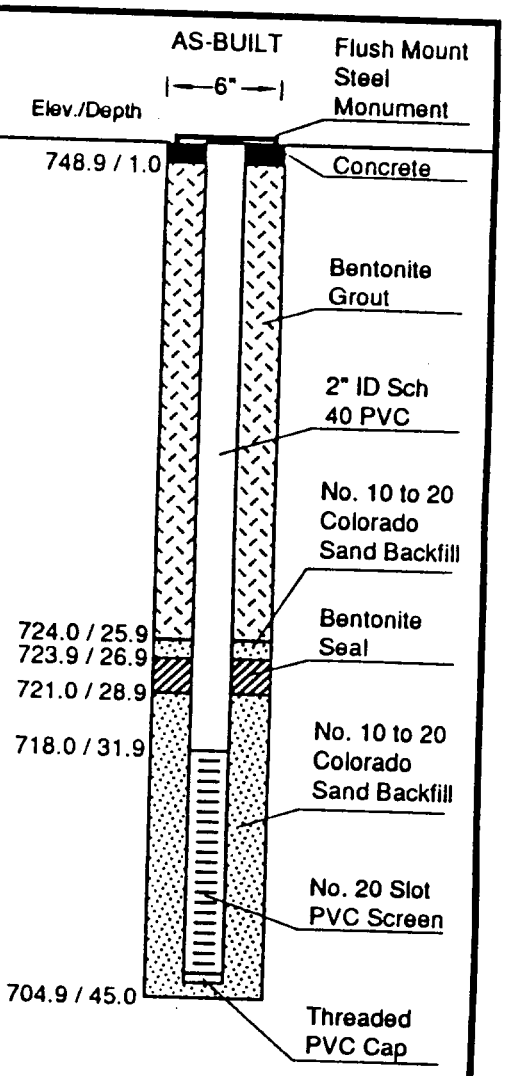


TYPICAL SECTION A

NTS

Lewiston Levees Lewiston, Idaho	
SITE PLAN AND MONITORING WELL LOCATIONS	
January 1992	V-100-01
SHANNON & WILSON, INC. Geotechnical & Environmental Consultants	FIG. 2

GEOLOGIC LOG Ground Elevation: 749.94 Feet	Depth, Ft.	Water Level	Blows/Ft.	Soil Sample	PID, ppm
Medium to dark brown, fine to medium SAND and medium to coarse GRAVEL; dry to damp - Grades to brownish grey, gravelly, fine to coarse SAND at 9 feet - Boulder at 12 to 13.5 feet	0				0
Dark brownish gray, slightly silty, fine to medium SAND and fine to coarse GRAVEL; dry to damp	13.5	2-4-92 ▽	See Note 1		
Dark gray, fine to medium SAND and SILT; trace fine to medium GRAVEL; moist	19				
Medium dense to dense, dark gray, slightly silty, fine to medium SAND; poorly graded; trace wood fragments; wet - Grades to some gravel at 35 feet	25		66/11" 50/4" 65	S-1 S-2 S-3	
BOTTOM OF BORING AT 45.0 FEET	45				



Drilled By: Environmental West Exploration
Drilling Method: Air Rotary Mobile B-80
PSI=120-150 During Drilling
Drilling Date: 1-31-92
Logged by: B. Geiger

Quantity Backfill Materials:
Sand 3.5 Bags
Bentonite 1 Bag
Grout 4 Bags

Development:
Method Brainard-Kilman Pump
Date 2-2-92
Quantity Water Removed 205 Gal.

LEGEND
I 2" O.D. Split Spoon Sample

NOTES
1. Drill cuttings logged continuously from 0 to 10 feet, at 5-foot intervals to 32.5 feet.
2. The contacts represent the approx. boundaries between soil types and the actual transitions may be gradual.
3. Elevations shown are preliminary.

Lewiston Levees
Lewiston, Idaho

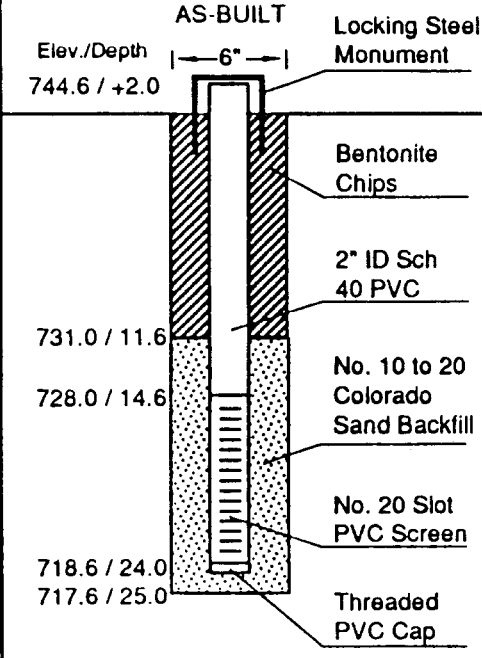
MONITORING WELL MW-1

February 1992 V-100-01

SHANNON & WILSON, INC.
Geotechnical Consultants

FIG. 3

GEOLOGIC LOG Ground Elevation: 742.64 Feet	Depth, Ft.	Water Level	Blows/Ft.	Soil Sample	PID, ppm
Medium to dark gray, fine to medium SAND and fine to medium GRAVEL; trace silt	0	2-4-92 ▽	See Note 1		0
Medium dense to dense, medium gray, medium SAND; pooly graded; trace medium gravel; wet - Grades to very dense at 17.5 feet	14.5		30 88 66/11" 88/9"	S-1 S-2 S-3 S-4	
BOTTOM OF BORING AT 18.0 FEET	25				



Drilled By: Environmental West Exploration
Drilling Method: Air Rotary Mobile B-80
PSI=120-150 During Drilling
Drilling Date: 2-1-92
Logged by: B. Geiger

Quantity Backfill Materials:
Sand 3 Bags
Bentonite 3.5 Bag
Grout

Development:
Method Brainard-Kilman Pump
Date 2-3-92
Quantity Water Removed 140 Gal.

LEGEND

I 2" O.D. Split Spoon Sample

NOTES

1. Drill cuttings logged continuously from 0 to 10 feet, at 5-foot intervals to 14.5 feet.
2. The contacts represent the approx. boundaries between soil types and the actual transitions may be gradual.
3. Elevations shown are preliminary.

Lewiston Levees
Lewiston, Idaho

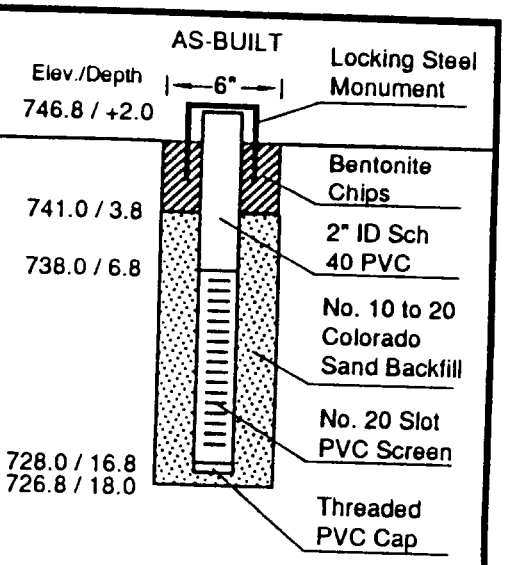
MONITORING WELL MW-2

February 1992 V-100-01

SHANNON & WILSON, INC.
Geotechnical Consultants

FIG. 4

GEOLOGIC LOG Ground Elevation: 744.81 Feet	Depth, Ft.	Water Level	Blows/Ft.	Soil Sample	PID, ppm
Dark brown, slightly silty, fine to medium SAND; dry - Grades to gravelly at 5 feet, gravels well rounded	0		See Note 1		0
Very dense, dark gray, silty, sandy, medium to coarse GRAVEL; well graded; some concrete pieces to 9 feet; wet - Grades to smaller gravels with increased sand content at 16 feet	7	2-4-92 ▽	90/9" 84/11" 50/4" 45	S-1 S-2 S-3 S-4	
BOTTOM OF BORING AT 18.0 FEET	18				



Drilled By: Environmental West Exploration
Drilling Method: Air Rotary Mobile B-80
PSI=120-150 During Drilling
Drilling Date: 2-1-92
Logged by: B. Geiger

Quantity Backfill Materials:
Sand 3 Bags
Bentonite 0.5 Bag
Grout

Development:
Method Brainard-Kilman Pump
Date 2-3-92
Quantity Water Removed 55 Gal.

LEGEND

I 2" O.D. Split Spoon Sample

NOTES

1. Drill cuttings logged continuously from 0 to 7 feet.
2. The contacts represent the approx. boundaries between soil types and the actual transitions may be gradual.
3. Elevations shown are preliminary.

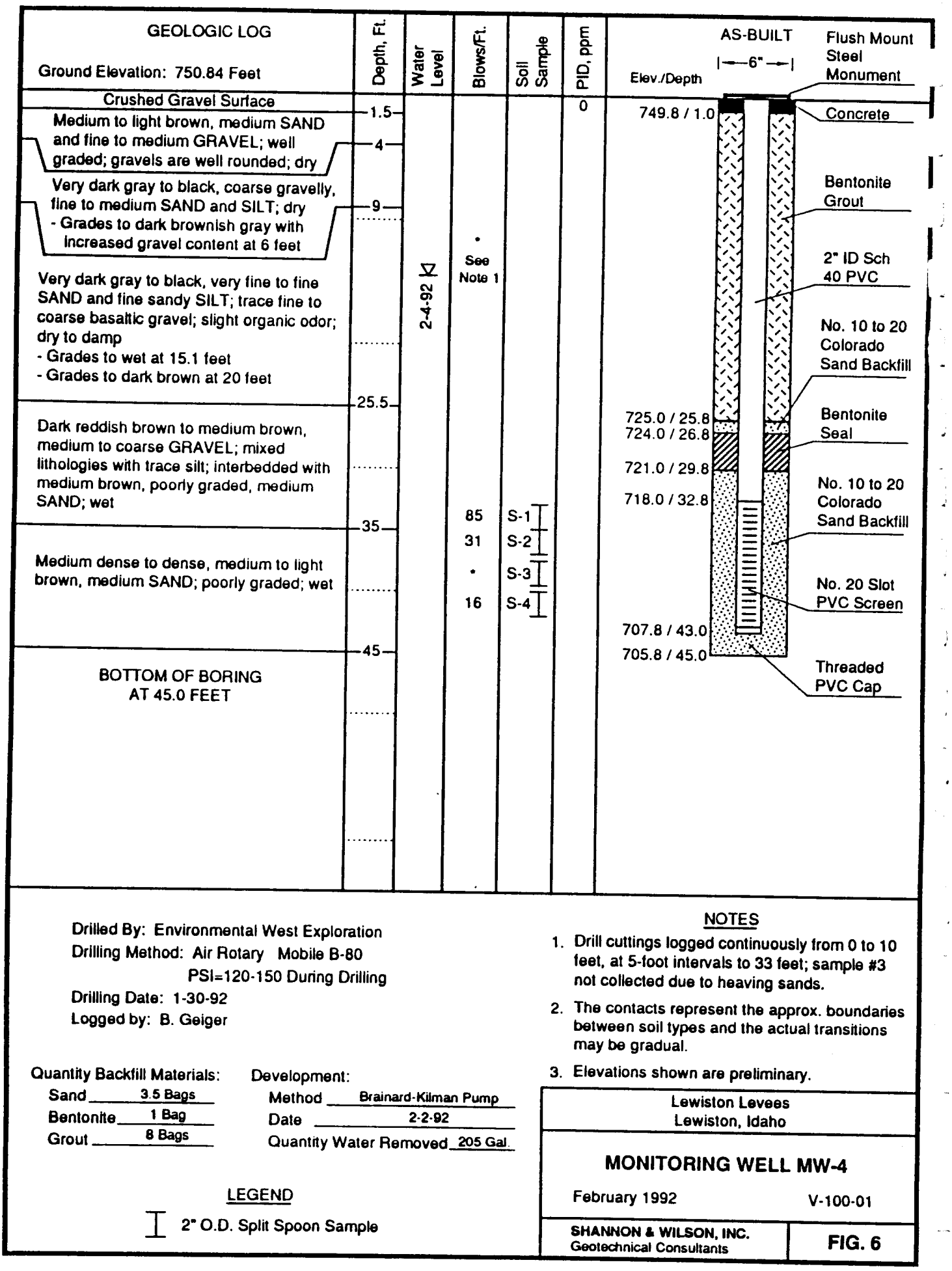
Lewiston Levees
Lewiston, Idaho

MONITORING WELL MW-3

February 1992 V-100-01

SHANNON & WILSON, INC.
Geotechnical Consultants

FIG. 5



Drilled By: Environmental West Exploration
Drilling Method: Air Rotary Mobile B-80
PSI=120-150 During Drilling
Drilling Date: 1-30-92
Logged by: B. Geiger

Quantity Backfill Materials:
Sand 3.5 Bags
Bentonite 1 Bag
Grout 8 Bags

Development:
Method Brainard-Kilman Pump
Date 2-2-92
Quantity Water Removed 205 Gal.

LEGEND

I 2" O.D. Split Spoon Sample

NOTES

1. Drill cuttings logged continuously from 0 to 10 feet, at 5-foot intervals to 33 feet; sample #3 not collected due to heaving sands.
2. The contacts represent the approx. boundaries between soil types and the actual transitions may be gradual.
3. Elevations shown are preliminary.

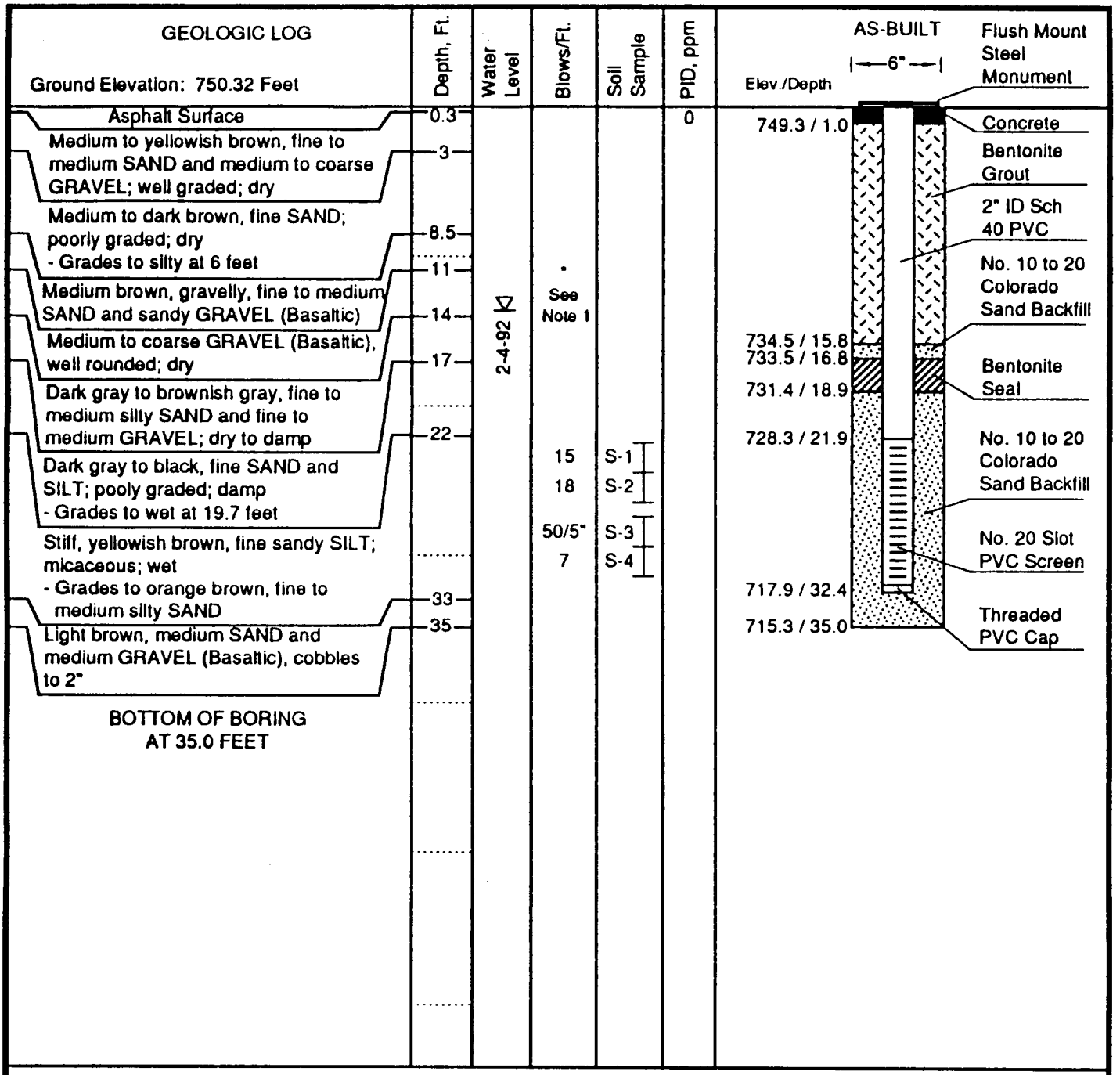
Lewiston Levees
Lewiston, Idaho

MONITORING WELL MW-4

February 1992 V-100-01

SHANNON & WILSON, INC.
Geotechnical Consultants

FIG. 6



Drilled By: Environmental West Exploration
Drilling Method: Air Rotary Mobile B-80
PSI=120-150 During Drilling
Drilling Date: 1-29-92
Logged by: B. Geiger

Quantity Backfill Materials:
Sand 3.5 Bags
Bentonite 0.5 Bag
Grout 2 Bags

Development:
Method Brainard-Kilman Pump
Date 2-2-92
Quantity Water Removed 140 Gal.

LEGEND

I 2" O.D. Split Spoon Sample

NOTES

1. Drill cuttings logged continuously from 0 to 10 feet, at 5-foot intervals to 22.5 feet.
2. The contacts represent the approx. boundaries between soil types and the actual transitions may be gradual.
3. Elevations shown are preliminary.

Lewiston Levees
Lewiston, Idaho

MONITORING WELL MW-5

February 1992 V-100-01

SHANNON & WILSON, INC.
Geotechnical Consultants

FIG. 7

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Andrew John Friedman
James E. Bruya, Ph.D.
(206) 285-8282

3008-B 16th Avenue West
Seattle, WA 98119
FAX: (206) 283-5044

February 13, 1992

Beth Geiger, Project Leader
Shannon and Wilson, Inc.
P.O. Box C-30313
Seattle, WA 98103

Dear Ms Geiger:

Enclosed are the results of the analyses of the sample submitted on January 30, 1992 from Project V-100-01, Lewiston.

Sample TW-1 (4 VOA's and 2 liters) were sent to Sound Analytical for 8240 and 8270 analyses. A copy of the documents accompanying the sample is enclosed in this report.

We appreciate this opportunity to be of service to you on this project. If you have any questions regarding this material, or if you just want to discuss any aspect of your projects, please do not hesitate to contact me.

Sincerely,

Janet Sheldon, Chemist

JS/dp

Enclosures

SOUND ANALYTICAL SERVICES, INC.

Shannon & Wilson

Lab No. 22392-D
February 6, 1992

Client ID: TW-1 (DUPLICATE)

EPA Method 8240 Continued . . . . .

CAS No.	Compounds	Concentration ug/l	PQL
71-43-2	Benzene	ND	10
10061-02-6	Trans-1,3-Dichloropropene	ND	10
75-25-2	Bromoform	*(5.6)	10
108-10-1	4-Methyl-2-Pentanone	ND	50
591-78-6	2-Hexanone	ND	10
127-18-4	Tetrachloroethene	ND	10
79-34-5	1,1,2,2-Tetrachloroethane	ND	10
108-88-3	Toluene	ND	10
108-90-7	Chlorobenzene	ND	10
100-41-4	Ethyl Benzene	ND	10
100-42-5	Styrene	ND	10
1330-20-7	Total Xylenes	ND	10

ND = Not Detected

PQL - Practical Quantitation Limit - These are the detection limits for this sample. This number is based on sample size, matrix and dilution required.

* = Compound was detected but below PQL. Value shown is an estimated quantity.

Volatile Surrogates

Surrogate	Percent Recovery	Control Limits
Toluene - D8	97	81 - 117
Bromofluorobenzene	98	74 - 121
1,2-Dichloroethane D4	96	70 - 121

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: February 13, 1992
Date Submitted: January 30, 1992
Project: V-100-01, Lewiston

RESULTS OF ANALYSES OF THE WATER SAMPLE FOR TOTAL METALS BY INDUCTIVELY COUPLED PLASMA (ICP) METHOD 6010
Results Reported as µg/g (ppm)

Sample #	TW-1
Analyte:	
Arsenic	<0.01
Cadmium	<0.001
Chromium	<0.005
Lead	<0.01
Selenium	<0.005
Silver	<0.005

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: February 13, 1992
Date Submitted: January 30, 1992
Project: V-100-01, Lewiston

RESULTS OF ANALYSES OF THE WATER SAMPLE FOR TCLP METALS IN ACCORDANCE WITH 40 CFR PART 261
Results Reported as mg/L (ppm)
Quality Assurance

Sample #	Method Blank	TW-1 Duplicate
Analyte:		
Arsenic	<0.01	<0.01
Cadmium	<0.001	<0.001
Chromium	<0.005	<0.005
Lead	<0.01	<0.01
Selenium	<0.005	<0.005
Silver	<0.005	<0.005

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: February 13, 1992
Date Submitted: January 30, 1992
Project: V-100-01, Lewiston

RESULTS OF ANALYSES OF THE WATER SAMPLE
FOR TOTAL METALS BY
INDUCTIVELY COUPLED PLASMA (ICP)
METHOD 6010
Results Reported as % Recovery
Quality Assurance

Sample #	TW-1 Matrix Spike	TW-1 Matrix Spike Duplicate	Spike
Analyte:	% Recovery	% Recovery	Level
Arsenic	107%	113%	2
Cadmium	108%	109%	1
Chromium	106%	109%	1
Lead	106%	110%	2
Selenium	111%	116%	2
Silver	102%	104%	0.4

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: February 13, 1992
Date Submitted: January 30, 1992
Project: V-100-01, Lewiston

RESULTS OF ANALYSES OF THE WATER SAMPLE
FOR TOTAL METALS BY
INDUCTIVELY COUPLED PLASMA (ICP)
METHOD 6010
Results Reported as % Recovery
Quality Assurance

Sample #	Spike Blank % Recovery	Spike Level
Analyte:		
Arsenic	120%	2
Cadmium	120%	1
Chromium	120%	1
Lead	120%	2
Selenium	120%	2
Silver	58%	0.4

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: February 13, 1992
Date Submitted: January 30, 1992
Project: V-100-01, Lewiston

RESULTS OF ANALYSES OF THE WATER SAMPLE FOR DISSOLVED METALS BY INDUCTIVELY COUPLED PLASMA (ICP) METHOD 6010
Results Reported as µg/g (ppm)

Sample #	TW-1
Analyte:	
Arsenic	<0.05
Cadmium	<0.01
Chromium	<0.05
Lead	<0.05
Selenium	<0.01
Silver	<0.05

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: February 13, 1992
Date Submitted: January 30, 1992
Project: V-100-01, Lewiston

RESULTS OF ANALYSES OF THE WATER SAMPLE FOR DISSOLVED METALS IN ACCORDANCE WITH 40 CFR PART 261
Results Reported as mg/L (ppm)
Quality Assurance

Sample #	Method Blank	TW-1 Duplicate
Analyte:		
Arsenic	<0.05	<0.05
Cadmium	<0.01	<0.01
Chromium	<0.05	<0.05
Lead	<0.05	<0.05
Selenium	<0.01	<0.01
Silver	<0.05	<0.05

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: February 13, 1992
Date Submitted: January 30, 1992
Project: V-100-01, Lewiston

RESULTS OF ANALYSES OF THE WATER SAMPLE FOR DISSOLVED METALS BY INDUCTIVELY COUPLED PLASMA (ICP) METHOD 6010
Results Reported as % Recovery
Quality Assurance

Sample #	TW-1 Matrix Spike % Recovery	TW-1 Matrix Spike Duplicate % Recovery	Spike Level
Analyte:			
Arsenic	114%	118%	2
Cadmium	120%	130%	1
Chromium	120%	130%	1
Lead	120%	130%	2
Selenium	118%	130%	2
Silver	15%	16%	0.4

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: February 13, 1992
Date Submitted: January 30, 1992
Project: V-100-01, Lewiston

RESULTS OF ANALYSES OF THE WATER SAMPLE FOR DISSOLVED METALS BY INDUCTIVELY COUPLED PLASMA (ICP) METHOD 6010
Results Reported as % Recovery
Quality Assurance

Sample #	Spike Blank % Recovery	Spike Level
Analyte:		
Arsenic	116%	2
Cadmium	120%	1
Chromium	130%	1
Lead	120%	2
Selenium	120%	2
Silver	<10%	0.4

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: February 13, 1992
Date Submitted: January 30, 1992
Project: V-100-01, Lewiston

RESULTS OF ANALYSES OF THE WATER SAMPLE FOR NONHALOGENATED ORGANICS BY EPA METHOD 8015 (GAS AND DIESEL)
Results Reported as mg/L (ppm)

Sample #	Gasoline (ppm)	Diesel (ppm)	Internal Standard Terphenyl % Recoveries
TW-1	<0.05	<0.05	150%
Quality Assurance			
Method Blank	<0.06	<0.06	130%
TW-1 (Duplicate)	<0.05	<0.05	114%
TW-1 (Matrix Spike) Percent Recovery	110%	150%	170%
TW-1 (Matrix Spike Duplicate) Percent Recovery	96%	107%	110%
Spike Level	10	10	

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: February 13, 1992
Date Submitted: January 30, 1992
Project: V-100-01, Lewiston

RESULTS OF ANALYSES OF THE WATER SAMPLE FOR PESTICIDES AND PCBS (EPA 8080 MODIFIED) Results Reported as mg/L (ppm)

Sample #	TW-1
Analyte:	
Aldrin	<0.0002
α - BHC	<0.0002
γ - BHC (Lindane)	<0.0002
δ - BHC	<0.0002
Chlordane	<0.0002
4,4'-DDD	<0.0002
4,4'-DDE	<0.0004
4,4'-DDT	<0.0002
Dieldrin	<0.0004
Endosulfan I	<0.0002
Endosulfan II	<0.0002
Endosulfan Sulfate	<0.0002
Endrin	<0.0002
Endrin aldehyde	<0.0002
Heptachlor	<0.0002
Heptachlor epoxide	<0.0002
Methoxychlor	<0.002
Toxaphene	<0.02
PCB-1016	<0.02
PCB-1221	<0.02

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: February 13, 1992
Date Submitted: January 30, 1992
Project: V-100-01, Lewiston

RESULTS OF ANALYSES OF THE WATER SAMPLE FOR PESTICIDES AND PCBS (EPA 8080 MODIFIED) Results Reported as mg/L (ppm)

Sample #	TW-1
Analyte:	
PCB-1232	<0.02
PCB-1242	<0.02
PCB-1248	<0.02
PCB-1254	<0.002
PCB-1260	<0.02

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: February 13, 1992
Date Submitted: January 30, 1992
Project: V-100-01, Lewiston

RESULTS OF ANALYSES OF THE WATER SAMPLE FOR PESTICIDES AND PCBS (EPA 8080 MODIFIED)
Results Reported as mg/L (ppm)
Quality Assurance

Sample #	Method Blank	Tap Water (Duplicate)
Analyte:		
Aldrin	<0.0002	<0.0002
α - BHC	<0.0002	<0.0002
γ - BHC (Lindane)	<0.0002	<0.0002
δ - BHC	<0.0002	<0.0002
Chlordane	<0.0002	<0.0002
4,4'-DDD	<0.0002	<0.0002
4,4'-DDE	<0.0004	<0.0004
4,4'-DDT	<0.0002	<0.0002
Dieldrin	<0.0004	<0.0004
Endosulfan I	<0.0002	<0.0002
Endosulfan II	<0.0002	<0.0002
Endosulfan Sulfate	<0.0002	<0.0002
Endrin	<0.0002	<0.0002
Endrin aldehyde	<0.0002	<0.0002
Heptachlor	<0.0002	<0.0002
Heptachlor epoxide	<0.0002	<0.0002
Methoxychlor	<0.002	<0.002
Toxaphene	<0.02	<0.02
PCB-1016	<0.02	<0.02
PCB-1221	<0.02	<0.02

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: February 13, 1992
Date Submitted: January 30, 1992
Project: V-100-01, Lewiston

RESULTS OF ANALYSES OF THE WATER SAMPLE FOR PESTICIDES AND PCBS (EPA 8080 MODIFIED) Results Reported as mg/L (ppm)
Quality Assurance

Sample #	Method Blank	Tap Water (Duplicate)
Analyte:		
PCB-1232	<0.02	<0.02
PCB-1242	<0.02	<0.02
PCB-1248	<0.02	<0.02
PCB-1254	<0.002	<0.002
PCB-1260	<0.02	<0.02

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: February 13, 1992
Date Submitted: January 30, 1992
Project: V-100-01, Lewiston

RESULTS OF ANALYSES OF THE WATER SAMPLE FOR PESTICIDES AND PCBS (EPA 8080 MODIFIED)
Results Reported as % Recovery
Quality Assurance

Sample #	Tap Water Matrix Spike % Recovery	Spike Level (ppm)
Analyte:		
Aldrin	84%	0.01
α - BHC	75%	0.01
γ - BHC (Lindane)	80%	0.01
δ - BHC	80%	0.01
Chlordane	**na**	
4,4'-DDD	79%	0.01
4,4'-DDE	85%	0.01
4,4'-DDT	84%	0.01
Dieldrin	67%	0.01
Endosulfan I	81%	0.01
Endosulfan II	91%	0.01
Endosulfan Sulfate	84%	0.01
Endrin	120%	0.01
Endrin aldehyde	89%	0.01
Heptachlor	97%	0.01
Heptachlor epoxide	85%	0.01
Methoxychlor	**na**	

na - The analyte indicated was not added to the matrix spike sample.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: February 13, 1992
Date Submitted: January 30, 1992
Project: V-100-01, Lewiston

RESULTS OF ANALYSES OF THE WATER SAMPLE
FOR PESTICIDES AND PCBS
(EPA 8080 MODIFIED)
Results Reported as % Recovery
Quality Assurance

Sample #	Matrix Spike % Recovery	Spike Level (ppm)
Analyte:		
Toxaphene	**na**	
PCB-1016	**na**	
PCB-1221	**na**	
PCB-1232	**na**	
PCB-1242	**na**	
PCB-1248	**na**	
PCB-1254	111%	0.01
PCB-1260	**na**	

na - The analyte indicated was not added to the matrix spike sample.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: February 13, 1992
Date Submitted: January 30, 1992
Project: V-100-01, Lewiston

RESULTS OF ANALYSES OF THE WATER SAMPLE FOR TOTAL MERCURY BY COLD VAPOR
Results Reported as ng/g (ppb)

Sample #	Total Mercury (ppb)	Dissolved Mercury (ppb)
TW-1	<1	<1
Quality Assurance		
Method Blank	<1	<1
TW-1 (Duplicate)	<1	<1
TW-1 (Matrix Spike) Percent Recovery	99%	97%
TW-1 (Matrix Spike Duplicate) Percent Recovery	98%	96%
Spike Level	100	50

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Shannon & Wilson

Date: February 5, 1992

Report On: Analysis of Water

Lab No.: 22392

IDENTIFICATION:
Sample Received on 01-30-92
Project: V-100-01 Lewiston
Client ID: TW-1

ANALYSIS:

Sample was analyzed in accordance with Test Methods for Evaluating Solid Waste, (SW-846), U.S.E.P.A., 1986 Method 8240 (Volatile Organics)

CAS No.	Compounds	Concentration ug/l	PQL
74-87-3	Chloromethane	ND	20
74-83-9	Bromomethane	ND	20
75-01-4	Vinyl Chloride	ND	20
75-00-3	Chloroethane	ND	20
75-09-2	Methylene Chloride	ND	10
67-64-1	Acetone	ND	200
75-15-0	Carbon Disulfide	ND	10
75-35-4	1,1-Dichloroethene	ND	10
75-34-3	1,1-Dichloroethane	ND	10
540-59-0	1,2-Dichloroethene (Total)	ND	10
67-66-3	Chloroform	ND	10
107-06-2	1,2-Dichloroethane	ND	10
78-93-3	2-Butanone	ND	50
71-55-6	1,1,1-Trichloroethane	ND	10
56-23-5	Carbon Tetrachloride	ND	10
108-05-4	Vinyl Acetate	ND	50
75-27-4	Bromodichloromethane	*(4.6)	10
78-87-5	1,2-Dichloropropane	ND	10
10061-01-5	Cis-1,3-Dichloropropene	ND	10
79-01-6	Trichloroethene	ND	10
124-48-1	Dibromochloromethane	ND	10
79-00-5	1,1,2-Trichloroethane	ND	10

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

Shannon & Wilson

Lab No. 22392
February 5, 1992

Client ID: TW-1

EPA Method 8240 Continued . . . . .

CAS No.	Compounds	Concentration ug/l	PQL
71-43-2	Benzene	ND	10
10061-02-6	Trans-1,3-Dichloropropene	ND	10
75-25-2	Bromoform	*(5.6)	10
108-10-1	4-Methyl-2-Pentanone	ND	50
591-78-6	2-Hexanone	ND	10
127-18-4	Tetrachloroethene	ND	10
79-34-5	1,1,2,2-Tetrachloroethane	ND	10
108-88-3	Toluene	ND	10
108-90-7	Chlorobenzene	ND	10
100-41-4	Ethyl Benzene	ND	10
100-42-5	Styrene	ND	10
1330-20-7	Total Xylenes	ND	10

ND = Not Detected

PQL - Practical Quantitation Limit - These are the detection limits for this sample. This number is based on sample size, matrix and dilution required.

* = Compound was detected but below PQL. Value shown is an estimated quantity.

Volatile Surrogates

Surrogate	Percent Recovery	Control Limits
Toluene - D8	97	81 - 117
Bromofluorobenzene	98	74 - 121
1,2-Dichloroethane D4	96	70 - 121

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

Shannon & Wilson
Page 3 of 5
Lab No. 22392
February 5, 1992

Client ID: TW-1

Sample was analyzed in accordance with Test Methods for Evaluating Solid Waste, (SW-846), U.S.E.P.A., 1986 Method 8270 (ABN Semivolatiles)

CAS No.	Compounds	Concentration ug/l	PQL
108-95-2	Phenol	ND	10
111-44-4	bis(2-Chloroethyl) ether	ND	10
95-57-8	2-Chlorophenol	ND	10
541-73-1	1,3-Dichlorobenzene	ND	10
106-46-7	1,4-Dichlorobenzene	ND	10
100-51-6	Benzyl Alcohol	ND	20
95-50-1	1,2-Dichlorobenzene	ND	10
95-48-7	2-Methylphenol	ND	10
39638-32-9	bis(2-Chloroisopropyl)ether	ND	10
106-44-5	4-Methylphenol	ND	10
621-64-7	N-Nitroso-Di-N-propylamine	ND	10
67-72-1	Hexachloroethane	ND	10
98-95-3	Nitrobenzene	ND	10
78-59-1	Isophorone	ND	10
88-75-5	2-Nitrophenol	ND	10
105-67-9	2,4-Dimethylphenol	ND	10
65-85-0	Benzoic Acid	ND	50
111-91-1	bis(2-Chloroethoxy)methane	ND	10
120-83-2	2,4-Dichlorophenol	ND	10
120-82-1	1,2,4-Trichlorobenzene	ND	10
91-20-3	Naphthalene	ND	10
106-47-8	4-Chloroaniline	ND	20
87-68-3	Hexachlorobutadiene	ND	10
59-50-7	4-Chloro-3-methylphenol	ND	20

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

Shannon & Wilson

Lab No. 22392
February 5, 1992

Client ID: TW-1

EPA Method 8270 continued

CAS No.	Compounds	Concentration ug/l	PQL
91-57-6	2-Methylnaphthalene	ND	10
77-47-4	Hexachlorocyclopentadiene	ND	10
88-06-2	2,4,6-Trichlorophenol	ND	10
95-95-4	2,4,5-Trichlorophenol	ND	10
91-58-7	2-Chloronaphthalene	ND	10
88-74-4	2-Nitroaniline	ND	50
131-11-3	Dimethyl phthalate	ND	10
208-96-8	Acenaphthylene	ND	10
99-09-2	3-Nitroaniline	ND	50
83-32-9	Acenaphthene	ND	10
51-28-5	2,4-Dinitrophenol	ND	50
100-02-7	4-Nitrophenol	ND	50
132-64-9	Dibenzofuran	ND	10
121-14-2	2,4-Dinitrotoluene	ND	10
606-20-2	2,6-Dinitrotoluene	ND	10
84-66-2	Diethylphthalate	ND	10
7005-72-3	4-Chlorophenyl phenyl ether	ND	10
86-73-7	Fluorene	ND	10
100-01-6	4-Nitroaniline	ND	50
534-52-1	4,6-Dinitro-2-methylphenol	ND	50
86-30-6	N-Nitrosodiphenylamine	ND	10
101-55-3	4-Bromophenyl phenyl ether	ND	10
118-74-1	Hexachlorobenzene	ND	10
87-86-5	Pentachlorophenol	ND	50
85-01-8	Phenanthrene	ND	10
120-12-7	Anthracene	ND	10
84-74-2	Di-n-butylphthalate	ND	10

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

Shannon & Wilson
Page 5 of 5
Lab No. 22392
date

Client ID: TW-1

EPA Method 8270 Continued

CAS No.	Compounds	Concentration ug/l	PQL
206-44-0	Fluoranthene	ND	10
129-00-0	Pyrene	ND	10
85-68-7	Butyl benzyl phthalate	ND	10
91-94-1	3,3'-Dichlorobenzidine	ND	10
56-55-3	Benzo(a)anthracene	ND	10
117-81-7	bis(2-ethylhexyl)phthalate	ND	10
218-01-9	Chrysene	ND	10
117-84-0	Di-n-octyl phthalate	ND	10
205-99-2	Benzo(b)fluoranthene	ND	10
207-08-9	Benzo(k)fluoranthene	ND	10
50-32-8	Benzo(a)pyrene	ND	10
193-39-5	Indeno(1,2,3-cd)pyrene	ND	10
53-70-3	Dibenz(a,h)anthracene	ND	10
191-24-2	Benzo(g,h,i)perylene	ND	10

ND = Not Detected
PQL - Practical Quantitation Limit - These are the detection limits for this sample. This number is based on sample size, matrix and dilution required.

Semi-Volatile Surrogates

Surrogate Compound	Percent Recovery	Control Limits Water
Nitrobenzene - d_5	71	35 - 114
2-Fluorobiphenyl	68	43 - 116
p-Terphenyl-d_{14}	71	33 - 141
Phenol-d_6	13	10 - 94
2-Fluorophenol	43	21 - 100
2,4,6-Tribromophenol	62	10 - 123

SOUND ANALYTICAL SERVICES

Dennis L. Bean

DENNIS L. BEAN

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Shannon & Wilson

Date: February 6, 1992

Report On: Analysis of Water

Lab No.: 22392-D

IDENTIFICATION:
Sample Received on 01-30-92
Project: V-100-01 Lewiston
Client ID: TW-1 (DUPLICATE)

ANALYSIS:

Sample was analyzed in accordance with Test Methods for Evaluating Solid Waste, (SW-846), U.S.E.P.A., 1986 Method 8240 (Volatile Organics)

CAS No.	Compounds	Concentration ug/l	PQL
74-87-3	Chloromethane	ND	20
74-83-9	Bromomethane	ND	20
75-01-4	Vinyl Chloride	ND	20
75-00-3	Chloroethane	ND	20
75-09-2	Methylene Chloride	ND	10
67-64-1	Acetone	ND	200
75-15-0	Carbon Disulfide	ND	10
75-35-4	1,1-Dichloroethene	ND	10
75-34-3	1,1-Dichloroethane	ND	10
540-59-0	1,2-Dichloroethene (Total)	ND	10
67-66-3	Chloroform	ND	10
107-06-2	1,2-Dichloroethane	ND	10
78-93-3	2-Butanone	ND	50
71-55-6	1,1,1-Trichloroethane	ND	10
56-23-5	Carbon Tetrachloride	ND	10
108-05-4	Vinyl Acetate	ND	50
75-27-4	Bromodichloromethane	*(4.6)	10
78-87-5	1,2-Dichloropropane	ND	10
10061-01-5	Cis-1,3-Dichloropropene	ND	10
79-01-6	Trichloroethene	ND	10
124-48-1	Dibromochloromethane	ND	10
79-00-5	1,1,2-Trichloroethane	ND	10

ND = Not Detected

Continued . . . . .

APPENDIX K-2

SCOPE OF WORK FOR SAMPLING AND TESTING

SAMPLING AND ANALYSIS PLAN

SCOPE OF WORK

PART 1 - GENERAL

1.1 SCOPE.

Work for this contract is located near the confluence of the Snake and Clearwater Rivers at Lewiston, Idaho (sheet 1). Work includes review of this scope of work, and sampling of existing monitoring wells and drummed sediment wastes. The monitoring wells and drums are located around the perimeter of an encapsulated waste area (sheet 2). The waste area contains oil saturated soil, municipal dump wastes, paper mill solid wastes, and bentonite slurry. The testing will be used to establish a detection monitoring program for contaminant migration from the encapsulated area during the 1992 Test Drawdown of the Lower Granite and Little Goose reservoirs. Testing will also determine whether drummed groundwater and solid wastes can be disposed of on site. If the State of Idaho Water Quality Standards are exceeded for any monitoring well sample, or National Primary Drinking Water Standards for parameters not covered by the State of Idaho, a surface water sampling program will be implemented in conjunction with the groundwater sampling program.

1.2 APPLICABLE PUBLICATIONS.

The publications listed below form a part of the specification to the extent referenced. The publications are referred to in the test by the basic designation only.

1.2.1 Idaho Department of Health and Welfare Rules and Regulations.

Title 1, Chapter 2	Water Quality Standards and Wastewater Treatment Requirements

1.2.2 U.S. Army Corps of Engineers Manuals/Regulations.

EM 385-1-1	Safety and Health Requirements
ER 385-1-92	Safety and Occupational Health Document Requirements for Hazardous Waste Site Remedial Actions

1.2.3 U.S. Environmental Protection Agency (EPA).

EPA 600/4-79-020	Methods for Chemical Analysis of Water and Wastes
SW-846	Test Methods for Evaluating Solid Wastes

40 CFR 141	National Primary Drinking Water Standards
40 CFR 142	National Primary Drinking Water Standards Regulations Implementation
40 CFR 143	National Secondary Drinking Water Regulations

1.2.4 U.S. Geological Survey (USGS).

ID-90-1	Water Resources Data Idaho Water Year 1990

1.3 GENERAL REQUIREMENTS.

The objective of the Lewiston Levees Waste Area investigation is to provide data of sufficient quality and completeness to serve as the basis for a determination of the presence or absence of contaminant migration from the encapsulated fill material.

1.3.1 Work by Others.

Chemical analysis of samples will be completed by the Corps' North Pacific Division Laboratory. The Division Laboratory shall be contacted a minimum of two weeks prior to the first sampling activity. The point of contact at the Division Laboratory is the Director. Test scheduling and arrangements for sample handling and shipping shall be coordinated with Ms. Pamela Swan. The Division Laboratory can be reached by telephone at (509) 665-4166.

Samples will be analyzed by one of the Division Laboratory's contract laboratories. Quality assurance (QA) samples will be analyzed by the Division Laboratory. All costs associated with laboratory analyses will be paid for by the Government. After receipt of the data from the analytical laboratories, the Division Laboratory will prepare a Chemical Quality Assurance Report (CQAR). The CQAR will be forwarded to the District, along with the original analytical results, Chain of Custody records and sample cooler receipt forms.

1.3.2 Work by Contractor.

It is the responsibility of the Contractor to properly collect, package, and transport samples, and present data pertaining to the chemical analyses of the samples. If drummed wastes are determined to be uncontaminated, on site disposal of the wastes shall be the responsibility of the Contractor. The Contractor is also requested to review the scope of work. Sampling procedures, requested analytical parameters as applicable to CERCLA requirements and the encapsulated waste shall be reviewed.

1.3.3 Measurement and Datum.

All measurements shall be made from the same point on the well as permanently marked surveyed by the Government for horizontal and vertical control. The depths to groundwater shall be converted to elevations (msl).

1.4 PERSONNEL REQUIREMENTS.

1.4.1 Site Geologist.

A site geologist (geologist or geotechnical engineer) experienced in sampling and testing of groundwater monitoring wells, shall be directly responsible for all well activities. The site geologist shall have on site sufficient tools and professional equipment in operable condition to efficiently perform his/her duties as defined herein. Items in the possession of the site geologist should include: a copy of the Field Sampling and Analysis Plan, and the Site Safety and Health Plan; an electronic water level detector; tools and equipment necessary to prepare samples for shipment or storage; a pH, specific conductance, and temperature measuring device; and instruments for measuring combustible gases and organic vapors.

1.4.2 Field Technician.

A field technician shall assist the site geologist during all field activities.

1.5 SUBMITTALS.

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only.

1.5.1 Site Safety and Health Plan (SSHP) (GA).

A written Site Safety and Health Plan, developed by qualified occupational health/industrial hygiene/safety personnel shall be submitted and approved prior to mobilization. The plan shall prescribe all actions for the health and safety protection of the field personnel at the site during implementation of sampling and field testing. This plan shall be specific to the site and shall meet the requirements ER 385-1-92.

1.5.2 Field Sampling and Analysis Plan (GA).

The Contractor shall submit for approval a Field Sampling and Analysis Plan prior to the commencement of any field work. The Plan shall establish protocols and procedures for groundwater sampling, preservation, handling, analytical requests, shipment, and chain-of-custody control. The plan shall include instrumentation and equipment to be used, calibration methods,

decontamination procedures, field sample log documentation, chain-of-custody documentation, and sample labeling and packing documentation. The Plan shall address quality control for all phases of field activities and data quality objectives.

1.5.3 Field Notebook (FIO).

Submit with the final report all field notebooks.

1.5.3 Field Measurements (FIO).

Field measurements shall be submitted within 48 hours of completion. Any unusual observations or measurements above background levels shall be reported immediately to the Contracting Officer.

1.5.4 Final Report (GA).

Submit a final report within 30 days of receipt of the analytical results summarizing findings based on monitoring well installation findings (under separate Delivery Order No. 4) and chemical analysis of field samples. At a minimum the Contractor shall describe findings with respect to Idaho Department of Health and Welfare Rules and Regulations Title 1, Chapter 2, EPA CFR 40 Parts 141 through 143 when contaminant levels are not addressed by the State of Idaho, and USGS Water Resources Data Idaho Water Year 1990 for the Clearwater River at Spalding. The final report shall address issues on data quality (test method detection limits, background level variances, statistical comparisons between upgradient and downgradient wells, and data completeness).

1.6 RIGHTS OF ENTRY.

The Government shall obtain rights of entry to the site. The Contractor shall notify the Contracting Officer a minimum of 48 hours prior to site entry. Keys for the locking covers on the monitoring wells shall be checked out to the Contractor and returned within 48 hours of the final sampling activity.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 EQUIPMENT.

All sampling and support equipment brought to the site shall be in operable condition prior to arrival on site. Field testing equipment shall be tested and calibrated to known standards before each day of sampling. Calibration procedures shall be described in the Field Sampling and Analysis Plan.

3.2 EQUIPMENT DECONTAMINATION.

Prior to sampling, all sampling and testing equipment shall be cleaned with steam or pressurized hot water. If the sampling and testing equipment is not immediately used, it shall be wrapped in aluminum foil or plastic and stored in a clean area. Washing may be omitted if sampling equipment has been prewashed and packaged by the manufacturer and packaging is intact up to the time of sampling. If the equipment is not clean it shall be decontaminated with a laboratory grade, non-phosphate detergent followed by a dilute (0.1N) hydrochloric acid rinse, a tap water rinse, and a reagent grade water rinse. Equipment used for organic samples shall also be rinsed with methanol or hexane. Equipment used for inorganic samples shall be rinsed with 0.1N nitric acid instead of the hydrochloric acid rinse. All equipment shall be decontaminated before leaving the site. Water collected during the decontamination process shall be stored in steel drums and labeled "Decontamination Water". Solid wastes shall be placed in separate steel drums and labeled "Decontamination Solid Wastes". Drums shall be stored as outlined in the following paragraph.

3.3 WASTE DISPOSAL.

Excess groundwater and materials removed from monitoring wells shall be placed in steel drums. Separate drums shall be used for each well. Each drum will be marked with the following information:

(a) Drum number.

(b) Site name.

(c) Monitoring well number.

(d) Contents.

(e) Date.

Drums shall be stored in the staging area or beside their corresponding monitoring well. A drum inventory will be maintained for tracking purposes. Disposal of drummed groundwater and materials from this Delivery Order and Delivery Order No. 4 shall be based on analytical findings. If it is determined that the drummed groundwater and solid wastes are not contaminated, the groundwater shall be released on site. Solid materials removed from the wells shall be spread over the land surface near their corresponding well site. If regulated concentrations of contaminants are found to be present, disposal plans shall be coordinated with the Contracting Officer under separate contract. Sampling of the drummed groundwater and solid wastes shall be as described in paragraph: DRUMMED WASTE SAMPLING.

3.4 FIELD NOTEBOOK.

All field activities shall be documented in a bound field notebook using a pen with permanent black ink. Any corrections made in the notebook shall be marked with a single line, initialed, and followed by the correct notation. Information to be recorded in the field notebook includes the following:

(a) Date.

(b) Weather conditions.

(c) Name of field personnel.

(d) Times of site arrival and departure.

(e) Documentation of all field measurements.

(f) Instrument calibration information.

(g) Odd or unusual occurrences.

(h) Site visitors.

For each monitoring well the following information shall be recorded during a sampling activity:

(a) Identification of well.

(b) Well head monitoring instrument readings.

(c) Total well depth.

(d) Static water level.

(e) Purging equipment used.

(f) Purge volume (including volume calculations), pumping rate and time well purged.

(g) Purging parameters for each volume of water removed (pH, temperature, and specific conductance).

(h) Sampling equipment used and withdrawal procedures.

(i) Date and time of sample collection.

(j) Well sampling sequence.

(k) Types of sample containers used and sample identification numbers.

(l) Preservatives used.

(m) Parameters requested for analysis.

(n) Field analysis data and methods used.

(o) Name of collector.

Each page in the field notebook shall be signed and dated by the site geologist.

3.5 GROUNDWATER SAMPLING.

3.5.1 Sampling Frequency.

Samples shall be obtained from each monitoring well on the following dates:

(a) 21 February 1992; Analysis will provide background water quality prior to the test drawdown that will commence 1 March 1992.

(b) Prior to reimpoundment of water tentatively set for 16 March 1992; Analysis will provide information relating to the maximum drawdown level.

If chemical analysis determines that maximum contaminant levels are being exceeded for any of the monitoring wells, a surface water monitoring program will be implemented along as described in paragraph: SURFACE WATER SAMPLING.

Static water levels shall be used to determine groundwater gradients and responses to the reservoir drawdown. If groundwater levels do not drop appreciably with respect to the reservoir drawdown a third sampling activity may be required after reimpoundment. Any additional groundwater sampling activities shall be Government directed optional items.

Drum samples shall also be collected for analysis on 21 February 1992. Sediment samples shall be collected as outlined in paragraph: DRUMMED WASTE SAMPLING.

3.5.2 Sample Locations.

The general locations of the five monitoring wells are shown on sheet 2. The wells are being placed under separate Delivery Order No. 4 and as built information is not available at this time but will be available no later than 17 February 1992. Wells located upgradient shall be sampled before downgradient wells.

3.5.3 Sampling Preparation.

Prior to field activities, sample labels and seals, field notebooks, chain-of-custody records, sample analysis document sheets, and shipping labels shall be filled out and organized in

a manner so that sampling activities are performed following the protocols outlined in the Field Sampling and Analysis Plan.

3.5.4 Groundwater Level Measurements.

The static water level shall be measured with an electronic water level detector prior to sampling activities. A minimum of two water level readings shall be made and recorded in the field notebook to the nearest 0.01 foot. Measurements at a well will be considered consistent if they are within +/- 0.05 foot.

3.5.5 Clearwater River Measurements.

Water level measurements shall be made for the Clearwater River during a sampling activity. Measurements shall be made from any of the monitoring wells using a survey rod and hand level. The height above the monitoring well to the eye level of the person making the reading shall be determined and recorded along with the reading on the rod above the water surface.

3.5.6 Total Depth Measurements.

The total depth of each well shall be measured after the static water level has been determined. If sediment is present in the well, the sediment thickness shall be measured and recorded.

3.5.7 Well Purging.

Each monitoring well shall be purged prior to sampling by pumping or bailing. Purging equipment shall be stainless steel or fluorocarbon resin bailers, or an appropriate pump made of inert material. At a minimum, a quantity of water equal to three times the submerged well casing and filter pack volume shall be removed. Purging shall continue until stabilized well purging parameters (pH, specific conductance, and temperature) are meet on two successive well volumes to within plus or minus 10 percent for specific conductance, plus or minus $0.1^{o}C$ for temperature, and plus or minus 0.1 pH units for pH.

Where groundwater recharge does not permit the extraction of three well volumes, the well shall be bailed or pumped dry with samples collected as soon as sufficient recharge has occurred.

Purged water shall be collected in steel drums. Field measurements (pH, temperature, and specific conductance) shall be taken by filling a glass or fluorocarbon resin beaker with a groundwater sample and placing the instrument probes into the beaker. All measurements shall be recorded in the field notebook.

3.5.8 Sample Collection.

Groundwater samples shall be collected using dedicated fluorocarbon resin bailers equipped with check valves and a bottom emptying device. Sampling equipment made of neoprene fittings, PVC, tygon tubing, silicon rubber bladders, neoprene impellers, polyethylene, and viton is prohibited. An inert cable/chain shall be used on bailers and decontaminated as described in paragraph: EQUIPMENT DECONTAMINATION.

Sample containers shall be precleaned in accordance to EPA guidelines and stored in coolers until used. Containers shall be returned to the cooler as soon after sampling as possible.

Samples shall be collected in the order of the volatilization sensitivity of the parameters to be tested. Sampling techniques shall ensure that:

(a) Pumps are operated in a continuous manner so that they do not aerate samples in the return tube or upon discharge.

(b) Sampling equipment is lowered slowly into the well to prevent degassing of the water upon impact.

(c) Agitation and aeration is minimized when transferring the sample container.

(d) Clean sampling equipment is not placed directly on the ground prior to insertion into the well.

(e) Sample containers for volatile analysis are filled so that a meniscus forms over the mouth of the container so that when capped and turned upside down, no trapped air bubbles are present.

3.5.9 Quality Control/Quality Assurance Samples.

Quality control samples to be collected include trip blanks. One trip blank shall be prepared and submitted for analysis for each cooler of samples containing sample containers to be tested for volatiles. Sample containers for trip blanks shall be the same as for volatile water samples. A trip blank sample container shall be filled with reagent water, transported to the site, handled like a sample, and returned to the Division Laboratory with the other samples for analysis. In order to reduce the number of trip blanks, all volatile samples for each sampling activity shall be placed in the same cooler.

Quality assurance samples to be collected include replicate samples. One additional round of samples shall be collected from MW2 for each sampling activity. Four additional volumes are required for semi-volatiles, organochlorine pesticides and PCBs, oil and grease, and for petroleum hydrocarbons.

3.6 SURFACE WATER SAMPLING.

3.6.1 Sampling Frequency.

Surface water sampling shall be a Government directed optional item implemented if maximum contaminant levels are exceeded for any of the monitoring well samples. Surface water samples shall then be obtained in conjunction with the groundwater samples.

3.6.2 Sample Locations.

Locations for the surface water sampling shall be coordinated with the Contracting Officer.

3.6.3 Sample Collection.

The Contractor will be required to have surface water sampling equipment available. Surface water samples shall be collected using a weighted-bottle type sampler made of stainless steel or fluorocarbon resin. The Contractor shall have additional sample containers available for surface sampling activities. Sample collection, and quality control and quality assurance samples will be obtained as outlined in paragraph: GROUNDWATER SAMPLING.

3.7 DRUMMED WASTE SAMPLING.

Composite samples will be collected from the drummed sediment wastes. These samples shall be taken in conjunction with the first sampling activity. A composite sample from all drums shall be collected and tested for dioxins and furans. A composite sample shall be collected from the upgradient well's drummed drill cuttings and tested for volatile organics, semi-volatile organics, organochlorine pesticides and PBCs, total metals, and petroleum hydrocarbons. A composite sample shall be collected from the downgradient well's drummed drill cuttings and tested for the above mentioned parameters.

3.8 SAMPLING HANDLING.

3.8.1 Preservation, and Packaging.

The types and size of sample containers and preservatives for each type of chemical analysis are identified in Table 1. Each sample container shall be enclosed in a clear plastic bag. Samples shall be placed in the cooler surrounded with vermiculite. Wet ice sealed in plastic bags shall be placed in the cooler. Paperwork shall be placed in a plastic bag and taped to the inside of the cooler lid. The cooler lid shall be secured with strapping tape at a minimum of two locations. The drain shall be taped shut. The cooler shall be sealed with numbered and signed custody seals. "This Side Up" labels shall be placed on all four sides of the cooler and "Fragile" labels on at least

two sides.

3.8.2 Chain-of-Custody.

All samples shall remain in the custody of the sampling personnel during each sampling activity. Prior to the transfer of the samples to the laboratory, chain-of-custody entries will be made using a chain-of-custody form. One chain-of-custody form shall be used for each cooler. All information on the chain-of-custody form, sample labels, and sample analysis request sheet, shall be checked before transferring custody. Upon transfer of custody, the chain-of-custody form will be signed by the site geologist and placed with the other paperwork in a plastic bag taped to the inside of the cooler lid. A signed and dated custody seal shall be placed over the lid opening of the cooler.

All chain-of-custody forms received by the Division Laboratory will be signed and dated by the Laboratory's sample custodian. The custodian will note the condition of each sample received as well as observations concerning sample integrity. The custodian will also maintain a sample-tracking record that will follow each sample through all stages of laboratory processing. These records will be used to determine compliance with holding time limits during laboratory audit and data verification.

3.8.3 Shipment.

At the end of the day during a sampling activity coolers shall be immediately shipped via air to the laboratory. Shipping labels shall read as follows:

North Pacific Division Laboratory
1491 N.W. Graham Avenue
Troutdale, Oregon 97060-9503
Attention: Director, Army Corps of Engineers

3.9 FORMS AND LABELS.

Forms and labels shall be described in the Field Sampling and Analysis Plan and shall include sample labeling, sample seals, field notebook entries, chain-of-custody records, and sample analysis request sheets.

3.9.1 Sample Labels.

Sample labels shall be affixed to the sample container and shall be sufficiently durable to remain legible even when wet. Labels shall contain the following information:

(a) Sample identification number. Develop a number system that includes the year, location abbreviation, well number and sample number, i.e. 92LLWA-MW1-001.

(b) Name and initials of collector.

(c) Date and time of collection.

(d) Analysis requested (include EPA method number).

(f) Preservatives used.

(g) Type of sample.

3.9.2 Sample Seals.

Sample seals shall be placed around the cap of each sample bottle. Sample seals shall be dated and initialized by the collector.

3.9.3 Chain-of-Custody Record.

The chain-of-custody record shall contain the following information:

(a) Sample identification number.

(b) Date and time of sample collection.

(c) Type of sample.

(d) Sample location.

(e) Number of containers per sample.

(f) Analysis requested (include EPA method number).

(g) Signature of person involved in the chain of possession.

(h) Inclusive dates of possession.

(i) Internal temperature of shipping container (cooler).

3.9.4 Sample Analysis Request Sheet.

A sample analysis request sheet shall accompany the samples on delivery to the laboratory and clearly identify the following information:

(a) Name of person receiving the sample.

(b) Date of sample receipt.

(c) Analyses requested (include EPA method numbers).

(d) Internal temperature of shipping container (cooler)

when opened at the laboratory.

3.10 CLEANUP.

After completion of all work, equipment, surplus materials, temporary drainage, rubbish, and debris incidental to work shall be removed from the site. All vehicular ruts shall be backfilled and dressed to conform with the existing topography. All work specified under this section shall be performed by the Contractor and shall be performed to the satisfaction of the Contracting Officer.

3.11 PUBLIC AFFAIRS.

The Contractor shall not make available to the news media or publicly disclose any data generated under this contract. When approached by the news media, or other outside parties, the Contractor shall refer them to the Government for response. Reports and data generated under this contract shall become the property of the Government and distribution to any other source by the Contractor, unless authorized by the Government, is prohibited.

Table 1. ANALYTICAL PARAMETERS

Analytical Parameter	Test Method[1]	Sample Container[3]	Preservation	Maximum Holding Times	
				Extraction	Analysis
Volatile Organics	Groundwater: GC/MS INC[2]/8240 Sediment: GC/MS INC[2]/8240	(2) 40 ml glass with Teflon™-lines septa vial (2) 40 ml glass with Teflon™-lined septa vial	pH<2 with HCl; Cool to 4°C Cool to 4°C	-	14 days
Semi-Volatile Organics	Groundwater: GC/MS 3510/8270 Sediment: GC/MS 3540/8270	(1) 1 liter amber glass bottle (1) 8 oz glass jar	Cool to 4°C Cool to 4°C	7 days 14 days	40 days 40 days
Organochlorine Pesticides and PCBs	Groundwater: GC 3510/8080 Sediment: GC 3540/8080	(1) 1 liter amber glass bottle (1) 8 oz glass jar	Cool to 4°C Cool to 4 °C	7 days 14 days	40 days 40 days
Total Metals (Target Analyte List)	Groundwater and Sediment: ICP EXT[5]/6010 or 7000 series	(1) 1 liter polyethylene bottle (1) 8 oz glass jar	pH<2 with metal free HNO_3; unfiltered Cool to 4°C	-	6 mos[4]
Petroleum Hydrocarbons (TRPH)	Groundwater: IR INC[2]/418.1 Sediment: IR 9071/418.1	(2) 1 liter amber glass bottle (1) 8 oz glass jar	pH<2 with HCl; Cool to 4°C Cool to 4°C	-	28 days
Common Anions (Sulfate and Nitrate)	Groundwater: IC 300.0	(1) 1 liter glass bottle	pH<2 with H_2SO_4 for NO_3^-; Cool to 4°C	-	28 days[6]
Cyanide	Groundwater: 9010	(1) 1 liter polyethylene bottle	pH>12 with NaOH; Cool to 4°C	-	14 days
Dioxins and Furans	Groundwater: GC/MS INC[2]/8280 Sediment: GC/MS INC[2]/8280	(1) 1 liter amber glass bottle (1) 8 oz glass jar	Cool to 4°C Cool to 4°C	-	45 days
Oil and Grease	Groundwater: IR 413.2	(1) 1 liter glass bottle	pH<2 with HCl; Cool to 4°C	-	28 days

1 - Test methods are from EPA SW-846, "Test Methods for Evaluating Solid Wastes" and EPA 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes".
2 - Abbreviations: INC-Method specific extraction procedure is incorporated into method.
3 - All containers must have Teflon™-lined seals.
4 - Holding time for Hg is 28 days, for remaining metals 6 months.
5 - Use appropriate extraction methods for medium and ICP.
6 - One liter for each method. Holding time for analysis is 48 hours for NO_3^- if not preserved.

Two oversize plates follow this page: Project Location Map and Site Plan and Section. Please refer to the original document for these plates.

V-102-01

Lewiston Levees Waste Area Sampling and Analysis Plan Lewiston, Idaho

February 1992

Army Corps of Engineers
Walla Walla, Washington
Contract No. DACW68-91-D-0004
Delivery Order No. 7

SHANNON & WILSON, INC.
400 N. 34th St., Suite 100
P.O. Box C-30313
Seattle, WA 98103
(206) 632-8020

V-102-01

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Over 35 Years of Excellence

400 North 34th Street, Suite 100 • P.O. Box C-300303 • Seattle, WA 98103 • (206) 632-8020 • Fax: (206) 633-6777

February 21, 1992

Department of the Army
Walla Walla District, Corps of Engineers
Building 602, City-County Airport
Walla Walla, Washington 99362-9265

Attn: Ms. Andy Shoulders

RE: FIELD SAMPLING AND ANALYSIS PLAN, LEWISTON LEVEES WASTE AREA

Shannon & Wilson is pleased to provide the enclosed revised Field Sampling and Analysis Plan for the Lewiston Levees Waste Area in Lewiston, Idaho. This plan describes groundwater and soil cuttings sampling to be conducted under Contract No. DACW68-91-D-0004, Delivery Order No. 7. The draft plan was submitted on February 18, 1992.

The first round of sampling is scheduled for February 24, 1992. Please contact us if you have any questions. We look forward to working with you on this project.

Sincerely,

SHANNON & WILSON, INC.

Beth C. Geiger
Geologist

Richard H. Gates, P.E.
Vice President

BDG:RHG/dgw

V102-01.LT2/BCG-lkd/dgw

V-102-01

LEWISTON LEVEES WASTE AREA
FIELD SAMPLING AND ANALYSIS PLAN
FEBRUARY 1992

U.S. ARMY CORPS OF ENGINEERS
WALLA WALLA, WASHINGTON
CONTRACT NO. DACW68-91-D-0004
DELIVERY ORDER NO. 7

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LEWISTON LEVEES WASTE AREA
FIELD SAMPLING AND ANALYSIS PLAN
FEBRUARY 1992

U.S. ARMY CORPS OF ENGINEERS
WALLA WALLA, WASHINGTON
CONTRACT NO. DACW68-91-D-0004
DELIVERY ORDER NO. 7

1.0 PROJECT DESCRIPTION

1.1 Introduction

This Sampling and Analysis Plan describes work to be conducted at the Lewiston Levees Waste Area, near the confluence of the Snake and Clearwater Rivers at Lewiston, Idaho. The project will involve the sampling and testing of five groundwater monitoring wells. The monitoring wells are located around the perimeter of an encapsulated waste area and will be used to detect and monitor contaminant migration from the waste area. The wells were drilled, installed and developed in January and February, 1992, under Delivery Order No. 4 of this contract.

1.2 Scope of Work

The scope of work for this project consists of the following tasks:

- Sample groundwater from five monitoring wells located at the Lewiston Levees encapsulated waste area, and collect two composite soil samples from drummed drill cuttings remaining on site from the monitor well installation. Sampling will be conducted on or about February 24, 1992.
- Submit the QA samples to the Corps of Engineers Northern Pacific Division laboratory in Troutdale, Oregon for chemical analysis, and the primary samples to ARDL Laboratory in Mount Vernon, Illinois, a contract laboratory approved by the Corps of Engineers Laboratory.
- Collect a second round of groundwater samples on or about March 16, 1992, and submit them for analysis as described above.
- Prepare a final report describing the monitor well installation (conducted under Delivery Order No. 4), and the analytical results of the two rounds of sampling.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

This project will be conducted by Shannon & Wilson, Inc. for the Army Corps of Engineers, Walla Walla, Washington, under Contract No. DACW68-91-D-0004, Delivery Order No. 7. Work will be performed in accordance with the Corps of Engineer's Scope of Work for the project, as well as procedures described in this Plan.

Shannon & Wilson, Inc. has developed this work plan based on the Scope Of Work provided by the Army Corps of Engineers, and will conduct the field work. Laboratory analysis will be conducted by a contract laboratory approved by the Corps of Engineers laboratory in Troutdale, Oregon.

Dr. Richard Gates, P.E. of Shannon & Wilson, Inc. is the project manager. Dr. Gates is responsible for the overall schedule, scope, and management of the project.

Mr. Donald Balmer, P.G. is the Senior Hydrogeologist who will provide technical guidance during the project.

Ms. Beth Geiger, Geologist, will be the field manager and site geologist during the fieldwork described in this Plan. With the assistance of a technician, she will conduct the monitor well and drum sampling. Ms. Geiger will also be responsible for alerting the project manager to any changed conditions, and will act as the Site Health and Safety manager.

Health Risk Associates has developed the Site Health and Safety Plan included in this plan as Appendix A.

3.0 SAMPLE COLLECTION AND ANALYSIS PROCEDURES

3.1 Overview

This Plan provides guidance for specific methods to be used during the purging, sampling, and analysis of five groundwater monitoring wells. Figure 1 shows the project location. Figure 2 is a site plan showing the locations and elevations of the monitoring wells.

The monitoring well sampling described will take place twice, on February 24 and on March 16, 1992, and will be conducted in accordance with this plan and with the Corps of Engineers Scope of Work during both of these rounds. The drummed soil sampling will take place only once, during the first groundwater sampling round.

3.2 Water Level and Depth Measurements

Before and after each well is purged, the static water level will be measured to the nearest 0.01 foot with an electronic water level indicator. Measurements will be taken from the top of the PVC well casing. Water level measurements will be read and recorded a minimum of twice to ensure accuracy of $\pm$ .05 feet. During each sampling event, one round of water levels will be measured in addition to measurements taken at each well prior to sampling.

The total depth of each well will also be measured and recorded to determine if sediment is present inside the well casing.

In addition, a measurement will be made of the Clearwater River level during each sampling round from any of the monitoring wells, using a rod and hand level.

3.3 Well Purging

Each monitoring well will be purged prior to sampling to remove standing water in the well and ensure that a representative sample of the groundwater is collected. A minimum volume equivalent to three times the volume of water in the saturated borehole will be removed during purging. For calculation purposes, a porosity of 30 percent will be assumed during volume measurements. If a well is bailed dry during purging, it will be sampled as soon as recharge permits.

During well purging, pH, temperature, and conductivity will be monitored and purging will continue until these parameters have stabilized as follows:

pH	to within 0.1 units
Conductivity	to within 10%
Temperature	to within 0.1°C

Temperature and pH will be measured using a Hach One pH meter. Conductivity will be measured using a Hach One conductivity meter. The pH meter will be calibrated daily as described in the manual provided by the manufacturer, using pH 4.01 and 7.00 calibration solutions. The conductivity meter will also be calibrated daily according to manufacturer's instructions.

All purge water will be discharged into drums, and the drums labelled with project, well number, contents, date, and drum number.

3.4 Groundwater Sample Collection

The wells will be sampled using Voss Single Sample™ disposable bailers constructed of polyethylene. Nylon cord used with the bailers will be discarded after each well is sampled. Sample containers will be supplied by Environmental Sampling Supply (ESS) of Oakland, California. Sample containers requiring preservation as described in Table 1 will be preserved by the laboratory, and all sample containers pre-cleaned by ESS according to U.S. EPA cleaning procedures.

Samples for volatile and semi-volatile analyses will collected first, and containers filled completely with no headspace remaining. Samples from all monitoring wells, will be analyzed for the following parameters:

Volatile Organic Compounds
Semi-Volatile Organic Compounds
Organochlorine Pesticides and PCBs
Total Metals
Petroleum Hydrocarbons
Common Anions
Cyanide
Dioxins and Furans
Oil and Grease

The containers required for each sample are described in Table 1. A duplicate sample will be collected from MW-2 for all parameters. In addition, four extra volumes will be collected and analyzed for semi-volatiles, organochloride pesticides/PCBs, oil and grease, and petroleum hydrocarbons. The duplicate will be sent to the Corps of Engineers' Laboratory in Troutdale,

Oregon.

3.5 Drummed Soil Sampling

During the first round of groundwater sampling, samples of the drummed soil cuttings which remain on site from drilling will be sampled. One composite sample from all drums will be collected and submitted for analysis of dioxins and furans. One composite sample from the upgradient wells (MW-4 and MW-5) cuttings will be collected, and one composite from the downgradient wells (MW-1, MW-2, and MW-3) cuttings will be collected. These latter two samples will be analyzed for the following parameters:

Volatile Organic Compounds
Semi-Volatile Organic Compounds
Organochlorine Pesticides and PCBs
Total Metals
Petroleum Hydrocarbons

In addition, one duplicate soil sample will be collected from the down gradient well cuttings.

3.6 Surface Water Sampling

Based on the analytic results from the initial round of groundwater sampling, surface water samples of the Clearwater River may be collected. If surface water samples are collected, they will be collected just off-shore from the site, at approximately the location indicated on Figure 2. Samples will be collected directly into sample containers or using an extender to obtain samples from 4 or 5 feet offshore.

3.7 Documentation

All sampling activities, measurements, purge volumes, water levels and other observations will be recorded by the site geologist in a bound field notebook using permanent black ink. This information will include date, sampling personnel, weather, sampling times and observations, visitors to the project site, instrument calibration, chronology of sampling activities, and any odd or unusual occurrences.

All samples will be recorded on chain-of-custody forms (Figure 3) which will indicate the required analyses, the number of containers for each analysis, the date and time of collection, the sample matrix, and other relevant sample and sample custody information. Chain-of-custody forms will remain with the samples until delivery to the laboratory.

Water level measurements will be recorded on a water level measurement form (Figure 4). Time of measurement, water level from top of casing, and any other relevant observations pertaining to each well will be recorded.

Figure 5 shows a sample label and custody seal.

3.8 Sample Labelling

All sample labels will include the date and time of sample collection, the analytical method and parameters, preservation methods used, the project number and name, and sampling personnel. Each jar lid will be secured with a chain-of-custody seal.

Samples will be designated by the following system:

Source	Sample I.D. (1st round)
Groundwater samples:	
MW-1	92LLWA-MW1-001
MW-2	92LLWA-MW2-001 (duplicate will the same I.D.)
MW-3	92LLWA-MW3-001
MW-4	92LLWA-MW4-001
MW-5	92LLWA-MW5-001
Drummed soil samples:	
Composite (all wells)	92LLWA-COMP-01
Composite (MW-4,5)	92LLWA-COMP-02
Composite (MW-1,2,3)	92LLWA-COMP-03 (duplicate will be same I.D.)
Surface water sample:	92LLWA-SW1-001
Trip Blank:	92LLWA-TP1-001 through 92LLWA-TP(X)-001

3.9 Sample Handling and Shipping

Immediately upon collection, samples will be placed into coolers maintained at 4°C. Each sample jar will be labelled, recorded on a chain-of-custody form, and placed in a separate plastic bag. Sample jars will be protected from breakage by filling the cooler with vermiculite. Chain-of-custody forms and other documentation will be placed in a plastic bag and taped inside the lid of each cooler. Signed and dated chain-of-custody seals will be taped across the lid of each cooler on all four sides. The cooler lid and drain will be secured with shipping tape, and both "This Side Up" and "Fragile" labels placed on at least two places on each cooler.

At the end of each sampling day, each cooler will be stocked with frozen "blue ice" and shipped by overnight courier directly to the following contract laboratory specified by the Corps of Engineers:

ARDL
1801 Forest Street
Mount Vernon, Illinois 62864
Tel: (618) 244-3236
Attn: Dan Gillespie

Duplicate samples will be shipped to:

Corps of Engineers
North Pacific Division Laboratory
1491 N.W. Graham Avenue
Troutdale, Oregon 97060-9503
Tel: (503) 665-4166
Attn: Director, Army Corps of Engineers

Upon receipt the coolers will be inspected by the laboratory and checked for intact custody seals, breakage, completeness, and documentation.

3.10 Decontamination

Wells will be purged and sampled using pre-washed, individually wrapped disposable bailers, which do not require decontamination. The water level indicator and measuring tape equipment will be decontaminated using distilled water. If teflon bailers are used, they will be decontaminated using a laboratory grade, non-phosphate detergent (e.g. Liquinox) followed by a dilute 0.1N hydrochloric acid rinse (or 0.1N nitric acid for inorganic samples), a tap water rinse, and a distilled water rinse. For organic samples, equipment will also be rinsed with methanol or hexane.

3.11 Sampling and Decontamination Wastes

Purge water and other well water will be placed in steel drums located adjacent to each well. Drums will be labelled with date, well, project, and drum number, and contents.

4.0 QUALITY CONTROL/QUALITY ASSURANCE

Quality Assurance/Quality Control are integrated into any successful field project to ensure that sampling, documentation, and laboratory data are effective and allow for representative samples and optimal accuracy of results.

Quality Assurance samples for this project will include the following:

Trip Blanks. Trip blanks are used to identify cross contamination of volatile components during transport and storage of samples and sample containers. Trip blanks consist of sample containers filled with reagent water prior to fieldwork and transported to and from the site with the sample containers. For this project, one trip blank will be included in each cooler containing samples to be analyzed for volatile components.

Duplicate samples. Duplicate samples will be submitted directly to the Corps of Engineers laboratory in Troutdale, Oregon and will be used to test the replicability of analytical results. During each groundwater sampling round, a duplicate sample will be collected from MW-2 and submitted for analysis of the same parameters as the primary MW-2 sample. Four additional volumes will be analyzed for semi-volatile organic compounds, organochlorine pesticides/PCBs, oil and grease, and petroleum hydrocarbons. During the first round, one duplicate soil sample will be collected from the downgradient well cuttings and analyzed for the same constituents as the MW-2 duplicate, with the exception of dioxin and furans. The duplicate samples will be recorded on a separate chain-of-custody.

Data quality objectives will be in accordance with the EPA Method Detection Limits referenced in SW-846. The practical quantitation limits for each analysis will vary depending on the sample matrix, specific analyte, matrix interferences, the concentration of analyte, and the laboratory analyzing the sample.

Table 1 summarizes the required containers, preservation, and holding times for each analysis. Samples will be collected in pre-cleaned sample containers provided by Environmental Sampling Supply (ESS) of Oakland, California. All sample containers will be pre-cleaned by the supplier according to U.S. EPA procedures.

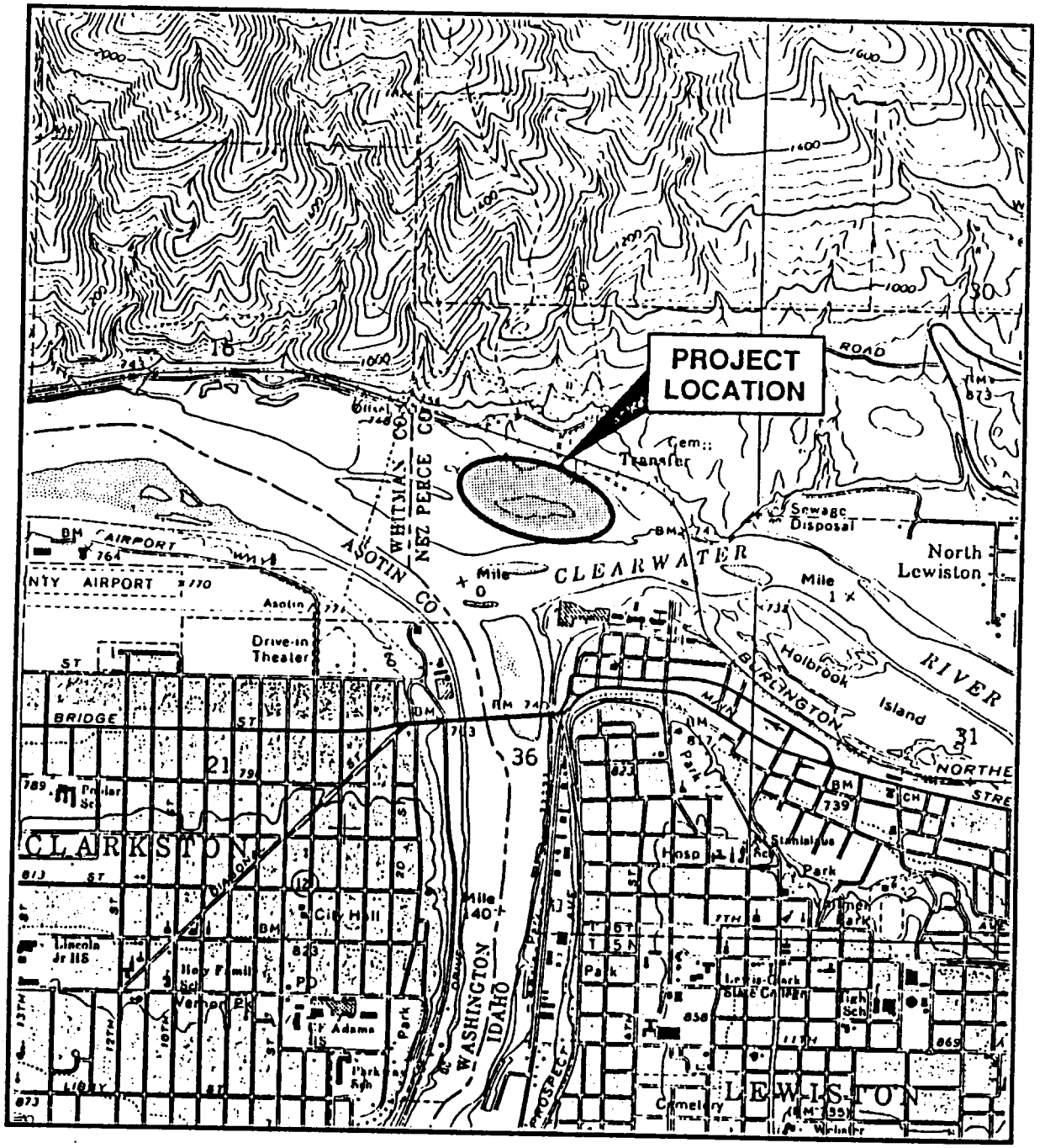
BCG:DKB:RHG/dgw

V102-01.RPT/BCG-lkd/dgw

Table 1. ANALYTICAL PARAMETERS

Analytical Parameter	Test Method[1]	Sample Container[3]	Preservation	Maximum Holding Times	
				Extraction	Analysis
Volatile Organics	Groundwater: GC/MS IWC[2]/8240 Sediment: GC/MS IWC[2]/8240	(2) 40 ml glass with Teflon™-Lined septa vial (2) 2-oz glass with Teflon™-Lined septa jar	pH<2 with HCl; Cool to 4°C Cool to 4°C	-	14 days
Semi-Volatile Organics	Groundwater: GC/MS 3510/8270 Sediment: GC/MS 3540/8270	(1) 1 liter amber glass bottle (1) 8 oz glass jar	Cool to 4°C Cool to 4°C	7 days 14 days	40 days 40 days
Organochlorine Pesticides and PCBs	Groundwater: GC 3510/8080 Sediment: GC 3540/8080	(1) 1 liter amber glass bottle (1) 8 oz glass jar	Cool to 4°C Cool to 4 °C	7 days 14 days	40 days 40 days
Total Metals (Target Analyte List)	Groundwater and Sediment: ICP EXT[5]/6010 or 7000 series	(1) 1 liter polyethylene bottle (1) 8 oz glass jar	pH<2 with metal free HNO_3; unfiltered Cool to 4°C	-	6 mos[4]
Petroleum Hydrocarbons (TRPH)	Groundwater: IR IWC[2]/418.1 Sediment: IR 9071/418.1	(1) 1 Liter amber glass bottle (1) 8 oz glass jar	pH<2 with HCl; Cool to 4°C Cool to 4°C	-	28 days
Common Anions (Sulfate and Nitrate)	Groundwater: IC 300.0	(1) 1 liter glass bottle	Cool to 4°C	-	28 days[6]
Cyanide	Groundwater: 9010	(1) 1 Liter glass or polyethylene bottle	pH>12 with NaOH; Cool to 4°C	-	14 days
Dioxins and Furans	Groundwater: GC/MS IWC[2]/8280 Sediment: GC/MS IWC[2]/8280	(1) 1 liter amber glass bottle (1) 8 oz glass jar	Cool to 4°C Cool to 4°C	-	45 days
Oil and Grease	Groundwater: IR 413.2	(1) 1 liter glass bottle	pH<2 with HCl; Cool to 4°C	-	28 days

1 - Test methods are from EPA SW-846, "Test Methods for Evaluating Solid Wastes" and EPA 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes".
2 - Abbreviations: IWC-Method specific extraction procedure is incorporated into method.
3 - All containers must have Teflon™-lined seals.
4 - Holding time for Hg is 28 days, for remaining metals 6 months.
5 - Use appropriate extraction methods for medium and ICP.
6 - One liter for each method. Holding time for analysis is 48 hours for NO_3 if not preserved.



0 1/4 1/2 1

Scale in Miles

NOTE

Map adapted from USGS topographic map of Clarkston, WA -ID quadrangle, dated 1971.

Lewiston Levees
Lewiston, Idaho

VICINITY MAP

February 1992 V-102-01

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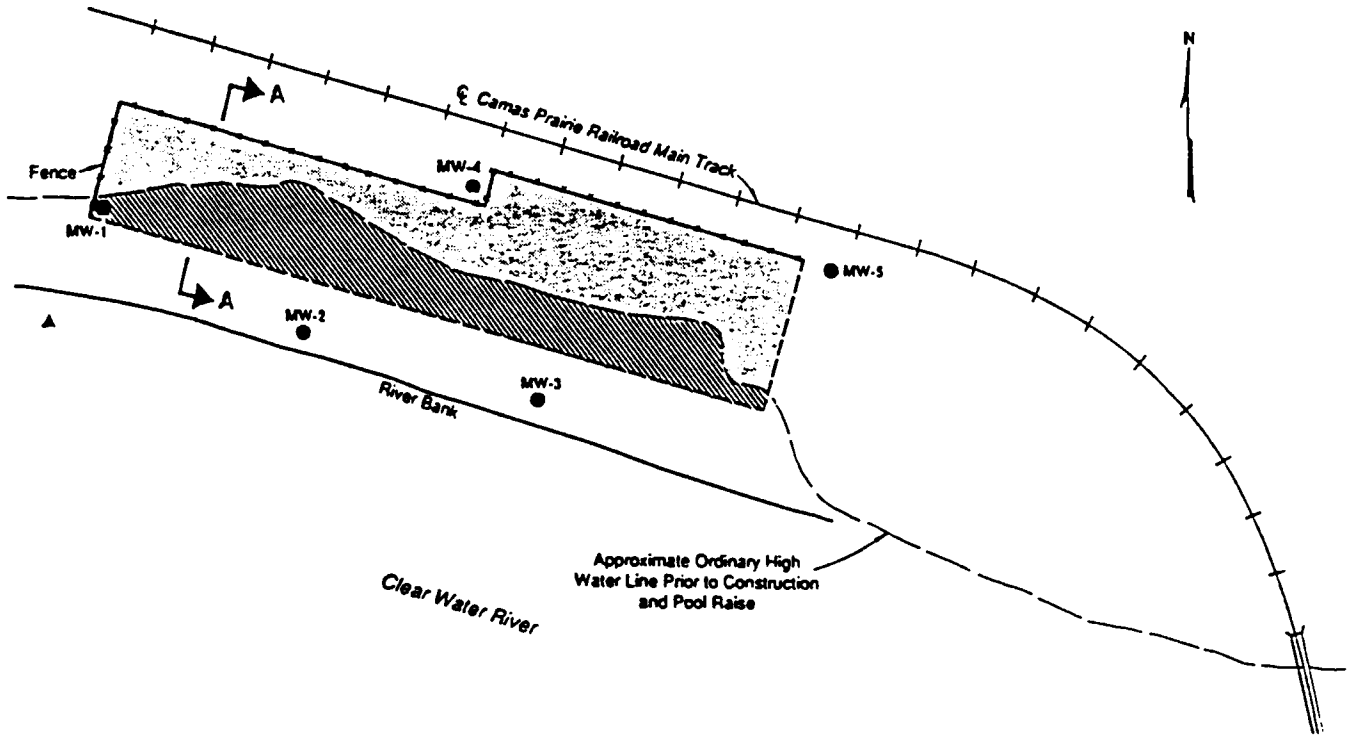
Geotechnical & Environmental Consultants

FIG. 1



LEGEND

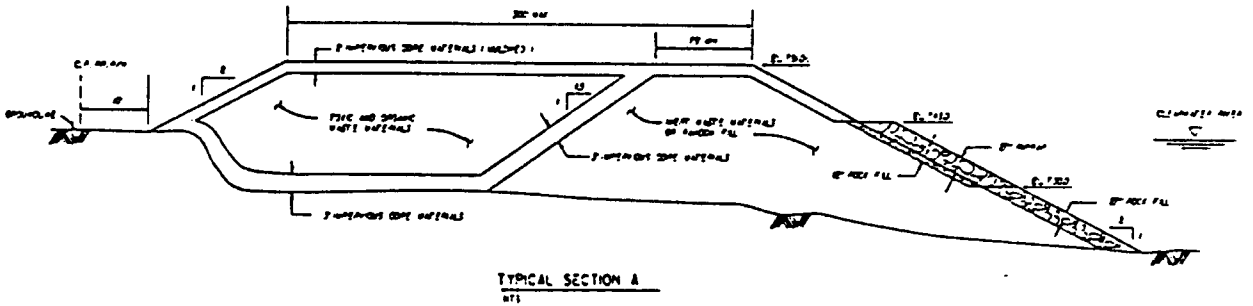
- Encapsulated Waste Area (Inert Materials)
- Encapsulated Waste Area (Toxic and Organic Materials)
- MW-4 ● Monitoring Well Locations
- ▲ Surface Water Sample Designation and Approximate Location

NOTE

Plan provided by U.S. Army Corps of Engineers, dated December 1991.

0 100 200 400

Scale in Feet



TYPICAL SECTION A

FIG. 2

Lewiston Levees
Lewiston, Idaho

SITE PLAN AND MONITORING WELL LOCATIONS

February 1992 V-102-01

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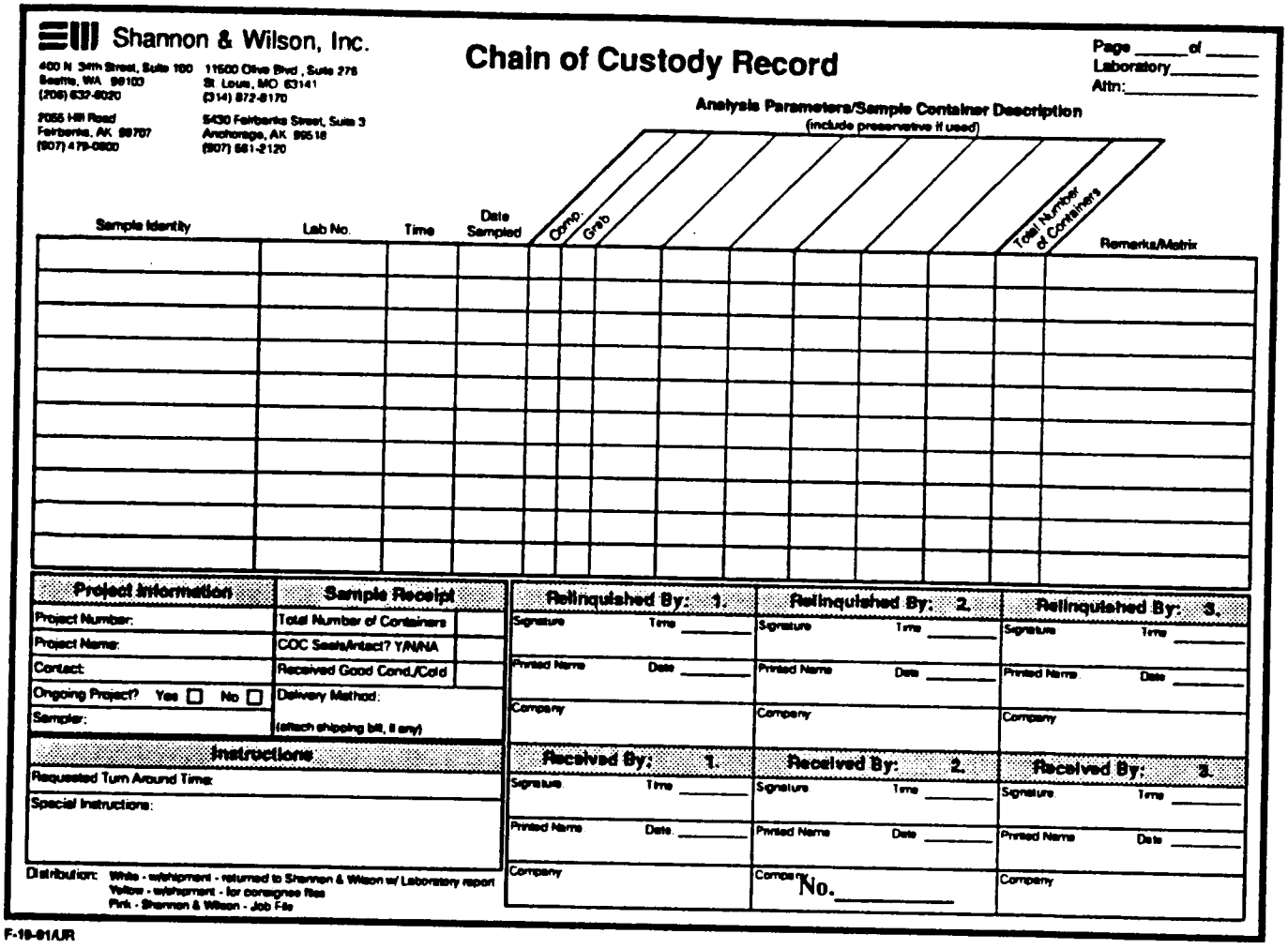
FIG. 2



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

Chain of Custody Record

Page _____ of _____
Laboratory_____
Attn:_____

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

Sample Identity	Lab No.	Time	Date Sampled	Comp.	Grab							Total Number of Containers	Remarks/Matrix

Project Information	
Project Number:	
Project Name:	
Contact:	
Ongoing Project? Yes ☐ No ☐	
Sampler:	

Sample Receipt	
Total Number of Containers	
COC Seals/Intact? Y/N/NA	
Received Good Cond./Cold	
Delivery Method: (attach shipping bill, if any)	

Instructions

Requested Turn Around Time:

Special Instructions:

Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.
Signature Time	Signature Time	Signature Time
Printed Name Date	Printed Name Date	Printed Name Date
Company	Company	Company
Received By: 1.	**Received By: 2.**	**Received By: 3.**
Signature Time	Signature Time	Signature Time
Printed Name Date	Printed Name Date	Printed Name Date
Company	Company No._____	Company

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

F-19-91/UR

FIG. 3

Lewiston Levees
Lewiston, Idaho

CHAIN OF CUSTODY FORM

February 1992 V-102-01

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Geotechnical and Environmental Consultants

FIG. 3

SHANNON & WILSON, INC.
Geotechnical Consultants

FIELD WATER LEVEL MEASUREMENTS

JOB NO. _____

SHEET _____ OF _____

PROJECT _____ LOCATION _____

CLIENT _____ FIELD REP. _____

WELL	DATE	TIME	MEASURING POINT	ELEV. OF MEASURING PT.	DEPTH TO WATER FROM M P.	ELEV. OF WATER	REMARKS

Lewiston Levees
Lewiston, Idaho

WATER LEVEL MEASUREMENT FORM

February 1992 V-102-01

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 4

SHANNON & WILSON, INC.
(206) 632-8020

Sample No.

Site Name	Job No.
Analysis	Date
Preservative	Time

SHANNON & WILSON, INC.
Geotechnical Consultants
400 N. 34th St., Suite 100
Seattle, WA 98103
(206) 632-8020

Custody Seal No. 10133

Date _____ Job No. _____

(Signature) _____

Lewiston Levees
Lewiston, Idaho

SAMPLE LABEL AND CUSTODY SEAL

February 1992 V-102-01

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 5

APPENDIX A

SITE HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

SAMPLING MONITORING WELL
LEWISTON LEVEES WASTE AREA
Lewiston, Idaho - 1992

Contract No. DACW68-91-0004

U.S. Army Corps of Engineers
Walla Walla District Office

prepared

for

Shannon and Wilson, Inc.

by

Health Risk Associates, Inc.

February, 1992

Elizabethe A. Taylor, C.I.H.

TABLE OF CONTENTS

HEALTH AND SAFETY PLAN
SAMPLING OF MONITORING WELL
LEWISTON LEVEES Waste Area
Lewiston, Idaho - 1992

I. PURPOSE

The purpose of this Health and Safety Plan is to address the issues arising out of the potential for chemical exposure which may be encountered during the sampling of monitoring wells. This plan is based on the information provided to Shannon and Wilson, Inc. (S&W) and its subcontractor, Health Risk Associates, Inc. (HRA).

II. DEFINITIONS

A. Permissible Exposure Level (PEL): The allowable limit set by OSHA that workers can be exposed to averaged over an 8-hour day (see TWA). Some levels can be exceeded, as long as the average is below the PEL. Usually expressed in parts per million (ppm).

B. Threshold Limit Value (TLV): The recommendation set by the American Conference of Governmental Industrial Hygienists (ACGIH). These limits are not enforceable legal standards.

C. Time Weighted Average (TWA): The highest level of exposure to a chemical averaged over an 8-hour work day that will not cause adverse effects on workers.

D. Ceiling Value (C): Level above the TWA which employees are not allowed to be exposed to, even for a short period of time.

E. Short Term Exposure or Excursion Limit (STEL): Term used by both OSHA and ACGIH. It is the amount of a chemical which a worker can be exposed to for up to fifteen continuous minutes, with at least 60 minutes between exposures. The exposure should not exceed four excursions a day with the PEL not being exceeded.

F. Lower Explosive Limit (LEL) : The percent of a flammable or explosive chemical in the air which will burn if an ignition source is available. The major chemical of concern at this site is methane which has an LEL of about 5.0% (total volume in air). Unrestricted work activities will take place in 20% or less of the LEL.

III. SITE HISTORY

The Lewiston Levees Waste Area is an area of encapsulated fill along the banks of the Clearwater River. The fill was emplaced in approximately 1972 and consists of "toxic and organic materials". Based on information from the COE, the waste includes: oil saturated soil, organic wastes, paper mill chemical wastes, and bentonite slurry. The fill area is surrounded by a 3 foot layer of impervious material. The previous project involved the drilling and installation of five groundwater monitoring wells around the perimeter of the waste area. During the that contract no combustible gases, sheen or odors were observed.

The site has been leased to Mountain Fir Lumber.

IV. SCOPE OF WORK

The wells to be sampled vary in depth from 17 to 42 feet. All five wells will be sampled using a bailer.

V. CHEMICALS FOUND ON SITE AND RELATED RISKS

Based on the previous project, it is unlikely that exposure will occur during this project. However, since the existence of contaminants cannot be totally ruled out, a conservative approach will be used. The following information is being provided as based on background information and may not exist on site.

The wastes reported to be on site are: oil saturated soils, "organic waste", paper mill chemical waste and bentonite slurry.

A. OIL SATURATED SOILS were most likely contaminated with petroleum products mainly petroleum distillates. They consist of a mixture of paraffins, aromatic hydrocarbons, gasoline, kerosene, fuel oils, gas oils, lubricating oils, paraffin waxes, asphalt, and alcohols. Diesel fuel (or Fuel Oil #2) is the fraction of petroleum distillates which consists of carbon chains ranging from 6-16 atoms in length.

Diesel fuel is a viscous, clear to yellowish liquid with a characteristic "petroleum odor" (smells like gasoline or kerosene). Airbourne diesel fuel is an eye, skin, and respiratory tract irritant. The most common effect from acute exposure is skin irritation. It has not been found to be mutagenic or teratogenic in man or animals.

RISK: If one presumes that all of the "hydrocarbons" found on site belong to this chemical group, they would not pose an inhalation hazard due to their propensity to bind with soils. Their levels are also not high enough to pose a risk to the skin of unprotected workers.

B. ORGANIC WASTE most likely consist of discarded vegetation. Once in the ground it would start to decay. The decay process can produce both methane and hydrogen sulfide.

Hydrogen Sulfide has a characteristic odor of "rotten eggs" and can be detected in the parts per billion range. It is heavier than air, therefore it tends to accumulate in lower areas. Hydrogen sulfide's toxic effect is similar to that of hydrogen cyanide. It interferes with the body's ability to utilize oxygen. Death results from respiratory arrest. Irritation to eyes occurs above 70 ppm. Exposure to high concentrations (150 - 250 ppm) results in the inability to smell it - olfactory fatigue. Levels above 300 ppm are generally recognized as sufficient to produce serious injury or death even for as short as 20 minutes exposure time. Hydrogen sulfide is not classified as a carcinogen or teratogen. It is not cumulative in the body; if recovery from acute exposure occurs, then no long term effects are seen.

Methane is a common decomposition product almost always found in old, wet landfills. Its primary action on the body is asphyxiation by displacing the oxygen in the air. It does not chemically react with the body. The primary concern is its flammability. It is lighter than air, therefore it rises. It is odorless and colorless.

RISK: There is little risk from the exposure to methane of explosion levels due to monitoring. Because hydrogen sulfide has such a low odor threshold and is so offensive at low (5 ppm) levels, overexposure is unlikely.

C. PAPER MILL CHEMICALS waste can be a variety of chemicals depending on the process being used. There are basically two primary methods - "kraft" method using calcium carbonate, sodium hydroxide, or sodium sulfide (pH 11-13); or "sulfite" method using acid sulfites or sodium dioxide (pH 1.7-2.3). The latter method is the major source of the characteristic smell associated with paper mills. One waste which is produced as an end product with both methods is lime mud.

Risk: Due to the age of the fill (1972) it is unlikely that the waste are in a concentrated form. The final "bleaching" process has been recently associated with dioxin production. This should not pose a risk to the workers due to the minute amount which may have been produced.

D. BENTONITE SLURRY are clay based muds produced when the clay is used to "clean" out a system such as a well. The bentonite binds most volatile and semi-volatile chemicals, thus reducing the chance of worker exposure. This binding also prevents the vapor and gases from migrating through the soils.

Risk: Because of the binding characteristics of bentonite employees are unlikely to be exposed to chemicals disposed of in the slurry. The bentonite itself is considered non-toxic.

VI. FIELD INSTRUMENTATION AND MONITORING

Due to the fact that during the previous contract a) no combustible gases were measured; and b) no odors were detected, no monitoring will be conducted during the sampling. If detectable odors are encountered, the operation will cease until the Field Manager (FM) can obtain instruments. If required the following instrument will be used.

A. Combustible Gas. A MSA Model 361 or equivalent with both audible and visual alarms will be used during operations where the soil surface is being disturbed or when work is being performed below ground level. The instrument will be calibrated with 2.5% methane prior to use. The audible alarm will be set at 20% LEL for methane.

VII. SELECTION OF PERSONAL PROTECTIVE CLOTHING

A. Head: Hard hats are required on the site. Only hard hats meeting ANSI Z89.1-1986 standards will be acceptable.

B. Body: Standard construction clothing, Tyvek coveralls or chemically resistant rainsuits if required from liquid contact.

C. Feet: Under high liquid contamination, chemically resistant boots will be worn.

D. Hand: During sampling, a glove such as natural rubber, will be used. This is done more for quality control for sampling than for health and safety reasons.

E. Eye: No special eye protection is required.

F. Personal Flotation Devise (PFD): If over water work is being preformed, a Type III or better USCG approved PFD will be worn by all persons. The PFD will be inspected prior to use. Devised with less than 13 pounds buoyancy will not be used.

VIII. SELECTION OF RESPIRATORY PROTECTION

Based on previous observation on this site, no respiratory protection is required.

IX. PHYSICAL HAZARDS and OTHER CONDITIONS

A. Noise. No noise hazard exists.

B. Overhead Power Lines. The existence of any overhead lines will not have a bearing on this project.

C. Underground Utilities. The wells were installed during the first project. The presence or absence of any underground utility lines is a mute point.

D. Temperature Stress. Due to the probability of low (lower than 32'F) temperature during site activities, hypothermia or frostbite may occur. In order to limit the stress:

1. Personnel shall wear waterproof and wind proof layer of clothing over appropriate work clothes.
2. Since it is impractical to physically measure the cold stress which each individual is experiencing, each worker will be responsible for monitoring his/her own stress level. Employees will be allowed to take rest periods whenever they feel distressed.
3. During cold weather, the wind chill factor chart will be used to determine work periods when windy conditions exist. The chart is Attachment B.

E. Slip/Trip Hazards. The areas around the wells have been cleared.

F. Illumination. All work will be performed during daylight hours. Therefore, no special provisions for lighting are required.

X. ACCESS CONTROL AND WORK ZONES

A. Site Control - The actual control of access to the site will be under the jurisdiction of the Mountain Fir Lumber. Only persons directly working for S&W will be allowed in the area(s). The number of persons will be limited to necessary personnel only. Mountain Fir Lumber will be notified if any other persons are found on or near the site.

B. Work Zones - It is anticipated that no Work Zones will be established.

XI. SPECIAL PROCEDURES

A. All site personnel are to immediately report any symptoms that may be related to a chemical exposure to the FM. This includes, but is not limited to: headaches, blurred vision, nausea, weakness, dizziness and eye irritation. In the case of an accident/incident, an Accident/Incident Report Form (Attachment A) will be completed and returned to the FM. A copy will be given to the employee and his/her supervisor. A copy will also be made available to the Owner.

XII. DECONTAMINATION (Worker)

Based on previous data from the site, it is anticipated that no workers will require decontamination. Decontamination of sampling equipment can be found in the Sampling and Analysis Plan

XIII. GENERAL WORK PRACTICES

A. No eating or drinking will be allowed except in specially designated locations.

B. "Clean" water will also be available at the work area to flush areas of the body free of contamination should it occur.

C. At least one 1st Aid kit will be available for minor injuries at the site. At least one person holding a currently approved first aid card will be available during working hours.

XIV. RESPONSIBILITIES

The FM is responsible for enforcing the health and safety requirements.

A. Project Manager will:

1. Assure that all on-site workers have received the required Health and Safety Training; as described in Section XVII
2. Assure that all on-site workers meet the required qualifications for site work;
3. Assure that all standard operating procedures are followed at all times

B. Field Manager will:

1. Conduct Health and Safety Orientation;
2. Periodically check the work environment for health and safety hazards;
3. Investigate all accidents/illnesses;
4. Oversee the proper use, maintenance and decontamination of personnel and equipment; and
5. Address any unusual problems or conditions which may be encountered on site.

D. Site Workers will:

1. Read and follow the site Health and Safety Plan;
2. Complete the required training;
3. Report any accident/illnesses, unsafe conditions, or any unusual situations to the site FM (such as a sheen or color on water or soils, or chemical odors);
4. Maintain and decontaminate personal protective equipment as required.

XV. EMERGENCY PROCEDURES

A. Medical Emergency: Each situation must be evaluated on site to determine if outside medical treatment is necessary. Symptoms involving eyes or respiratory systems which do not readily respond to "fresh air" should be seen by medical personnel.

Due to the low potential for skin exposure that may require medical attention, no special equipment will be required for handling such. (The chemicals and concentrations found on this site are less than found in most industrial settings.)

The nearest phones are located at:

1. Mountain Fir Lumber's office

Ambulance: 911

Nearest Medical Facility:

St. Joseph's Hospital
415 - 6th Street
Lewiston, ID
Emergency: (208) 799-5210
Non-Emergency: (208) 743-2511

B. Fire Emergency: In the event of a fire, the FM will evacuate the site. No one will return until the FM notifies the workers that it is safe to return. All situations will be reported to the Lewiston District and the COE.

Non-Emergency, call: (208) 743-3554
Fire emergency calls: 911

C. Criminal or related problems: 911

Routine call Lewiston Police: (208) 745-0171

D. All emergency calls can be made to: 911

E. Emergency Numbers:

Project Manager:
Richard Gates, Ph.D. (S&W) Office: (206)632-8020

Field Manager:
Beth Geiger (S&W) Home Office: (206) 632-8020

Mountain Fir Lumber:
Martin Hirt - Manager Office: (208) 746-0277

Certified Industrial Hygienist:
Betty Taylor (HRA) Office: (206) 328-6221
Home: (206) 328-6221

All accidents/incidents will be reported on the standard Accident/Incident Report form (see Attachment A). Originals will be maintained by the FM. Copies will be provided for the employees involved, their supervisors/companies and to the Owner.

XVI. MEDICAL MONITORING

All site workers will be participants in a medical monitoring program. The following are the minimum requirements:

A. Baseline "hands-on" physical by a physician or nurse practitioner;
B. History of previous chemical exposures;
C. Family history;
D. CBC and blood chemistries;
E. Urinalysis;
F. Spirometry; and
G. Any additional tests that the examining physician/nurse feels are necessary.

A modified version of the above will be repeated at least annually. A copy of the "Letter of Findings" prepared by the physician will be maintained on site.

XVII. TRAINING REQUIREMENTS

All site personnel will be required to have training which will include, as a minimum the following:

A. A copy of the Health and Safety Plan.

B. A review of the chemical risks on site. This will include a list of the chemical names, permissible exposure limits, acute and chronic symptoms of exposure, first aid treatment, and any other information related to the chemicals which is deemed warranted, such as flammability.

C. What personal protective equipment will be used and under what circumstances, including their limitations.

D. What methods of engineering controls will be used and when they are appropriate.

E. Employee responsibilities while on the job site.

F. A description and demonstration of the air monitoring equipment.

G. A review on fire and explosion hazards, including the use of the fire extinguishers.

H. Uses and limitations of respirators will be presented. All persons required to wear air-purifying respirators will be fit tested prior to use. Training will include chemical warning properties.

In addition to the above listed training, all site workers who are performing sampling or well installation will have the following:

1. Initial 40 hours, as required by 29 CFR 1910.120(e);
2. Annual refresher training; and
3. Any task specific training that is required to perform the job properly.

The FM will have in addition to the above:

1. Training as required in WAC 296-62-300, 80 hours of classroom time. Additional 24 hours on site under supervision.
2. Site Supervisor's Training.
3. Current annual refresher.

TABLE 1

Health Risk by Operations

Job Classification	Risk	EPA Levels
Sampling of Monitoring Wells		
Sampling Personnel	Low	D

Risk refers to the likelihood of taking an "action".
Low: No adverse health effects are likely to occur.
Moderate: Slightly more likely to occur.

APPENDIX B

PROJECT CONTACT LIST

APPENDIX B

PROJECT CONTACT LIST

Army Corps of Engineers, Walla Walla, WA
Walla Walla, Washington 99362-9265
Mr. Richard Glenn, Chief Contracting Division
(509) 522-6801
Ms. Andy Shoulders; COE project contact; Geotechnical Branch
(509) 522-6766

Natl. Pacific Division Laboratory
1491 N.W. Graham Avenue
Troutdale, Oregon 97060
Ms. Pamela Swan
(503) 665-4166

ARDL
1801 Forest Street
Mount Vernon, Illinois 62864
Mr. Dan Gillespie
(618) 244-3236

Shannon & Wilson, Inc.
400 North 34th Street, Suite 100
Seattle, Washington 98103
Dr. Richard Gates, Seattle (206) 633-6830
Pasco (509) 547-9696
FAX (206) 633-6777 (Seattle)
Ms. Beth Geiger, Seattle (206) 633-6841

Site
Mountain Fir Lumber Co., Inc.
Mr. Martin Hirt, Plant Manager
(208) 746-0277