Site/OU IDAHO POLE
8-01-09-09-02
Yes ✓ No
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Yes No
Comments:

REMEDIAL INVESTIGATION REPORT FOR IDAHO POLE SITE BOZEMAN, MONTANA

SUBMITTED BY:

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EXECUTIVE SUMMARY

The objective of this Remedial Investigation (RI) was to gather sufficient information to support an informed risk management decision regarding the Idaho Pole Company (IPC) CERCLA Site. The purpose of this report is to summarize both the site characterization information gathered at the IPC Site and evaluations found in the Baseline Human Health and Ecological Risk Assessments. Specific site characterization objectives included: review of site history and present operations; assess pertinent physicochemical and biological characteristics of the site via study area investigations; assess the nature and extent of contamination, including contaminant fate and transport; and assess potential risk to the public and to the surrounding environment. Additional information on the various affected media (soil, sediment, surface water, groundwater, vegetation, and air), contaminant transport pathways, and receptors are presented in the risk assessment documents associated with the RI report.

The resulting site RI data for soils indicates that noncarcinogenic toxicity, in decreasing order, is wood-treating area > former roundhouse > other potential sources > IPC yard areas. The selected contaminants of concern (CoCs) used in the quantitative risk assessment for surface soils are PCP, anthracene, benzo(a)pyrene, fluoranthene, pyrene, and 2,3,7,8-TeCDD Toxicity Equivalent (TE). The RI data for sediments indicates that noncarcinogenic toxicity, in decreasing order, is Cedar Street ditch > MPC Substation ditch > L Street ditch > Rocky Creek > Mill Creek > Bohart Lane > groundwater drainage ditch. The selected CoCs used in the quantitative risk assessment for sediments are PCP, anthracene, benzo(a)pyrene, fluoranthene, pyrene, and 2,3,7,8-TeCDD TE. The RI data for groundwater indicates that the selected CoCs for the quantitative risk assessment are PCP, anthracene, benzo(a)pyrene, fluoranthene, pyrene and 2,3,7,8-TeCDD TE, as based upon elevated levels of these compounds detected in downgradient monitoring wells.

The RI data indicate that spills and leaks of IPC wood-treating fluid and possibly from historic railroad activities are the sources of site contamination. The primary media contaminated are subsurface soils, light nonaqueous phase liquid (LNAPL), and to a lesser extent surface soils. The secondary contaminated media are ditch sediments and aquifer materials. The primary pathways are groundwater, surface water, and air; secondary pathways are surface water and vegetation. Potentially affected receptors include humans and terrestrial and aquatic biota; potential routes of exposure include ingestion of/direct contact with CoC-contaminated media by these receptors.

Despite the inherent uncertainties associated with the overall assessment of risks, MSE concludes that lifetime excess cancer risk estimates equalling or exceeding the one-in-ten thousand (1E-04) magnitude for current onsite and hypothetical offsite individuals are reasonable and realistic. Therefore, as these cancer risk estimates exceed the EPA's (1990) "point of departure" value of one-in-one million (1E-06), consideration should be given to removal of the LNAPL and contaminated soil/sediment sources, and expedited remediation of the CoC groundwater plume, for protection of currently and potentially exposed persons on and adjacent to the IPC CERCLA Site. The Ecological Risk Assessment (ERA) suggests that the IPC Site poses no environmental threat requiring large-scale or immediate remediation.

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1.0 INTRODUCTION

This document presents the report of site characterization for the Remedial Investigation/Feasibility Study (RI/FS) for the Idaho Pole Company (IPC) National Priorities Site in Bozeman, Montana. The MultiTech Services Division of MSE, Inc., (MSE) has prepared this RI report for the Montana Department of Health and Environmental Sciences (MDHES) under the provisions of Contract No. 400003, Task Order 7.

1.1 PURPOSE OF THE REMEDIAL INVESTIGATION REPORT

The objective of the RI is to gather sufficient information to support an informed risk management decision during the forthcoming FS. The purpose of the RI report is to summarize both the site characterization information gathered at the IPC Site plus the Baseline and Ecological Risk Assessments (MSE, 1992a). The RI report incorporates study area investigations as reported in the Cultural Resources Inventory (MSE, 1990a); Biota Investigation (MSE, 1991a); Technical Memorandum 1 (MSE, 1990b); Technical Memorandum 2 (MSE, 1990c), including Addenda A, B, C and D (MSE, 1991b, 1991c, 1991d, 1991e, respectively); and the Additional Sampling Report (MSE, 1991f); the nature and extent of contamination as reported in the Technical Memorandum 5 (MSE, 1991g) and Technical Memorandum 6 (MSE, 1991h); the data validation and evaluation as reported in the First, Second, Third, Fourth and Fifth Quarterly Contamination Reports (MSE, 1991i, 1991j, 1991k, 1991l, and 1992b, respectively); and the baseline risk assessment as reported in Technical Memorandum 3 (MSE, 1991m).

1.2 ORGANIZATION OF THE REPORT

The report is organized into the following specific sections to achieve the site characterization objective:

- assess site background;
- assess the physical characteristics of the site;
- assess the study area investigations;
- assess the nature and extent of the contamination;
- assess fate and transport of the contaminants; and
- assess risk to the public and the environment.

Information on the various media (soil, sediment, surface water, groundwater, vegetation, and air), the pathways, and receptors is presented within these sections.

2.0 SITE BACKGROUND

The site background section of the RI report presents information on the site description, the site history, previous investigations, and the cultural resources of the site. Most of the site background information has been previously presented in the Work Plan (MSE, 1990d); however, the RI report includes information obtained since the Work Plan.

2.1 SITE DESCRIPTION

The IPC Site is located at the northern limits of Bozeman, Montana, and occupies approximately 50 acres in the east half of Section 6 and the west half of Section 5, Township 2S, Range 6E of Gallatin County. The Vicinity Map, Figure 2-1, shows the site and overall study area relative to the town and surrounding area. Significant features of the IPC plant and surrounding land are shown on the Study Area Plan, Figure 2-2.

The study area is located on gently sloped land along, and partly within, the floodplain of Rocky Creek, a tributary of the East Gallatin River. The study area includes all land owned or leased by IPC; portions of Burlington Northern Railroad (BNRR) property; land owned by The Montana Power Company (MPC), including the East Gallatin Substation; and privately owned land west and east of Rocky Creek. Interstate 90 (I-90) crosses and is included within the study area.

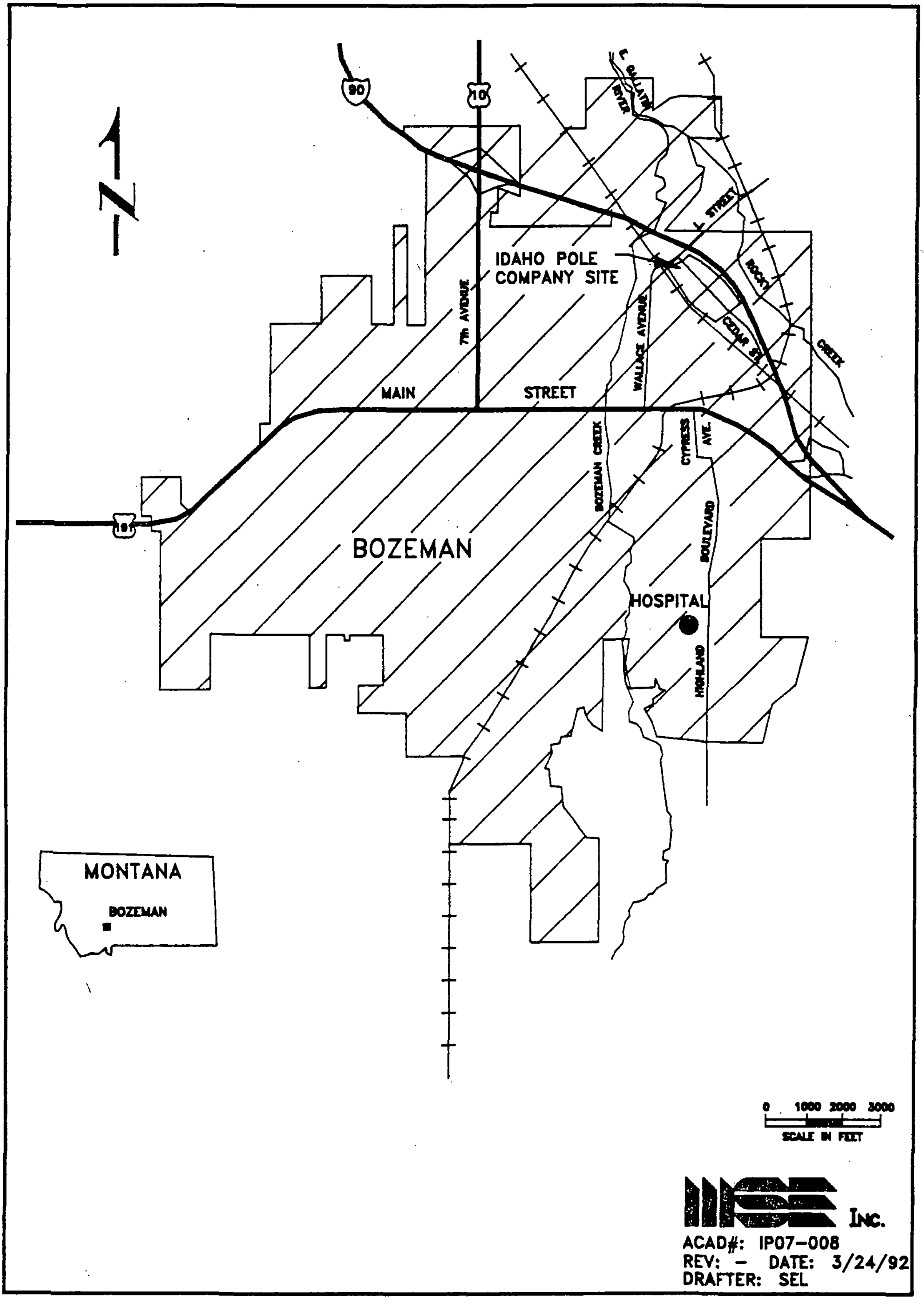

FIGURE 2-1 -- VICINITY MAP OF IDAHO POLE COMPANY
NPL SITE BOZEMAN,MONTANA

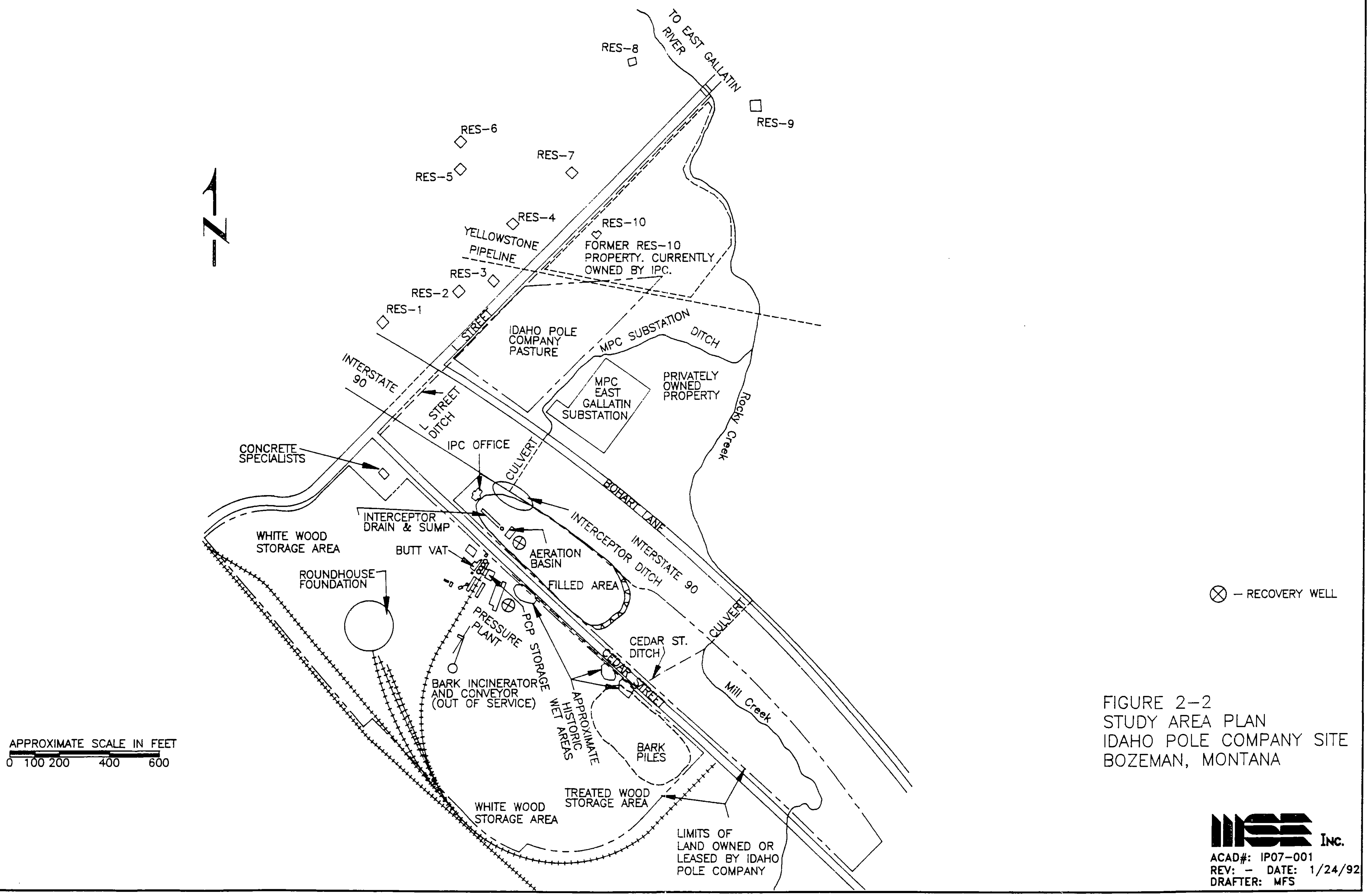

FIGURE 2-2
STUDY AREA PLAN
IDAHO POLE COMPANY SITE
BOZEMAN, MONTANA

MSE INC.
ACAD#: IP07-001
REV: - DATE: 1/24/92
DRAFTER: MFS

BNRR owns and operates rail lines and a railcar transfer station west of the study area. BNRR has leased some of its property to Montana Rail Link (MRL). A narrow portion of IPC's wood storage areas is leased from BNRR. Spur lines shown on the Study Area Plan, Figure 2-2, are occasionally used for delivering and shipping poles and for rail car storage.

IPC's facility currently consists of the preparation and treating plant, treated pole and untreated pole (white wood) storage yards, bark piles, and the plant office. The treating plant located south of Cedar Street is comprised of several buildings, chemical storage and treating containers, and wood handling structures. Major plant features are labeled on the Study Area Plan, Figure 2-2. The portion of the study area north of I-90 and Bohart Lane supports various activities. The IPC pasture is occasionally used for grazing, along with most of the other properties between the IPC and Rocky Creek. A portion of the Res-10 property has been transferred to IPC, and the property remaining appears under a 1981 Agreement for Sale of Real Estate showing the resident as the seller and IPC as buyer; however, the sale has not been finalized.

2.2 SITE HISTORY

Before 1946, property southwest of Cedar Street was owned by BNRR or its precursor, the Northern Pacific Railroad; however, BNRR leased the land out rather than occupying it. A roundhouse used for light maintenance of locomotives occupied part of the yard currently used by IPC for white wood storage. Schematic diagrams of the roundhouse facility show a drain originating from the roundhouse and ending north of Bohart Lane. The facility included a turntable for steam locomotives. The roundhouse is visible on historic vertical aerial photographs, and portions of the roundhouse foundations are still exposed.

IPC began operation in 1946 using creosote as the wood preservative medium. Poles were treated by immersion in heated creosote solution contained in one full-length vat and one butt vat for partial treating. A second full-length vat for total coverage was added in 1951 or 1952 when pentachlorophenol (PCP) dissolved in a medium hydrocarbon solvent oil replaced creosote as the preservative liquid.

PCP-based preservative fluid has since been used as the only preservative medium. A pressure plant with one 144-feet-long retort was put into operation in 1975 and is currently used for most treating. Some poles are still treated using unpressured hot preservative fluid in the butt vat; the full-length vats are no longer used and have been removed.

Past disposal practices pertaining to sludges accumulated in the thermal treatment vats are unknown. Two former surface water bodies apparent on historic vertical aerial photographs were considered potential waste disposal locations by the U.S. Environmental Protection Agency (EPA) and MDHES; however, no evidence of disposal can be found in these areas (see Section 4.1.3). The locations of these features are indicated on the Study Area Plan, Figure 2-2. The bark fill area in the vicinity of the office was alleged to receive PCP, which was mopped up during spills at the site. However, the office area apparently did not act as a large dump site for bark and wood-treating waste (see Section 4.1.5). Also, the current area of white wood storage was previously a treated pole storage area.

I-90 was constructed through the property adjacent to IPC from 1967 to 1969. Test boring logs for the project have been obtained and vertical aerial photographs show right-of-way conditions prior to and during construction. Historically, the land now occupied by I-90 and the area northeast of I-90 to Rocky Creek was predominantly used for residential and ranch purposes. However, IPC, BNRR, and others had active industrial or commercial facilities in the area before the 1980's and the MPC East Gallatin Substation was constructed in the mid-1970's.

2.3 PREVIOUS INVESTIGATIONS

2.3.1 IPC Investigations

In 1978, State of Montana officials observed a creosote-like material in a ditch originating at the IPC Site. In 1979 and 1980 the IPC had a contractor install the office interceptor ditch (Figure 2-2) paralleling I-90 to recover subsurface lighter-than-water nonaqueous phase liquid (LNAPL). The ditch was excavated with a backhoe and was reportedly 400-feet in length and approximately 7 feet deep (recent measurement of the ditch show it to actually be 300-feet in length and approximately 5 feet deep). A 36-inch diameter metal corrugated pipe approximately 56 inches in length travels southwest off the west end of the office interceptor ditch. Various rope and belt skimmers and absorbent pads have been employed to recover LNAPL from the water surface in the office interceptor ditch. The office interceptor ditch is also discussed in Section 3.5.4.1 in relation to man-made structures at the site, in Section 4.1.4.5 in relation to a pipe that enters the ditch discharging LNAPL, and in Section 4.4.3 in relation to water sampling of the ditch.

In 1980, IPC had a contractor install an interceptor drain to recover subsurface LNAPL. The drain extends approximately east and west from the IPC office to a sump near the old aeration basin (Figure 2-2). The interceptor drain consists of a 24-inch diameter, perforated, corrugated metal pipe installed in an approximately 8-feet-below-ground-surface (bgs) trench excavated by a backhoe. The trench was lined with plastic on the north side and backfilled with washed pea gravel. The interceptor drain connects to a 4-feet diameter sump. The sump is currently equipped with a Groundwater Technologies Scavenger Oil Skimmer.

In 1984, IPC hired Applied Geotechnology, Inc., (AGI) to study soil, sediment, surface water, and groundwater contamination. The results (analytical data are invalidated) of the investigation, which was conducted without MDHES or EPA oversight, are presented in a 1985 report (AGI, 1985).

2.3.2 MDHES Investigations

In 1983, MDHES sampled surface water at the outfall at the plant's east end (no longer in use). PCP was detected at 8,500 ppb.

In 1984, MDHES sampled two residential wells for PCP, and a low level was detected in Res-10. No PCP was detected in the other well. Also, four IPC monitoring wells (5A, 14A, 10, and 3A) were sampled as splits with IPC. MDHES results were 30 to 100 times higher than those of the IPC.

In 1985, MDHES sampled 11 residential wells (mainly L Street residences) for PCP. None of the residential wells detected PCP. Also, 11 soil samples were collected from the vicinity of the IPC Site. The sampling was performed to calculate contamination caused by runoff concentrated in the area around Res-10 to Rocky Creek. No PCP was detected in the soil samples.

In 1987, MDHES sampled surface water in the Cedar Street ditch and the outfall from the culvert that runs from under I-90 and discharges to the MPC Substation ditch. PCP was detected in the Cedar Street ditch at 10 ppb and at the culvert outfall at 520 ppb.

In 1991, MDHES sampled surface water at the outfall from the culvert that runs from under I-90 and discharges to the MPC Substation ditch. PCP was detected at 303 ppb. Also, MDHES sampled three residential wells (one well was sampled twice). The residential well that was sampled twice (Res-8) had the only detectable PCP levels.

2.3.3 EPA Investigations

In 1986, EPA sampled residential wells along L and Oak streets for dioxins/furans. One residential well (Res-2) detected contamination. Also, two ditches were sampled for dioxins/furans. Contamination was detected in the office interceptor ditch and the MPC Substation ditch. Also, a soil gas survey was performed to determine the extent of offsite contamination migration. The soil gas survey detected benzene, toluene, xylene, tetrachloroethane, 1,1-dichloroethane, and methylene chloride.

In 1987, EPA collected 20 samples at the IPC Site, including residential wells, surface water, and oil from a tank and a trench for dioxins/furans, metals, semivolatile organics (BNA), and volatile organic analysis (VOA). Various dioxins/furans and PCP were detected.

In 1989, EPA sampled 10 residential wells for dioxins/furans and BNAs. No dioxin/furans were detected and only one BNA compound was detected, bis(2-ethylhexyl)phthalate, which was also found in the blank.

2.4 CULTURAL RESOURCES INVESTIGATION

Three historic sites were recorded in the vicinity of the IPC Site (Figure 2-2). They include the Bohart Place (now Concrete Specialists, Inc.), the Bibber house (formerly Res-10; IPC has bought some of the property), and Northern Pacific Railyard (BNRR; now Montana Rail Link leased).

2.4.1 Bohart Place

The site is indirectly associated with the McAdow Brothers, who were early pioneers to the Gallatin Valley. The site was sold to W.O Bohart who constructed the house, garage, and shop. The site is not associated with events of historical significance and lacks architectural distinction and integrity. It is not eligible for the National Register of Historic Places.

2.4.2 Bibber House

This site is also indirectly associated with the McAdow Brothers, who were early pioneers to the Gallatin Valley; they sold the house to Gertrude (Bibber) Menden, who later sold it to Carl and Auguste Bibber. The Bibbers moved the house onto the site and constructed the root cellar and the horse barn. The site is not associated with events of historical significance and lacks architectural distinction and integrity. It is not eligible for inclusion in the National Register of Historic Places.

2.4.3 Northern Pacific Railyard

The site (former roundhouse, turntable, cooling tower, and water tank) is directly associated with the Northern Pacific Railroad, which was an important economic and social link to the east and other parts of the United States. However, the demolition of almost all the structures in the former locomotive area and the obvious change of land use in the immediate surroundings have severed the historic and functional connections of railroading between the ruins of the engine-servicing area and the main line corridor. The site lacks architectural distinction and integrity. It does not meet the criteria for eligibility of the National Register of Historic Places.

2.4.4 Prehistoric Features

A professional archaeologist from GCM, Inc., performed a field inventory and monitored the backhoe test pits (excavated by MSE) as part of the cultural resources investigation on April 25, 26 and May 1, 1990. No prehistoric sites were discovered within the 50 acre project area (MSE, 1990a).

3.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

3.1 SURFACE FEATURES

Surface features of the IPC Site and the adjacent area are depicted on the IPC Site topographic map generated for use in this investigation. The IPC Site was flown over in May 1990, and a topographic map was subsequently produced from the aerial photography. The topographic map is presented in Attachment A (map pocket). The map was produced at a scale of 1 inch equals 100 feet with 2-feet contour intervals.

A separate map was also generated and is included as Attachment A (map pocket) to show the sampling and monitoring well locations from all of the investigations. Sample locations and monitoring well locations were added to the map as sampling activities were completed.

3.2 SOILS

3.2.1 Percent Moisture, Organic Matter, Total Organic Carbon, Bulk Density, Texture, and Permeability

The Work Plan detailed collecting samples from groundwater monitor well borings 20 and 28; however, the air rotary drilling technique in combination with the soil textures made split spoon sampling impossible. Therefore, the planned soil samples from monitoring wells 20 and 28 were collected from backhoe test pits. The sample originally planned from monitor Well (MW-20) was collected from the pasture east of the IPC office (Figure 3-1) and renamed

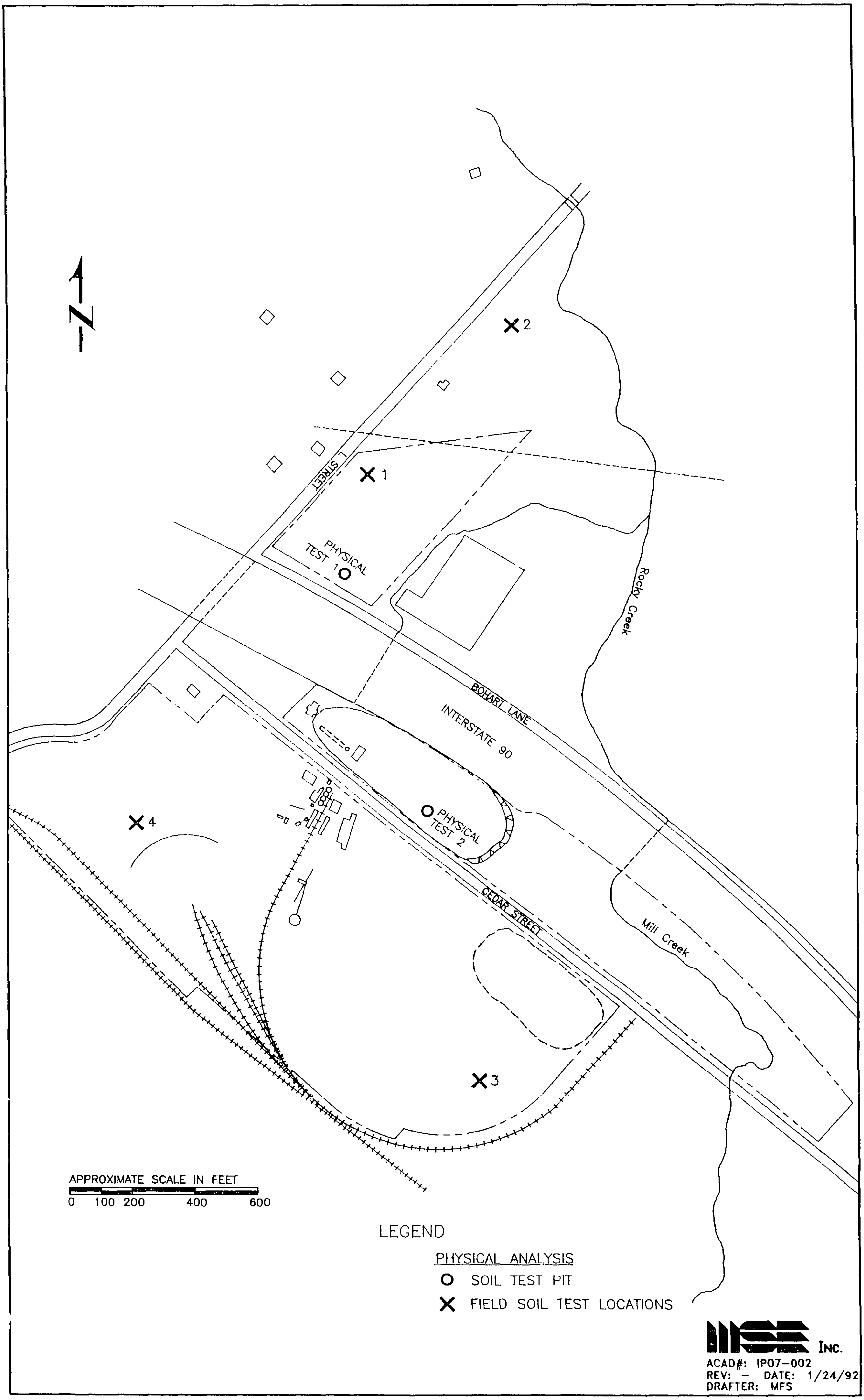

FIGURE 3-1 -- SOIL AND SEDIMENT INVESTIGATION STATIONS

Physical Test 2 and the sample originally planned from MW-28 was collected from the pasture on the corner of L Street and Bohart Lane and renamed Physical Test 1. Planned locations were altered because the soils tested needed to reflect soils the contaminants may migrate through, and the planned locations were in soils at the edge of the study area and not in areas where contaminants may be located. Samples at these two locations were analyzed for bulk density, particle size distribution, total organic carbon, moisture content, and organic matter by MSE, Inc., in Butte, Montana. Physical Test 1 had the following results:

TABLE 3-1

ANALYSES OF PHYSICAL TEST 1

	0 to 12 inches	12 to 48 inches	48 to 72 inches
Moisture (%)	30.1	26.7	33.5
Organic matter (%)	1.17	2.2	3.5
Total organic carbon (%)	0.68	1.3	2.0
Bulk density (g/ml)	0.92	1.05	1.23
Texture	loam	loam	clay

Physical Test 2 had the following results:

TABLE 3-2

ANALYSES OF PHYSICAL TEST 2

	0 to 12 inches	12 to 40 inches	40 to 64 inches
Moisture (%)	15.2	32.6	18.6
Organic matter (%)	1.9	9.3	2.9
Total organic carbon (%)	1.1	5.4	1.7
Bulk density (g/ml)	1.18	0.69	1.45
Texture	silt loam	sandy clay	sand

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Texture	silt loam	sandy clay	sand

Permeability measurements were determined with percolation testing. Percolation testing was performed on June 7, 1990, and field soil test Location 1 (Figure 3-1) was 12 inches deep and had a permeability class of slow (0.1 inches/hour). Test Location 2 (Figure 3-1) was 15 inches deep and had a permeability class of slow to moderately slow (0.2 inches/hour). Two additional permeability measurements were determined with field percolation testing on September 9, 1990. Field soil test Location 3 (Figure 3-1) was 24 inches deep and had a permeability class of moderate (1.0 inch/hour). Field soil test Location 4 (Figure 3-1) was 18 inches deep and had a permeability class of very slow (0 inches/hour).

3.3 GEOLOGY

3.3.1 Regional Geologic Setting

The IPC Site is located near the southeast margin of the Gallatin Valley, an intermontane basin in southwestern Montana. Three mountain systems define the valley: the Bridger Range to the east, the Gallatin Range to the southeast, and the Madison Range to the southwest and west. The study area is located near the foothills of the Bridger Range.

The Gallatin Valley is near the southern border of the northern Rocky Mountain physiographic province and is part of one of the high intermontane basins that are characteristic of that province. The following is a description by Hackett (1960): "The Three Forks structural basin, in which the Gallatin

Valley is located, was formed as the result of crustal movements in early Tertiary time."

"Subsequently, the basin was filled to a depth of 4,000 feet or more with volcanic ash and with sand, silt, and clay eroded from the surrounding highlands. As the result of renewed crustal unrest in late Tertiary or early Quaternary time, the Tertiary strata were tilted eastward; where exposed in the Camp Creek Hills, in the western part of the Gallatin Valley, they form a homocline that dips 1 to 5 degrees to the east."

"The Tertiary strata are divisible into three units, of which the lowest is known only from subsurface data. The subsurface unit probably is of early Oligocene age and is inferred to be at least 2,400 feet thick and to consist, in part, of blue-green sandstone, claystone, and siltstone and to contain a few beds of bentonite(?) and lignite. The lower of the exposed units probably includes strata of late Oligocene and early Miocene age and is about 900 feet thick in the Camp Creek Hills. Predominantly of lacustrine origin, this unit is composed largely of well-stratified volcanic ash, tufaceous marl, siltstone, and sandstone and contains a few beds of limestone. The next higher unit, probably of late Miocene and Pliocene age, is predominantly of fluvial and colluvial origin and is a little more than 400 feet thick in most places in the Camp Creek Hills. It consists of poorly stratified to massive, buff to tan, variously consolidated tufaceous siltstone, claystone, sandstone, and conglomerate, and contains a few beds of gray ash."

"Whether the strata of Tertiary age that skirt the mountain ranges on the east and south sides of the Gallatin Valley are equivalent in age to, or younger than, those of the Camp Creek Hills has not been determined."

"Post-Tertiary crustal movement created a deep east-trending trough in the Tertiary strata between the Camp Creek Hills and the Bridger Range. Alluvium deposited by the Gallatin River and its tributaries during Quaternary time not only filled this trough but mantled the Tertiary strata throughout the lower part of the Gallatin Valley. Also, broad fans of alluvium were deposited on the lower slopes of the Bridger and Gallatin Ranges by streams originating in the mountains. The alluvium consists of cobbles and gravel intermixed with sand, silt, and clay."

Hackett (1960) subdivides the Gallatin Valley into areas and subareas according to geologic and hydrogeologic characteristics (Figure 3-2).

The IPC Site is located near the intersection of three of these subareas: the Bozeman Fan; the Fort Ellis; and the Upper East Gallatin. Each subarea discussed below is paraphrased from Hackett, unless cited otherwise.

3.3.1.1 The Bozeman Fan

An alluvial fan composed of material derived from the Gallatin Range slopes northward from the mouth of Hyalite Canyon where Middle (Hyalite) Creek enters the Gallatin Valley (Section 14, Township 3S. Range 5E). The fan is bounded

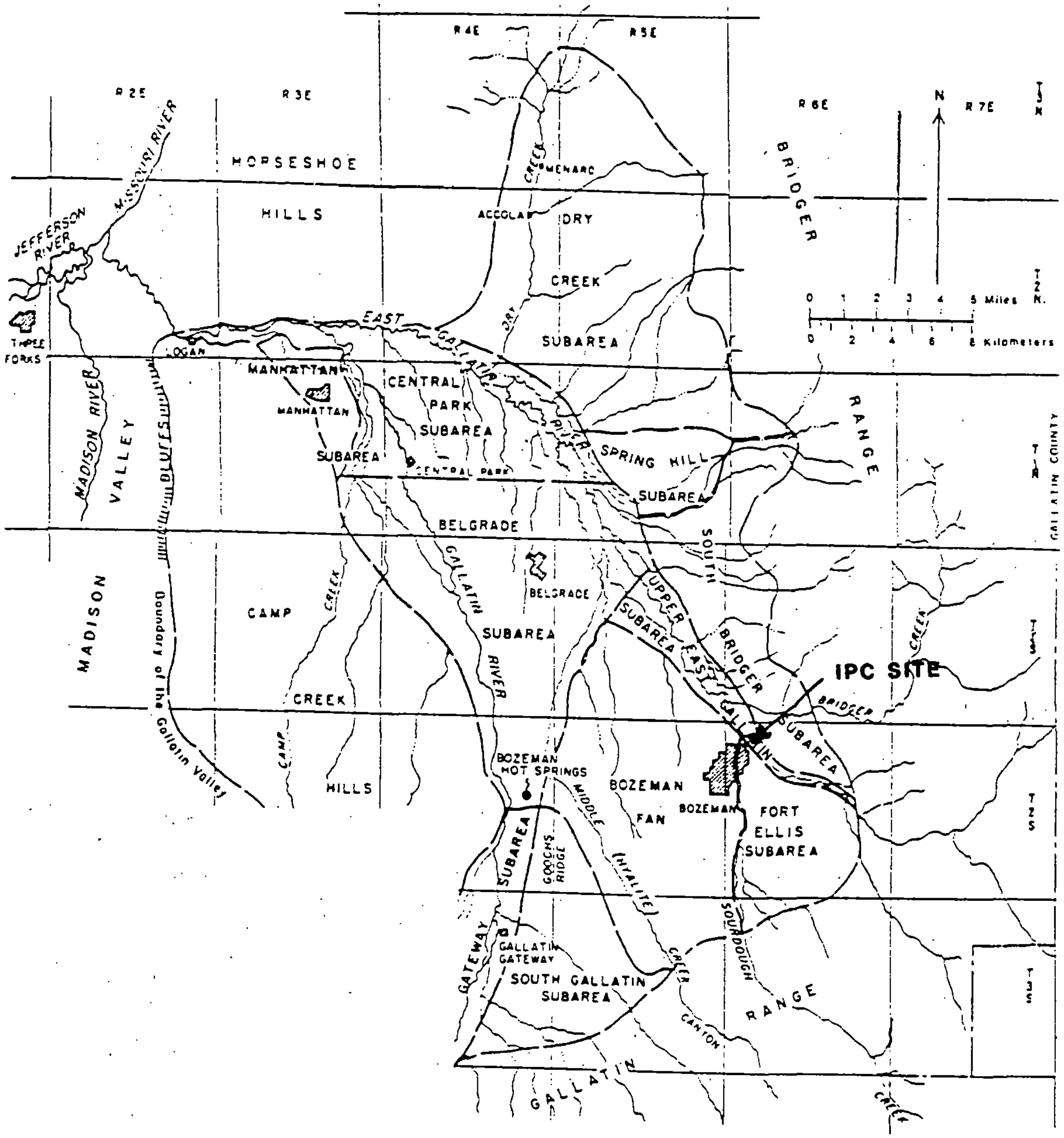

FIGURE 3-2 — LOCATION OF GEOLOGIC SUB-AREAS AS DEFINED BY HACKETT (1960) on the southwest by Goochs Ridge and on the east by Sourdough (Bozeman) Creek; along its northwest margin it merges with the floor of the valley and on its northeast margin with the floodplain of the East Gallatin River.

The alluvium composing the fan is the principal aquifer in this area. The logs of test holes indicate that the alluvial-fan deposits thin from nearly 200 feet near the head of the fan to 100 feet or less near the toe of the fan where it grades into, or interfingers with, the alluvium of the Gallatin and East Gallatin Rivers.

3.3.1.2 Fort Ellis Subarea

In general, the geologic and hydrologic characteristics of the Fort Ellis subarea are similar to those of the Dry Creek subarea.

Tertiary strata underlies most of the subarea. Along the stream courses, the Tertiary strata are mantled by alluvium; along the west margin of the area they are mantled by alluvial fans from the Gallatin Range. The entire area has been dissected by tributaries of the East Gallatin River.

The stream alluvium and alluvial fans seem to consist of coarse and moderately permeable material but, because the latter are dissected by draws and small canyons, they probably are well drained and contain little groundwater.

3.3.1.3 Upper East Gallatin Subarea

The Upper East Gallatin subarea consists of the floodplain of the East Gallatin River from the river's point of entry into the valley northwestward for about 11 miles and includes the Rocky Creek Floodplain. The subarea is about 1/4 of a mile wide at its upper end and broadens to about 2 1/2 miles at its lower end.

Well D2-6-10dc, 3 miles east-southeast of the IPC Site, is reported to have been drilled through 29 feet of alluvium before entering red clay of probable Tertiary age. Test hole D1-5-9cd, near the lower end, was drilled to a depth of 162 feet in the alluvium without reaching the underlying Tertiary strata. In this test hole the alluvium is poorly sorted and contains more silt and clay than the alluvium of the Gallatin River. Because Bear and Bridger Creeks, tributaries to the East Gallatin River in this upper reach, drain areas partly underlain by relatively fine-grained, easily eroded formations of Cretaceous age, they probably transported to the East Gallatin River much of the fine-grained material in the alluvium (Hackett).

3.3.2 Local Geology

Understanding the subsurface geology in the immediate area of the IPC Site is important since lithologic controls on groundwater hydrology are significant in this geologic environment.

Detailed geology is compiled from existing IPC wells (MW-1 through MW-17 installed in 1984-85), Stage II RI monitoring wells (MW-18 to 22 installed in April 1990), Stage IV RI monitoring wells (MW-23 to 28 installed in November 1990), and the Stage V RI monitoring well (MW-29 installed in September 1991). The geologic log data and well construction details for all monitoring site wells are presented in Appendix A. Each well plate includes a gamma log, a construction log, and a lithology log. Gamma logs were run for each of the monitoring wells. The construction log for each well and well nest illustrates the placement of well screens, bentonite seals, and completion materials such as filter pack and grout. Lithology logs were constructed for each well location to graphically view the stratigraphy in relation to the gamma log response and the placement of well screens. The lithology logs are also useful for construction of geologic cross sections.

Two southwest-northeast cross sections through the IPC site are presented in Figures 3-3 and 3-4. There are only a few mappable horizons at the site: a surficial clay unit; an intermediate silty unit at 25 feet bgs; a silty-clay unit at approximately 35 feet deep; and a second silty-clay unit at a 50 feet deep. Each of these units may be important in defining the local groundwater hydrology.

The surficial clay unit is associated with the recent Rocky Creek alluvial system. It is most evident in the pasture area north of I-90; in the IPC plant area, several feet of fill have been placed over this unit. This surficial clay can affect the vertical migration in the plant area and may be important if the layer is continuous and of sufficient thickness to retard

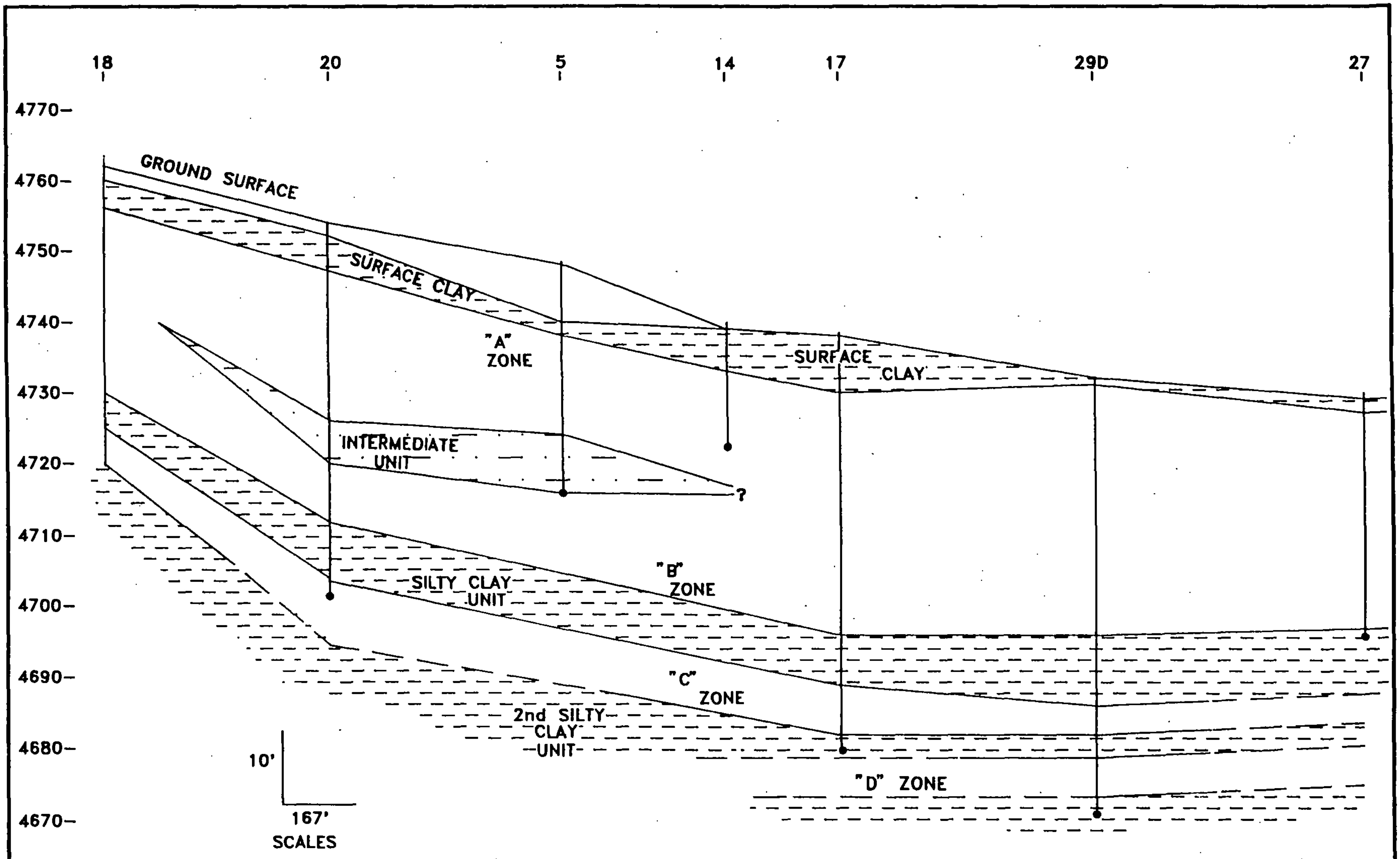

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FIG. 3–3 GEOLOGIC CROSS
SECTION WEST SIDE IPC SITE
WELLS 18, 20, 5, 14, 17, 29D & 27

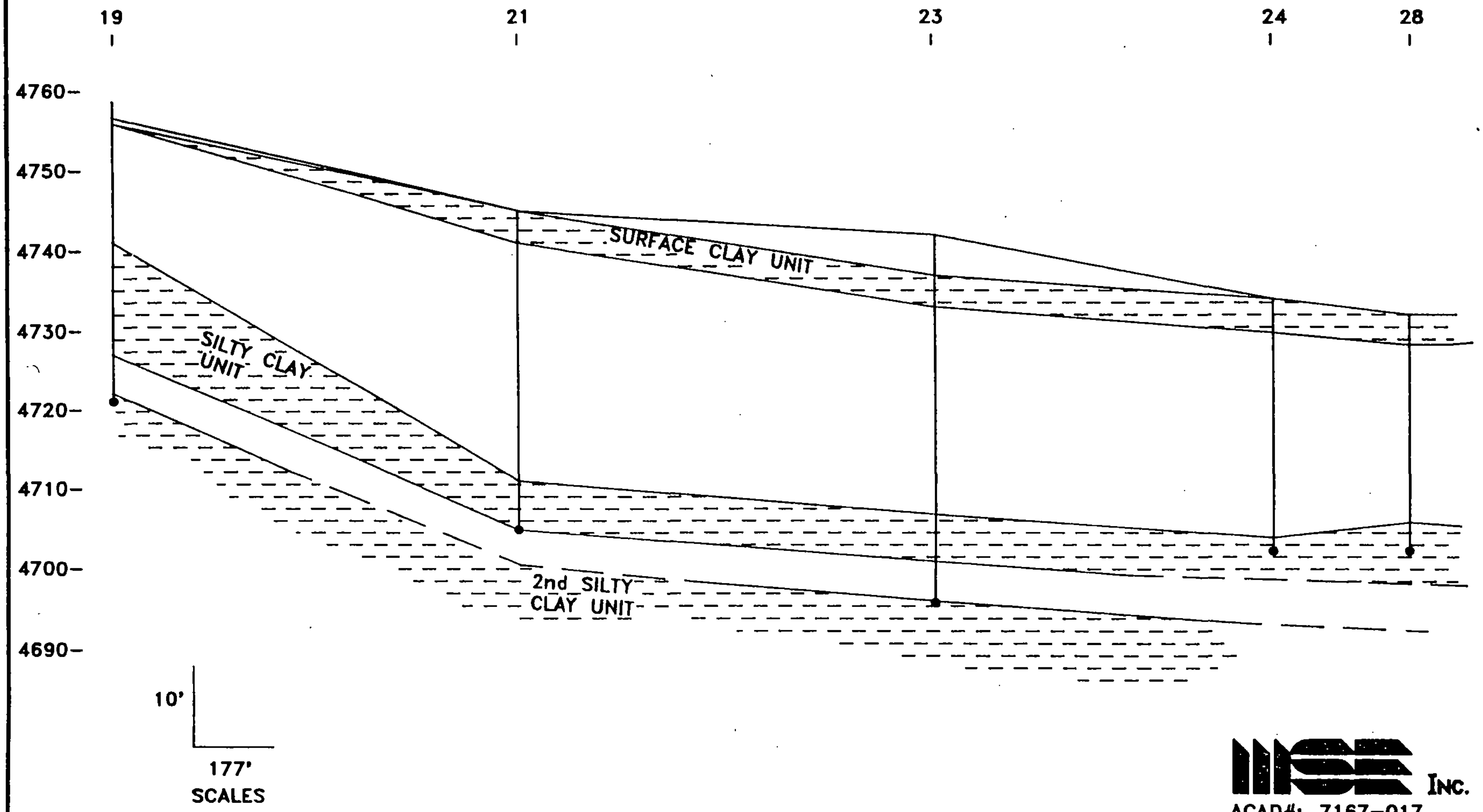

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FIG. 3-4 GEOLOGIC CROSS SECTION EAST SIDE IPC SITE WELLS 19, 21, 23, 24 & 28 downward movement of fluids. Horizontal migration of the LNAPL may be affected where the groundwater surface intersects this surficial clay unit in the pasture area. The second geologic horizon is a smaller area of silty sand/clay material at approximately 25 feet bgs in the immediate area of the IPC plant. This horizon is logged primarily in the IPC installed wells but was also evident in some of the RI wells. It is mapped variously as a silty sand, clayey sand, and silty clay (coarser grained to the northeast) and it may have the capacity to affect the downward movement of fluids if it is sufficiently less permeable than adjacent strata. This intermediate unit is observed in wells 3, 5, 6, 19, 20, 22, and 23.

The silty-clay unit logged at 35 to 45 feet bgs may be very important; it may represent the top of the Tertiary sediments in the area. The contact is not definitive (Hackett, 1960), but some slight cementation is evident in this unit. Whether or not this is the contact of the Tertiary, current geologic information indicates that this unit is a continuous, mappable geologic horizon beneath and downgradient of the IPC Site. It ranges from 4 to 10 feet thick and has a clay/silty, clay/very fine sand lithology. The geologic log for Well 17, installed by IPC and now abandoned, indicates a silty clay zone in the pasture between Bohart Lane and Res-10; however, it is logged deeper than is expected from the recent drilling data. Gamma logging of Well 9C (30 feet east of the former location of Well 17) confirms a less permeable zone at 42 feet bgs as logged for Well 17. The geologic log for Well 17 also shows a second silty-clay layer beneath the aquitard that was also observed in wells 18C, 23C, and 26C, which gives additional validity to the Well 17 geologic log. The drilling log for Well 29D also indicates a deeper location for this unit. Examination of the surface elevations for the silty clay unit yields a trough or depression in the silty-clay surface aligning with wells 17, 29D and 27B. Figure 3-5 illustrates the surface configuration of this unit. This may be due to local deformation of the Tertiary or to an erosional channel in the unit's surface.

A second silty-clay unit is located beneath the zone described earlier and is logged in wells 17, 18C, 23C, 26C, and 29D. This zone has similar lithology to the upper silty-clay zone and both may be parts of the same unit, interbedded with more transmissive sands and gravels.

Locally, horizontal variations in subsurface lithology may affect groundwater and contaminant movement. The area around the MPC Substation appears to have a less permeable upper zone (corresponding to the "A" well completions). Geologic logging of the Well 23 cluster confirmed that a clay-bound silty gravel was present from 8 to 20 feet bgs and a cleaner sand and gravel existed below that at 20 to 35 feet bgs. During development, Well 23A (upper zone) could only produce 4 gallons per minute (gpm), while 23B (Lower zone) produced in excess of 13 gpm indicating a more prolific zone exists beneath the "A" completion in this area. This less permeable upper zone area does not extend as far north as Well 24; however, it does exist in the area of Well 23 and may extend west to include the MPC Substation and as far north as wells 7 and 8. A hypothetical northwest-southeast geologic cross section is constructed in Figure 3-6, illustrating this less permeable upper zone. This zone may have

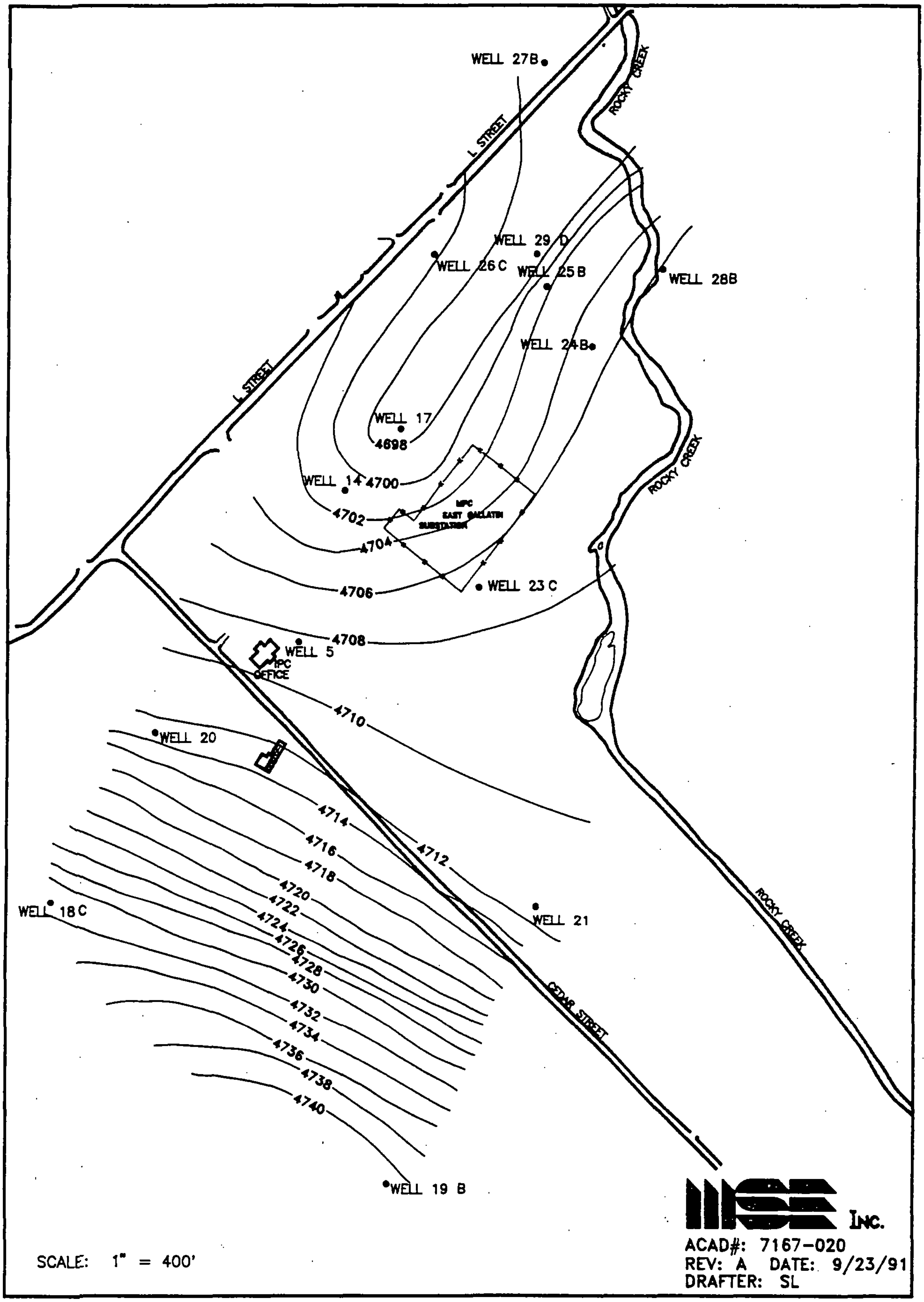

FIG. 3-5 CONTOUR MAP OF THE SURFACE
OF THE FIRST SILTY CLAY UNIT

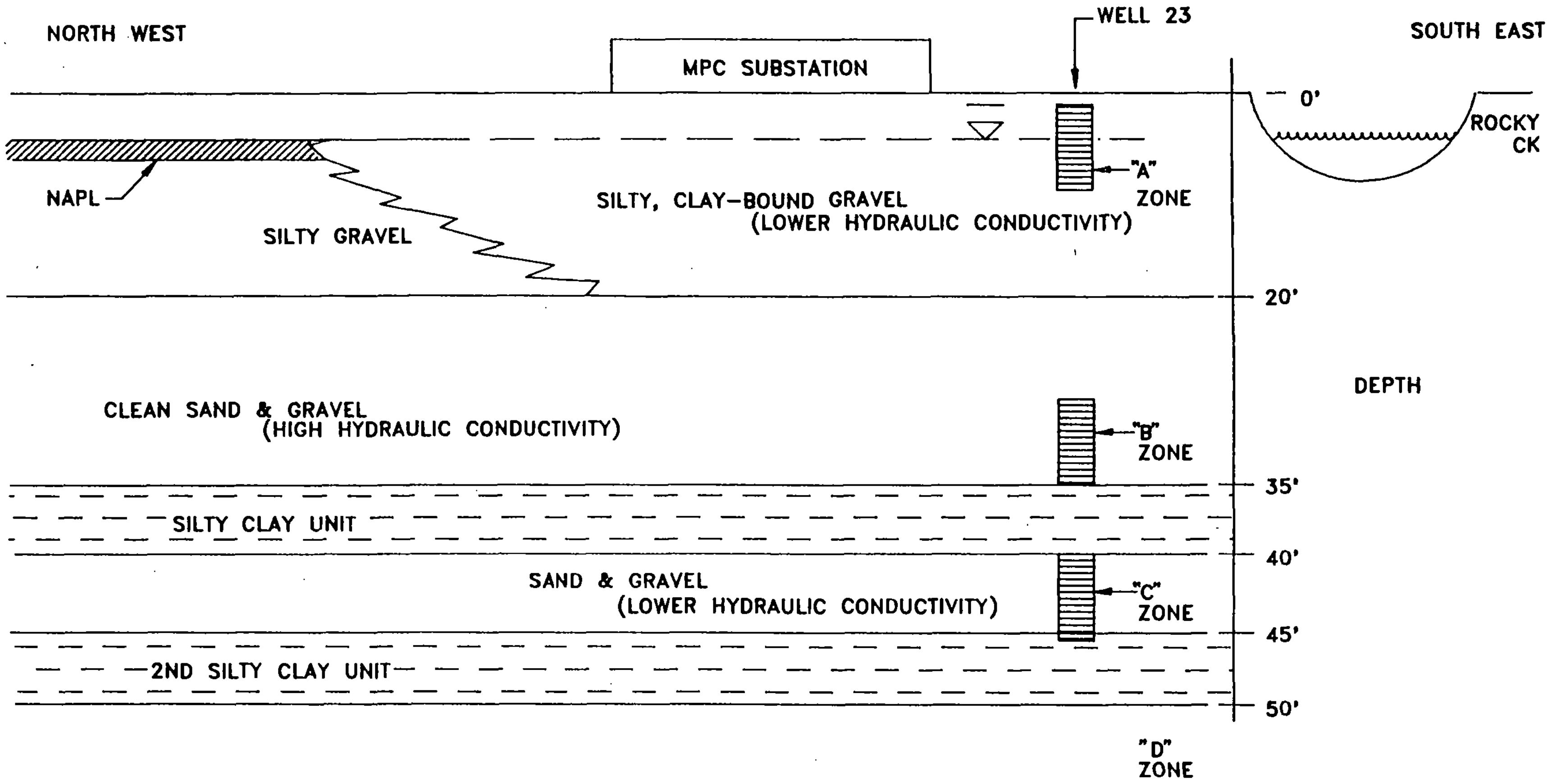

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FIGURE 3-6 NW-SE GEOLOGIC
CROSS SECTION
MPC SUBSTATION AREA

NOT TO SCALE

affected the migration of the LNAPL, directing it in a more northerly direction than the predominant groundwater flow direction would indicate. It also may affect the migration of dissolved contaminants, possibly causing the lower, more permeable zone to carry higher concentrations, over the entire area downgradient of the IPC Site.

3.4 HYDROGEOLOGY

3.4.1 Regional Hydrogeologic Setting

The Gallatin Valley hydrogeology is summarized from Hackett (1960): "Although much groundwater is available in the Gallatin Valley, this resource is largely undeveloped. The principal aquifer is the alluvium beneath the valley floor. This aquifer is characterized by generally high coefficients of transmissibility -- 100,000 to 300,000 gpd (gallons per day) per foot. The adjacent alluvial fans generally yield sufficient water for only stock and domestic use, but the more extensive fans probably would yield supplies sufficient for some irrigation. Low to moderate coefficients of transmissibility (7,000 to 65,000 gpd per foot) characterize the alluvial fans. The Tertiary strata have relatively low coefficients of transmissibility (generally less than 6,000 gpd per foot) and yield sufficient water for only stock and domestic use."

"The groundwater reservoir is recharged principally by infiltrating irrigation water. Influent seepage from streams, particularly during the period of high runoff in the spring, is another important means of recharge. Groundwater is discharged by seepage to the streams at the lower end of the valley and by evapotranspiration. The discharge of groundwater as surface flow from the valley is estimated to be about 240,000 acre-feet per year. Recharge to the groundwater reservoir exceeds this amount by the unknown volume of groundwater consumed through evapotranspiration."

"Along the valley sides, groundwater moves toward the valley floor, and in the Bozeman fan and beneath the valley floor it moves generally northward. In most of the area between the Gallatin and East Gallatin Rivers the water table is within 30 feet of the land surface throughout the year, and within much of this area it is within 10 feet of the surface. Data indicate an increase of groundwater in storage during the late spring and early summer months, and a decrease in storage during the rest of the year."

"Calcium and bicarbonate are the principal dissolved constituents in groundwater from deposits of Quaternary age in the Gallatin Valley. Generally, the water has a mineralization of about 150 to 400 ppm of dissolved solids, is hard, and contains iron in excess of 0.3 ppm. The chemical quality of water from the alluvium underlying the valley floor does not vary from place-to-place nor with depth; it resembles the quality of water from Quaternary deposits in the Bozeman fan and the valley-fringe area. However, water from the Tertiary strata does vary in quality from place-to-place as well as with depth. Sodium is a principal dissolved constituent in some water from Tertiary strata."

As discussed previously, Hackett (1960) subdivides the Gallatin Valley into subareas based on geological and hydrologic characteristics (Figure 3-2). The IPC Site is located near the intersection of three of these subareas: the Bozeman Fan; the Fort Ellis; and the Upper East Gallatin. Hydrogeologic characteristics of each subarea are discussed in the following are paraphrased from Hackett unless noted otherwise.

3.4.1.1 The Bozeman Fan

The alluvium composing the fan is the principle aquifer in this area. The coefficient of transmissivity of the alluvial-fan deposits, determined at six sites, ranged from 26,000 to 65,000 gpd per foot and averaged about 48,000 gpd per foot. The range in values reflects variations in permeability and thickness of the saturated material.

Even where they are drilled into the more permeable, thicker sections of water-bearing alluvial-fan deposits, wells yielding more than 500 gpm should not be expected. Alluvial deposits filling the channels of former distributaries that built the fan are the most likely sources of groundwater supplies. These deposits cross the fan from head to toe and can be located by careful test drilling. Most of the wells on the Bozeman fan are less than 35 feet deep (many are dug wells) and few are more than 75 feet deep. However, when wells D2-6-19cb1 and -19cb2 were drilled about 1 mile south of Bozeman, sufficient water for domestic use reportedly was not obtained until the wells reached depths of 80 and 155 feet, respectively. It is probable that the upper part of the alluvial-fan deposits is not water bearing in the vicinity of these wells because of the draining effect of nearby Sourdough (Bozeman) Creek.

A test hole described in Hackett was drilled through 165 feet of alluvial-fan deposits and 835 feet into the underlying Tertiary strata, and another was drilled through 127 feet of alluvial-fan deposits and 123 feet into Tertiary strata. The Tertiary strata penetrated by both test holes were relatively impermeable.

Streamflow, irrigation water, and precipitation are the principal sources of recharge on the Bozeman fan. Sourdough (Bozeman) and Middle (Hyalite) Creeks, near where they enter the valley, are sources of recharge, particularly during the months of high streamflow and low groundwater level in the spring. Seepage from the numerous irrigation ditches crossing the surface of the fan, and infiltrating irrigation water applied to the fields, are generally the main sources of recharge during most of the summer. In this part of the Gallatin Valley precipitation is somewhat greater than elsewhere. Generally much of the winter precipitation is stored as snow; snowmelt and relatively high rainfall in the spring produce appreciable recharge.

Discharge of groundwater from the Bozeman fan is by effluent seepage to streams, by underflow to adjacent areas downvalley, and by evapotranspiration. Middle (Hyalite) and Sourdough (Bozeman) Creeks, the only streams that completely cross the Bozeman fan, are effluent in the lower parts of their courses across the fan. Several small streams rise about 3 miles north of the head of the fan and drain northward into either Middle (Hyalite) Creek or the

East Gallatin River. During the irrigation season most of the water in the streams draining the Bozeman fan is diverted for irrigation. Evapotranspiration is greatest along the streams and drains. Underflow from the Bozeman fan enters the alluvium underlying the Belgrade plain and the floodplain of the East Gallatin River.

At the head of the fan, where the land is steeply sloping, and at the toe of the fan, where the surface is dissected and drainage is adequate, the water table is more than 30 feet bgs. Elsewhere on the fan, the water table is less than 10 feet bgs and in many places is less than 5 feet bgs. Near the head of the fan, the water level in wells fluctuates as much as 25 feet, but throughout the remainder of the fan the fluctuations are less than 10 feet.

Custer (1991) performed a more detailed study of the Bozeman Fan's groundwater and hydrogeology, expanding and refining the work by Hackett. However, the conclusions are generally the same and apply to the areas west of the IPC study area.

3.4.1.2 The Fort Ellis Subarea

Few wells tap the Tertiary strata; most wells in the subarea tap either alluvium along the stream courses or alluvial-fan deposits. Springs along the mountain front are a source of water on several ranches.

Streamflow from the Gallatin Range and precipitation along in the subarea are the chief sources of recharge. Groundwater discharges principally as streamflow.

Because the Tertiary strata are relatively impermeable and the alluvial fans contain little water, it is probable that large yields of groundwater cannot be obtained in the subarea.

3.4.1.3 Upper East Gallatin Subarea:

Although several aquifer tests were made in this subarea, the coefficient of transmissivity could not be determined from the data obtained.

The alluvium is recharged by infiltrating precipitation, by underflow from adjacent areas, and, in the upper reach of the subarea, by seepage from the East Gallatin River and its tributaries (Rocky Creek). Groundwater is discharged by evapotranspiration, seepage into the East Gallatin River in the lower reach of the subarea, and underflow to the Belgrade subarea.

The water table is within 10 feet of the land surface during most of the year. Most wells are less than 30 feet deep, and the range of water-level fluctuations is small.

Although existing data indicate that the alluvium will not yield large quantities of water to wells, an accurate evaluation of the groundwater resources of this subarea would be required.

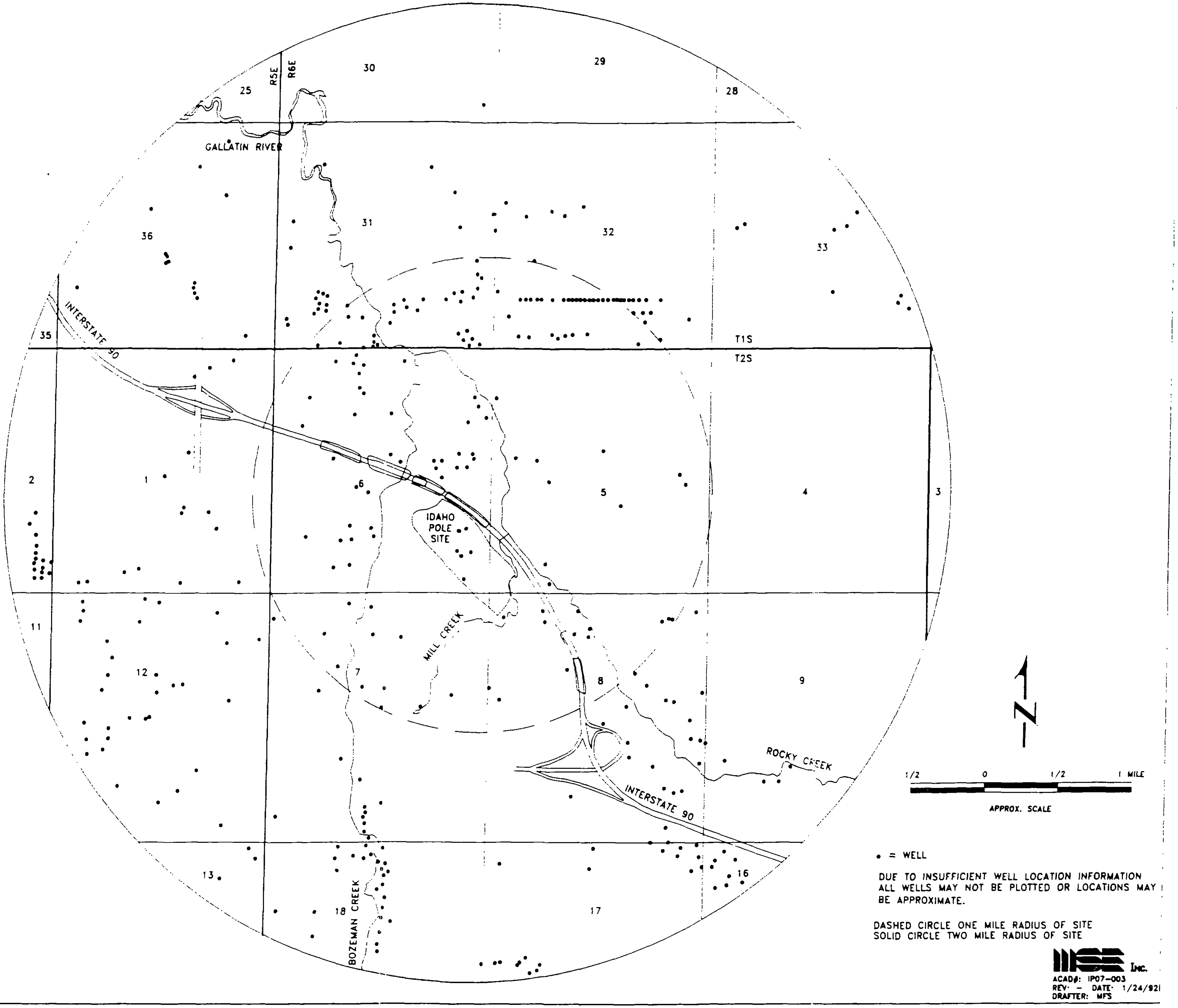
3.4.2 Local Hydrogeology

Groundwater occurs in the IPC area alluvial deposits at shallow depths under water table or semiconfined conditions. The zone of saturation extends through the upper silty gravels beneath the plant and office area into finer-grained alluvial deposits within the Rocky Creek floodplain. The water table intersects land surface in the swampy area between the plant office and Mill Creek. Groundwater occurs within the alluvial deposits in thin sand and gravel seams interbedded with the otherwise clayey gravel portions of the alluvium. The seams are laterally and vertically discontinuous, and the degree of interconnectedness is difficult to determine with available data.

Several studies were undertaken as part of this RI to define the hydrogeologic characteristics of the IPC Site. These include: groundwater use inventory; potentiometric elevation data collection in monitoring wells and at surface water stations; and response testing of monitoring well nests and clusters.

3.4.2.1 Groundwater Usage Inventory

Stage I of the groundwater investigation consisted of a groundwater usage inventory. Approximately 400 wells were found to exist within a 2-mile radius of the site (Figure 3-7). Sixteen of the 400 wells were identified as being located hydraulically downgradient and within 1/4 mile of the IPC Site and 9 of those 16 wells were included in the IPC RI/FS study area. Another 84 wells were identified as lying further downgradient from the site, with most being located across potential hydrogeologic boundaries. A hydrogeologic boundary



• = WELL

DUE TO INSUFFICIENT WELL LOCATION INFORMATION ALL WELLS MAY NOT BE PLOTTED OR LOCATIONS MAY BE APPROXIMATE.

DASHED CIRCLE ONE MILE RADIUS OF SITE
SOLID CIRCLE TWO MILE RADIUS OF SITE

Inc.
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DRAFTER: MFS

FIGURE 3-7 -- GROUNDWATER USE WITHIN A TWO MILE RADIUS OF THE IPC SITE is defined as a boundary between two groundwater flow systems and can include rivers and creeks. Appendix B contains well information compiled for wells within a 2-mile radius of the IPC Site.

3.4.2.2 Potentiometric Elevations

Water levels have been collected monthly on all 52 monitoring wells at the IPC Site. Potentiometric maps were developed for all wells. Figure 3-8 presents water table elevation contours for the upper aquifer for water level measurements in December 1990. Figure 3-9 presents potentiometric surface contours for the deep aquifer for water levels measured in December 1990. The monthly monitoring showed fluctuations in the water levels on the order of one to two feet. However, the fluctuations were consistent throughout the monitoring well network and the potentiometric surface configuration is nearly identical to the December 1990 figures. The monthly water level data is included in Appendix C.

Prior to the RI, IPC had 16 well nests in the study area and each nest had either one, two, or three separate well completions. The A completion is the shallowest; the C completion is deepest; and the B completion is mid-range. An evaluation of existing wells at the IPC Site found all wells to be in acceptable condition for use.

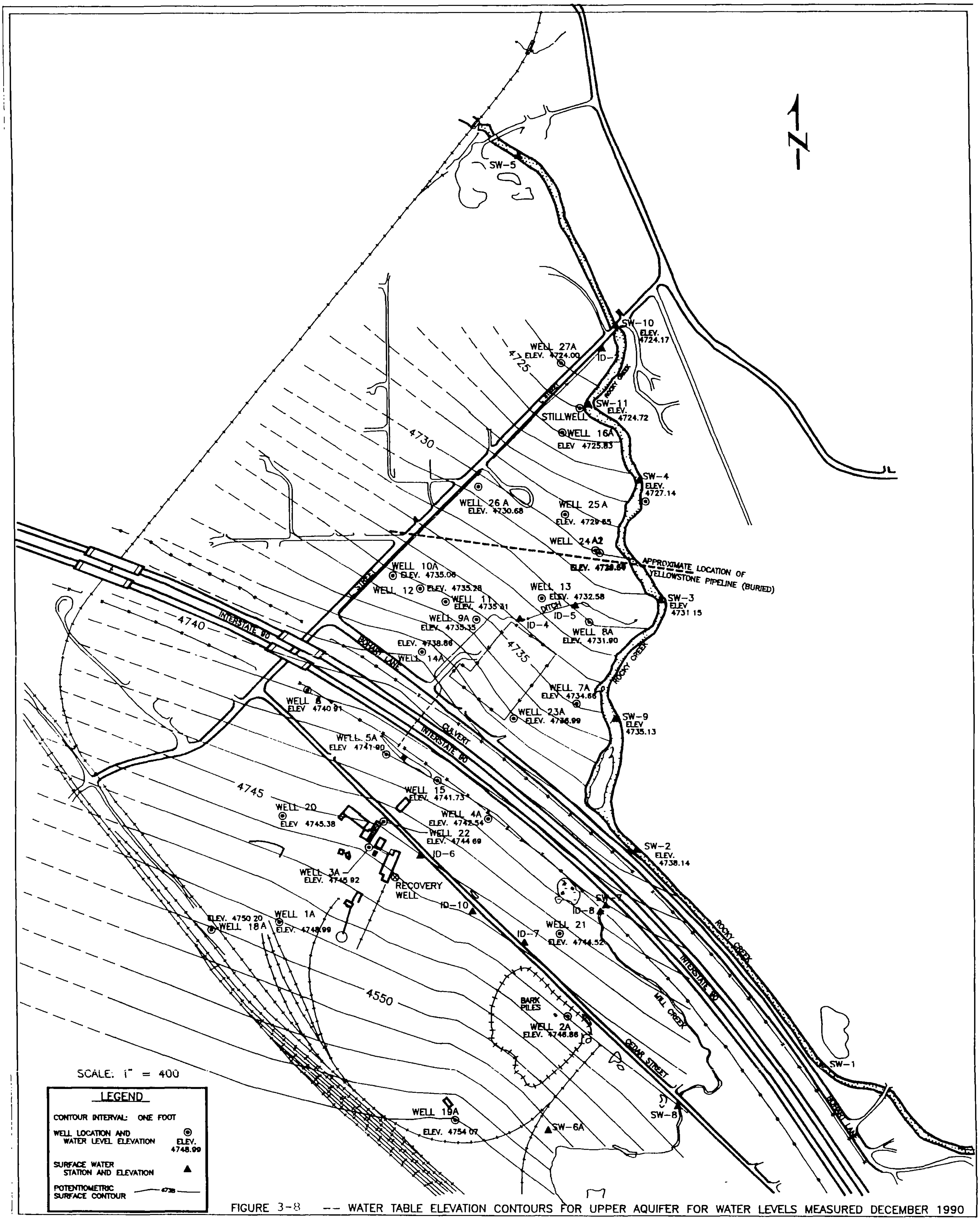

FIGURE 3-8 — WATER TABLE ELEVATION CONTOURS FOR UPPER AQUIFER FOR WATER LEVELS MEASURED DECEMBER 1990

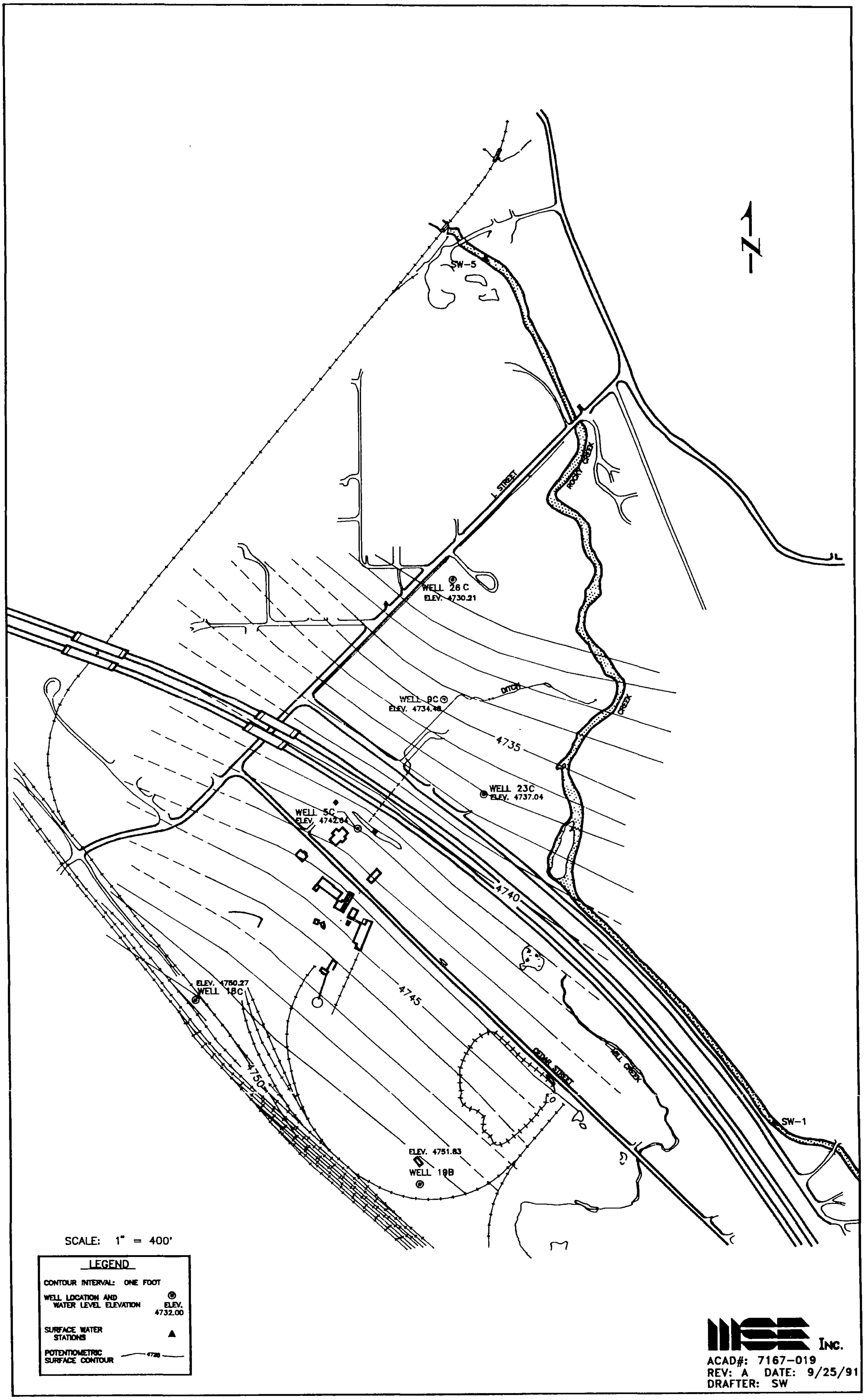

FIGURE 3-9 -- POTENTIOMETRIC SURFACE CONTOURS FOR THE DEEP ZONE FOR WATER LEVELS MEASURED IN DECEMBER 1990.

A resurvey of the existing IPC wells was conducted. A United States Geologic Survey (USGS) benchmark located on the northeast side of the MRL railroad station was used as a reference location and elevation. Significant differences were found to exist between the original elevation survey completed by IPC and the resurvey.

The original IPC water level data were recalculated for the existing wells utilizing the new survey data, and potentiometric maps were constructed for the following time frames: October 1984, January 1985, April 1985, and July 1985. Potentiometric maps were developed for wells screened at the top of the water table (A wells) and designated "upper" to indicate the top of the aquifer. Potentiometric maps were also built for wells screened below the top of the water table (B wells) and designated "lower" to indicate a lower zone in the aquifer. All of the maps were constructed at the same scale so that they could be easily compared. General groundwater flow patterns appear to be in the same direction as the 1985 IPC data indicated, since the error in the old survey data was relatively consistent. Only minor elevation changes in the water table surface occur throughout the year, and the general configuration of the water table potentiometric lines remains fairly constant. In general, aquifer flow directions are to the northeast with an approximate gradient of 0.011 foot/foot.

3.4.2.3 Response Testing

Pneumatic response testing was performed on all well nests/clusters at the IPC Site. The testing was performed in two stages, corresponding with the existing IPC wells (14 locations, Stage I), and the RI wells installed later (10 locations, Stage II and IV).

The pneumatic-response test method worked very well and produced good results for data interpretation. A data logging system was used to measure and record water levels in the tested wells. The data logging system used a Campbell Scientific data logger model 21X and Instrumentation Northwest pressure transducers. The pneumatic slug test uses a well-head apparatus (Figure 3-10) and air pressure to create a desired water level displacement in the well. The well is pressurized and the water level displacement held constant to allow the well-aquifer system to reequilibrate. The air pressure is then released through a ball valve, creating a nearly instantaneous head differential between water in the well and water in the aquifer. The resulting water level recovery in the well is measured and recorded using a submerged pressure transducer and data logger. Water levels in other wells in the nest can also be monitored using pressure transducers during the test to determine the degree of interconnection between aquifer zones.

The purposes of conducting the pneumatic slug tests at the IPC Site were to:

1) determine aquifer parameters for the completion zone at each well (i.e., transmissivity, hydraulic conductivity, and storativity); and
2) determine if the upper and lower aquifers are connected in the vicinity of each well nest.

PNEUMATIC SLUG TEST EQUIPMENT SET-UP

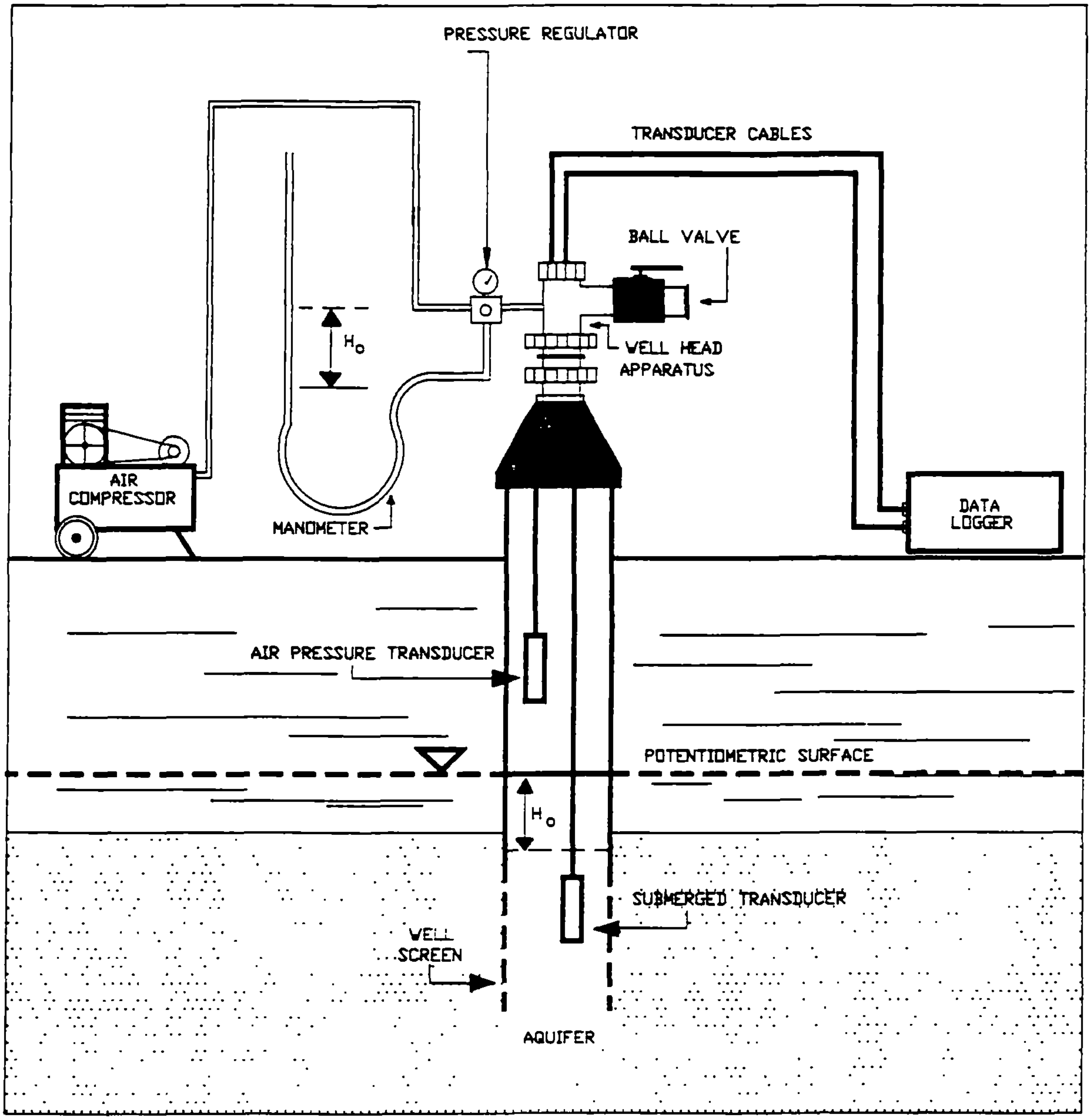

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FIGURE 3-10 -- EQUIPMENT NEEDED TO CONDUCT A PNEUMATIC SLUG TEST

This was accomplished by conducting a pneumatic slug test in one of the nested wells while monitoring and recording water level changes in the remaining wells of the nest (herein called observation wells). If water level changes are recorded in an observation well, it can be reasoned that the aquifer is interconnected between the completion zones of the observation well and the slug tested well. Of main interest were the tests conducted at well nests having "B" and "C" wells. The "C" wells have been completed beneath a zone of lower permeability (aquitard), which may isolate the "C" aquifer zone from contaminants above.

Equilibrium times for the IPC wells were considered to be short (5 minutes) due to the relatively high hydraulic conductivities of the aquifer material. Once equilibrium was achieved, the data logger was activated, and the pressure was released. This created nearly instantaneous head differential between water in the well bore and the aquifer. The resulting water level recovery was recorded by the data logger. Due to the fast recoveries of the wells, data logger sample rates were set at either 0.3 or 0.5 second intervals for most wells. Well 5C allowed slower sample rate due to its slow recovery. Water levels were also monitored and recorded in the non-tested wells of the nest to evaluate any communication between screened zones. Slug test data were plotted and fit to either the Cooper, Papadopoulos, Bredeholft type curve for confined aquifers or to type curves developed by Kenneth Kipp of the USGS for wells having oscillatory recoveries.

STAGE I - RESPONSE TESTS

Response (slug) tests were performed on seven IPC monitoring well nests (14 wells total) at the IPC Site. The well nests tested included 1, 2, 5, 8, 9, 10, and 16. The well nests were selected for their distribution throughout the site and the fact they contain two or three wells screened in separate zones. All of the response tests utilized the pneumatic slug test technique except for 1A (Well 1B was slug tested) and 16A (Well 16B was slug tested). These two wells (1A and 16A) had water levels that fell in the screened portion of the well, which would not allow the well to pressurize; pressurization would only result in the added air escaping through the well screen above the static water level. An attempt was made to test 1A by adding a 1-gallon slug of deionized water (DI). However, this was not successful because an instantaneous head differential could not be created by pouring DI water into the well as water was being added, the well was equilibrating due to the aquifer's high hydraulic conductivity. Well 16A was not slug tested for the same reason.

Results of the slug tests showed transmissivity values ranging from 14,000 gpd per foot in Well 8A to 41.5 gpd per foot in Well 5C. Results are summarized in Table 3-3. Test data, response plots, and type curve plots for each slug tested well are presented in Appendix D. Three well pairs were found to have some communication; a test conducted on one well caused the water level to fluctuate in the second. Communication appears to exist between well pairs 2A and 2B, 9A and 9B, and 10A, and 10B. The observation wells exhibited the

TABLE 3-3

SLUG TEST RESULTS FOR THE IDAHO POLE COMPANY SITE

Well #	Water Displace (ft)	Screen Length (ft)	Transmissivity (gpd/ft)	Storativity	Hydraulic Conductivity (cm/sec)
1A	6.12	5.0	*	*	*
1B	8.12	5.0	14,017	10^{-9}	1.3×10^{-1}
2A	4.00	7.5	5,678	10^{-4}	3.6×10^{-2}
2B	8.00	5.0	4,272	10^{-10}	4.0×10^{-2}
5B	6.97	2.5	4,077	10^{-10}	7.7×10^{-2}
5C	7.60	2.5	41.5	10^{-3}	7.8×10^{-4}
8A	1.00	10.0	14,070	.0005**	6.5×10^{-2}
8B	8.00	5.0	1,180	10^{-8}	1.1×10^{-2}
9A	3.00	1.25	5,040	10^{-4}	1.9×10^{-1}
9B	7.80	1.25	2,039	10^{-10}	7.7×10^{-2}
9C	8.00	3.5	1,466	10^{-8}	2.0×10^{-2}
10A	6.20	6.0	4,231	10^{-3}	3.3×10^{-2}
10B	7.85	4.0	2,803	10^{-3}	3.3×10^{-2}
16B	6.00	1.0	10,940	10^{-10}	5.2×10^{-1}

* - Data was not usable to calculate aquifer parameters
@ - Oscillatory Recovery in Well
** - Storativity assumed using data from 10A, 9A, and 2A slug tests

expected water level response to a rising head recovery in a slug tested well in close proximity. The response is a sharp drop in water level followed by a more gradual recovery to the original level. Effects were observed in 1A and 1B; however, the response was very small and may represent transducer drift. A test was not conducted on well 5A because it had measurable amounts of LNAPL and the well was not disturbed. A response was not observed between 5B and 5C as expected because 5C is completed in a finer-grained unit that may act as an aquitard. A response was not observed between 8A and 8B, or between 9C and 9A and 9B; well 9C is completed below a silty-clay that appears to isolate it from 9A and 9B. Communication between 16A and 16B does not appear to exist; however, only one test was conducted in 16B. Water levels in 16A dropped slightly during the test of 16B and never recovered. This water level drop was attributed to transducer noise during the test.

Communication between well pairs in these nested wells neither proves or disproves that the two wells are completed in the same aquifer zone. The possibility exists that bentonite seals were not installed properly between screened intervals, forming an avenue of hydraulic communication. However, the gamma logs confirmed the presence of bentonite plugs in the communicating wells witnessed by higher natural gamma readings adjacent to the plug. Therefore, it is likely that the observed communication is via the aquifer system.

RI Monitoring Wells - Stage IV

Pneumatic response tests were conducted on all the new monitoring wells installed at the IPC Site (well nests 18 through 28) with the exception of 18A, 20, 24A1, 25A, 26A, and 27A. These wells were not tested because water levels were located within or immediately above the screened portion of the well. This precluded the use of the pneumatic response test because air used in pressurizing the well chamber would only leak through the screen. If water levels were less than 1 foot above the screen, the well was not tested. Test data were downloaded off the data logger to a portable computer. Data for each tested well was plotted in an appropriate format to be fitted to type curves. Two types of recoveries were recorded: oscillating and non-oscillating. Out of the 16 wells tested, 10 had oscillating recoveries, while six had non-oscillating recoveries. The non-oscillating data sets were fitted to the Cooper, Papadopulos, and Bredehoeft type curves for confined aquifers. The oscillating well data sets were fitted to the Kip type curves for wells exhibiting damped, oscillatory responses. Due to inertial effects of the water column moving upward in oscillating wells, the pressure transducer in the tested well was unable to accurately measure the water levels in the recovering well. However, it appears that when the water is moving downward, the inertial effects are nullified and water level readings are accurate. For that reason, the wells exhibiting oscillations with large amplitudes were handled in a slightly different manner. The second half of the first oscillation was used in matching the type-curves to determine the proper damping coefficient. In other words, the water levels extending up past the static level are ignored. But, water levels recorded during the fall past the static level are used to do the type-curve matching. Once each data set was matched to corresponding type curves, aquifer parameters could be determined. Table 3-4 summarizes test results for this set of pneumatic slug tests. Transmissivities ranged from 93 to 14,000 gpd per foot. Both vertical and horizontal variations are apparent from these data. The "C" zone has very low hydraulic conductivity (3.9×10^{-2} to 8.8×10^{-2} cm/sec), while "B" zone hydraulic conductivities are generally higher than in the "A" zone by as much as an order of magnitude though most "A" zone wells could not be tested. The hydraulic conductivities in wells 22, 23, 24 and 27 are an order of magnitude higher than those in wells 18, 19, 21, 26, and 28. These lateral and vertical variations in hydraulic conductivity are important controls on groundwater and contaminant movement at the IPC Site. Data plots and associated calculations for the response tests are presented in Appendix D.

To measure aquifer interconnectedness, water levels were measured in observation wells, adjacent to the tested well, and were plotted as a function of time along with the water level recoveries recorded in the test well. One scale is used for observation well water levels and a second for water level recoveries observed in the test well. The primary wells of interest were the Stage IV well nests containing "A", "B", and "C" well completions. The response tests indicated that the "B" and "C" zones are not isolated from each other, based on the interactions between the "B" and "C" wells.

Tests conducted in 18B and 18C displayed very graphic results in terms of well-to-well interaction. During the water level recovery in 18B, distinct

TABLE 3-4

SLUG TEST RESULTS FOR THE IDAHO POLE COMPANY SITE

Well #	Water Displace (ft)	Screen Length (ft)	Transmissivity (gpd/ft)	Storativity	Hydraulic Conductivity (cm/sec)
18B	8.00	10.0	6,378	*	4.1×10^{-2}
18C	8.00	5.0	4,077	10^{-5}	3.9×10^{-2}
19A	3.00	10.0	1,019	10^{-1}	4.8×10^{-3}
19B	8.00	5.0	2,492	10^{-5}	2.4×10^{-3}
21	3.00	10.0	10,918	*	6.7×10^{-2}
22	8.00	5.0	10,382	*	1.1×10^{-1}
23A	2.50	10.0	7,353	10^{-8}	3.5×10^{-2}
23B	8.00	5.0	14,002	*	1.3×10^{-1}
23C	8.00	5.0	93	10^{-3}	8.8×10^{-4}
24A2	8.00	10.0	9,922	*	5.5×10^{-2}
24B	8.00	5.0	11,089	*	1.1×10^{-1}
25B	8.00	5.0	9,592	*	9.3×10^{-2}
26B	8.00	5.0	4,443	*	4.2×10^{-2}
26C	8.00	5.0	554	$10^{-2.5}$	5.2×10^{-3}
27B	8.00	5.0	11,983	*	1.3×10^{-1}
28B	8.00	5.0	4,776	*	4.5×10^{-2}

* - An estimated Storativity was used to determine aquifer parameters where oscillatory recoveries were observed

effects on the water levels in 18C and 18A were recorded. The recovering water level in tested Well-18B caused a pressure drop in the aquifer system causing water levels to drop in the two observation wells which indicates that interconnection exists. Water levels dropped approximately 0.076 feet in 18C and 0.048 feet in 18A. The same responses were observed while testing 18C. Water levels in 18A and 18B dropped as expected, but the amount in 18A was very slight, probably because there is an increase in distance from 18C and 18A versus 18B to 18A (i.e., less effect due to decay of the pressure pulse created by the test wells).

Slug tests conducted at Well Nest 23 also indicated that the "A", "B", and "C" zones are interconnected. However, due to the lower hydraulic conductivity in the "C" zone, the water level response caused by the test conducted in 23B is minimal. A classic response is recorded in 23A with which to compare the response recorded in 23C. Generally, when the water level in 23A drops, a corresponding drop can be seen in 23C, albeit slight. The same is true for rises in 23A. Even though the water level change in 23C is slight, it follows the same pattern seen in 23A, showing that there is some degree of interconnection between 23B and 23C. Tests conducted in 23C did not affect water levels in either 23B or 23A. Again, this is probably because 23C is completed in a relatively "tight" zone, not creating a dramatic pressure pulse in which to stress the aquifer system.

Tests completed at Well Nest 26 showed interconnection between the "A", "B", and "C" wells. While slug testing 26B, water levels in both 26A and 26C dropped. Water levels dropped sooner in 26C than in 26A, which reflects the fact that 26C is closer to 26B, the tested well, than 26A. The response in 26C shows the sharp drop and recovery but then shows a general decline and stabilization below the static level. This is probably due to transducer drift. The water level in 26A responds as expected with a sharp drop and subsequent, gradual recovery. The test performed on 26C resulted in water level changes in 26B but nothing in 26A. 26C has lower hydraulic conductivity values and, therefore, only creates a limited pressure pulse that is only observed in 26B, located closer to the test well. The resultant water level fluctuations point to the fact that all three completion zones are interconnected to some degree.

Two additional tests demonstrate the interconnections between A and B wells at the MW-24 nest and the MW-27 nest. Tests conducted on 24A2 and 24B show good connection between all three wells in the nest. A good connection is also shown for Well Nest 27 where 27B is tested, and 27A, showing a definite response.

3.5 <u>HYDROLOGY</u>

3.5.1 Surface Water Setting

Primary surface water features of the IPC Site include Rocky Creek and Mill Creek. Rocky Creek and Mill Creek make up the northern and eastern boundaries of the study area, respectively. The locations of both streams are indicated on the Study Area Plan, Figure 2-2. There are also several ditches that intermittently flow during periods of rapid snow melt, storm water runoff, or high groundwater levels.

Rocky Creek flows in a broad shallow valley situated between the Bozeman Fan to the southwest and the foothills of the Bridger Range to the northeast. Along the study area, Rocky Creek flows north toward the East Gallatin River. Flow rates measured during the study period ranged from approximately 5 to 175 cubic feet per second (cfs).

Mill Creek enters an undeveloped portion of IPC property east of the plant area. Mill Creek flows through a low, swampy area between Cedar Street and I-90, enters the culvert beneath I-90, then discharges to Rocky Creek northeast of the highway. Flow rates measured during the study period in Mill Creek range from 0.1 to 0.7 cfs.

One significant change to the surface water hydrological setting of the IPC Site has been discovered since the initiation of the investigation. Mill Creek is a ditch containing water diverted from Bozeman Creek. Flows through this ditch are usually maintained at near bank-full levels throughout the summer for stock watering. It is therefore likely that Mill Creek is continuously recharging the aquifer, creating a groundwater mound that could locally affect groundwater flow direction and limit the amount of potentially contaminated groundwater discharging to Mill Creek.

Several ditches intermittently carry snow melt or storm water runoff from the IPC Site and are listed below.

- L Street Ditch: This open ditch located along the east side of L Street intermittently receives runoff from the western third of the IPC log yard of the IPC Site. The L Street ditch discharges to Rocky Creek at the L Street bridge.
- MPC Substation Ditch: This open ditch extends from Bohart Lane at the MPC Substation to Rocky Creek. This ditch receives discharge from a culvert extending beneath I-90 from the IPC Site near the plant office. This area collects runoff from portions of the treatment area, the office parking lot, I-90, and overflow from the office interceptor ditch.
- Cedar Street Ditch: This open ditch extends along the treatment plant side (south) of Cedar Street from near the pressure plant toward the current bark piles. Runoff from the treatment area and the treated log storage area enters the Cedar Street ditch. A culvert beneath Cedar Street drains the ditch into an open ditch located in a low, swampy area discharging to Mill Creek.

Ditch locations are indicated on the Study Area Plan, Figure 2-2.

3.5.2 Flow Monitoring

Flow measurements using a current meter were collected on Rocky Creek, Mill Creek, and the intermittent drainages during each sampling event (spring peak flow and late summer, low flow) and periodically (April 13, May 31, July 25, September 18, 1990, and February 22, March 27, 1991) between sampling events to develop stage/discharge relationships on these surface water expressions. Stage has been measured with bi-weekly readings of staff gauges for the extent of this monitoring period (May 1990 to April 1991), except during the summer low flow period (August through September, 1990) when weekly stage measurements were conducted. The weekly measurements were conducted during this period to better quantify flows during the low-flow period when it was expected that groundwater would be providing the most significant contribution to Rocky Creek and, if significant contamination was detected, the additional flow information would be necessary to calculate contaminant loadings accurately and to assist in defining the surface water/groundwater interactions.

The detailed presentation of all flow information collected was presented in Technical Memorandum 2, Addendum A (MSE, 1991b). Due to the finding that Mill Creek is simply a diversion from Bozeman Creek and no significant flows occurred from the intermittent drainages for the majority of the monitoring period, flow summaries are provided for Rocky Creek only in this text.

Stage/discharge equations were derived from each surface water station by regressing flow and stage data based on linear, log/log, and log/normal relationships. The relationship that provided the "best fit" was utilized to generate an equation necessary to assign flow rate values with each stage measurement made. Table 3-5 provides a summary of the stage/discharge data collected on Rocky Creek used to generate the regression equations. Table 3-6 provides a summary of flow rates calculated for each of the Rocky Creek stations based on the stage measurements.

This information has been used to assist in conducting the Surface Water/Groundwater Interaction Study presented in Section 6.4.

3.5.3 Storm Runoff Evaluation

Storm runoff modeling was conducted for the three IPC plant area drainage areas as delineated on Figure 3-11. Modeling was conducted utilizing the

TABLE 3-5

ROCKY CREEK STAGE/DISCHARGE MEASUREMENT SUMMARY

	SW-01		SW-02		SW-09		SW-03		SW-04		SW-10		SW-05	
Measurement Date	Stage (ft)	Q (cfs)	Stage (ft)	Q (cfs)	Stage (ft)	Q (cfs)	Stage (ft)	Q (cfs)	Stage (ft)	Q (cfs)	Stage (ft)	Q (cfs)	Stage (ft)	Q (cfs)
13-Apr-90	4749.37	96.28	4738.84	95.74	4735.71	97.80	4741.45	104.00	4728.10	104.93	4724.70	99.41	4717.77	107.88
17-Apr-90	4749.70	160.23	4739.10	150.23	4735.85	146.08	4731.73	156.80	4728.30	165.11	4725.03	160.88	4717.85	168.13
31-May-90	4749.84	167.96	4739.22	150.02	4735.93	169.56	4731.61	175.00	4728.51	167.44	4725.06	159.73	4717.97	150.32
25-Jul-90	4748.45	17.06	4738.10	10.09	4735.19	10.09	4730.99	17.74	4727.26	20.11	4723.87	21.08	4716.77	17.95
13-Sep-90	4748.08	10.74	4738.04	5.07					4727.16	14.26	4723.8	15.42	4716.63	13.93
18-Sep-90	4748.02	11.91	4738.03	11.95	4735.07	11.95	4730.96	12.97	4727.16	11.33	4723.79	12.19	4716.66	14.02
18-Sep-90	4748.02	11.47	4738.03	11.73	4735.07	11.73	4730.96	12.87	4727.17	11.96	4723.79	12.07	4716.66	13.07
07-Feb-91	4748.09	12.88	4737.98	12.25			4730.90	12.90	4727.17	11.70	4723.81	14.99	4716.63	12.63
22-Feb-91			4738.15	23.12			4730.98	24.57	4727.35	23.72				
27-Feb-91									4727.25	13.84			4716.77	16.38
27-Mar-91	4748.28	14.98		19.07	4735.22	18.14	4730.93	19.29	4727.28	14.6	4723.95	20.41	4716.79	19.88

TABLE 3-6

IPC REGRESSED STREAM FLOW COMPILATION FOR ROCKY CREEK

Date	SW-1	SW-2	SW-9	SW-3	SW-4	SW-10	SW-5
01-May-90	96.72	100.98	83.47	107.89	105.48	101.09	108.90
15-May-90	199.26	167.08	181.87	184.85	193.36	187.03	168.05
01-Jun-90	149.37	134.39	151.65	132.68	168.58	149.21	133.22
18-Jun-90	33.00	69.68	60.56	82.24	98.42	73.92	63.66
02-Jul-90	19.95	35.65	18.30	69.04	27.35	30.62	26.79
16-Jul-90	14.71	20.81	12.81	17.74	20.82	19.04	19.26
31-Jul-90	13.05	16.37	11.89	11.60	14.29	14.72	17.02
07-Aug-90	12.78	16.37	11.43	9.31	14.29	16.91	17.02
14-Aug-90	13.33	16.37	11.43	14.38	14.29	16.91	17.02
21-Aug-90	14.16	19.33	14.28	21.80	15.38	20.09	16.30
28-Aug-90	13.60	17.85	12.81	21.80	14.29	19.04	16.66
04-Sep-90	14.43	19.33	13.26	17.74	14.29	20.09	16.30
11-Sep-90	11.40	14.88	11.43	14.38	12.12	15.83	14.91
18-Sep-90	11.40	13.40	11.43	9.31	12.12	13.59	13.58
24-Sep-90	11.40	13.40	11.43	9.31	12.12	14.72	13.58
08-Oct-90	12.50	17.85	11.43	14.38	14.29	20.09	14.91
22-Oct-90	13.33	19.33	12.81	17.74	17.56	23.12	14.91
05-Nov-90	13.60	28.23	9.60	4.67	16.47	24.10	14.91
20-Nov-90	12.22	14.88	7.77	3.67	14.29	20.09	12.93
12-Feb-91	13.19	11.92	11.66	16.6	14.84	15.82	14.91
26-Feb-91	12.64	13.4	12.12	10.65	17.02	14.72	14.91
13-Mar-91	13.47	11.92	12.12	13.66	13.75	16.91	16.30
26-Mar-91	15.12	16.37	15.33	22.29	20.28	22.12	17.75
04-Apr-91	--	35.66	--	38.00	30.07	34.92	28.44
23-Apr-91	91.45	83.10	87.17	102.10	105.48	116.86	102.09

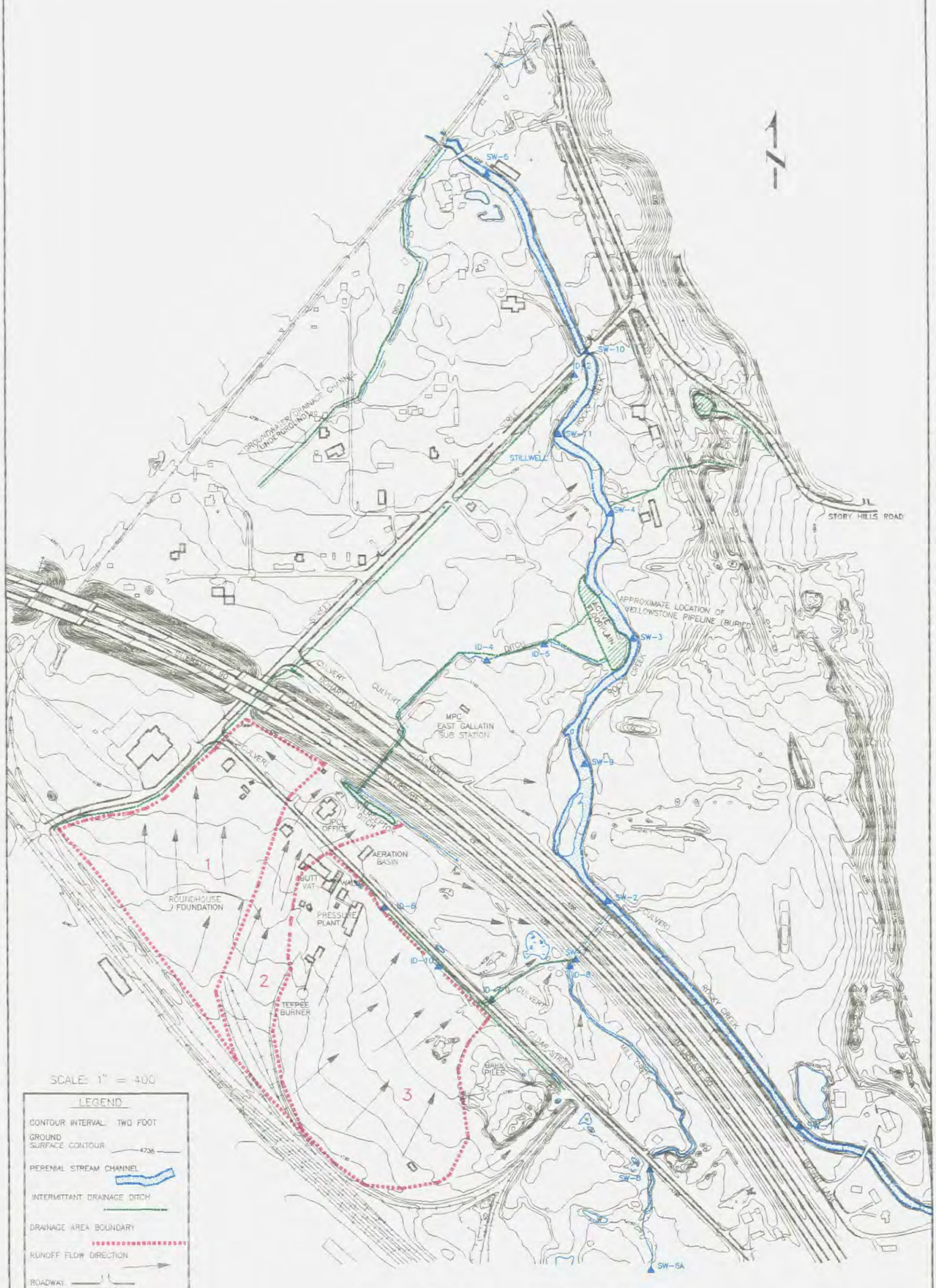


Figure 3–11 –– IPC Plant Site
Surface Water Runoff Areas and Flow Deliniations

MSE INC.
ACAD#: 7167–026
REV: – DATE: 9/23/91
DRAFTER: SL

SEDCAD^{+}, Version 3.0 Sediment, Erosion, and Discharge Model. Results were generated for storms of the following frequency and duration: 2-year, 24-hour; 5-year, 24-hour; 10-year, 24-hour; 25-year, 24-hour; 50-year, 24-hour; and 100-year, 24-hour.

3.5.3.1 Hydrology Model Inputs

This program generates storm runoff predictions based on inputs of surface characteristics and storm information, utilizing the United States Department of Agriculture (USDA), Soil Conservation Service's (SCS) Soil-Cover Complex Method. Drainage areas, slopes, and runoff path lengths for each drainage area were input by digitizer on the 1 inch equals 200 feet scale IPC Site topographic map. These parameters were field verified during a snow-melt runoff episode.

Rainfall depths for each discrete storm event were obtained from the Precipitation-Frequency Atlas of the Western United States [National Oceanic and Atmospheric Administration (NOAA)], Volume 1, Montana.

Drainage area time-of-concentration was calculated using the Upland Curve Method from digitizer inputs. Overland flow time is calculated as a function of land use, length of travel, and slope. The land use was represented as unvegetated level area with small upland gullies.

The SCS curve number designates the runoff potential of an area based on the land use, condition, hydrologic soil group, and antecedent moisture condition.

The curve number selected for all three drainage areas within the IPC Site was determined to be 85. This number was selected based on an unvegetated dirt area with a hydrologic soil group classification of B-C representative of a silt-loam to a silty-clay loam with moderate to low infiltration rates.

Ranges were provided for Area 1 and Area 2 due to differences in modeled peak discharge rates dependant on the unit hydrograph response shape. SEDCAD$^+$ utilizes three dimensionless double triangle unit hydrograph response shapes classified as fast, medium, or slow dependant on land use and condition. The IPC Site is classified as a fast response site due to lack of vegetation but, due to the large amounts of debris and rough, irregular surfaces, medium response was also modeled. A range was not given for Area 3 because no change in peak discharge rates occurred between fast and medium response due to a faster time of concentration associated with this area.

3.5.3.2 Sedimentology Model Inputs

Surface soil samples were collected from the IPC yard area and parking lot/pole storage areas at the IPC Site for analysis of specific gravity, submerged bulk specific gravity, and particle size distribution to be used for input in the sedimentology portion of the SEDCAD$^+$ Model.

The Revised Universal Soil Loss Equation (RUSLE) subroutine was used to calculate sediment yield for each drainage area. The RUSLE subroutine requires input of the soil erodibility factor K, the representative slope length, the representative slope gradient, the control practice factor, along with the three parameters mentioned in the previous paragraph. The K factor selected for all three drainage areas was 0.37, representative of a silt-loam. Representative slope lengths and gradients were determined from the topographic map by obtaining averages of several potential flow path lengths and gradients for each drainage area. The control practice factor selected for all three drainage areas was 0.90 representative of a rough irregular surface, tracked in all directions.

3.5.3.3 Interpretation of Results

Results of the flood runoff modeling presented in Tables 3-7 through 3-9 are used in the man-made structures evaluation presented in Section 3.5.4.

3.5.4 Man-Made Structures Evaluation

This evaluation was designed to determine impacts of man-made structures associated with the IPC Site on surface water hydrology and contaminant migration. Structures evaluated included the office interceptor ditch constructed by the IPC, the MPC Substation ditch, structures on the L Street ditch, and structures on the Cedar Street ditch. The other man-made structures potentially affecting contaminant migration include I-90, the MPC Substation, and the Yellowstone pipeline.

A detailed field survey was conducted on the office interceptor ditch and the MPC Substation ditch. In addition supplemental elevation data was collected over the expanse of the site to verify surface runoff flow paths and to

TABLE 3-7

IPC SITE STORM RUNOFF MODELING RESULTS
Drainage Area 1
(Area = 12.70 acres)

Storm Event	Runoff Volume (ac-ft)	Peak Discharge (cfs)	Sediment Volume (tons)	Peak Sediment Concentration (mg/l)	Peak Settleable Sediment Conc. (mg/l)	Volume Weighted Settleable Sed. Conc.* (mg/l)
2-year, 24-hour	0.29	2.6-3.1	8.7-9.5	42,000-47,600	38.8-44.3	19.7-21.6
5-year, 24-hour	0.55	5.2-6.1	18.2-19.7	45,400-50,000	42.0-46.7	22.0-23.9
10-year, 24-hour	0.69	6.8-7.8	23.8-25.7	46,500-50,500	43.1-47.1	22.8-24.6
25-year, 24-hour	1.08	10.7-12.3	39.6-42.8	48,500-52,800	45.1-49.3	24.2-26.1
50-year, 24-hour	1.33	13.2-15.2	50.1-54.1	49,500-53,900	46.0-50.4	24.9-26.8
100-year, 24-hour	1.50	14.8-17.1	57.3-62.0	50,000-54,500	46.5-51.0	25.2-27.2

* Average of Peak Hourly Concentrations

TABLE 3-8

IPC SITE STORM RUNOFF MODELING RESULTS
Drainage Area 2
(Area = 6.07 acres)

Storm Event	Runoff Volume (ac-ft)	Peak Discharge (cfs)	Sediment Volume (tons)	Peak Sediment Concentration (mg/l)	Peak Settleable Sediment Conc. (mg/l)	Volume Weighted Settleable Sed. Conc.* (mg/l)
2-year, 24-hour	0.14	1.3-1.6	3.6-3.9	36,800-41,400	34.2-38.7	17.1-18.7
5-year, 24-hour	0.26	2.7-3.0	7.6-8.1	39,600-43,200	36.9-40.5	19.2-20.6
10-year, 24-hour	0.33	3.4-3.8	9.9-10.6	40,500-43,800	37.8-41.1	19.8-21.2
25-year, 24-hour	0.52	5.3-6.0	16.4-17.5	42,200-45,000	39.5-42.3	21.1-22.4
50-year, 24-hour	0.64	6.6-7.4	20.7-22.1	43,000-45,900	40.3-43.2	21.6-22.9
100-year, 24-hour	0.72	7.4-8.4	23.7-25.3	43,500-46,400	40.7-43.7	21.9-23.3

* Average of Peak Hourly Concentrations

TABLE 3-9

IPC SITE STORM RUNOFF MODELING RESULTS
Drainage Area 3
(Area = 17.43 acres)

Storm Event	Runoff Volume (ac-ft)	Peak Discharge (cfs)	Sediment Volume (tons)	Peak Sediment Concentration (mg/l)	Peak Settleable Sediment Conc. (mg/l)	Volume Weighted Settleable Sed. Conc.* (mg/l)
2-year, 24-hour	0.40	5.3	18.8	71,900	67.51	31.75
5-year, 24-hour	0.75	9.9	37.9	71,600	67.20	33.93
10-year, 24-hour	0.95	12.4	48.9	71,600	67.25	34.66
25-year, 24-hour	1.48	18.9	79.7	72,000	67.61	35.98
50-year, 24-hour	1.83	23.0	00.9	72,300	67.89	36.57
100-year, 24-hour	2.07	25.7	114.0	72,500	68.09	36.90

* Average of Peak Hourly Concentrations

evaluate capacities of structures of the Cedar Street and L Street ditches.

3.5.4.1 Office Interceptor Ditch

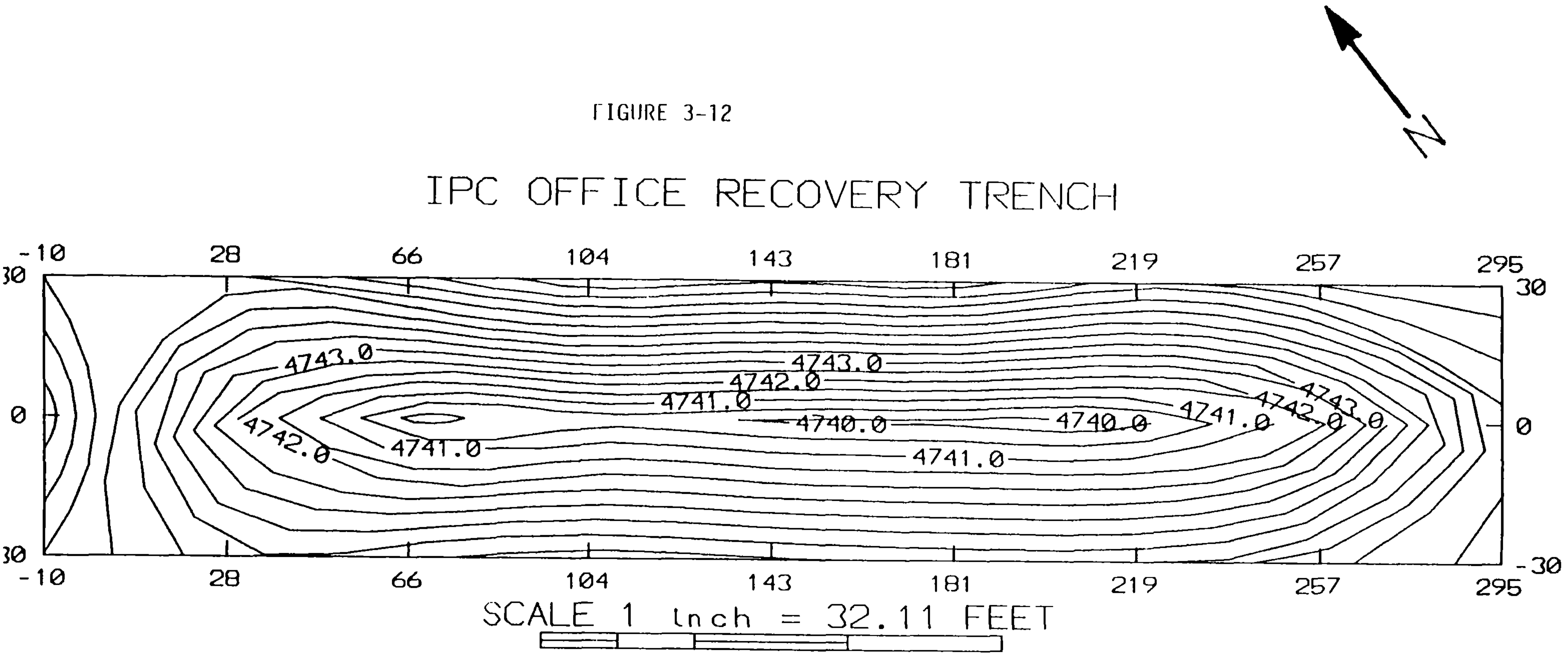
Based on results of this investigation, the man-made structure most critically affecting surface migration of contaminants at the IPC Site is the office interceptor ditch (Figure 2-2) constructed by the IPC in 1979 and 1980. The office interceptor ditch was designed to intercept the subsurface LNAPL plume originating in the IPC treatment area. This system was intended to allow liberation of the LNAPL from the formation for collection by the IPC using a rope skimmer and sorbent pads.

The major concern about this system, as it relates to surface transport of wood-treating contaminants, is that during certain storm events or high groundwater level periods, runoff flows into the office interceptor ditch filling it to discharge capacity. A discharge structure was installed after several over-toppings of the ditch released LNAPL to the MPC Substation ditch which eventually discharges to Rocky Creek either directly or by infiltration to the groundwater. The discharge structure was constructed with a 12-inch diameter carbon steel pipe that is 23 feet in length installed at a slope of 0.78 percent. At the intake, a 45 degree elbow was constructed and 12-inch pipe was extended an unknown distance below the water surface. This intake pipe is placed within a 3-feet diameter slotted culvert standing upright in the office interceptor ditch. The purpose of this structure is to allow water from the ditch to discharge without allowing the release of floating LNAPL.

During the field survey, cross sections were obtained on the ditch at 50-feet intervals. This information was used to generate a detailed topographic map of the ditch, which was necessary for determining the present capacity of the ditch. This map is presented in Figure 3-12 at a scale of 1 inch equals 32.11 feet and a 0.5-feet contour interval. Each contour was digitized and summed for capacity determination. The total bank-full capacity of the ditch has been estimated at 0.59 acre-feet (25,700 cubic feet) and would be discharging approximately 6.0 cfs. Full capacity without discharge would be approximately 0.50 acre-feet (21,780 cubic feet). The actual capacity reserved for storage of storm water runoff inflow is significantly less due to the standing groundwater already in the ditch. At the highest groundwater elevation measured in May 1990, at Well 15 directly east of the office interceptor ditch, groundwater already accounted for 0.20 acre-feet (8,712 cubic feet) of the capacity of the office interceptor ditch. At this groundwater level, 0.39 acre-feet (17,000 cubic feet) remain for additional storage at the bank-full discharging level, and 0.30 acre-feet (13,000 cubic feet) remain for additional storage at the zero-discharge level. The lowest groundwater elevation measured in September 1990, at Well 15 correlated to groundwater volume of 0.044 acre-feet (1,900 cubic feet) of the total capacity of the office interceptor ditch. At this low groundwater level, 0.546 acre-feet (23,800 cubic feet) remains for storage at the bank-full discharging capacity, and 0.456 acre-feet (19,900 cubic feet) remains for storage at the zero-discharge level.

In addition to discharge from the office interceptor ditch discharge structure, overtopping of the north berm was observed in late May 1991. This

FIGURE 3-12


IPC OFFICE RECOVERY TRENCH

SCALE 1 inch = 32.11 FEET

release occurred approximately 40 feet west of the structure in the center of the ditch. LNAPL was observed in the I-90 right-of-way at this release location.

Based on the flood runoff model outputs presented in Tables 3-7 and 3-8 presented in Section 3.5.3.3, Table 3-10 presents estimates of discharge from the ditch during the modeled storm events.

Discharge from the office interceptor ditch flows under I-90 through a 24-inch-diameter cement culvert approximately 240-feet long into another 24-inch-diameter corrugated steel culvert passing under Bohart Lane. This culvert discharges into a small pond area that is drained by a 100-feet long 12-inch-diameter smooth iron pipe and empties into the MPC Substation ditch. Due to the uneven bed slope at which the MPC Substation ditch was constructed, some ponding (storage) is facilitated by the ditch, holding back a certain amount of flow from direct discharge to Rocky Creek. Calculations roughly estimate this storage capacity at 0.031 acre-feet (1,350 cubic feet).

During the LNAPL investigation discussed in Section 4.1.4.2 soil borings drilled directly north of the office interceptor ditch indicate the LNAPL is present below a clay layer which is at a lower elevation than the bottom of the ditch. The original depth of the office interceptor ditch is approximately 7 feet, but it is possible that the clay layer was not disturbed and LNAPL is migrating under the ditch. The majority of the LNAPL currently recovered in the office interceptor ditch flows in from a 2-inch diameter

TABLE 3-10

IMPACTS OF STORM RUNOFF ON THE IPC OFFICE INTERCEPTOR DITCH (MODEL AREA 2)

Storm Event	Storm Intensity (Inches)	Runoff Volume (acre-feet)	Peak Discharge (cfs)	High-Water Trench Outflow Volume (acre-feet)	Low-Water Trench Outflow Volume (acre-feet)	Peak Discharge Structure Exceedance (cfs)
2-year, 24-hour	1.20	0.14	1.3-1.6	0.00	0.00	0.00
5-year, 24-hour	1.60	0.26	2.7-3.0	0.00	0.00	0.00
10-year, 24-hour	1.80	0.33	3.4-3.8	0.00	0.00	0.00
25-year, 24-hour	2.30	0.52	5.3-6.0	0.13	0.00	0.00
50-year, 24-hour	2.60	0.64	6.6-7.4	0.25	0.09	0.6-1.4
100-year, 24-hour	2.80	0.72	7.4-8.4	0.33	0.17	1.4-2.4

plastic pipe. The results of the investigation into the origin of this pipe is discussed in Section 4.1.4.5.

3.5.4.2 Cedar Street Ditch

Investigation of the Cedar Street ditch revealed that the culvert passing under Cedar Street approximately 400-feet downgradient from the IPC process area was effectively plugged with large cobbles, which reduces the capacity of the culvert significantly but still allows minimal flow to pass (acting more like a french drain). This modification to the culvert is apparently responsible for creating the artificial wetland along the south side of Cedar Street by maintaining saturated conditions throughout the summer. It also appears that water levels are maintained above the mouth of this culvert, thus preventing floating LNAPL (if present) from passing through the culvert.

3.5.4.3 L Street Ditch

The final man-made structure investigated was the L Street ditch and its associated culvert passing under Bohart Lane. No well-defined ditch is present along L Street going north from the IPC Site under I-90 but, based on the contour map and supplementary level survey, approximately 12.7 acres of the IPC Site drain to the west, eventually flowing north along L Street. The supplementary elevation survey was conducted on February 14, 1991, which was an unseasonably warm day. During this survey, snow-melt runoff was observed running off the IPC Site flowing north along the east side of L Street under

I-90, passing through the Bohart Lane culvert (2-feet-diameter corrugated steel) and then flowing into the more defined L Street ditch north of I-90. This ditch extends to Rocky Creek, discharging directly upstream of the L Street Bridge. During low-probability storm events, calculations indicate that the capacity of the culvert on Bohart Lane would be insufficient to pass the runoff flows, and water would be diverted down the south side of Bohart Lane, flowing east. The L Street culvert crossing Bohart Lane is sized sufficiently to handle the 10-year, 24-hour storm, but will not completely handle larger storm events. Portions of the runoff from the larger events will flow along the south side of Bohart Lane to the MPC Substation ditch culvert. This scenario creates potential for contamination of sediments along the south side of Bohart Lane.

Elevated concentrations of PCP and PAHs were detected in the Bohart Lane ditch sediments approximately 90 feet east of the L St. culvert during the additional sampling activities as discussed in detail in Section 4.2.3. The contamination may be due to surface runoff as described above or could be associated with the LNAPL plume underlying this area.

3.5.4.4 I-90

I-90 was constructed through the property adjacent to the IPC Site from 1967 to 1969. There is no information presently available indicating that LNAPL was observed or uncovered during construction of the interstate. Data obtained from soil borings drilled during the LNAPL investigation strongly indicate that a shallow silty-clay layer is present under interstate, and that the LNAPL is contained in the coarser grained aquifer material below the clay layer. Assuming this clay layer is continuous under the extent of the interstate fill within the bounds of the LNAPL Plume, the interstate would not significantly affect or impact the migration of LNAPL. Further discussion of the LNAPL Plume related to I-90 is presented in Section 4.1.4.

3.5.4.5 MPC Substation

The MPC Substation was constructed in the mid-1970's and expanded in 1983. AGI reported that soil borings were drilled in the southeast corner of the substation area at the time of this expansion, and boring logs indicated no evidence of contamination present (AGI, 1985). Data compiled from test pits, well installations, and soil borings strongly indicate that the shallow silty clay layer described in Section 3.5.4.5 is also present below the substation, which would confine the LNAPL to the coarse aquifer material below the clay layer, if LNAPL is present. During LNAPL investigation activities (results presented in Section 4.1.4), LNAPL was detected in soil borings south of the MPC Substation on the south side of Bohart Lane, indicating the possibility that some LNAPL may be present under the southwest corner of the substation fill area.

3.5.4.6 Yellowstone Pipeline

The Yellowstone pipeline is a buried natural gas distribution line that crosses the north end of the IPC pasture and then crosses Rocky Creek. In the early stages of the RI investigation, concern was expressed that the pipeline might intercept and channel a significant volume of contaminated groundwater to Rocky Creek. Rocky Creek water analyses and flow measurements collected during the surface water investigation do not indicate that the Yellowstone pipeline has any impact on migration of contaminants associated with the dissolved plume.

3.6 BIOTA

3.6.1 Floodplain Inventory

The appropriate panels of the National Flood Insurance Program map for the Bozeman area were acquired [U.S Federal Emergency Management Agency] (FEMA). Figure 3-13 shows the 1:4800 scale map of the 100-year and 500-year floodplains for the IPC Site and vicinity. Inspection of this figure indicates that very little, if any, of the IPC Site is situated within the 100-year floodplain. At most, a small portion of the filled area may be affected by overflow from the Cedar Street ditch and/or Mill Creek during the 100-year flood event. However, the portion of the IPC Site located east of the Cedar Street ditch is situated in the 500-year floodplain.

3.6.2 Wetlands Inventory

The locations of plant communities sampled within the IPC Site vegetation-related study area are shown in Figure 3-14. Descriptions of sampling methodologies utilized and the plant communities identified are presented in the Final Biota Investigation Report (MSE, 1990a). Using the vegetation

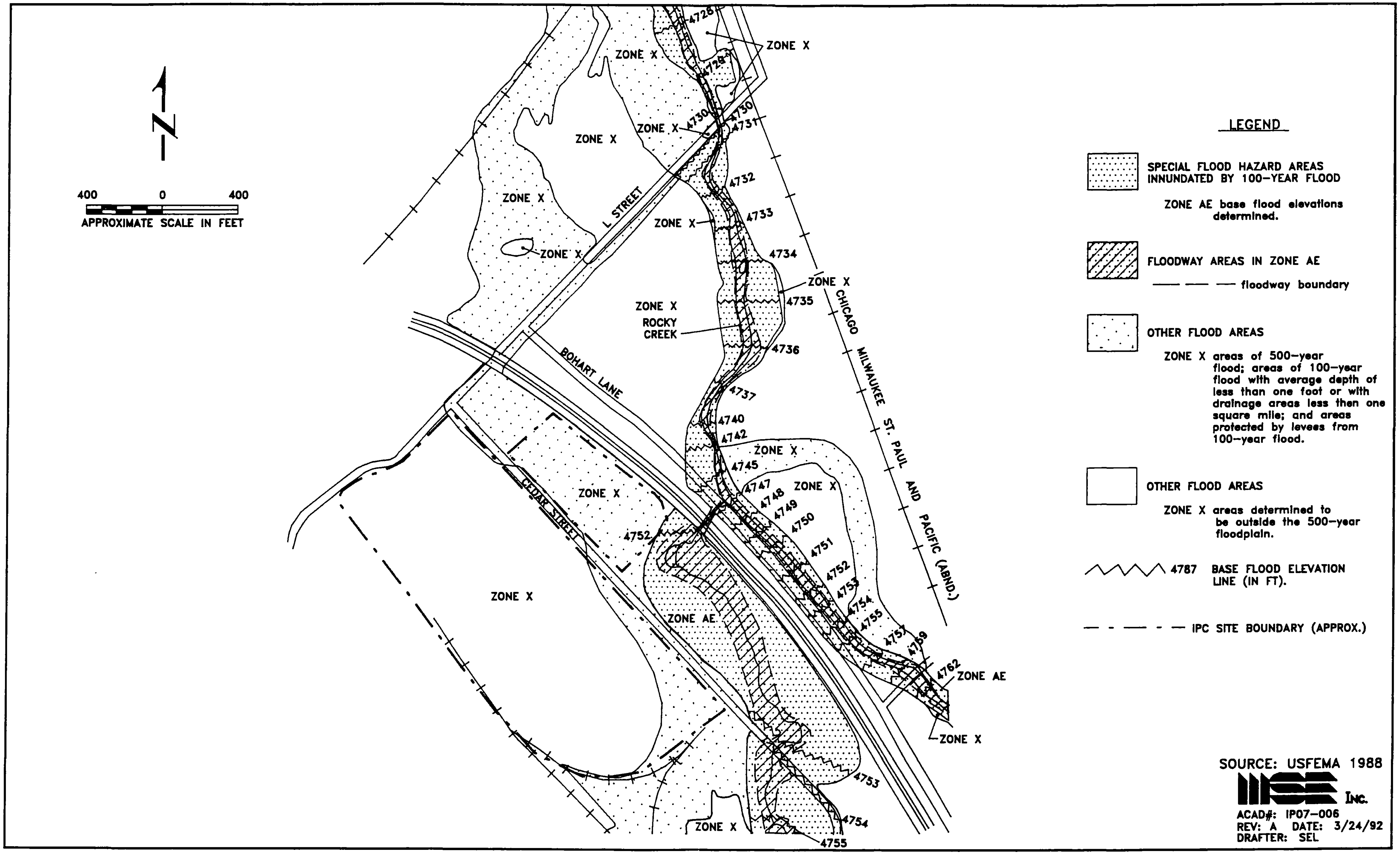


FIGURE 3-13 -- DELINEATION OF THE 100-YEAR AND 500-YEAR FLOODPLAINS WITHIN THE IPC STUDY AREA

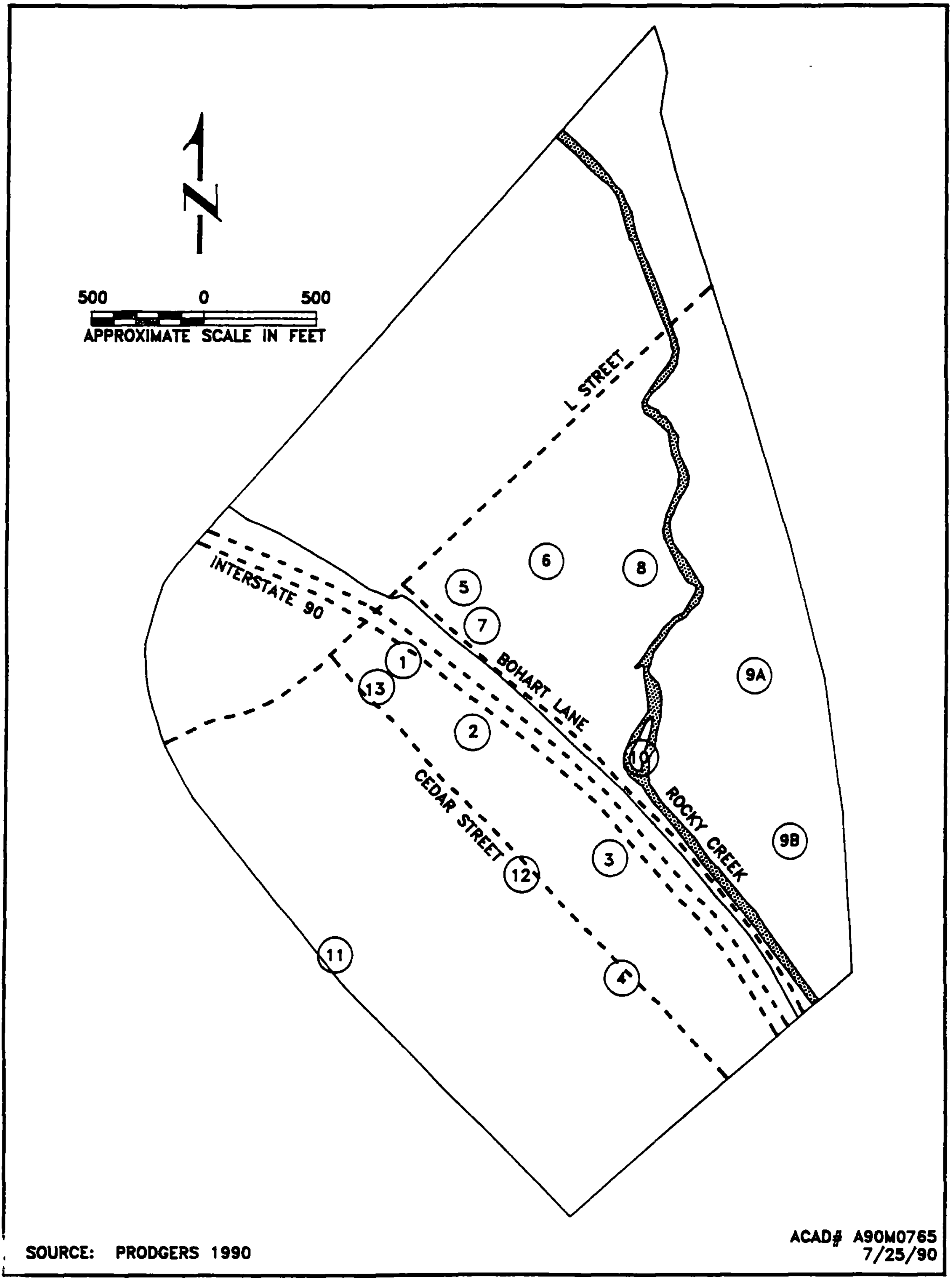
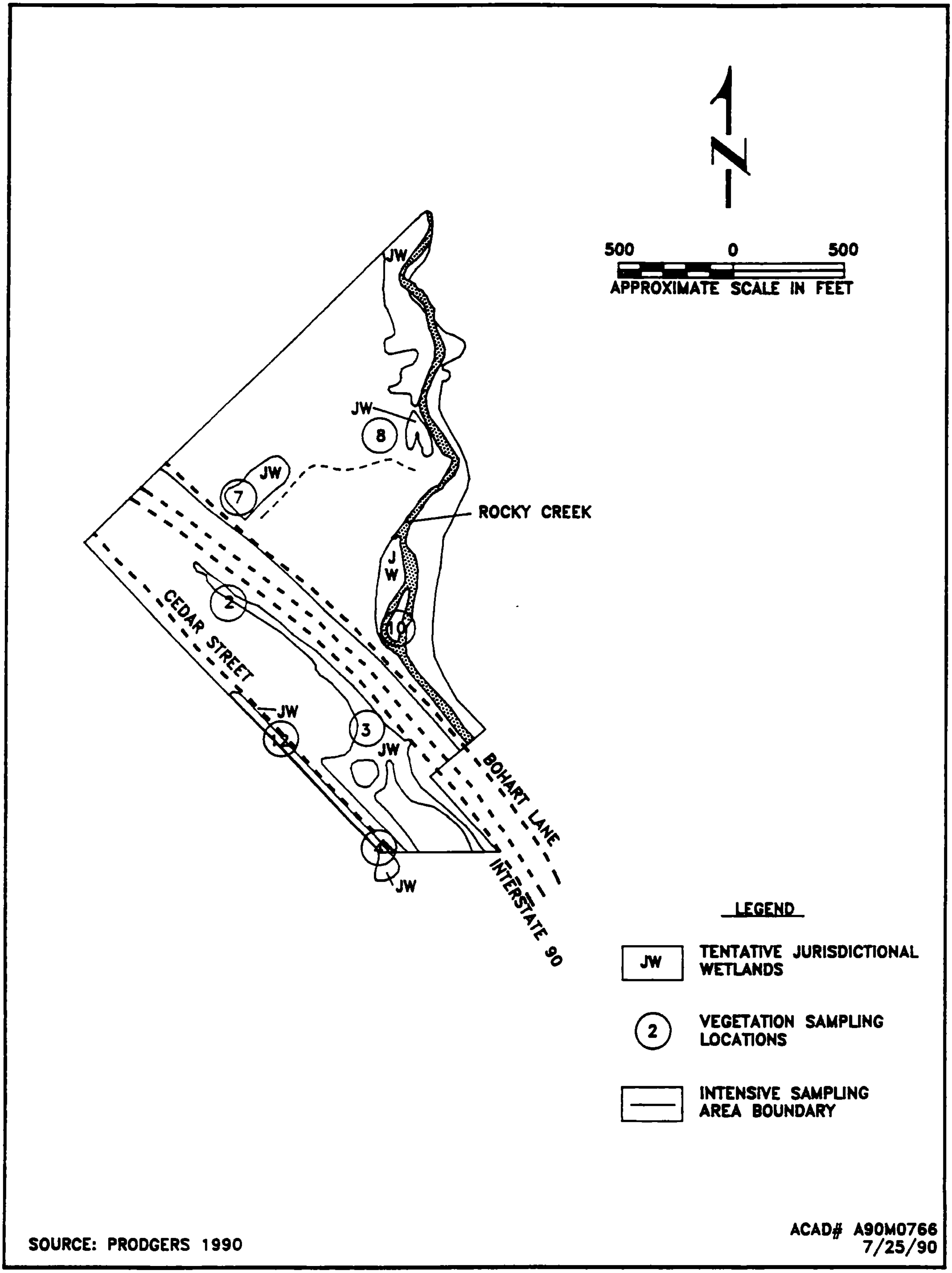
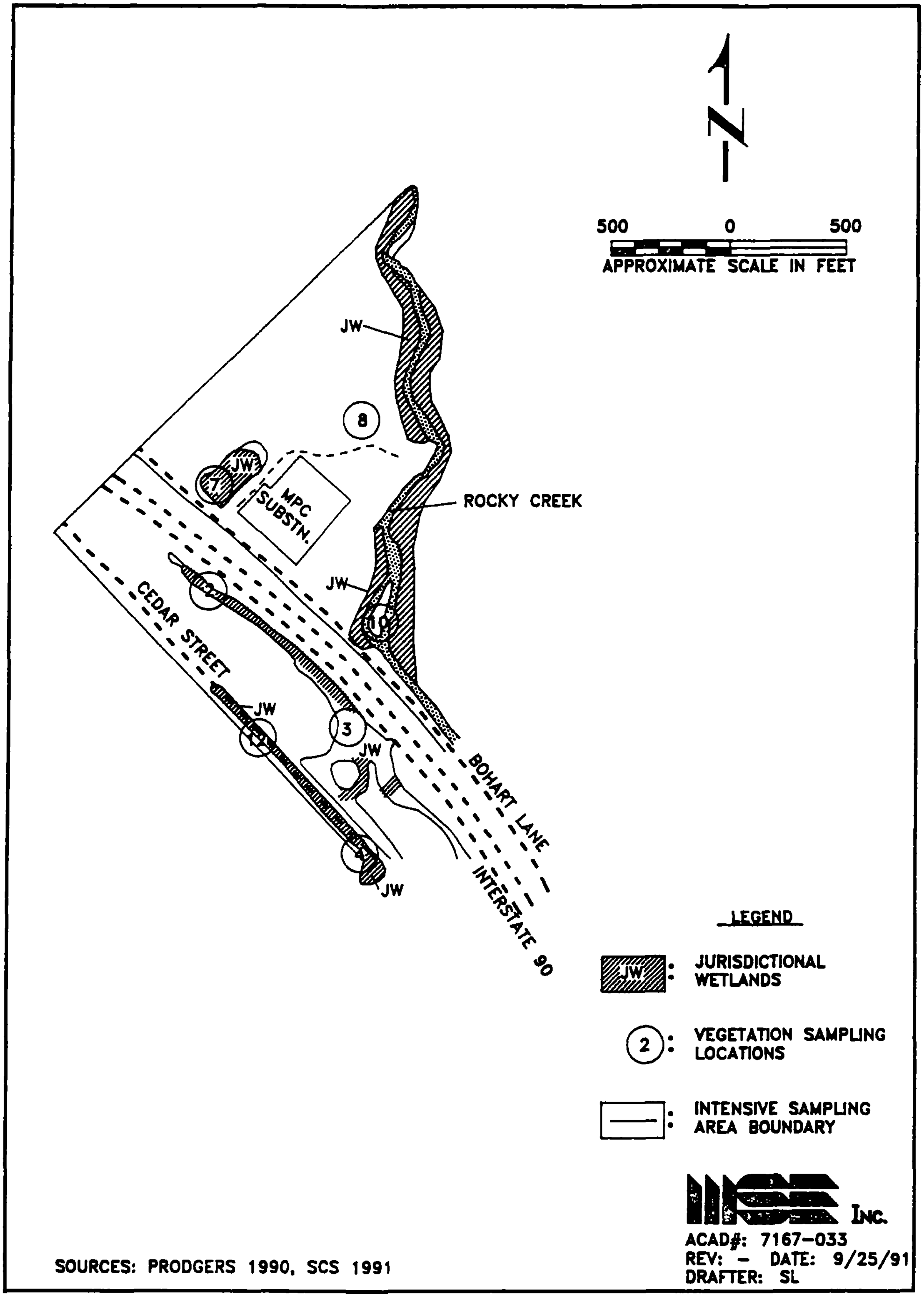


FIGURE 3-14 -- VEGETATION SAMPLING LOCATIONS evaluation criteria contained in the Federal Interagency Committee for Wetland Delineation (FICWD 1989) manual and the species list contained in Reed (1988), jurisdictional wetlands were tentatively identified at sample locations 2, 3, 4, 7, 10, 12. These data were used to map those areas within and hydrologically downgradient from the IPC Site that met the vegetative wetlands criteria. The results are presented in Figure 3-15. Identification of tentative jurisdictional wetlands based upon vegetative characteristics focused on those plant species which usually, if not always, occur in wetlands (Reed, 1988). Thus, species specific indicator category status (e.g., obligate wetland) were assigned only to each species at those sites meeting the FICWD's vegetative criteria for jurisdictional wetlands. The field evaluation of soils and hydrological criteria (from FICWD, 1989) were completed by MSE's soil scientist shortly after receipt of the Biota report. In addition, the SCS completed mapping of the IPC Site area in September 1991. Those areas exhibiting both hydric soil characteristics and wetlands vegetation characteristics were judged by MSE to be accurate and representative of jurisdictional wetlands as defined by the FICWD (1989). These designated areas are cross-hatched in Figure 3-16. Inspection of this figure indicates that these wetlands are limited to drainage ditches along Cedar Street and I-90; lowland areas along Mill Ditch; a 6-(±) acre willow/sedge grove situated immediately west of the MPC Substation and located on pasture land owned by the IPC; and the Rocky Creek floodplain.



SOURCE: PRODGERS 1990

FIGURE 3-15 -- TENTATIVE JURISDICTIONAL WETLANDS(JW) AREAS, BASED ON THE FICWD (1989) VEGETATION COMPONENT



SOURCES: PRODGERS 1990, SCS 1991

ACAD#: 7167-033
REV: - DATE: 9/25/91
DRAFTER: SL

FIGURE 3-16 -- JURISDICTIONAL WETLANDS (JW) AREAS, BASED ON FICWD (1989) VEGETATION, SOILS AND HYDROLOGIC CRITERIA

3.6.3 Wildlife Inventory

The Montana Natural Resource Information System (NRIS) was searched for terrestrial vegetation/land use, terrestrial biota, and aquatic biota reference materials pertinent to Sections 5 and 6 of Township 2S, Range 6E (i.e., those sections of Township 2S, Range 6E incorporating the IPC Site). The specific databases included the following: Montana Rivers Information System (MRIS), Online Computer Library Center (CDROM data disk) of USGS publications, Montana Natural Resource Index, USGS Watstore database and USGS Nawdex database. In addition, personnel from the Region 3 Office of Montana Department of Fish, Wildlife, and Parks (MDFWP) and from the Montana Natural Heritage Program (MNHP) were also contacted for information pertinent to this investigation. The key findings are discussed below; as the text is not exhaustive, other species (e.g., the masked shrew) may exist in the study area.

3.6.3.1 <u>Terrestrial Biota</u>

The wildlife assessment section of the MRIS Report for Rocky Creek notes that whitetail deer usage is year-round and important throughout the drainage; the report also noted moderately important year-round use by mule deer. Other game and furbearing species probably residing within the IPC Site study area include river otter, beaver, and waterfowl (e.g., mallards, Canada goose). Personnel performing the vegetation/wetlands field work observed the presence or sign of beaver, deer, skunk, waterfowl, and songbirds. The MRIS Report also remarked that cormorant, heron, and pelicans utilize certain sites along the creek. Of the three species, blue herons are the most likely, as they do nest on the East Gallatin River and probably forage upstream as far as the IPC Site according to Dennis Flath of MDFWP.

The MNHP database search for Sections 5 and 6 of Township 2S Range 6E did not reveal any records of sensitive plant or animal species occurring in this area. The vascular plant list presented in the Biota report does not contain any members from the most recent MNHP list of species of special concern. Although neither source is exhaustive, the disturbances created by over one century of intensive human development reduces considerably the likelihood of any such species' presence in the IPC Site study area.

Of the nongame mammals of special interest or concern which are known to occur in Gallatin County, the riparian and meadow/agricultural habitats may be sufficient to support the spotted skunk and uinta ground squirrel, respectively (Flath, 1977; Burt and Grossenheider, 1976).
Flath (1977) reported no reptile species of special interest or concern; among the amphibians, the tailed frog may occur within Gallatin County. J.H. Black (1970) believed this frog extends into the northwestern corner of the county and would be found in cold, swift mountain streams having numerous waterfalls. Given the absence of such habitat, this frog species' presence is not likely within the IPC Site study area.

In regards to the IPC Site Superfund Project, the two avian species of particular concern to the MDFWP are the peregrine falcon and bald eagle; both have been Federally designated as being endangered in Montana (50 CFR Section

17.11). Although there probably is not a breeding pair of falcons currently residing near the IPC Site, it may be within the approximately 6-mile foraging radius of breeding pairs known to exist in the area. Thus, intermittent use of the IPC Site vicinity as a food source is probable during late spring and through the summer months. Bald eagles may utilize lands in the vicinity of the IPC Site occasionally during the winter (December--February) months as "secondary wintering habitat". Such use would include preying on ducks along the creek bottoms and consumption of winter kill (e.g., deer, antelope) carcasses in the adjacent foothills. Other birds of prey of special interest or concern which may breed and/or hunt within the IPC Site study area include the prairie falcon, marsh hawk, pigeon hawk, screech owl, and seasonal (migratory) use by the ferruginous hawk (Flath, 1977; Peterson, 1961).

3.6.3.2 Aquatic Biota

The MRIS Report for the 5.1-mile stretch of Rocky Creek -- from its headwaters to confluence with Bozeman Creek -- notes the presence of a high value fishery resource. The ca. 1977 data by E.R. Vincent indicated that rainbow trout and brown trout are common, while brook trout are uncommon; in regard to rough fish, mottled sculpins were abundant while mountain whitefish and white sucker were common species. The sport fish species are expected in the meandering stream sections having banks well stabilized by abundant riparian vegetation (Wells, 1977), as observed in the northernmost portion of the study area (Figure 2-2). Rough fish species probably dominate the channelized, riprapped section of Rocky Creek along I-90 (Wells, 1977), particularly schooling in riffle areas (Brown 1971). However, the rock jetties installed by the Montana

Department of Highways provide cover habitat for trout via creation of pools downstream of these structures (Wells, 1977).

Finally, no fish species of special interest or concern to the MDFWP have been reported to exist within Gallatin County (Flath, 1977). This evaluation is supported by comparison of those fish species listed in the MNHP's (1990) Animal Species of Special Concern against their respective distribution maps/habitat requirements described in Brown (1971), as supplemented by Holton and West (1981).

4.0 STUDY AREA INVESTIGATIONS

4.1 POTENTIAL SOURCES

4.1.1 Former Roundhouse Area

The former roundhouse was sampled April 17 and 19, 1990, by a three person sampling team that included Kim Connors, Julie Flammang, and either Meg Babits or Bill Bullock, MSE, Inc. Visitors included Carol Vega, MSE, John Brady-Finke, IPC, and Les Lonning, McFarland-Cascade (M-C). Gene Munson, archaeologist, and Dale Decco, historian, both with GCM Services, Inc., of Butte, Montana, monitored backhoe test pits excavated in the roundhouse area.

An historic photograph (dated approximately 1906) of the intact and operating roundhouse was located at the Museum of the Rockies in Bozeman, Montana. Inspection of the photograph indicates a pit west of the roundhouse and stockpiles of railroad ties; although the use of this pit is unknown, it may have been used for preserving railroad ties. During the field investigation of the roundhouse area, a layer of fill from surface to 30 inches was observed. The fill was comprised mainly of broken and whole brick, concrete, bark, cinders, and steel scrap. Deteriorated, oil-stained soil (very dark soil with a shine and a massive structure) appeared in the majority (eight out of 12) of soil test pits.

A total of 36 soil samples (B1A,B,C through B12A,B,C) were collected from 12 test pits. Sample collection methods are outlined in the Field Sampling Plan (FSP; MSE, 1990e). Test pit locations are presented in Figure 4-1. Pits were excavated to the water table (which varied across the site) approximately 87

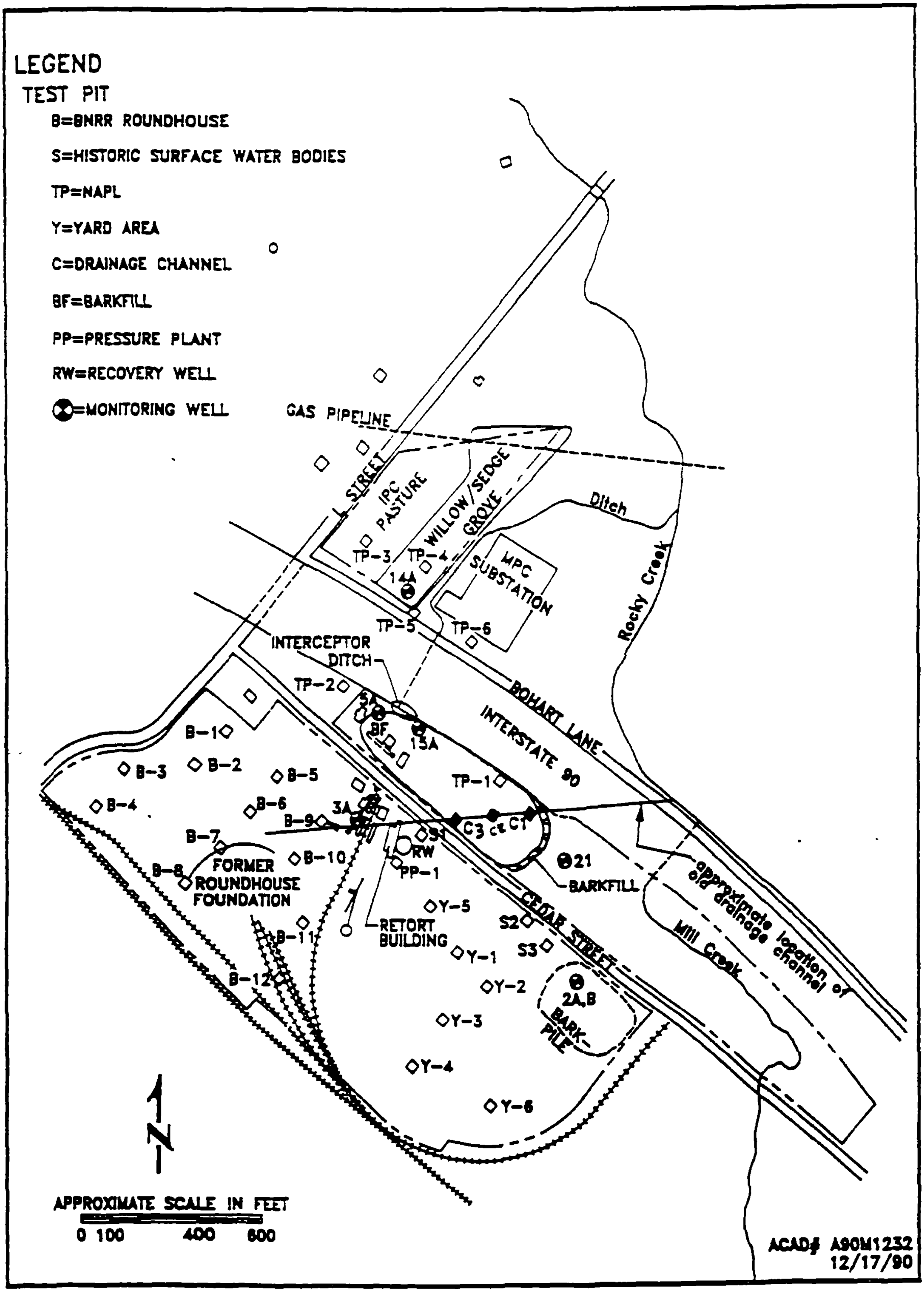


FIGURE 4-1 -- POTENTIAL SOURCE INVESTIGATION STATIONS to 127 inches bgs (Table 4-1). Sample intervals were surface to 12 inches (A), bottom of test pit to 24 inches above bottom (C), and a middle interval ranging from 12 to 103 inches (B). Table 4-2 describes the sample number designation. Of the 36 samples, 32 were submitted for target compound list (TCL) analyses (volatiles, semivolatiles, and total metals) and 4 (B1A, B7B, B7C, and B10B) were submitted for gross analyses, including TOX (total organic halides) and TFH (total fuel hydrocarbons). Table 4-3 lists the compounds included in the TCL.

The separation of samples for TCL or gross analysis was based on a field HNU headspace analysis reading above background or obvious staining (determined by soil color and structure). The HNU is a field photoionization detector that reads in ppm of organic vapors. A reading above background (ambient air) or obvious staining would determine the samples analysis for the TCL. The HNU readings for the former roundhouse are presented in Table 4-4.

The volatile organic analyses are presented in Appendix E, pages E-160 through E-168. Three compounds were detected without being an estimated quantity (no J flag) and were detected in the lab blank (a B flag), including methylene chloride in 32 samples (9 to 180 ppb), chloroethane in one sample (53 ppb), and acetone in nine samples (14 to 60 ppb). Two compounds were detected as being estimated quantities (J flag) and were detected in the blank (B flag), including acetone in seven samples (3 to 48 ppb) and 2-butanone in one sample (1 ppb). When a compound is detected in the blank, which was generated in the lab, it indicates the lab is contributing a source of contamination such as a compound from lab extraction. Two compounds were detected without being

TABLE 4-1

FORMER ROUNDHOUSE TEST PIT INFORMATION

Sample Number	Sample Depth (in.)
SSB01A	0-12
SSB01B	12-63
SSB01C	63-87
SSB02A	0-12
SSB02B	12-64
SSB02C	64-88
SSB03A	0-12
SSB03B	12-72
SSB03C	72-96
SSB04A	0-12
SSB04B	12-82
SSB04C	82-106
SSB05A	0-12
SSB05B	12-72
SSB05C	72-96
SSB06A	0-12
SSB06B	12-66
SSB06C	66-90
SSB07A	0-12
SSB07B	12-103
SSB07C	103-127
SSB08A	0-12
SSB08B	12-88
SSB08C	88-112
SSB09A	0-12
SSB09B	12-70
SSB09C	70-94
SSB10A	0-12
SSB10B	12-64
SSB10C	64-93
SSB11A	0-12
SSB11B	12-84
SSB11C	84-108
SSB12A	0-12
SSB12B	12-90
SSB12C	90-114

TABLE 4-2

SAMPLE NUMBER DESIGNATION

Soil/Sediment (SS)	Intermittent Drainage (ID) Surface Water (SW)	Groundwater (GW)
IP-SS-B1-A	IP-SW-1-A/IP-ID-1-A	IP-GW-18A-01
IP- Project Site	IP - Project Site	IP - Project Site
SS - Sample Media	SW/ID - Sample Media	GW - Sample Media
B1 - Sample Location	1 - Sample Location	18A - Well Location
A - Sample Depth (ft)	A - Sampling Round	01 - Sampling Round

TABLE 4-3

TARGET COMPOUND LIST

Volatiles

benzene
carbon tetrachloride
chlorobenzene
1,2,-dichloroethene
1,1,1-trichloroethane
1,1-dichloroethene
1,1,2-trichloroethane
1,1,2,2-tetrachloroethane
chloroethane
chloroform
1,1-dichloroethane
1,2-dichloropropane
trans-1,3-dichloropropene
cis-1,3-dichloropropene
bromoform
ethylbenzene
methylene chloride
chloromethane
bromomethane
bromodichloromethane
dibromochloromethane
tetrachloroethane
toluene
trichloroethene
vinyl chloride
styrene
viny acetate
4-methyl-2-pentanone
2-hexanone
1,2-dichloroethane
acetone
carbon disulfide
2-butanone
xylenes (total)

Semivolatiles

4-methylphenol
benzoic acid
2-methylphenol
2,4-trichlorophenol
4-nitroaniline
benzyl alcohol
2,4,6-trichlorophenol
4-chloro-3-methylphenol
2-chlorophenol
2,4-dichlorophenol
2,4-dimethylphenol
2-nitrophenol
4-nitrophenol
2,4-dinitrophenol
4,6-dinitro-2-methylphenol
pentachlorophenol
phenol
acenaphthene
1,2,4-trichlorobenzene
hexachlorobenzene
hexachloroethane
bis(2-chloroethyl)ether
2-chloronaphthalene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
4-chloroaniline
dibenzofuran
2-nitroaniline
2-methylnaphthalene
3-nitroaniline
hexachlorobutadiene
hexachlorocyclopentadiene
isophorone
naphthalene
nitrobenzene
N-nitrosodiphenylamine
N-nitroso-di-n-propylamine
bis(2-ethylhexyl)phthalate
butylbenzylphthalate
di-n-butylphthalate
di-n-octylphthalate
diethylphthalate
dimethylphthalate
benzo(a)anthracene
benzo(a)pyrene
benzo(k)fluoranthene
chrysene
acenaphthylene
anthracene
benzo(g,h,i)perylene
fluorene

TABLE 4-3 (cont'd)

TARGET COMPOUND LIST

Semivolatiles (cont'd)

3,3-dichlorobenzidine
2,4-dinitrotoluene
2,6-dinitrotoluene
fluoranthene
4-chlorophenyl-phenylether
bis(2-chloroisopropyl)
phenanthrene
dibenz(a,h)anthracene
indeno(1,2,3-cd)pyrene
pyrene
4-bromophenyl-phenylether
bis(2-chloroethoxy)methane

TARGET ANALYTE LIST

aluminum
antimony
arsenic
barium
beryllium
cadmium
calcium
chromium
cobalt
copper
cyanide
iron
magnesium
manganese
mercury
nickel
potassium
selenium
silver
sodium
thallium
vanadium
zinc
lead

TABLE 4-4

FORMER ROUNDHOUSE HNU READINGS

Sample No.	Background Reading of Ambient Air (ppm)	Sample Reading (ppm)	Obvious Staining
B01A	0.2	0.4[1]	No
B01B	2.0	3.0	Yes
B01C	0.4	2.0	No
B02A	1.0	5.8	No
B02B	1.2	4.4	No
B02C	1.4	4.0	No
B03A	1.0	4.2	Yes
B03B	1.0	6.6	Yes
B03C	1.2	5.0	No
B04A	1.2	7.0	No
B04B	1.2	6.2	Yes
B04C	1.2	6.0	No
B05A	0.4	2.0	No
B05B	0.8	3.0	Yes
B05C	0.2	2.5	No
B06A	1.2	3.2	Yes
B06B	1.2	2.8	No
B06C	1.7	3.0	No
B07A	2.4	4.0	Yes
B07B	3.2	2.0	No
B07C	3.2	3.0	No
B08A	1.2	5.0	No
B08B	1.2	6.2	No
B08C	1.2	5.4	No
B09A	2.0	5.0	No
B09B	3.0	4.8	No
B09C	3.0	7.0	No
B10A	2.0	5.8	Yes
B10B	3.0	3.0	No
B10C	3.6	5.0	No
B11A	1.2	7.1	No
B11B	1.1	7.2	No
B11C	1.2	4.4	No
B12A	1.0	5.2	Yes
B12B	1.0	5.4	No
B12C	1.2	6.8	No

1. Judged not to be a reliable reading because of the very slight sample reading above background (sample submitted for gross analysis).

estimated quantities and were not detected in the blank, including acetone in two samples (14 to 26 ppb) and 2-butanone in one sample (10 ppb). Three compounds were detected as estimated quantities and were not detected in the blank, including acetone in one sample (4 ppb), benzene in one sample (1 ppb), and chloroform in one sample (2 ppb). The compounds detected either as estimated quantities or not and not detected in the blank are in low concentrations and commonly associated with bottle cleaning agents or lab solvents. Appendix F describes the process of qualifying quantities as estimated (J flag), quantities with contamination from the lab (B flag), etc.

The semivolatile organic analyses are presented in Appendix E, pages E-139 through E-159. Twelve compounds were detected without being estimated quantities (no J flag), including fluoranthene in seven samples (400 to 9200 ppb), benzo(a)anthracene in six samples (460 to 5900 ppb), chrysene in six samples (480 to 6100 ppb), phenanthrene in eight samples (380 to 10000 ppb), pyrene in 11 samples (390 to 12000 ppb), benzo(a)pyrene in six samples (350 to 5000 ppb), benzo(b)fluoranthene in eight samples (450 to 6700 ppb), benzo(k)fluoranthene in eight samples (450 to 6700 ppb), benzo(g,h,i)perylene in five samples (460 to 2100 ppb), anthracene in four samples (510 to 1700 ppb), indeno(1,2,3-cd)pyrene in five samples (370 to 1700 ppb), and dibenz(a,h)anthracene in two samples (510 to 870 ppb). Twenty-three compounds were detected as being estimated quantities (J flag), including 2-methylnaphthalene in 10 samples (43 to 240 ppb), fluoranthene in 10 samples (47 to 340 ppb), benzo(a)anthracene in 12 samples (43 to 340 ppb), chrysene in 11 samples (44 to 370 ppb), phenanthrene in 10 samples (38 to 380 ppb), pyrene in eight samples (54 to 310 ppb), pentachlorophenol in seven samples (73 to 650 ppb), bis-2-ethylhexylphthalate in five samples (39 to 120 ppb), benzo(a)pyrene in 10 samples (44 to 280 ppb), benzo(b)fluoranthene in eight samples (74 to 300 ppb), benzo(k)fluoranthene in eight samples (68 to 320 ppb), benzoic acid in one sample (48 ppb), dibenzofuran in six samples (39 to 340 ppb), naphthalene in seven samples (56 to 190 ppb), di-n-butylphthalate in one sample (43 ppb), acenaphthalene in seven samples (60 to 990 ppb), benzo(g,h,i)perylene in six samples (48 to 230 ppb), acenaphthene in four samples (44 to 150 ppb), anthracene in five samples (77 to 190 ppb), fluorene in six samples (55 to 790 ppb), dibenz(a,h)anthracene in six samples (58 to 850 ppb), indeno(1,2,3-cd)pyrene in five samples (41 to 200 ppb), and di-n-octylphthalate in one sample (370 ppb). High molecular weight PAH compounds (4, 5, and 6 rings) such as fluoranthene, pyrene, and benzo(a)anthracene may indicate creosote.

The trace element metal analyses are presented in Appendix E, pages E-169 through E-174. Nine elements were detected without being estimated quantities (no J flag) and above the normal ranges of elemental concentrations (Shacklette and Boerngen, 1984), including mercury, arsenic, lead, zinc, barium, cobalt, nickel, thallium, and copper. Table 4-5 lists the normal elemental ranges for soils in the Western U. S. reported by Shacklette and Boerngen. However, the concentrations were only slightly elevated above normal ranges. An additional three elements, including antimony, manganese, and silver, were detected as being estimated quantities (J flag) and above normal elemental concentrations.

TABLE 4-5

NORMAL RANGES OF ELEMENTAL CONCENTRATIONS IN SOILS OF THE WESTERN UNITED STATES (ppm)

Element	Normal Range (mean+/STD.DEV.)
Aluminum	29,000-116,000
Antimony	0.22-1.01
Arsenic	2.8-10.9
Barium	337-998
Beryllium	0.30-1.56
Cadmium	0.1-0.5
Chromium	19-90
Cobalt	3.6-14.0
Copper	10-43
Iron	10,800-41,000
Lead	9-31
Manganese	192-752
Mercury	0.02-0.11
Nickel	7-32
Selenium	0.09-0.56
Silver	0.1-0.4
Thallium	0.1-0.4
Tin	0.4-1.9
Vanadium	36-136
Zinc	31-98

The TOX data are presented in Appendix E, page E-175. No TOX were detected. The TFH data are presented in Appendix E, page E-176. No TFH compounds were detected.

The objective of this investigation was to characterize soil conditions in the former roundhouse area. In general, oil-stained soil appeared close to the railroad tracks in test pits B-3 (12 to 36 inches), B-4 (10 to 24 inches), and B-12 (0 to 11 inches) as well as far from the railroad tracks in test pits B-1 (15 to 29 inches), B2 (4 to 24 inches), B-5 (18 to 38 inches), B-6 (6 to 20 inches), and B-10 (0 to 20 inches). No TOX or TFH compounds were detected. Two volatile compounds were detected without being an estimated quantity (no J flag) or without being detected in the blank (no B flag). These two compounds appear in test pits closer to the railroad tracks (Figure 4-1): acetone in B-11B and 12A and 2-butanone in B-4C. Twelve semivolatile compounds were detected without being an estimated quantity (no J flag). These 12 compounds include fluoranthene, benzo(a)anthracene, chrysene, benzo(a)pyrene, pyrene, phenanthrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, anthracene, indeno(1,2,3)pyrene, and dibenz(a,h)anthracene. These PAHs appear in seven of the 12 test pits (Figure 4-1); four test pits were closer to the railroad tracks (B-3, 4, 7, and 8) and three test pits were farther from the railroad tracks (B-6, 9, and 10). All the highest concentrations of the 12 semivolatile compounds appear in test pits closer to the railroad tracks (B-3 and 7). The highest concentrations of contaminants in test pit B-3 appear in the middle sample interval (12 to 72 inches) and the highest concentrations of contaminants in test pit B-7 appear in the top interval (0 to 12 inches). The semivolatile analyses did not detect contamination of the bottom interval (84 to 127 inches) of any of the 12 test pits.

The volatile analyses results are not significant enough to represent a concern at the site. The contamination visually observed indicates a distribution of possibly contaminated soil throughout the former roundhouse area. The semivolatile analyses indicate that test pits closer to the railroad tracks have higher concentrations of contaminants. The analyses indicate a total of seven test pits have contamination and four of the seven test pits are closer to the railroad tracks. The semivolatile analyses indicate no contamination directly above the water table in any test pit. There is an indication that previous railroad activities may have contributed to local surface and subsurface soil contamination based on this analytical data. The fact that no lower interval samples indicated contamination can mean that no contamination reached the water table or that contamination reached the water table and was flushed from the soils. Section 4.3, Groundwater Investigation, also discusses the former roundhouse as a potential source based on groundwater analyses.

4.1.2 Old Drainage Channel

The old drainage channel was sampled April 18, 1990, by a three-person sampling team, including Kim Connors, Julie Flammang, and Meg Babits, MSE. Visitors included John Brady-Finke, IPC. Using historic plans, the approximate location of the old drainage channel, which originated from the depot, was surveyed at the IPC Site. Both test pits (Table 4-6) were located

TABLE 4-6

OLD DRAINAGE CHANNEL TEST PIT INFORMATION

Sample Number	Sample Depth (in.)
SSC1A	0-12
SSC1B	12-56
SSC1C	56-80
SSC2A	0-12
SSC2B	12-36
SSC2C	36-60

in the pasture southeast of the IPC office (Figure 4-1) and both intersected the old drainage channel. The first pit (C1) excavated was the farthest from the roundhouse. The old drainage channel consisted of a clay pipe approximately 4 inches in diameter and was encountered at a depth of 80 inches; water entered the pit through the clay pipe from the western side (closest to the roundhouse). The second pit (C2) was excavated closer to the roundhouse. The same clay pipe was encountered at a similar depth (60 inches); however, water entered the clay pipe from the eastern side. The water had an HNU reading of 6 ppm, and a visible sheen appeared on the water surface as the pit began to fill. A piece of the clay pipe was brought to the surface and a dark, viscous material was observed to be coating the inside (from 0 to 1 inch thick).

A total of six soil samples (C1A,B,C and C2A,B,C) were collected from two test pits. Test pit locations are presented in Figure 4-1. Pits were excavated to the water table (which varied throughout the site) approximately 60 and 80 inches bgs. Sample intervals were surface to 12 inches (A), bottom of test pit to 24 inches above the bottom (C), and a middle interval ranging from 12 to 56 inches (B). Table 4-2 describes sample number designation. Of the six samples, four were submitted for TCL analyses (C1A, C2A, C2B, and C2C) and two were submitted for TOX and TFH, based on the field screen. The HNU readings for the old drainage channel are presented in Table 4-7 and the compounds included in the TCL appear in Table 4-3.

The volatile organic analyses are presented in Appendix E, pages E-160 through E-168. Two compounds were detected without being estimated quantities (no J

TABLE 4-7

DRAINAGE CHANNEL HNU READINGS

Sample No.	Background Reading of Ambient Air (ppm)	Sample Reading (ppm)	Obvious Staining
C1A	2.5	7.5	No
C1B	3.0	3.0	No
C1C	3.0	0	No
C2A	3.0	7.0	Yes
C2B	3.0	6.2	Yes
C2C	3.0	4.5	Yes

flag) and were detected in the lab blank (B flag) including methylene chloride in four samples (17 to 160 ppb) and acetone in two samples (19 to 42 ppb). One compound, acetone, was detected as being an estimated quantity (J flag) and detected in the lab blank in two samples (3 to 4 ppb). Two compounds were detected as being estimated quantities and not detected in the lab blank, including chloroform (4 ppb) and toluene (2 ppb). The semivolatile analyses are presented in Appendix E, pages E-139 through E-159. No semivolatiles were detected.

The trace element metal analyses are presented in Appendix E, pages E-169 through E-174. Two elements were detected without being estimated quantities (no J flag) and above the normal ranges of elemental concentrations (Shacklette and Boerngen, 1984),including lead in one sample (59.5 ppm) and zinc in one sample (117 ppm). Table 4-5 presents normal ranges of elemental concentrations.

The TOX analyses are presented in Appendix E, page E-175. No TOX compounds were detected. The TFH analyses are presented in Appendix E, page E-176. No TFH compounds were detected.

The objectives in the April 1990 sampling of the old drainage channel were to locate the channel and examine the soil. No volatile, semivolatile, TOX, or TFH compounds were detected above the Contract Required Detection Limit (CRDL). The old drainage channel/pipe does not appear to be contributing contamination to the surrounding soil or acting as a conduit for groundwater movement along the outside of the pipe. However, the old drainage channel did have visible contamination on the inside of the clay pipe, indicating that it may be a conduit for contamination.

MSE conducted an additional investigation of the old drainage channel to characterize the dark viscous material inside the clay pipe and to evaluate if the inside of the channel/pipe is or was acting as a conduit for contamination to Rocky Creek or groundwater. On May 30, 1991, MSE personnel intercepted the clay pipe in the old drainage channel at 26 inches bgs. The clay pipe had been previously intercepted in sample locations C1 and C2 in May 1990 with soil samples collected surrounding the exterior of the channel, but the material inside the pipe had not been sampled. The location for the May 30, 1991, sampling (Figure 4-1) was to the east of the locations of previous old drainage channel sample locations (C1 and C2). The clay pipe was broken with a tamping bar. The water from the pipe at this location was not oily and no sludge was found. The excavation was abandoned and bentonite was added and the hole was backfilled. MSE decided to try another location to the west of the previous old drainage sample locations (C1 and C2), which might still have oily water and/or sludge. On June 5, 1991, the clay pipe in the old drainage channel was intercepted at approximately 6 feet bgs (Figure 4-1). The pipe was broken with a tamping bar. The pipe at this location had oily water exiting and there was sludge coating the inside of the pipe (a sludge sample could not be collected because a laboratory was not available). A sample (IPGWC305) of the oily water was collected and analyzed for volatile organics, semivolatile organics, and total metals. This sample contained enough oily material to characterize the sludge inside the clay pipe.

Table 4-8 summarizes the detected organics (volatile and semivolatile) and inorganics concentrations in the water sample. The complete data are presented in Appendix E, volatiles page E-53, semivolatiles E-49, and metals E-56. The objective of characterizing the sludge was not met in the first sampling (May 1991) because that location had no sludge in the pipe. A second sampling was performed and a lab was booked for a water sample. The water sample collected contained a significant amount of oily material.

No volatile organic compounds were detected in the old drainage channel and only a few volatile organics in low concentrations have been detected in Rocky Creek surface water or Rocky Creek sediment or groundwater. The semivolatile compounds detected and their concentrations do not correlate with the compounds and concentrations found downgradient in Rocky Creek surface water, Rocky Creek sediments or groundwater. The metals data are much higher than groundwater concentrations and no similar high metal concentrations are found in Rocky Creek surface water or Rocky Creek sediment. Because concentrations in the old drainage channel do not correlate to those in Rocky Creek surface water or Rocky Creek sediment or groundwater, the old drainage channel is probably not or was not acting as a conduit to Rocky Creek or groundwater. The high metals levels may be from water treatment chemicals (lime and soda ash) used at the BNRR roundhouse (HRA 1988). The conclusion indirectly satisfies one of the original objectives (characterization) and satisfies the second objective (evaluate the drainage channel as a conduit to surface water or groundwater).

TABLE 4-8

OLD DRAINAGE CHANNEL (SAMPLE C3) VOLATILE AND SEMIVOLATILE ORGANICS AND INORGANICS CONCENTRATIONS (ug/L)

Compound	Concentration
2-methylnaphthalene	8J
Acenaphthene	3J
Fluorene	8JX
PCP	13J
Phenanthrene	51
Anthracene	5J
Pyrene	6J
Benzo(a)anthracene	1JX
Chrysene	2J
Aluminum (AL)	105,000
Arsenic (As)	72N
Barium (Ba)	2,120
Beryllium (Be)	6.2
Calcium (Ca)	748,000
Chromium (Cr)	194
Cobalt (Co)	93.1
Copper (Cu)	125
Iron (Fe)	158,000
Lead (Pb)	134+
Magnesium (Mg)	105,000
Manganese (Mn)	3,110
Nickel (Ni)	186
Potassium (K)	33,400
Sodium (Na)	51,700
Vanadium (Vn)	323
Zinc (Zn)	323

J - Estimated concentration.
X - Compound does not meet EPA spectral matching protocol but the chemist believes that the compound is there.
\+ - Correlation coefficient is less than .995 (for MSA).
N - Spike was out of control limits.

4.1.3 Historic Surface Water Bodies

The historic surface water bodies were sampled April 18, 1990, by a three-person sampling team, including Kim Connors, Julie Flammang, and Meg Babits, MSE. Visitors included John Brady-Finke, IPC, Les Lonning, M-C, and Kevin Kirley, MDHES. Using historic vertical aerial photos, the three historic wet areas (Figure 2-2) were surveyed in at the IPC Site. All three areas could be investigated with the backhoe because the areas were not under any bark. Test pit S1 was excavated first, and a visible sheen appeared on the water surface as the pit filled; samples were submitted for TCL analyses. Test pit S2 was excavated second; while no visible sheen appeared, the pit had a strong odor of decomposition or decay with no HNU reading. Test pit S3 was excavated last and had an odor similar to S2 with no HNU reading.

A total of nine soil samples (S1A,B,C through S3A,B,C) were collected from three test pits. Sample collection methods are outlined in the FSP. Test pit locations are presented in Figure 4-1. Pits were excavated to the water table (which varied throughout the site) approximately 77 to 100 inches bgs (Table 4-9). Sample intervals were surface to 12 inches (A), bottom of test pit to 24 inches above bottom (C), and a middle interval ranging from 12 to 76 inches (B). Table 4-2 describes sample number designations. Of the nine samples, six were submitted for TCL analyses and three were submitted for TOX and TFH (S2A, B, and C) based on the field screen. The HNU readings for the historic surface water bodies are presented in Table 4-10 and the compounds included in the TCL appear in Table 4-3.

TABLE 4-9

HISTORIC SURFACE WATER BODIES TEST PIT INFORMATION

Sample Number	Depth (in.)
SSS1A	0-12
SSS1B	12-60
SSS1C	60-84
SSS2A	0-12
SSS2B	12-76
SSS2C	76-100
SSS3A	0-12
SSS3B	12-48
SSS3C	48-72

TABLE 4-10

HISTORIC SURFACE WATER BODIES
HNU READINGS

Sample No.	Background Reading of Ambient Air (ppm)	Sample Reading (ppm)	Obvious Staining
S1A	2.4	4.8	Yes
S1B	3.0	0	Yes
S1C	2.0	0	Yes
S2A	3.0	0	No
S2B	2.5	0	No
S2C	2.5	0	No
S3A	2.0	6.0	No
S3B	2.5	6.0	No
S3C	2.2	6.8	No

The volatile analyses are presented in Appendix E, pages E-93 through E-95. Three compounds were detected without being estimated (no J flag) and were detected in the lab blank (B flag), including methylene chloride in six samples (17 to 84 ppb), acetone in four samples (13 to 53 ppb), and chloroethane in one sample (27 ppb). One compound, acetone, was detected as being an estimated quantity (J flag) and was detected in the lab blank (B flag) in one sample (17 ppb).

The semivolatile analyses are presented in Appendix E, pages E-86 through E-92. Sixteen compounds were detected without being estimated (no J flag), including pentachlorophenol in one sample (17000 ppb), fluoranthene in one sample (4500 ppb), benzo(a)anthracene in one sample (1100 ppb), benzo(a)pyrene in one sample (580 ppb), benzo(b)fluoranthene in two samples (610 to 4300 ppb), benzo(k)fluoranthene in two samples (610 to 4300 ppb), chrysene in one sample (1500 ppb), pyrene in two samples (960 to 4000 ppb), 2-methylnaphthalene in two samples (1300 to 18000 ppb), naphthalene in one sample (1800 ppb), 4-nitrosodiphenylamine in one sample (4600 ppb), acenaphthalene in one sample (3500 ppb), anthracene in one sample (830 ppb), fluorene in one sample (3700 ppb), phenanthrene in two samples (820 to 6600 ppb), and acenaphthene in one sample (610 ppb). Eighteen compounds were detected as being estimated quantities (J flag), including pentachlorophenol in two samples (74 to 10000 ppb), fluoranthene in two samples (96 to 230 ppb), benzo(a)anthracene in two samples (59 to 180 ppb), benzo(a)pyrene in two samples (49 to 240 ppb), benzo(b)fluoranthene in one sample (120 ppb), benzo(k)fluoranthene in one sample (120 ppb), chrysene in two samples (80 to 400 ppb), pyrene in one sample (130 ppb), dibenzofuran in one sample

(310 ppb), naphthalene in one sample (180 ppb), bis(2-ethylhexyl)phthalate in two samples (51 to 81 ppb), acenaphthalene in one sample (280 ppb), anthracene in one sample (150 ppb), benzo(g,h,i)perylene in two samples (120 to 170 ppb), fluorene in one sample (340 ppb), indeno(1,2,3-cd)pyrene in two samples (130 to 210 ppb), diethylphthalate in one sample (78 ppb), and dibenz(a,h)anthracene in one sample (73 ppb).

The trace element metal analyses are presented in Appendix E, pages E-96 and E-97. Three elements were detected without being estimated quantities (no J flag) and above the normal elemental concentrations (Shacklette and Boerngen 1984), including lead in one sample (70.1 ppm), mercury in four samples (.13 to .54 ppm), and zinc in one sample (102 ppm). Table 4-5 lists normal ranges of elemental concentrations.

The TOX analyses are presented in Appendix E, page E-175. No TOX were detected. The TFH data are presented in Appendix E, page E-176. No TFH compounds were detected.

The objective of the historic surface water bodies soil sampling was to characterize the locations as possible disposal sites. The volatile compounds were either detected as being estimated (J flag) or were detected in the blank (B flag). Sixteen semivolatile compounds were detected without being estimated (no J flag) and were detected in only one test pit (S1), which is adjacent to the retort building. The lower interval has higher concentrations of contaminants and 14 of the 16 compounds detected are found in this interval (the middle interval has six of the 16 compounds). No TOX or TFH compounds were detected.

The interpretation of the semivolatile analyses indicates that the S2 and S3 historic surface water bodies are probably not sources of contamination. The S1 historic surface water body has contamination in the lower (60 to 84 inches) and, to a lesser extent, the middle interval of the test pit (12 to 60 inches). Two scenarios exist for this pit: first, this historic surface water body received contamination and fill was placed on top; or second, the contamination reached the water table at another location and is contaminating the soil at S1 with the fluctuation of the water table. Because this historic surface water body is adjacent to the retort building (a site of at least one PCP spill), the second scenario is more likely. Section 4.3, Groundwater Investigation, discusses the historic surface water bodies as a potential source based on groundwater analyses.

4.1.4 LNAPL

4.1.4.1 Subsurface LNAPL Investigation

The LNAPL was sampled May 1 and 2, 1990, by a two-person sampling team, including John Ruth and Meg Babits, MSE. Visitors included Bob Miller, Hydrometrics, a landowner, Gene Munson, GCM, and John Brady-Finke, IPC. Four LNAPL samples were planned to be collected from monitoring wells according to the Work Plan for the IPC Site. The LNAPL is a wood-treating preservative (diesel fuel and pentachlorophenol). A sample was collected from MW-5A only.

The PVC casing of MW-14A had broken off at ground surface, and the wet spring conditions created standing water inside the steel casing. Surface water was entering the well, and it was not sampled. The south pressure plant recovery well and MW-3A did not have any measurable product to sample (see Figure 4-1). Only a slight sheen existed on the water surface. MW-5A had a product layer 0.005-feet thick using an interface probe. A decontaminated teflon bailer was sent down the well and emptied into a decontaminated stainless steel bucket. LNAPL was skimmed off the top of the bucket with a decontaminated teflon beaker and put into sample bottles. The sample submitted was a combination of water and LNAPL because of the difficulty in separating the two.

Five LNAPL samples were planned to be collected from test pits according to the Work Plan for the IPC Site. However, although six test pits (Table 4-11) were excavated, a sample was collected from TP-5 only. TP-1 encountered no LNAPL at its planned location, and it was decided not to excavate closer to MW-15A, where LNAPL was observed, because many underground lines run in the area (Figure 4-1). TP-2 was excavated closer to MW-5A than planned because previous test pits (TP-3, 4, and 5) indicated the LNAPL plume was narrower than previously thought. TP-2 encountered no LNAPL, and it was decided not to excavate closer to MW-5A because the office interceptor ditch, which has LNAPL, was 68 feet to the east. TP-3 did not encounter LNAPL in its planned location, and it was decided not to excavate closer to MW-14A, where LNAPL had been observed in the past, because standing water in the area indicated where LNAPL began and ended. TP-4 did not intercept LNAPL in its planned location, and it was decided not to move closer to MW-14A because it appears that the LNAPL is confined to the swampy, willow/sedge grove adjacent to the IPC

TABLE 4-11

SUBSURFACE LNAPL TEST PIT INFORMATION

Test Pit Number	Depth (in.)
TP-1	50
TP-2	90
TP-3	24
TP-4	57
TP-5	60
TP-6	102

pasture. It is not clear how far downgradient the LNAPL plume has migrated beyond MW-14A because the backhoe could not access the swamp. TP-5 was excavated closer to MW-14A than planned, and LNAPL was encountered but not measurable with an interface probe. The LNAPL was collected by skimming a decontaminated teflon beaker on the LNAPL/water surface and emptying into sample bottles. A test pit, TP-6, was added approximately 200 feet southeast from TP-5, and no LNAPL was encountered.

A total of two LNAPL samples (AG5A and TP5) were collected from one test pit and one well. Sample collection methods are outlined in the FSP. Locations are presented in Figure 4-1. The two samples were submitted for TCL, TAL and dioxin/furan analyses. Table 4-3 lists the compounds included in the TCL. However, the lab erred and, contrary to the request on the traffic report, one TCL sample (TP5) did not have metals analyzed and only 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) was analyzed. The HNU readings for AG5A and TP5A were both 0 ppm.

The volatile organic analyses are presented in Appendix E, pages E-160 through E-162 and E-163 through E-165. Three compounds were detected as being estimated quantities (J flag), including methylene chloride in one sample (3 ppb), toluene in two samples (1 ppb), and tetrachloroethene in one sample (2 ppb). Two compounds were detected without being estimated (no J flag), including ethylbenzene in one sample (6 ppb) and total xylenes in one sample (13 ppb).

The semivolatile organics analyses are presented in Appendix E, pages E-139 through E-145 and pages E-153 through E-159. Nine compounds were detected as being estimated quantities (J flag), including pyrene in one sample (770000 ppb), benzo(a)anthracene in one sample (220000 ppb), anthracene in one sample (520000 ppb), fluoranthene in one sample (730000 ppb), acenaphthylene in one sample (680000 ppb), dibenzofuran in one sample (2800000 ppb), chrysene in one sample (340000 ppb), benzo(b)fluoranthene in one sample (200000 ppb), and naphthalene in one sample (360000 ppb). Twelve compounds were detected without being estimated (no J flag), including 2-methylnaphthalene in two samples (3900 and 450000 ppb), acenaphthylene in one sample (850 ppb), dibenzofuran in one sample (340 ppb), fluorene in one sample (700 ppb), pentachlorophenol in one sample (6800 ppb), phenanthrene in two samples (1500 and 3200000 ppb), pyrene in one sample (860 ppb), benzo(a)anthracene in one sample (260 ppb), chrysene in one sample (450 ppb), anthracene in one sample (260 ppb), fluoranthene in one sample (860 ppb), and benzo(b)fluoranthene in one sample (700 ppb).

The trace element metal analyses are presented in Appendix E, pages E-169 through E-171. Three elements were detected as being estimated quantities (J flag) and above the normal ranges of elemental concentrations (Shacklette and Boerngen, 1984), including cadmium (3 ppb), mercury (.2 ppb), and silver (3 ppb). One element, copper, was detected without being estimated (no J flag) and above the normal elemental concentrations (65.6 ppb). Table 4-5 lists the normal ranges of elemental concentrations.

The 2,3,7,8-TCDD analyses are presented in Appendix E, page E-136. No 2,3,7,8-TCDD was detected.

The objectives of the May 1990 LNAPL investigation were to obtain additional information on the thickness, chemical characteristics, and extent of the LNAPL plume. Two volatile compounds were detected without being estimated (no J flag); ethylbenzene and total xylenes both appeared in TP-5. Twelve compounds were detected without being estimated (no J flag) and appeared mostly in Well 5A. As stated previously, it appears from this investigation that the width of the LNAPL plume is confined to approximately the willow/sedge grove on the north side of I-90 and from approximately the west end of the office interceptor ditch to approximately Well 15A on the south side of I-90. The LNAPL begins approximately at Well 3A and the end on the north side of I-90 is unknown. Because the objective of defining the extent of the LNAPL plume was not met, additional work as outlined in Technical Memorandum 4, the Additional Sampling Plan (MSE, 1991m) was performed in April and June 1991, see Section 4.1.4.2.

4.1.4.2 LNAPL Plume Location

MSE conducted the LNAPL plume location investigation to determine the northern extent of the LNAPL plume and the east and west dimensions under I-90. On April 29 and 30, 1991, MSE personnel began investigating the LNAPL plume location in the IPC pasture on the corner of L Street and Bohart Lane (Figure 4-2). Transect lines were laid out on an east-west line. Spacing for boreholes on the transect line was 20 feet with Well 14 being the zero-

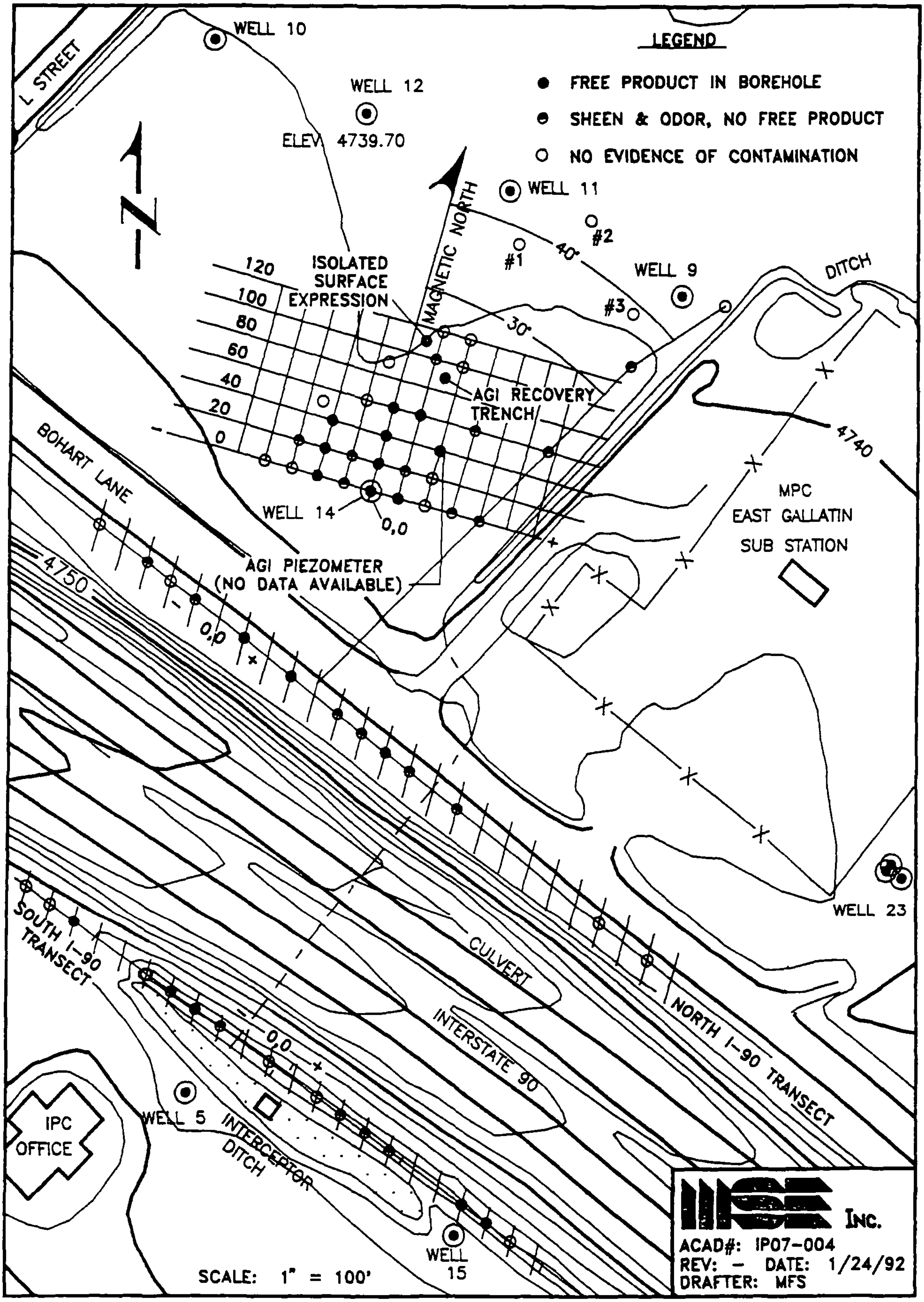


FIGURE 4-2

NAPL BOREHOLE LOCATION MAP

zero location. Boreholes were drilled along six east-west lines (0, 20, 40, 60, 100, and 120). Twenty-four boreholes were drilled in this grid. During the April 29 and 30, 1991, investigation, the LNAPL was observed as occurring in a very patchy pattern, as opposed to a continuous surface. On June 6, 1991, MSE personnel returned to the pasture boreholes to drill some of the same borehole locations deeper. It was found when drilling the I-90 transect investigation (see following paragraphs) that the LNAPL is not always limited to floating on top of the water table but is also found intermittently below a clay layer approximately 10 feet bgs. Five boreholes were redrilled at this time. All the borehole cross sections from the 24 pasture boreholes are presented in Figures 4-3 through 4-8. Bore logs are not presented for 0-0 or 40-20 because 0-0 is MW-14 and 40-20 is an IPC installed piezometer. Characterization of the pasture area LNAPL was completed on June 14, 1991. Four boreholes were drilled parallel to the MPC Substation ditch (Figure 4-2) outside of the grid pattern to assist in defining the eastern extent of contamination. These four borehole cross sections are presented in Figure 4-9. Boreholes 40+0 and 60+0 were drilled deeper than originally planned on April 30, 1991. LNAPL was detected from the lower depths where nothing was found previously. Three additional holes were drilled along the western edge of the pasture LNAPL plume to complete the determination of the extent of the plume on this side. These three borehole cross sections are presented in Figure 4-10.

On May 30, 1991, MSE personnel began investigating the LNAPL plume as it flows under I-90 (the south side of I-90). Fifteen boreholes were drilled parallel to the south side of I-90. The 15 borehole cross sections are presented in

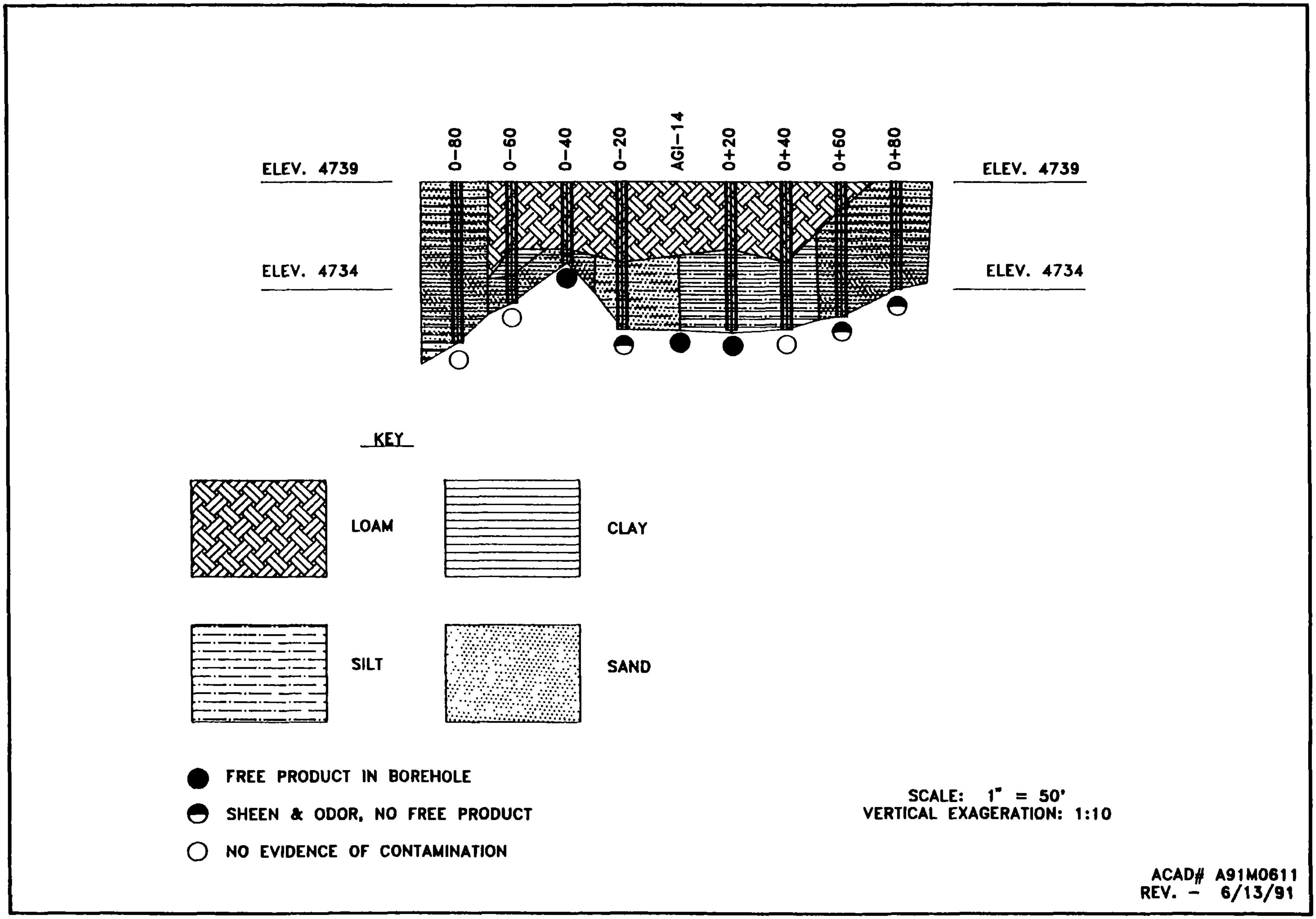


FIGURE 4-3 BOREHOLE CROSS-SECTION, PASTURE TRANSECT "O"

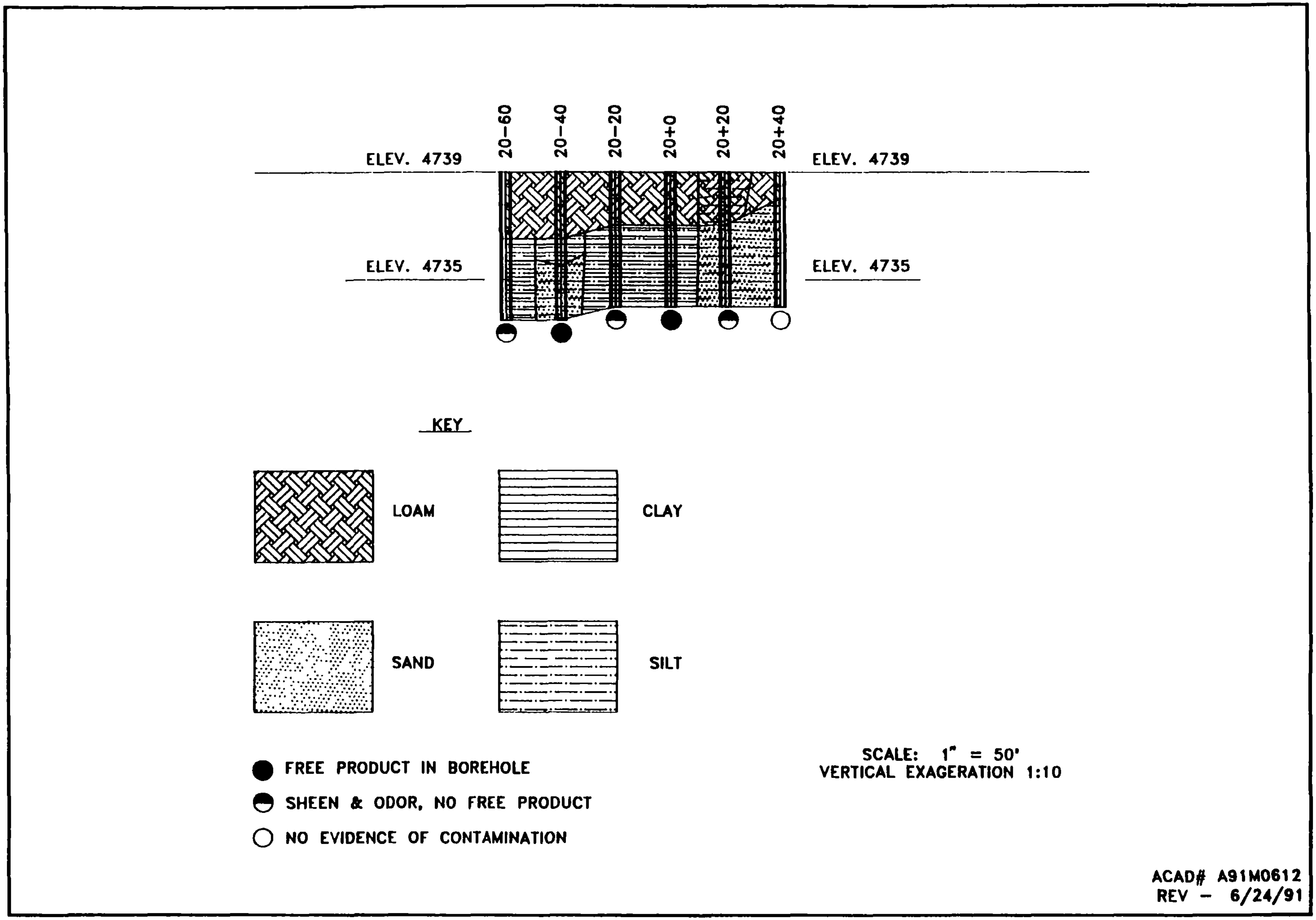


FIGURE 4-4 BOREHOLE CROSS-SECTION, PASTURE TRANSECT "20"

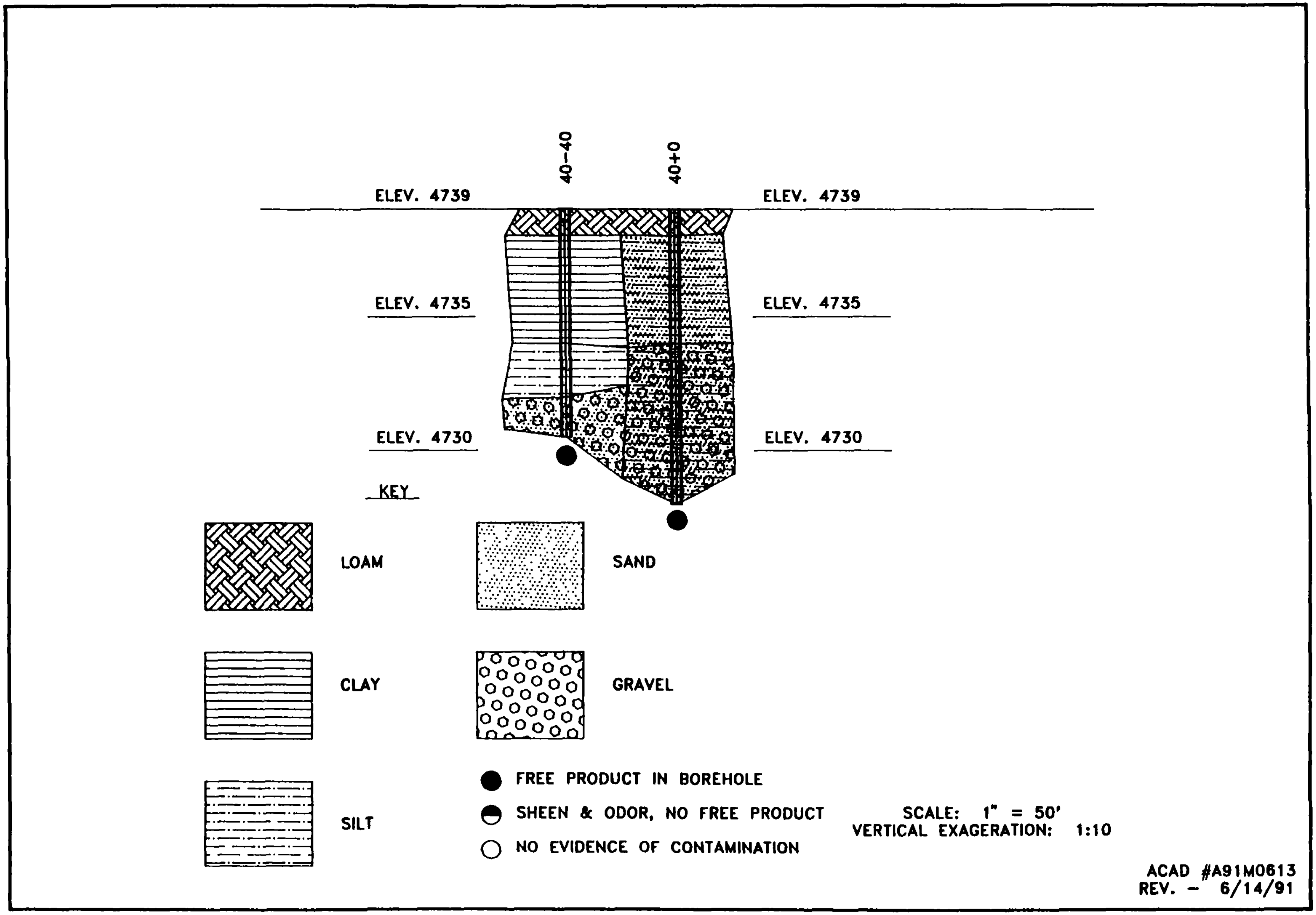
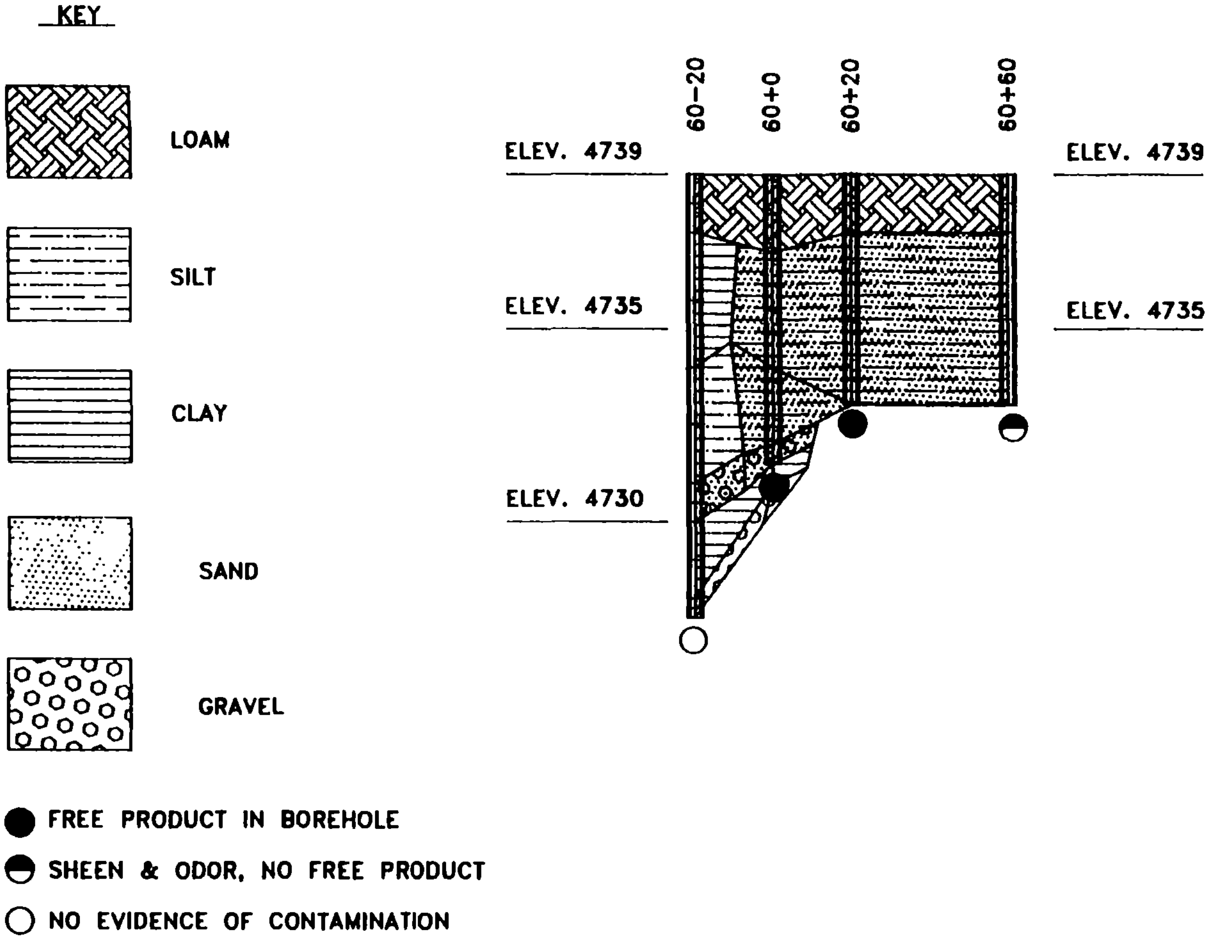


FIGURE 4-5 BOREHOLE CROSS-SECTION, PASTURE TRANSECT "40"



SCALE: 1" = 50'
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FIGURE 4-6 BOREHOLE CROSS-SECTION, PASTURE TRANSECT "60"

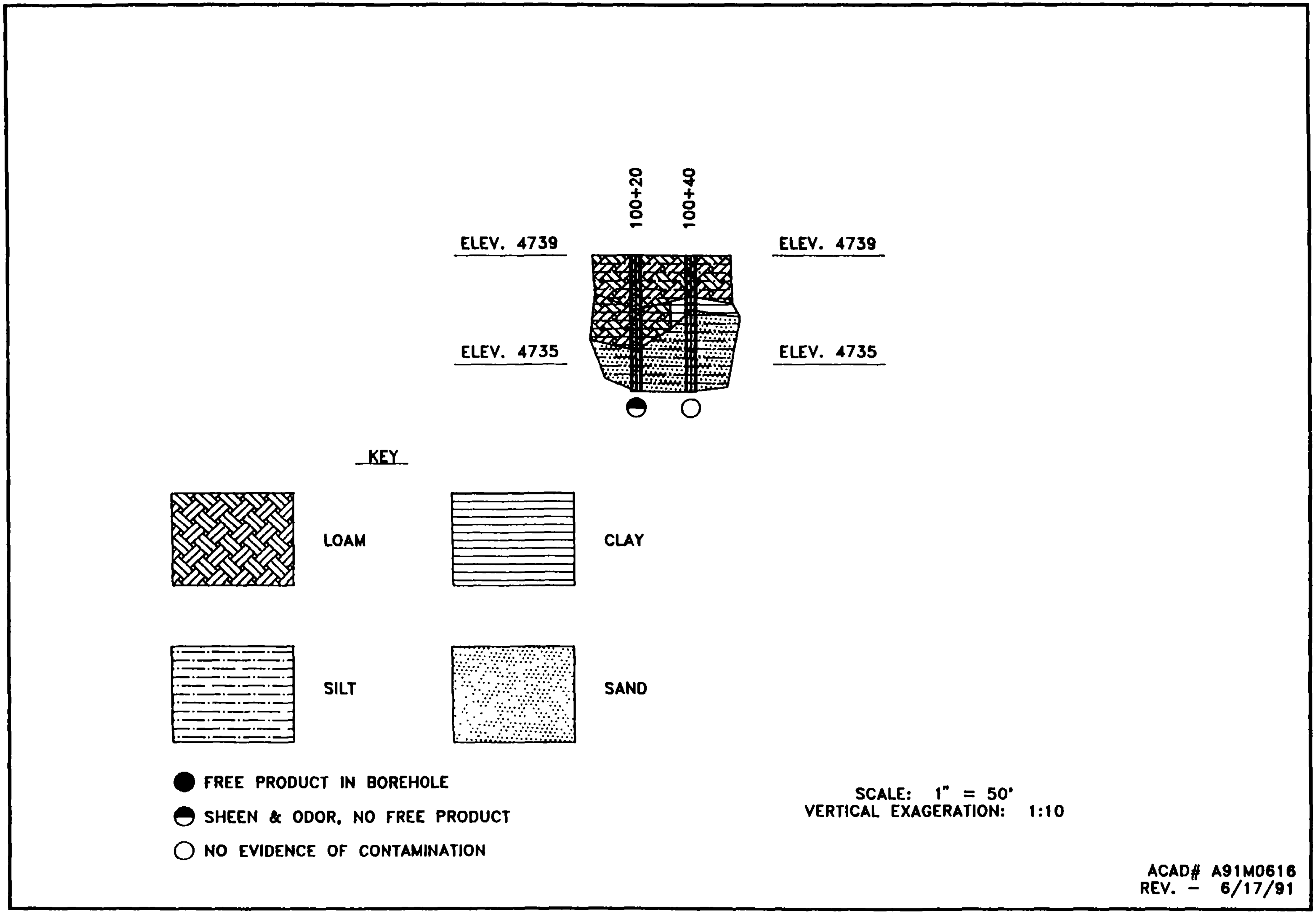

FIGURE 4-7 BOREHOLE CROSS-SECTION, PASTURE TRANSECT "100"

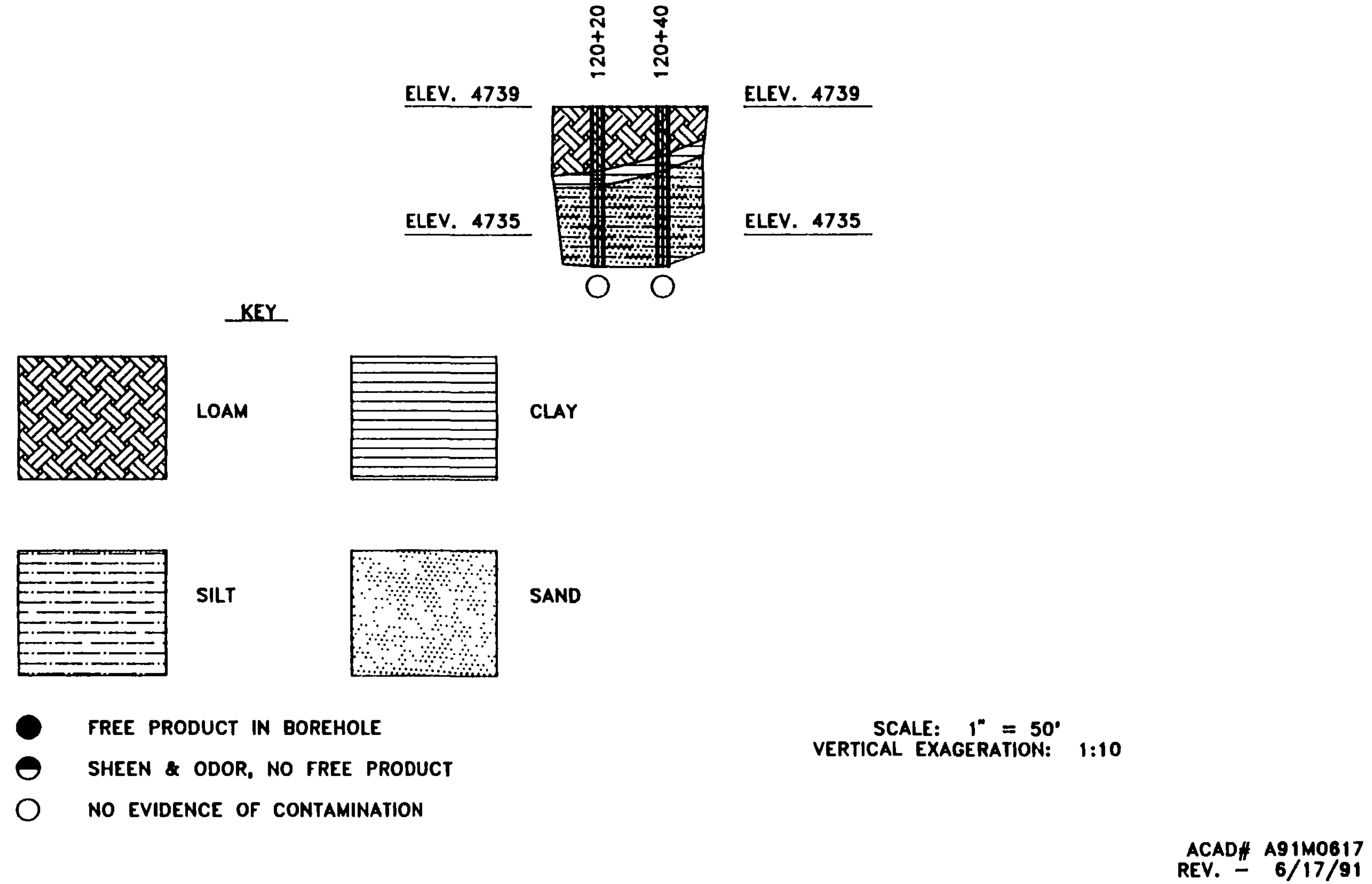

FIGURE 4-8 BOREHOLE CROSS-SECTION, PASTURE TRANSECT "120"

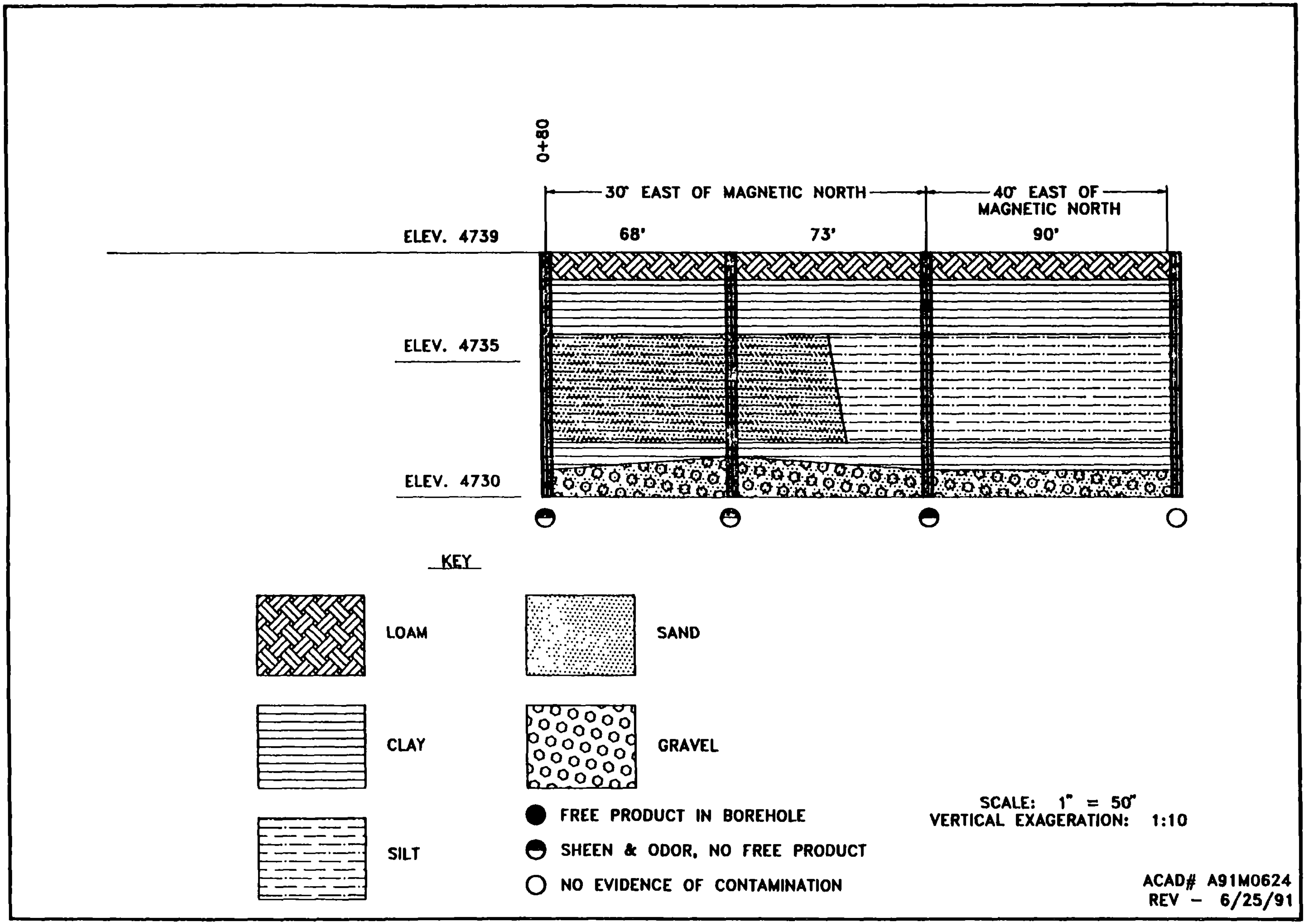

FIGURE 4-9 BOREHOLE CROSS-SECTION, DRAINAGE DITCH

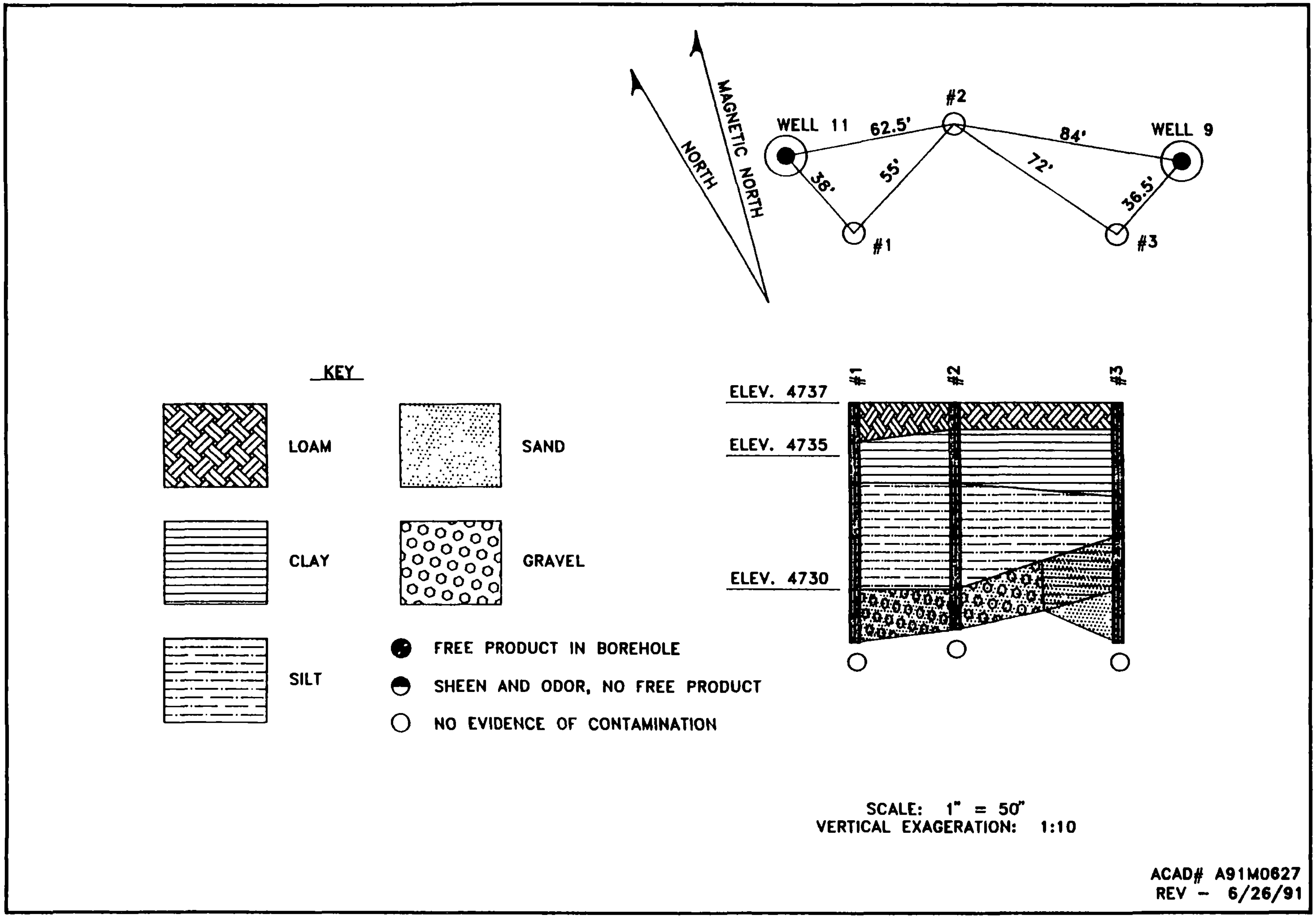

FIGURE 4-10 BOREHOLE CROSS-SECTION, NORTH OF PASTURE

Figure 4-11. On May 31, 1991, MSE personnel began investigating the LNAPL plume as it flows from under I-90 (the north side of I-90). Thirteen boreholes were drilled parallel to the north side of I-90. The 13 borehole cross sections are presented in Figure 4-12.

It appears from the boreholes in the IPC pasture, the south side of I-90, and the north side of I-90 that the LNAPL in most cases flows on top of the water table. In some anomalous cases, however, the LNAPL is below a confining clay layer at approximately 10 feet bgs. Contamination (sheen or odor) absent of free LNAPL is consistently associated with the deeper clay unit, indicating more wide-spread presence of LNAPL at this depth than actually found.
Figure 4-2 indicates the northern boundary of the LNAPL plume approximately 100 feet north of Well 14 (partially in the willow/sedge grove) towards Well 11. The figure also indicates south of I-90 the LNAPL plume extends 60 feet to the west of the interceptor ditch (not west of IPC property) and 20 feet east of Well 15; north of I-90 the LNAPL plume extends east 40 feet short of the culvert, which brings water to the MPC Substation ditch, and to approximately 160 feet west of the culvert.

4.1.4.3 Surface LNAPL Investigation

MSE conducted the surface LNAPL investigation to relate the LNAPL on the ground surface in the willow/sedge grove to LNAPL produced by the IPC. Two samples of LNAPL, which intersect the ground surface (N1 and N2) in the IPC pasture on Bohart Lane and L Street (Figure 4-13), and one sample of LNAPL

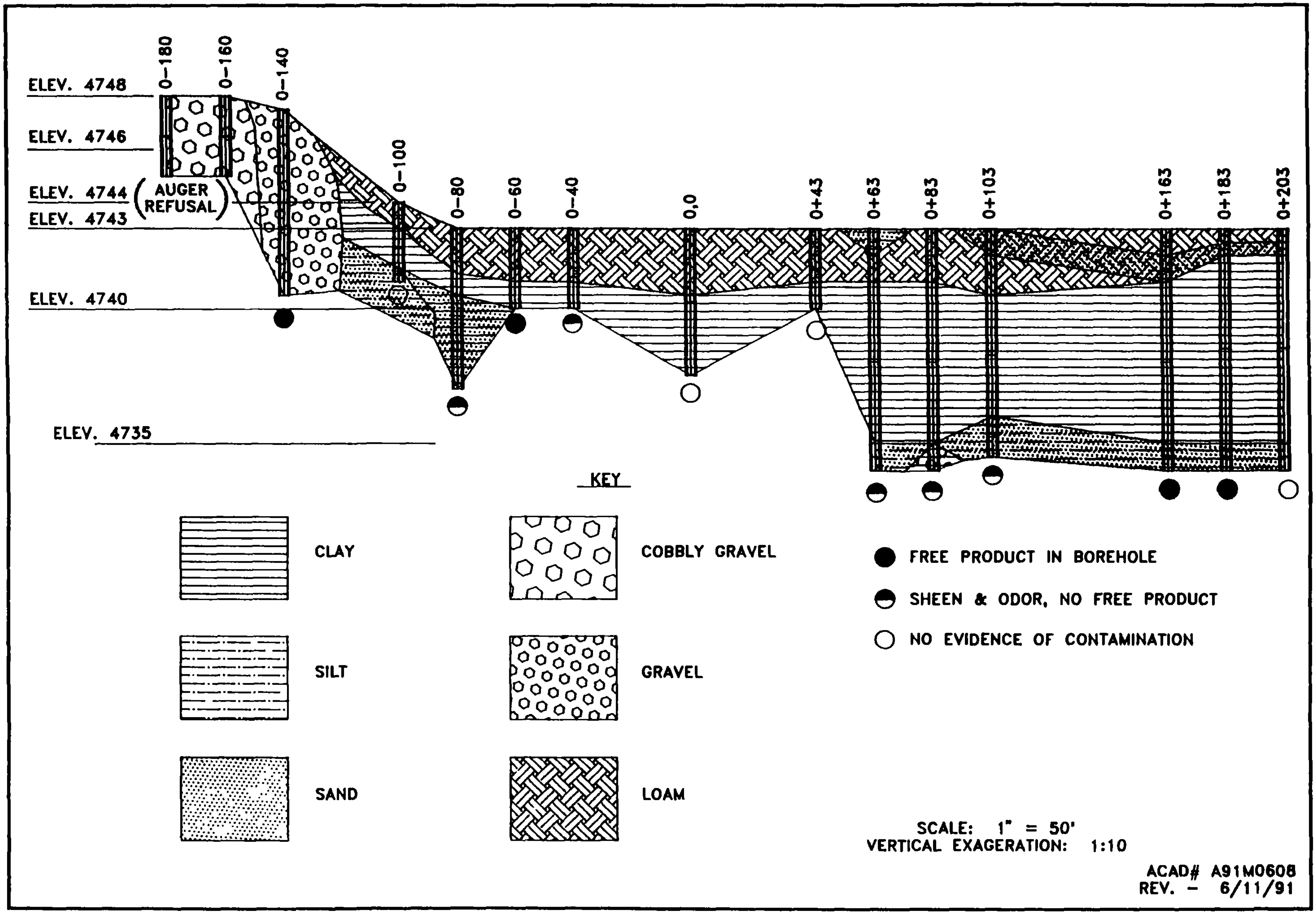

FIGURE 4-11 BOREHOLE CROSS-SECTION, SOUTH I-90 TRANSECT

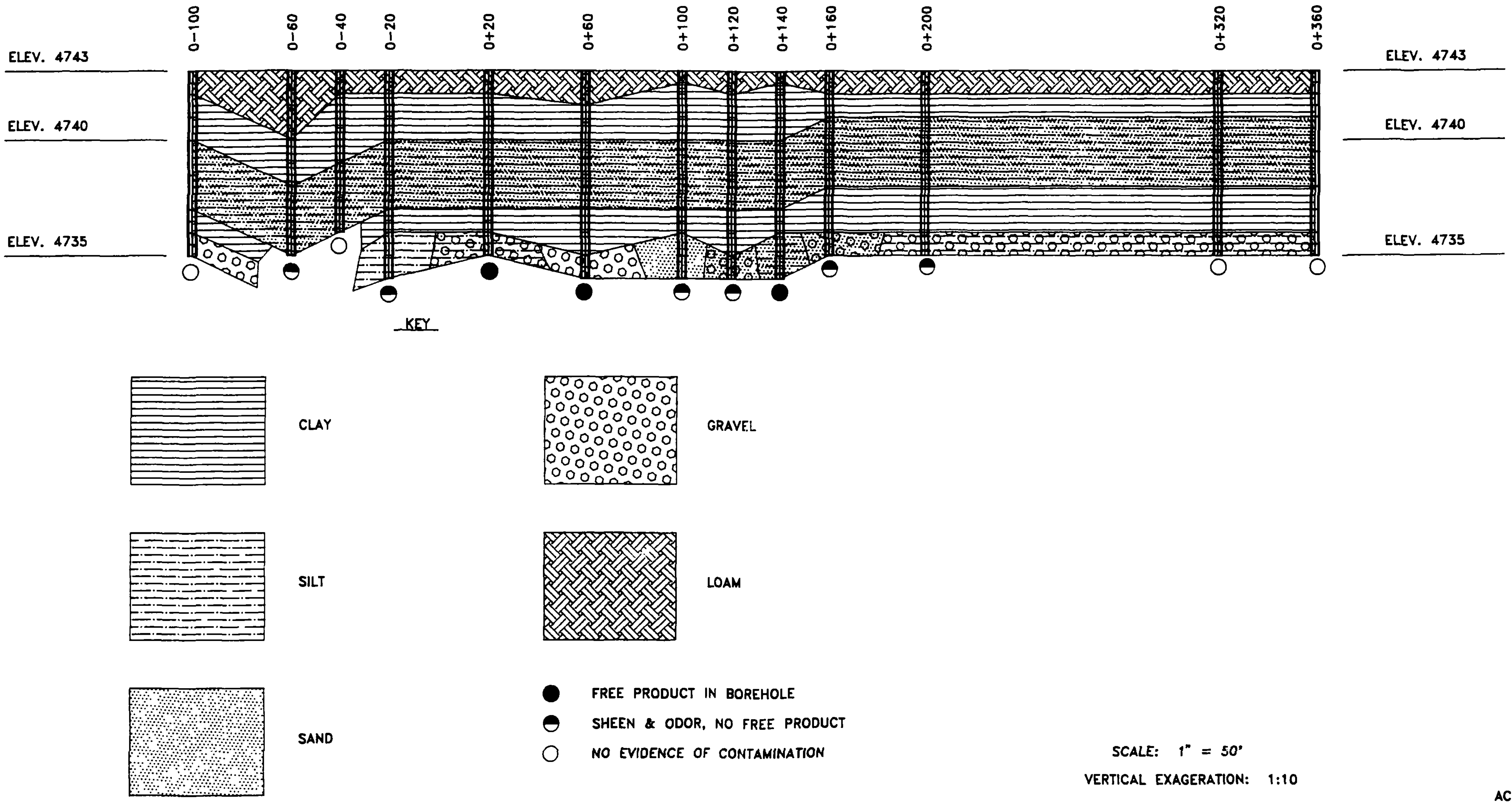

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FIGURE 4-12 BOREHOLE CROSS-SECTION, NORTH I-90 TRANSECT

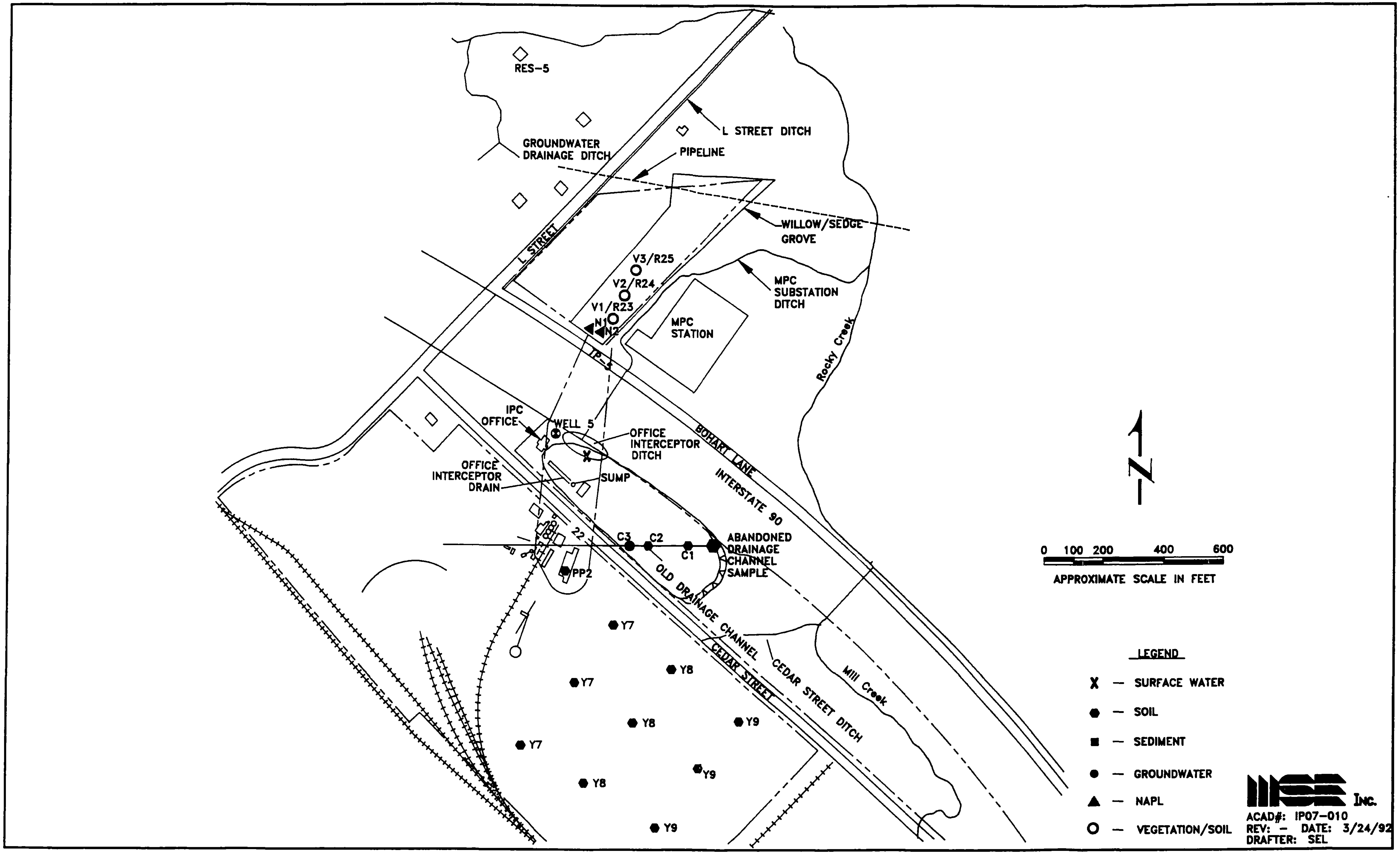


FIGURE 4-13 -- SOIL, VEGETATION AND NAPL INVESTIGATION STATIONS from Well 5A (AGI5A2) were collected on April 25, 1991. N1 and N2 were analyzed for phenols, PAHs, and dioxins/furans. AGI5A2 was sampled for dioxin/furans only; phenols and PAHs were previously analyzed in May 1990 (see Section 4.1.4.1). Table 4-12 summarizes the PCP and total B2 carcinogenic PAHs. The complete data are presented in Appendix E, phenols pages E-118 and E-119, PAHs pages E-134 and E-135, dioxins page E-137, and furans page E-138. Total B2 carcinogenic PAHs include benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. A total of the B2 carcinogenic PAHs was achieved by adding the seven individual compounds. If a qualifier ("J" flag) existed for one or more of the seven compounds, it was reported with the total. Data with other qualifiers ("U" or "R") were not added into the total. PCP and B2 carcinogenic PAHs were chosen for

TABLE 4-12

NAPL PCP, TOTAL B2 CARCINOGENIC PAHs, TOTAL TCDD, AND TOTAL TCDF CONCENTRATIONS (ppb)

SAMPLE NUMBER	PCP	B2 PAHS	TOTAL TCDD	TOTAL TCDF
N1	280,000 J	283,000 J	ND(38.9)	1,130.0
N2	170,000 J	231,700 J	ND(33.1)	991.0
AGI5A2	NS	NS	ND(7.1)	246.0
AG5A (5/90)	6,800	2,130 J	NS	NS

ND(##) - None Detected (detection limit).
NS - Not sampled.
J - Estimated concentration because of the poor lab surrogates, method blanks, and internal standards.

presentation because they represent the primary compounds upon which the risk assessment and remedial cleanup will be based. Also included in the table are total TCDD and total tetrachlorodibenzofuran (TCDF). The similarity between onsite LNAPL in Well 5A and offsite LNAPL in the pasture is that PCP was the only phenol detected in Well 5A and in samples N1 and N2 and all PAHs in Well 5A were detected in LNAPL in the pasture (4 PAHs in the pasture did not appear in Well 5A). However, the PCP and PAH concentrations in the surface LNAPL in the pasture are much higher than those found in Well 5A in May 1990. The higher levels of contaminants are possibly due to concentration in the surface expressions with the yearly rise and fall of the water table. The similarity in compounds detected in Well 5A and in the LNAPL in the pasture does allow a relationship between the two occurrences.

4.1.4.4 Vegetation Investigation

MSE conducted the vegetation investigation to determine if NAPL on the ground surface is entering the food chain. Three vegetation samples (V1, V2, and V3) and three soil samples (R23, R24, and R25) were collected in the IPC pasture (Figure 4-13) on Bohart Lane and L Street on April 25, 1991. Each vegetation sample was paired with a 12-inch depth (V1 paired with R23, etc.) soil sample collected beneath the vegetation sample. The vegetation and soil samples were analyzed for phenols, PAHs, and dioxins/furans. The complete data are presented in Appendix E, phenols pages E-118 and 119, PAHs E-134 and E-135, dioxins page E-137, and furans page E-138. Table 4-13 summarizes the PCP, total B2 carcinogenic PAHs, total TCDD, and total TCDF concentrations.

TABLE 4-13

VEGETATION AND SOIL PCP, TOTAL B2 CARCINOGENIC PAHs, TOTAL TCDD, AND TOTAL TCDF CONCENTRATIONS (ppb)

SAMPLE NUMBER	PCP	B2 PAHS	TOTAL TCDD	TOTAL TCDF
V1	ND (6,000)	ND	ND (0.046)	ND(0.05)
V2	ND (5,000)	ND	ND (0.095)	ND(0.14)
V3	ND (10,000)	ND	ND (0.1)	ND(0.075)
R23	1,100	ND	ND (0.12)	ND(0.09)
R24	ND (760)	ND	ND (0.018)	ND(0.043)
R25	ND (350)	ND	ND (0.025)	ND(0.037)

ND - None detected.
ND(##) - None detected; detection limit.

The data indicate that the soil in the most visually contaminated area of the IPC pasture (R23) contains PCP. The vegetation does not seem to be taking up the PCP, however, the relatively high detection limits create difficulty in assessing uptake. Hence, the objective of determining uptake must be met via use of transfer coefficients acquired from the literature.

4.1.4.5 Pipe at Office Interceptor Ditch

MSE conducted the investigation of the pipe at the office interceptor ditch to determine where the pipe originates. A white perforated plastic pipe enters the office interceptor ditch just east of the metal shed, which is located in the middle of the office interceptor ditch. The plastic pipe enters the ditch at approximately 4 feet bgs (the bottom of the office interceptor ditch is approximately 7 feet bgs). When the water table is lowest, LNAPL can be seen discharging to the office interceptor ditch from the plastic pipe. When the pipe was thought to be metal, MSE planned to determine where the pipe originated by excavating along the orientation of the pipe. However, it was decided not to excavate because the plastic pipe could be broken easily. When the water table is low, the plastic pipe reportedly can be seen in the sump at the office interceptor drain. However, the water table had not lowered and an alternative method of confirming the origin of the pipe had to be made.

On September 14, 1991, an MSE employee descended into the 8 feet bgs sump at the office interceptor drain. Approximately 2 feet of an oil/water mixture existed in the bottom of the sump. A search was made for the white perforated plastic pipe but it was not found. The only pipes entering the sump were the 24-inch culvert from the interceptor drain and a 4-inch solid PVC pipe entering from the aeration basin. Hence, the origin of the white perforated pipe still had to be determined.

On September 20, 1991, a metal tape (flat fish tape) was inserted in the open end of the white perforated pipe at the interceptor ditch. The tape travelled 75 feet before stopping. A tone was then put on the wire and an attempt was made to locate the pipe using the tone. However, the pipe was too far bgs and the wire too small to read the tone.

Finally, an IPC employee was found who actually helped install the white perforated plastic pipe. The employee stated the pipe was installed as a recovery system. The pipe begins at the southwest corner of the aeration basin and runs parallel to the aeration basin (east side) then heads to the interceptor ditch at the northwest corner of the aeration basin. The pipe was packed in sand and backfilled with dirt.

4.1.5 Bark Investigation

4.1.5.1 Bark Pile

The bark pile (Figure 4-1) was not sampled because the drill rig could not access the soft top of the bark pile. It was decided to wait for the analytical results from MW-2A before sampling the bark pile. MW-2A is located directly downgradient of the bark pile and, if contamination was detected in MW-2A, portions of the bark pile would be bulldozed to allow sampling from the ground surface.

Wells 2A and B were installed by the IPC during their 1984 investigation and are located in the bark pile; Well 2A was sampled by MSE for volatiles, semivolatiles, and metals in May 1990. Methylene chloride was the only volatile detected (290 ppb) and this compound was also detected in the lab blank; butylbenzylphthalate was the only semivolatile detected (4 ppb). Wells 2A and B were sampled by MSE for phenols and PAHs in August 1990; phenolic or PAH compounds were not detected. Wells 2A and B were sampled by MSE for phenols and PAHs in November 1990. Well 2A had no phenolic compounds, but chrysene at 30.82x and benzo(k)fluoranthene at 2.59x ppb were detected; however, the MSE data review identified these values as suspected carry-over from a contaminated sample that was analyzed earlier. Well 2B had phenol detected at 0.72x ppb and chrysene at 18x ppb; however, MSE data review identified these values as suspected carry-over from a contaminated sample(s) that was analyzed earlier.

Well 21 was installed by MSE in May 1990 as a screen to test for contamination originating from the historic surface water bodies (another potential source) or the bark pile. Well 21 was sampled by MSE for volatiles, semivolatiles, and metals in May 1990. Methylene chloride was the only volatile detected (4 ppb) and this compound was also detected in the lab blank; no semivolatile compounds were detected. Well 21 was sampled by MSE for phenols and PAHs in August 1990; phenolic or PAH compounds were not detected. Well 21 was sampled by MSE for phenols and PAHs in November 1990; no phenolic compounds were detected and chrysene was detected at 88.5x ppb. MSE data review identified the chrysene value as suspected carry-over from a contaminated sample that was analyzed earlier.

Based on the above analytical data, MSE recommended that the bark pile should not be bulldozed and sampled because the data indicated no contaminant release to groundwater; MDHES and EPA concurred. At this time, the IPC bark pile and underlying soils are not considered potential sources of contamination.

4.1.5.2 Bark Fill

The office bark fill was investigated in April 1990 with a backhoe test pit (see Figure 4-1). The pit was moved from its original location because of telephone lines to a new location approximately 75 feet north of the northeast corner of the aeration basin. No bark was found in this pit, and no other suitable location could be found because of the density of cultural influences, including phone lines, power lines, septic system, interceptor ditch, and aeration basin. MSE believes that test pits C1 and 2 characterize the bark in the area; however, additional work was performed in June 1991 to provide more detailed information.

MSE conducted the additional investigation of the bark fill to determine if the bark fill near the office has received wood-treating waste. On June 5, 1991, MSE personnel investigated bark fill at the office by excavating with a hand-held power auger. The first excavation (Figure 4-13) was 20 feet to the east of the northeast corner of the IPC office. This excavation went to six feet before the auger met refusal from rocks. No bark was found in this excavation. The second excavation (Figure 4-13) was 30 feet to the west of the northwest corner of the IPC office. This excavation went to 11 feet before the auger met refusal from rocks. No bark was seen in this excavation and the soil was saturated at 10 feet and no oil or sheen was present.
The stated objective is met by concluding that based on the well log of Well 5 (slight bark), the soil profile of the office interceptor ditch (slight bark), the two boreholes surrounding the IPC office (no bark), and the test pit in the IPC office parking lot (no bark) that a large bark fill area does not exist in this area. Hence, the office area did not apparently act as a large dump site for bark and wood-treating waste and the bark does not act as a large adsorbent for wood-treating fluid spilled hydraulically upgradient.

4.1.6 IPC Yard Areas

4.1.6.1 Treated Wood Storage Area Investigation

The IPC yard areas were sampled April 16 and 17 and May 1, 1990, by a three person sampling team, including Kim Connors, Julie Flammang, and Meg Babits, MSE. Visitors included Bob Miller, Hydrometrics, Carol Vega, MSE, Gene Munson, GCM, and John Brady-Finke, IPC. A total of 21 soil samples (Y1A,B,C through Y6A,B,C and PP1A,B,C) were collected from seven test pits. Sample collection methods are outlined in the FSP. Test pit locations are presented in Figure 4-1. Pits were excavated to the water table (which varied throughout the site) approximately 42 to 80 inches bgs (Table 4-14). Sample intervals were surface to 12 inches (A), bottom of test pit to 24 inches above bottom (C), and a middle interval ranging from 12 to 56 inches (B). Table 4-2 describes the sample number designation. Of the 21 samples, three (PP1A, B, and C) were submitted for TCL analyses and 18 were submitted for TOX and TFH based on the field screen. The HNU readings for the yard areas are presented in Table 4-15 and Table 4-3 lists compounds included in the TCL.

The volatile organic analyses are presented in Appendix E, pages E-163 through E-165. One compound, methylene chloride, was detected as an estimated quantity (J flag) and was detected in the lab blank (B flag) in one sample (6 ppb). One compound, acetone, was detected as an estimated quantity (J flag) and was not detected in the lab blank (no B flag) in one sample (9 ppb). Two compounds were detected without being estimated quantities and were detected in the lab blank (B flag), including methylene chloride in two samples (8 to 15 ppb) and acetone in one sample (19 ppb).

TABLE 4-14

IPC YARD AREA TEST PIT INFORMATION

Sample Number	Depth
SSY1A	0-12
SSY1B	12-18
SSY1C	18-42
SSY2A	0-12
SSY2B	12-48
SSY2C	48-72
SSY3A	0-12
SSY3B	12-24
SSY3C	24-48
SSY4A	0-12
SSY4B	12-30
SSY4C	30-54
SSY5A	0-12
SSY5B	12-42
SSY5C	42-66
SSY6A	0-12
SSY6B	12-22
SSY6C	22-46
SSPP1A	0-12
SSPP1B	12-56
SSPP1C	56-80

TABLE 4-15

IPC YARD AREAS HNU READINGS

Sample No.	Background Reading of Ambient Air (ppm)	Sample Reading (ppm)	Obvious Staining
Y1A	0	1.0	No
Y1B	0	3.0	No
Y1C	0	1.0	No
Y2A	0	0	No
Y2B	0	0	No
Y2C	0	0	No
Y3A	0	0	No
Y3B	0	0	No
Y3C	0	0	No
Y4A	0	0	No
Y4B	0	0	No
Y4C	0	0	No
Y5A	0	0	No
Y5B	0	0	No
Y5C	0	0	No
Y6A*	4.6	0	No
Y6B*	3.2	0	No
Y6C*	3.0	0	No

* Sample numbers Y6A, B, and C were collected on the following day from the remaining yard area samples. Because the HNU is calibrated daily the background reading is different for Y6A, B, and C.

The semivolatile organic analyses are presented in Appendix E, pages E-146 through E-152. Seven compounds were detected as being estimated quantities (J flag), including dibenzofuran in one sample (810 ppb), pentachlorophenol in two samples (2500 to 7800 ppb), di-n-butylphthalate in two samples (220 to 270 ppb), benzo(a)anthracene in one sample (200 ppb), chrysene in two samples (190 to 700 ppb), anthracene in one sample (690 ppb), and pyrene in one sample (320 ppb). Six compounds were detected without being estimated (no J flag), including 2-methylnaphthalene in one sample (6600 ppb), fluoranthene in one sample (920 ppb), acenaphthalene in one sample (1000 ppb), fluorene in one sample (1800 ppb), phenanthrene in one sample (11000 ppb), and pyrene in one sample (1900 ppb).

The trace element metal analyses are presented in Appendix E, pages E-172 through E-174. Two elements were detected without being estimated quantities (no J flag) and above the normal elemental concentrations (Shacklette and Boerngen, 1984), including manganese in one sample (846 ppm) and mercury in one sample (0.28 ppm). Table 4-5 lists the normal ranges of elemental concentrations.

The TOX analyses are presented in Appendix E, page E-175. TOX were detected without being estimated quantities (no J flag) in three samples (0.048 to 0.088 ppb).

The TFH analyses are presented in Appendix E, page E-176. No TFH compounds were detected.

The objective of the yard investigation was to check soils for other potential contaminant sources from current or historic operations. The volatile compounds were either detected as being estimated (J flag) or were detected in the blank (B flag). Six semivolatile compounds were detected without being estimated (no J flag) and all appeared in PP-1C (lower interval) at the retort building. No TFH compounds were detected and three TOXs were detected at very low concentrations (0.048 to 0.088 ppb) in the middle intervals of test pits Y-1, 3, and 4.

There are no volatile or TFH data to interpret and the TOX data is not significant enough to allow an interpretation. The interpretation of the semivolatile analyses indicates that the test pit PP-1 has contamination only in the lower interval of the test pit. Two scenarios exist for this pit: first, this area of the yard received contamination and fill was placed on top; and second, the contamination reached the water table at another location and is contaminating the soil at PP-1 with the fluctuation of the water table. Because PP-1 is hydraulically downgradient to the retort building (a site of a PCP spill), the second scenario is more likely. Because the majority of samples (18 of 21) were submitted for screening TOX and TFH analysis, an interim decision was reached that additional sampling would be necessary. Early draft risk assessment work determined that shallower soil samples with TCL analyses were required in order to better assess a direct contact route.

MSE conducted the additional treated wood-storage area investigation to determine if the area is a direct contact route. Three soil samples were collected from the IPC yard area on April 10, 1991, and analyzed for phenols and PAHs. Each of the three soil samples (Y7, Y8, and Y9) was composited from three locations (see Figure 4-13). Table 4-16 summarizes the PCP and total B2 carcinogenic PAH concentrations. The complete data are presented in Appendix E, phenols pages E-116 and E117 and PAHs pages E-132 and E-133.

TABLE 4-16

IPC YARD AREA PCP AND TOTAL B2 CARCINOGENIC PAH CONCENTRATIONS (ppb)

SAMPLE NUMBER	DEPTH (IN)	PCP	B2 PAHS
Y7	0-2	1,200.0	59.0J
Y8	0-2	190.0J	136.0J
Y9	0-2	750.0	657.0J

J - Estimated concentration.

The objective of determining a direct contact route is satisfied by determining a surficial source of wood-treating contaminants exists at the IPC yard areas. This surficial source was factored in to direct contact exposure in the baseline risk assessment. The investigation in May 1990 screened soil samples in the yard areas using TFH, EPA Method 8015, and TOX, EPA Method 9020, analyses. These screening TFH and TOX analyses indicated there was no elevated concentrations of organic compounds that were considered a suspected source of wood-treating contaminants on surficial soils.

4.1.6.2 Retort Building Investigation

MSE conducted the retort building investigation to determine the amount of vadose zone soil that has been contaminated by pole-treating facilities. One composite soil sample (Figure 4-13) was collected from under the retort building (also known as the pressure plant) on April 12, 1991. This was a deviation from the Technical Memorandum 4, Additional Sampling Plan (MSE, 1991m) because five samples at discrete depth intervals were planned to be collected. The investigation was to determine unsaturated soil contamination; however, saturated soil conditions were encountered directly beneath the retort building. Also, two former drains exist in the retort building; MSE planned to sample under the 10-inch-round drain; however, this drain was welded shut and MSE only sampled under the 12-inch by 12-inch square drain. Both drains are suspected to have received contamination from wood-treating fluid spills. The sample (PP2) was collected beneath 8 inches of concrete and bentonite from 8 to 10 inches and analyzed for phenols and PAHs. PCP was detected at 83,000 ppb and total carcinogenic B2 PAHs were detected at 1,680 ppb. The complete data are presented in Appendix E, phenols pages E-106 and E-107 and PAHs pages E-130 and E-131.

The objective has been satisfied because the data indicate that the aquifer materials under the retort building are contaminated with wood-treating waste. The volume of aquifer material that is contaminated is assessed in Section 5.0. Sampling was conducted during the spring high water table period. Unsaturated conditions may exist during the summer, fall, or early winter.

4.1.6.3 Treating Area Investigation

MSE conducted the treating area investigation to determine the amount of vadose zone soil that has been contaminated by pole-treating facilities. Ninety soil samples (Figure 4-14) were collected from thirty sample locations (T01 through T25, T30 through T32, and T34 and T35) in the treating area on April 8 through 12, 1991 The treating area was considered to be all soils within 35 feet of any treating or storage structure. Each soil sample was a depth composite (A=upper interval; B=middle interval; C=lower interval) and was analyzed for phenols and PAHs; in addition, one sample (T07C) was analyzed for dioxin/furans. Table 4-17 summarizes the PCP and total B2 carcinogenic PAH concentrations. Sample T07C had no detectable total TCDD (detection limit 0.00029 ppb) and had 0.003 ppb of total TCDF.

Table 4-17 presents the PCP and total B2 carcinogenic PAH concentrations. In the presentation of the treating area data only, the total B2 carcinogenic PAH concentrations were achieved by adding samples that did not have concentrations detected ("U" flag) with samples with detected concentrations ("*" or "J" flag). For samples that did not have concentrations detected, the detection limit was used as the conservative concentration value. The PAH values presented in Table 4-17 have a combination of the flags. The complete phenols data are presented in Appendix E, phenols pages E-104 through E-119 and PAHs E-120 through E-137.

The data in Table 4-17 have been contoured using computer kriging techniques. The total B2 carcinogenic PAH data have been contoured by intervals (A=upper

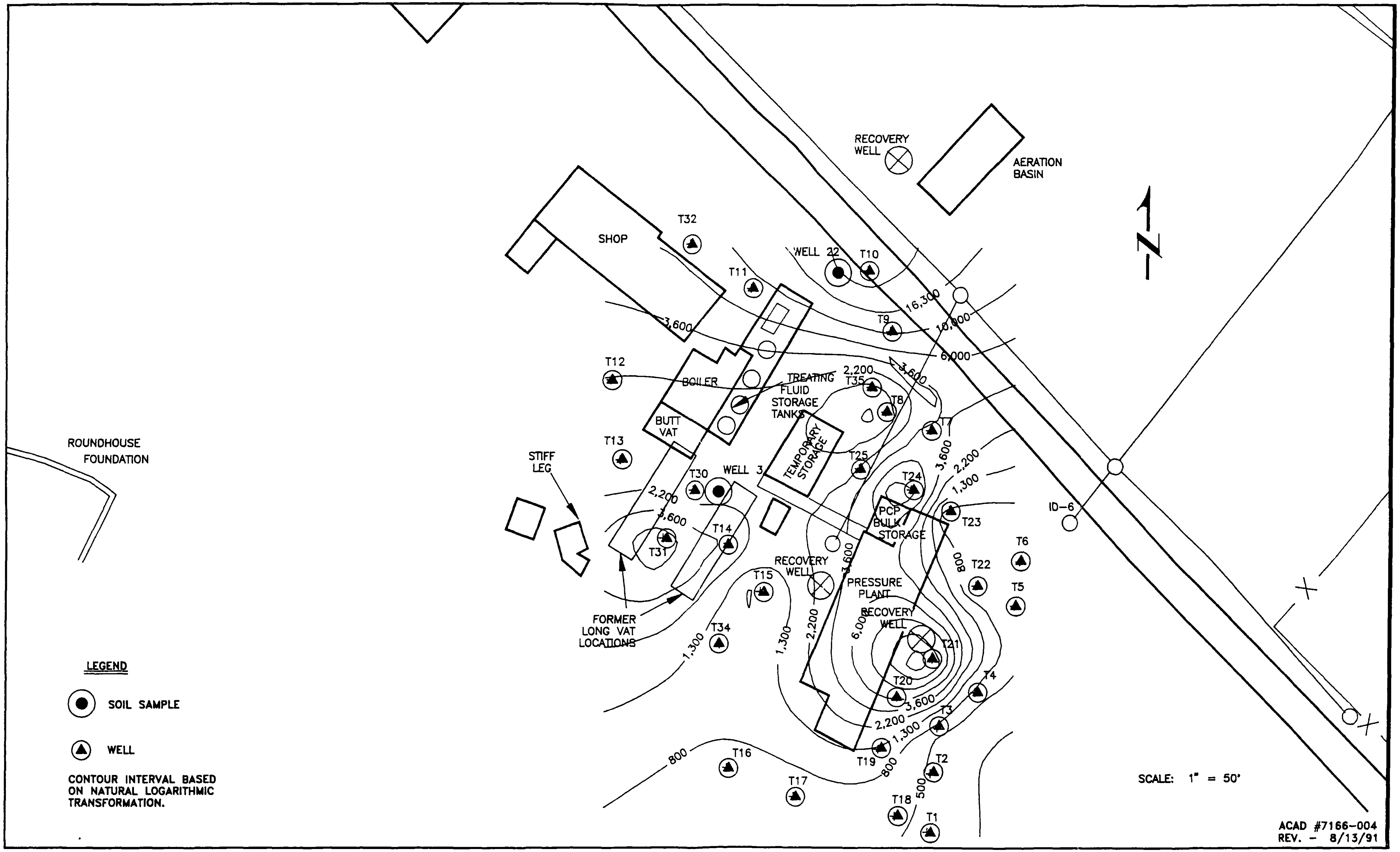


FIGURE 4-14 -- IPC TREATMENT ZONE A B2 PAH CONC. MAP (PPB)

TABLE 4-17

TREATING AREA PCP AND TOTAL B2 CARCINOGENIC PAH CONCENTRATIONS (ppb)

SAMPLE NUMBER	INTERVAL (FT)	PCP	B2 PAHs
T1	A (0-1)	700	455 U J
	B (1-4)	280 U	529 U J
	C (4-7)	330 U	693 U
T2	A (0-1)	890	483 U J
	B (1-3)	260 J	513 U J
	C (3-5)	180 J	747 U J *
T3	A (0-1)	17,000 D	524 U J
	B (1-4)	1,200	580 U J
	C (4-7)	85 J	679 U
T4	A (0-1)	600	595 U
	B (1-4)	230	551 U J
	C (4-7)	170 J	672 U
T5	A (0-1)	530	567 U
	B (1-3)	93 J	444 U J *
	C (5-7)	63 J	757 U J *
T6	A (0-1)	4,200	567 U
	B (1-3)	1,600	588 U
	C (5-7)	240 J	665 U J
T7	A (0-1)	3,000	4,644 U *
	B (1-3)	1,600	588 U
	C (5-7)	240 J	665 U J
T8	A (0-1)	610	649 U J *
	B (1-3.5)	220,000 D	6,350 U J *
	C (3.5-6.5)	110,000	12,570 U J *
T9	A (0-1)	16,000	10,510 U *
	B (1-4)	84,000	61,100 U *
	C (4-7)	23,000	8,760 U J *
T10	A (0-1)	48,000	37,440 U *
	B (1-4)	570,000 D	7,780 U J *
	C (4-8)	100,000 D	10,290 U J *
T11	A (0-1)	40,000	7,700 U J *
	B (1-4)	550,000 D	10,560 U J *
	C (4-7.5)	1,800,000 D	468,000 U J *

TABLE 4-17 (cont'd)

TREATING AREA PCP AND TOTAL B2 CARCINOGENIC PAH CONCENTRATIONS (ppb)

SAMPLE NUMBER	INTERVAL (FT)	PCP	B2 PAHs
T12	A (0-1)	12,000 D	2,140 U J *
	B (1-4)	370,000 D	6.240 U J *
	C (4-9)	15,000 D	640 U *
T13	A (0-1)	4,300	1,260 U
	B (1-4)	6,000	2,110 U J *
	C (4-8.5)	23,000	2,800 U
T14	A (0-1)	35,000	3,910 U J *
	B (1-4)	54 J	577 U J
	C (4-8)	66,000	5,600 U
T15	A (0-1)	4,000	625 U J *
	B (1-4)	100 J	629 U J
	C (4-8)	300	553 U
T16	A (0-1)	1,700	670 U *
	B (1-4)	ND	595 U
	C (4-6.5)	ND	574 U
T17	A (0-1)	440	550 U J
	B (1-4)	ND	548 U J
	C (4-7)	ND	557 U J
T18	A (0-1)	27,000 D	574 U
	B (1-4)	950	1,844 U J *
	C (4-6.5)	330	560 U
T19	A (0-1)	58,000 D	1,193 U *
	B (1-3)	8,100	574 U
	C (3-5)	9,100	636 U *
T20	A (0-1)	120,000 D	5,710 U J *
	B (1-4)	75,000 D	1,025 U *
	C (4-6.67)	86,000 D	2,652 U *
T21	A (0-1)	380,000	57,400 U
	B (1-4)	94,000 D	2,354 U J *
	C (4-7)	180,000 D	2,460 U J *
T22	A (0-1)	1,400	581 U
	B (1-4)	7,800	779 U J *
	C (4-7)	61,000	624 U J

TABLE 4-17 (cont'd)

TREATING AREA PCP AND TOTAL B2 CARCINOGENIC PAH CONCENTRATIONS (ppb)

SAMPLE NUMBER	INTERVAL (FT)	PCP	B2 PAHs
T23	A (0-1)	110 J	581 U
	B (1-4)	7,700	542 U J *
	C (4-7)	47,000	25,900 U
T24	A (0-1)	230,000	23,800 U
	B (1-3)	6,400	631 U J
	C (3-6)	190,000	21,200 U J
T25	A (0-1)	29,000 D	1,870 U J *
	B (1-3.5)	15,000 D	581 U
	C (3.5-6)	27,000 D	1,236 U J *
T30 (NO 26, 27 28,29)	A (0-1)	83,000 D	1,540 U J *
	B (1-4)	84,000 D	15,880 U *
	C (4-8.5)	14,000	1,380 U J *
T31	A (0-1)	380,000 D	9,870 U J *
	B (1-4)	1,300	1,129 U J *
	C (4-8.5)	14,000	1,380 U J *
T32	A (0-1)	11,000	6,640 U *
	B (1-4)	180,000 D	2,930 U *
	C (4-7.5)	210,000 D	21,870 U *
T32	A (0-1)	11,000	6,640 U *
	B (1-4)	130 J	565 U J
	C (4-7.5)	270 U	560 U
T34 (NO 33)	A (0-1)	2,300	1,088 U *
	B (1-4)	130 J	565 U J
	C (4-7.5)	270 U	560 U
T35	A (0-1)	2,900	926 U *
	B (1-4)	4,000	1,032 U *
	C (4-7.5)	110,000 D	1,968 U *

D - Diluted concentration because the nondiluted sample exceeded the instrument's calibration range.
U - None detected.
J - Estimated concentration.
* - Contains a sample concentration with no qualifier.

interval; B=middle interval; C=lower interval). Figure 4-14 presents the total B2 carcinogenic PAH contours in the upper (surface to 12 inches) interval.

Figure 4-14 shows three zones of higher PAH concentrations in the upper interval: 1) east of the pressure plant (possibly because treated wood is sometimes stored there); 2) north of the pressure plant (no treated wood is stored in this area and the reason for the PAH occurrence is unknown); and 3) between the former long vat locations (this area is used when poles are taken out of the butt vat). Figure 4-15 shows zones of higher PAH concentrations in the middle interval similar to the zones found in the upper interval.
Figure 4-16 shows the same zones of higher concentrations of PAHs as the upper and middle intervals, however, an additional zone of higher PAH concentrations appears between the boiler and the shop. This area has the highest total B2 carcinogenic PAH concentrations in the treating area investigation.

The PCP data have also been contoured by intervals (A=upper interval; B=middle interval; C=lower interval). Figure 4-17 shows zones of higher PCP concentrations in the upper interval similar to the PAH concentrations in the upper interval. Again, these zones of higher concentrations are most likely due to storage of treated wood. Figure 4-18 shows zones of higher PCP concentrations in the middle interval similar to the zones found in the upper interval. Figure 4-19 shows zones of higher PCP concentrations similar to the upper and middle intervals; however, an additional zone of higher PCP concentrations appears between the boiler and the shop. This area has the highest PCP concentrations in the treating area investigation.

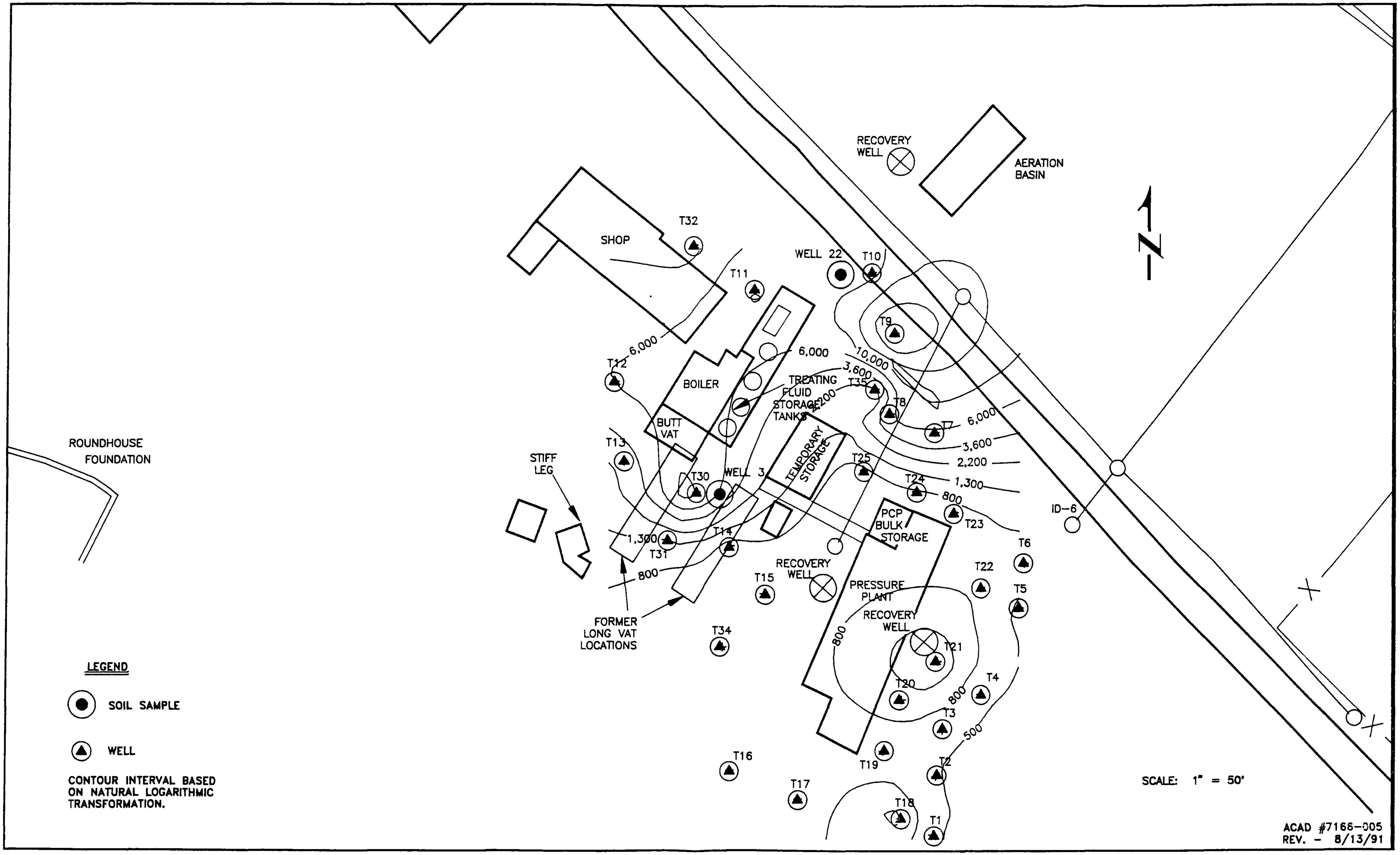


FIGURE 4-15 -- IPC TREATMENT AREA ZONE B B2 PAH CONC. MAP (PPB)

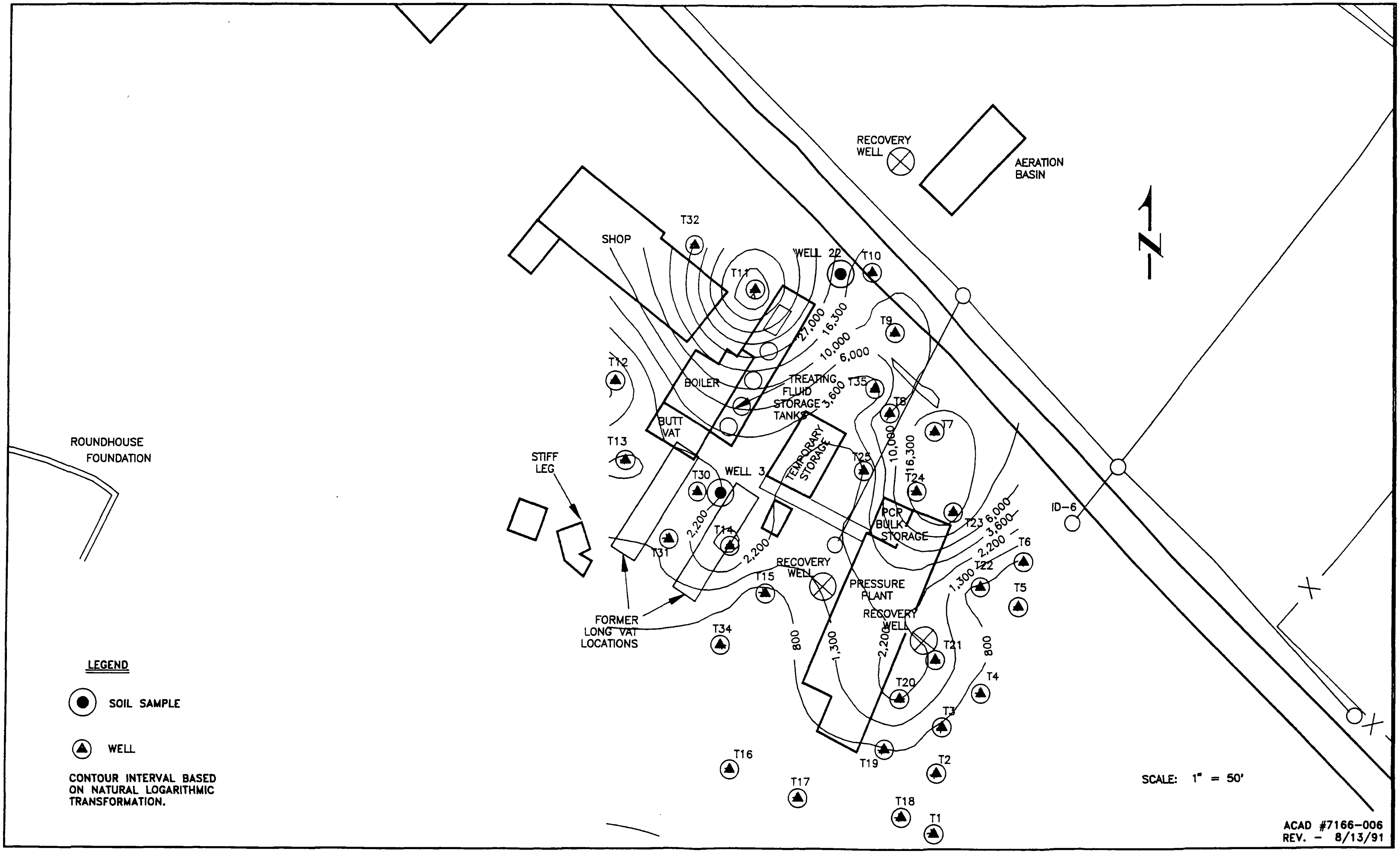


FIGURE 4-16 -- IPC TREATMENT AREA ZONE C B2 PAH CONC. MAP (PPB)

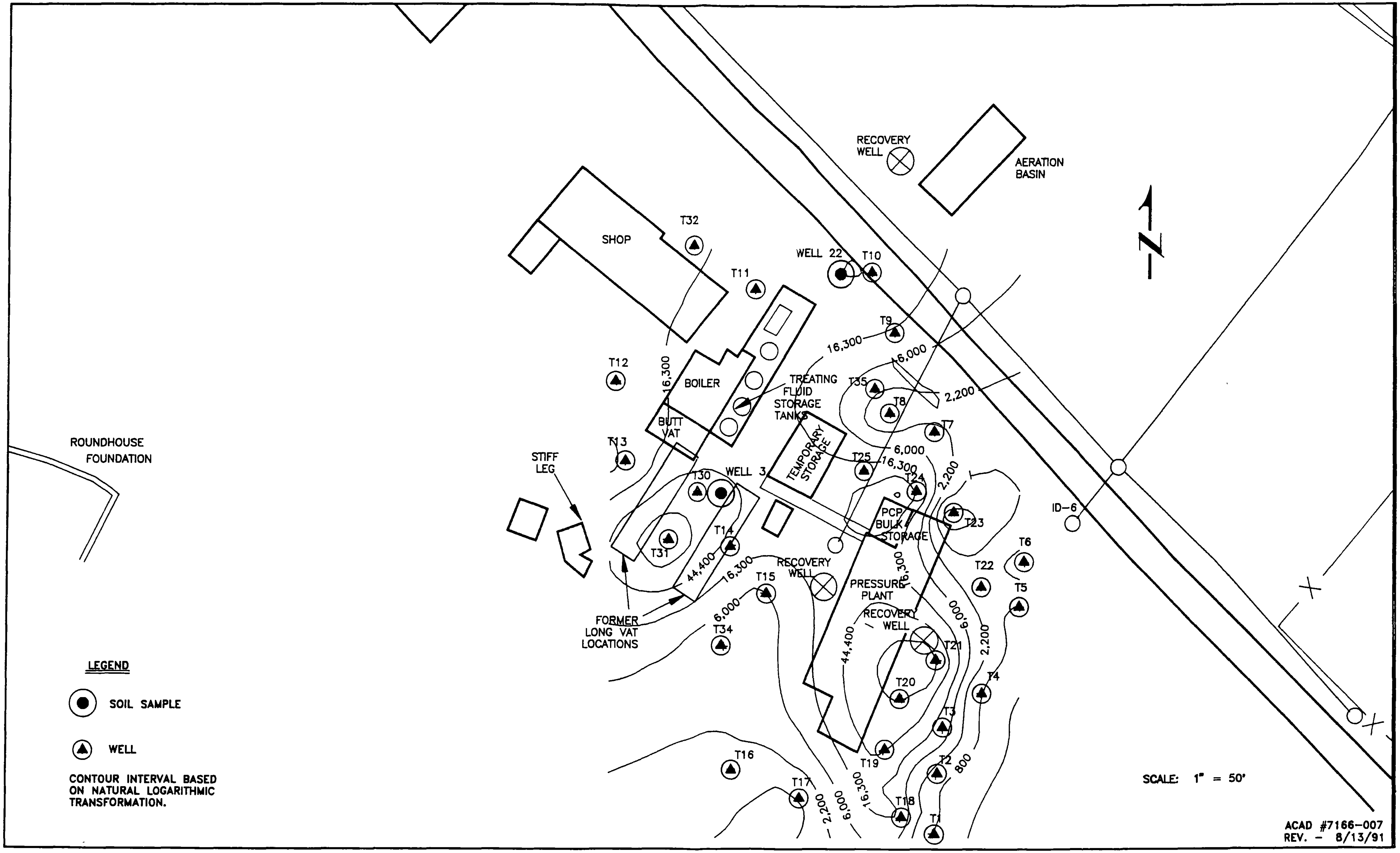


FIGURE 4-17 -- IPC TREATMENT AREA ZONE A PCP CONC. MAP (PPB)

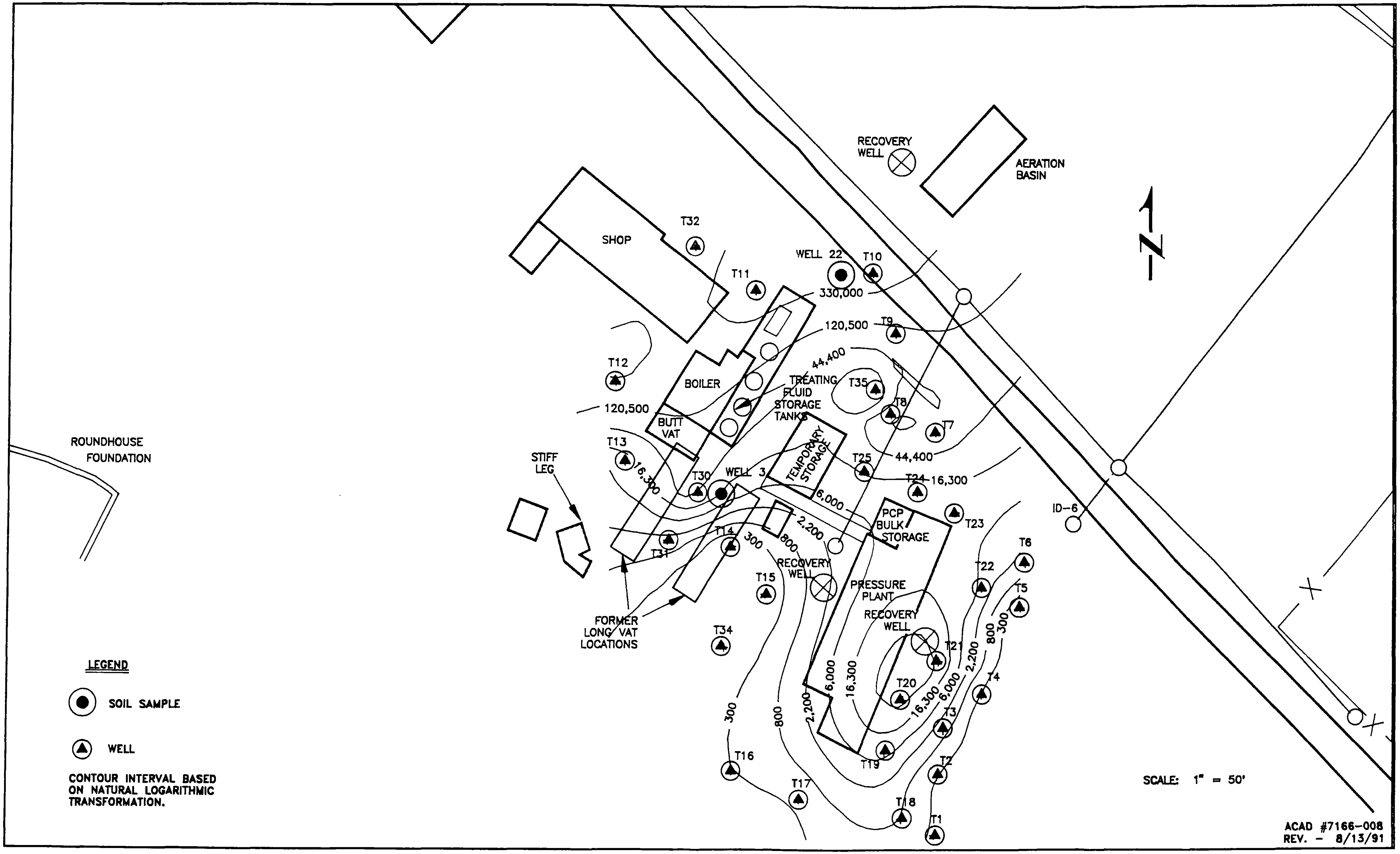


FIGURE 4-18 -- IPC TREATMENT AREA ZONE B PCP CONC. MAP (PPB)

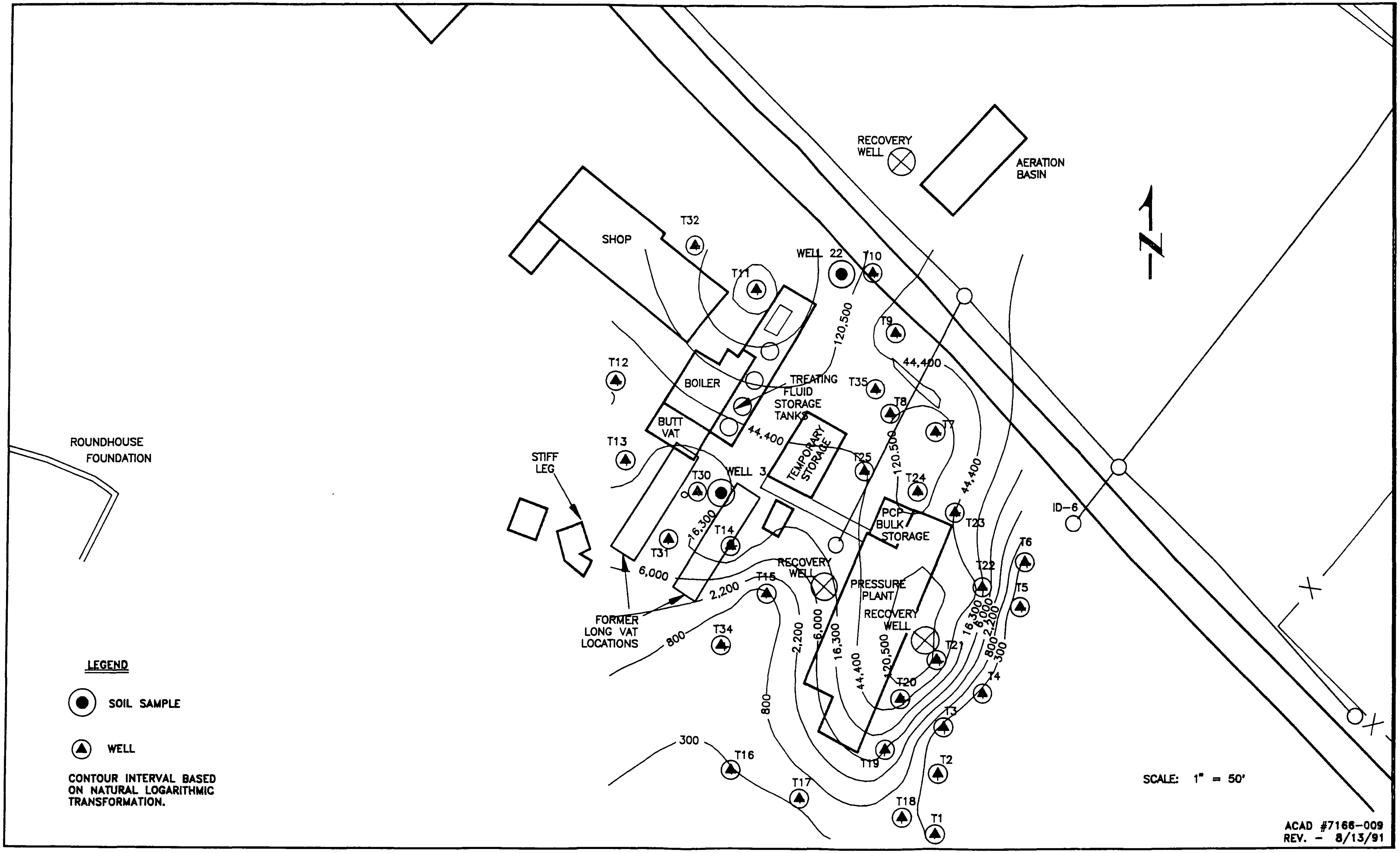


FIGURE 4-19 -- IPC TREATMENT AREA ZONE C PCP CONC. MAP (PPB)

MSE estimates volumes of contaminated soil in Section 5.0 based on the contours generated in this investigation. This volume estimation satisfies the stated objective.

4.2 GEOLOGIC INVESTIGATION

4.2.1 Background Soils Investigation

The background soils were sampled May 8, 1990 by a two-person sampling team, including John Ruth and Meg Babits, MSE. Visitors included Bob Miller, Hydrometrics, a landowner, and Bill Sullivan, IPC. Two background soil sample were collected upgradient and offsite of the IPC Site. Sample A was collected in a residential yard at the end of Cedar Street, and sample B was collected in a pasture bordered on the north by the MRL tracks, on the south by Main Street/Frontage Road, on the east by the I-90 east Bozeman exit, and on the west by an abandoned railroad grade. The samples were collected from backhoe test pits.

A total of six soil samples (AA,B,C and BA,B,C) were collected from two test pits. Sample collection methods are outlined in the FSP. Test pit locations are presented in Figure 4-20. Pits were excavated to the water table (which varied throughout the site) approximately 60 and 82 inches bgs (Table 4-18). Sample intervals were surface to 12 inches (A), bottom of test pit to 24 inches above bottom (C), and a middle interval ranging from 12 to 36 inches (B). Table 4-2 describes the sample number designation. All of the six

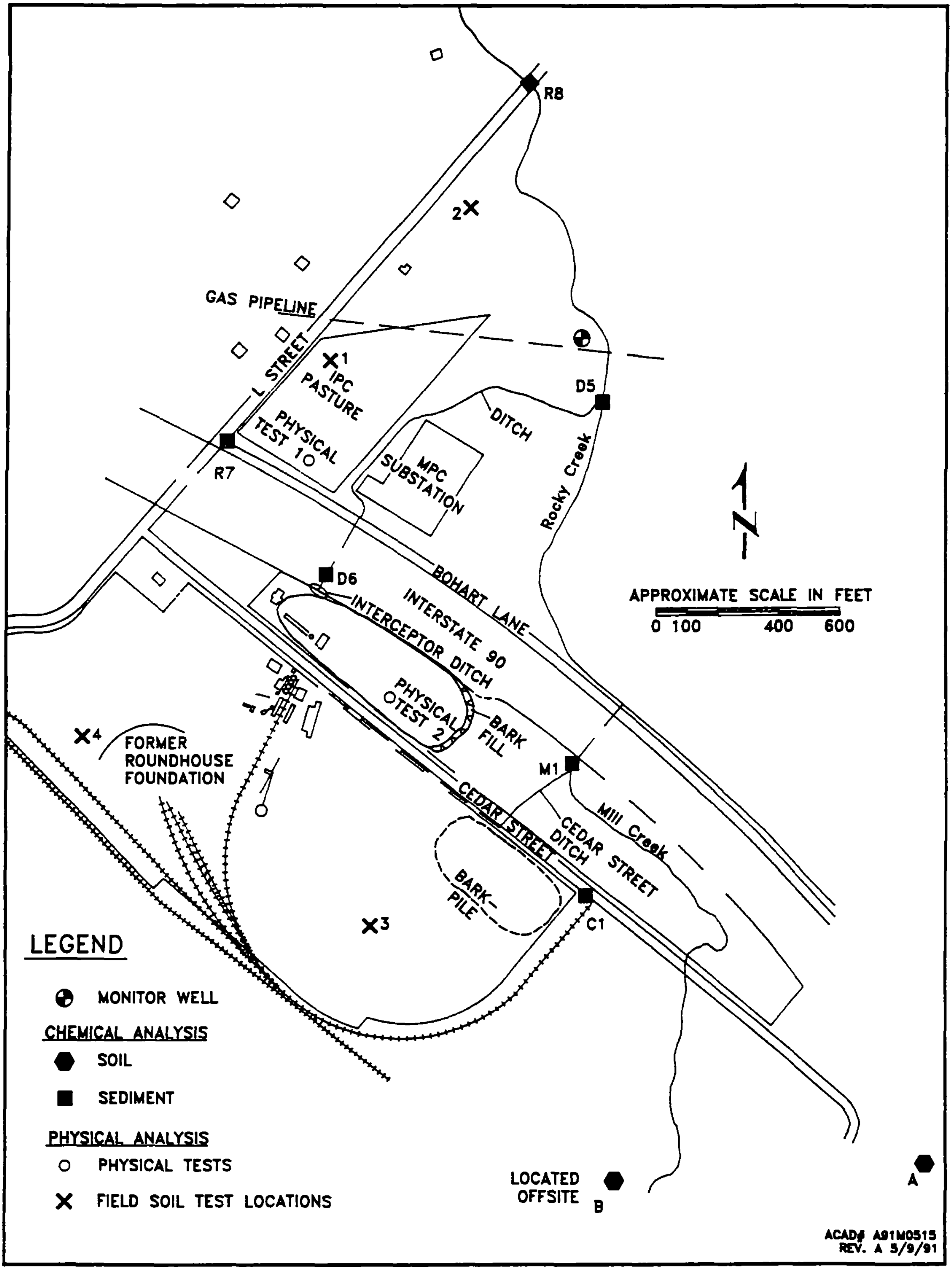


FIGURE 4-20 -- SOIL AND SEDIMENT INVESTIGATION STATIONS

TABLE 4-18

BACKGROUND SOIL TEST PIT INFORMATION

Sample Number	Depth(in.)
SSAA	0-12
SSAB	12-48
SSAC	48-72
SSBA	0-12
SSBB	12-36
SSBC	36-60

samples were submitted for TCL analyses; Table 4-3 lists the compounds included in the TCL.

The volatile analyses are presented in Appendix E, pages E-160 through E-165. One compound, acetone, was detected without being an estimated quantity (no J flag) and was not detected in the lab blank (no B flag) in one sample (34 ppb). One compound, methylene chloride, was detected as being an estimated quantity (J flag) and was not detected in the lab blank in three samples (4 ppb).

The semivolatile analyses are presented in Appendix E, pages E-139 through E-152. One compound, di-n-butylphthalate, was detected without being an estimated level (no J flag) and was detected in the lab blank (B flag) in two samples (2100 and 3400 ppb). One compound, bis(2-ethylhexyl)phthalate, was detected without being an estimated quantity (no J flag) and was not detected in the lab blank (no B flag) in two samples (1800 and 3200 ppb). Two compounds were detected as estimated quantities and were not detected in the lab blank including benzoic acid in one sample (4000 ppb) and bis(2-ethylhexyl)phthalate in one sample (130 ppb).

The trace element metal analyses are presented in Appendix E, pages E-169 through E-174. Two elements were detected as being estimated quantities (J flag) and above the normal elemental concentrations (Shacklette and Boerngen 1984), including cadmium in two samples (1.1 and 0.8 ppm) and thallium in two samples (0.48 and 0.43 ppm). Six elements were detected without being estimated quantities and above the normal ranges of elemental concentrations

(Shacklette and Boerngen, 1984), including cobalt in one sample (14.9 ppm), lead in two samples (77 and 39.2 ppm), manganese in one sample (2820 ppm), mercury in one sample (0.12 ppm), and nickel in two samples (36.6 and 39.1 ppm). Table 4-5 lists the normal ranges of elemental concentrations.

The objective of the background soil investigation (SS-A and B) was to characterize background soils. The volatile analyses detected one compound, acetone, that was not an estimated quantity (no J flag) and was not detected in the blank (no B flag) in soil sample SS-BC. The semivolatile analyses detected one compound, bis(2-ethylhexyl)phthalate, that was not an estimated quantity in soil sample SS-BB and BC (1800 and 3400 ppb).

The volatile analyses are not significant enough to allow interpretation because only one compound, acetone, was detected at a low concentration (34 ppb). The semivolatile analyses detected bis(2-ethylhexyl)phthalate, which was not detected in any other soil samples in the investigation, although another phthalate, diethylphthalate, was detected in creek sediment sample D5 and in six groundwater samples. Phthalates are man-made compounds and when they appear randomly in the environment not much significance can be drawn from their occurrence. The background soil investigation indicates the semivolatile compounds that appear onsite do not occur in the offsite locations tested. However, the May 1990 sampling had high minimum detection limits because of the analysis method used. Additional sampling and analysis would be needed to achieve lower detection limits.

MSE conducted the additional background soil sampling in order to ascertain the naturally occurring or background levels of contaminants in the vicinity of the site (MSE, 1991m). These data were required to assist in establishment of recommended cleanup levels for soils at the site. Six soil samples (AA, AB, AC, BA, BB, and BC) were collected from two locations similar to the May 1990 locations on April 12, 1991 and analyzed for phenols, PAHs, and dioxin/furans. Each soil sample is a depth composite. Table 4-19 summarizes the PCP, total B2 carcinogenic PAHs, and total TCDD, and TCDF concentrations. The complete data are presented in Appendix E, phenols pages E-106 through E-107, PAHs pages E-122 through E-123, dioxins page E-136, and furans page E-138.

TABLE 4-19

**BACKGROUND PCP, TOTAL B2 CARCINOGENIC PAHs,
TOTAL TCDD, AND TOTAL TCDF CONCENTRATIONS (ppb)**

SAMPLE NUMBER	DEPTH (FT)	PCP	B2 PAHS	TOTAL TCDD	TOTAL TCDF
AA	0-1	ND (320)	ND	ND (0.094)	ND (0.078)
AB	1-3	ND (330)	ND	ND (0.11)	ND (0.065)
AC	3-5	ND (330)	ND	ND (0.079)	ND (0.057)
BA	0-1	ND (370)	ND	ND (0.17)	ND (0.16)
BB	1-2.5	ND (320)	ND	ND (0.13)	ND (0.077)
BC	2.5-3.17	ND (330)	ND	ND (0.078)	ND (0.052)

ND - None Detected.
ND(##) - None detected; detection limit.

The stated objective was fulfilled by determining that soils of the same type as those found on the IPC Site do not naturally contain any contaminants associated with wood-treating waste.

4.2.2 Creek Sediments

The creek sediments were sampled on July 11, 1990, by Meg Babits, MSE. Visitors included Bob Miller, Hydrometrics. A total of three sediment samples (M1, D5, R8) were collected and the locations are presented in Figure 4-20. Sample collection methods are outlined in the FSP. Sample depths were surface to 2 inches. All samples were submitted for TCL analyses; Table 4-3 lists the compounds included in the TCL.

The volatile analyses are presented in Appendix E, pages E-160 through E-168. Two compounds were detected without being estimated quantities (no J flag) and were detected in the lab blank, including methylene chloride in two samples (15 to 27 ppb) and acetone in three samples (68 to 230 ppb). One compound, 2-butanone, was detected without being an estimated quantity (no J flag) and was not in the lab blank (47 ppb). One compound, methylene chloride, was detected as being an estimated quantity and was detected in the blank in two samples (15 to 27 ppb). One compound, toluene, was detected as being an estimated quantity and was not detected in the lab blank in three samples (3 to 6 ppb).

The semivolatile analyses are presented in Appendix E, pages E-139 through E-159. Two compounds were detected without being estimated quantities (no J flag), including 4-methylphenol in two samples (1600 to 2800 ppb) and diethylphthalate in one sample (3100 ppb). Six compounds were detected as being estimated quantities (J flag), including pentachlorophenol in three samples (420, 2400, and 2600 ppb), phenanthrene in three samples (86 to 94 ppb), fluoranthene in three samples (60 to 120 ppb), pyrene in two samples (77 to 170 ppb), chrysene in one sample (98 ppb), and bis(2-ethylhexyl) phthalate in one sample (210 ppb).

The trace element metal analyses are presented in Appendix E, pages E-169 through E-174. One element, selenium, was detected as being an estimated quantity (J flag) and above the normal ranges of elemental concentrations (Shacklette and Boerngen, 1984) in two samples (1.2 and 2.1 ppm). Two elements were detected without being estimated quantities (no J flag) and above normal ranges of elemental concentrations (Shacklette and Boerngen, 1984), including lead in one sample (62.9 ppm) and mercury in one sample (0.21 ppm). Table 4-5 lists the normal ranges of elemental concentrations.

The objective of the creek sediment sampling was to assess what impact the ditches have on the creeks. The volatile analyses detected one compound, 2-butanone, that was not estimated (no J flag) or that was not in the blank (no B flag) in one sample (47 ppb); this compound is a common lab contaminant. The semivolatile analyses detected two compounds that were not estimated quantities, including 4-methylphenol in R8 and D5 (1600 and 2800 ppb, respectively) and diethylphthalate in D5 (3100 ppb). The data indicate that the creeks have some levels of contamination that need to be confirmed by additional sampling.

MSE conducted the additional creek sediment sampling to confirm levels of contamination previously detected in Rocky Creek sediments and to assess whether upgradient contaminant sources exist (MSE, 1991n). Six sediment samples (R18, R19, R20, R21, R22, and R26) were collected in Rocky Creek and one sediment sample (M2) was collected in Mill Creek on April 11, 1991 and analyzed for phenols and PAHs. Table 4-20 summarizes the PCP and total B2 carcinogenic PAH concentrations. The complete data are presented in Appendix E, phenols pages E-116 and E-117 and PAHs pages E-132 and E-133.

TABLE 4-20

CREEK PCP AND TOTAL B2 CARCINOGENIC PAH CONCENTRATIONS (ppb)

SAMPLE NUMBER	LOCATION	DEPTH (IN)	PCP	B2 PAHS
R18 (Rocky)	Upstream	0-2	ND	269 J
R19 (Rocky)	Below Mill Creek	0-2	ND	240 J
R20 (Rocky)	Below Old Drainage Channel	0-2	ND	136 J
R21 (Rocky)	Below MPC Ditch	0-2	ND	59 J
R22 (Rocky)	Below L Street	0-2	760 J	76 J
R26 (Rocky)	Below GW Drainage Ditch	0-2	ND	ND
M2 (Mill)	Upstream	0-2	ND	424 J

ND - None detected.
J - Estimated concentration.

The phenols data indicate that there is no upstream source of PCP in the sediments in Rocky Creek; however, some upstream concentrations of PAHs do exist in both Rocky and Mill Creeks. Offsite sources for the PAHs observed in creek sediments are likely. The only location of PCP detection is below the L Street ditch. The source is most likely interception of dissolved contaminants discharging from the groundwater plume. The 1990 Rocky Creek sampling detected PCP below the MPC Substation ditch (3,600J ppb) and below the L Street ditch (2,400J ppb). The 1990 data were in question because of low Matrix Spike/Matrix Spike Duplicates (MS/MSDs). The 1991 data only confirmed the location below the L Street ditch but not the concentration. Hence, the objective was satisfied to assess upgradient sources and confirm levels of Rocky Creek contamination.

4.2.3 Ditch Sediments Investigation

The ditch sediments were sampled on May 1, 1990, by Julie Flammang, MSE. Visitors included Bob Miller, Hydrometrics. Three sediment samples were collected from ditch beds at the IPC Site. Sediment samples C1 and D6 were collected in the planned locations. Sediment sample R7 was moved from the planned location because the L Street ditch does not begin until the intersection with Bohart Lane rather than the intersection with Cedar Street. The city of Bozeman was observed using a backhoe to excavate (deepen) the ditches on the east and west corners of L Street and Bohart Lane 7 days after the ditch was sampled.

A total of three sediment samples (D6, R7, C1) were collected and the locations are presented in Figure 4-20. Sample collection methods are outlined in the FSP. Sample depths were surface to 4 inches, and all the samples were submitted for TCL organics, TAL metals and dioxin/furan analyses; Table 4-3 lists the compounds included in the TCL and TAL.

The volatile analyses are presented in Appendix E, pages E-160 through E-168. Two compounds were detected without being estimated quantities (no J flag) and were detected in the lab blank, including methylene chloride in three samples (33 to 95 ppb) and acetone in two samples (25 and 75 ppb). One compound, 2-butanone, was detected as being an estimated quantity (J flag) in one sample (4 ppb).

The semivolatile analyses are presented in Appendix E, pages E-139 through E-159. Four compounds were detected without being estimated quantities (no J flag), including pentachlorophenol in one sample (150,000 ppb), pyrene in one sample (7400 ppb), benzo(b)fluoranthene in one sample (6400 ppb) and benzo(k)fluoranthene in one sample (6400 ppb). Sixteen compounds were detected as being estimated quantities (J flag), including pentachlorophenol in one sample (600 ppb), anthracene in one sample (990 ppb), fluoranthene in two samples (94 and 700 ppb), pyrene in one sample (110 ppb), chrysene in two samples (85 and 2200 ppb), bis(2-ethylhexyl)phthalate in two samples (290 and 920 ppb), benzo(b)fluoranthene in one sample (180 ppb), benzo(k)fluoranthene in one sample (180 ppb), benzo(a)pyrene in two samples (94 and 1300 ppb), indeno(1,2,3-cd)pyrene in one sample (890 ppb), benzo(g,h,i)perylene in one sample (1200 ppb), phenanthrene in one sample (59 ppb), di-n-butylphthalate in one sample (62 ppb), butylbenzylphthalate in one sample (73 ppb), benzo(a)anthracene in one sample (66 ppb), and di-n-octylphthalate in one sample (54 ppb).

The trace element metal analyses are presented in Appendix E, pages E-169 through E-174. One element, mercury, was detected without being estimated quantity (no J flag) and above the normal ranges of elemental concentrations (Shacklette and Boerngen, 1984) in one sample (0.42 ppm). Table 4-5 lists the normal ranges of elemental concentrations.

The 2,3,7,8-TCDD analyses are presented in Appendix E, page E-136. No 2,3,7,8-TCDD was detected.

The data indicate that the MPC Substation ditch carries contamination offsite. The contamination probably originated from overflows of the interceptor ditch.

The sediment sample, C1 (Figure 4-20), was identified in the RI/FS Work Plan to be located where the Cedar Street ditch leaves the IPC Site boundary. The sample was collected in this location; however, the Cedar Street ditch crosses under the street west of the bark pile. Conclusions regarding IPC contaminants moving offsite in the Cedar Street ditch cannot be made based on this sample; however, sample C1 indicates no contamination in the vicinity of the bark pile mobilized via surface water. Because sample C1 did not accurately reflect offsite migration and because only the 2,3,7,8-TCDD congener was analyzed, additional sampling for all dioxin/furan congeners was determined to be necessary.

The ditch sediments were sampled on November 15, 1990, by Julie Flammang, MSE. Three sediment samples were collected (D6, R7, and C1) and the locations are presented in Figure 4-20. Sample collection methods are presented in the FSP.

All samples were analyzed for dioxin/furans; the May 1990 sampling of these sediment locations were analyzed for the isomer 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) only, not for dioxins/furans as requested. It should be noted that the location of ditch sediment sample C1 was moved from its May 1990 (Figure 4-20) location to better reflect the Cedar Street ditch sediments.

The complete data are presented in Appendix E, dioxins page E-137 and furans page E-138. The following total dioxins were detected: TCDD at 0.20 ppb in D6 and 0.05 ppb in C1; pentachlorodibenzo-p-dioxin (PeCDD) at 4.8 ppb in D6 and 0.13 ppb in C1; HxCDD at 0.31 ppb in R7, at 168 ppb in D6, and at 13.8 ppb in C1; HpCDD at 4.4 ppb in R7, at 1,610 ppb in D6, and at 142 ppb in C1; and OCDD at 23.9 ppb in R7, at 7,040 ppb in D6, and at 474J ppb in C1.

The following total furans were detected: TCDF at 0.02 ppb in R7, at 3.5 ppb in D6, and at 0.19 ppb in C1; pentachlorodibenzofuran (PeCDF) at 0.08 ppb in R7, at 71.2 ppb in D6, and at 2.9 ppb in C1; hexachlorodibenzofuran (HxCDF) at 0.54 ppb in R7, 339 ppb in D6, and at 10.4 ppb in C1; heptachlorodibenzofuran (HpCDF) at 0.73 ppb in R7, 594 ppb in D6, and at 17.6 ppb in C1; and OCDF at 0.47 ppb in R7, at 559 ppb in D6, and at 8.8 ppb in C1.

The data present a trend of higher levels of dioxin/furan contamination in the MPC Substation ditch. This trend coincides with the highest levels of semivolatiles in sediments and surface water appearing in this ditch. The data confirm that ditch sediments are contaminated and are likely to be remediated. However, the data do not indicate the volume of sediments that may be remediated, hence, additional sampling was necessary to determine volumes.

MSE conducted the additional ditch sediment sampling investigation in May 1990 to collect additional data regarding the depth and distribution of contaminated ditch sediments (MSE, 1991m). More detailed sampling was required to allow design of remedial alternatives for contaminated ditches. Nine sediment samples (C2, C3, C4, C5, C6, C7, C8, C9, and C10) were collected in the Cedar Street ditch (Figure 4-21) on April 9, 1991, and analyzed for phenols and PAHs. The nine samples were from six locations; one location had three depth composites, one location had two depth composites, and the remaining four locations had one depth composite. Table 4-21 summarizes the PCP and total B2 carcinogenic PAH concentrations. The complete phenols data are presented in Appendix E, phenols pages E-114 and E-115 and PAHs pages E-130 and E-131.

The data indicate that the Cedar Street ditch has contaminants that are associated with wood-treating wastes. The contaminants occur in the Cedar Street ditch, decreasing slightly until just prior to its confluence with Mill Creek; the contaminants occur at depth. The contamination is most likely from a surface runoff source from the IPC operation.

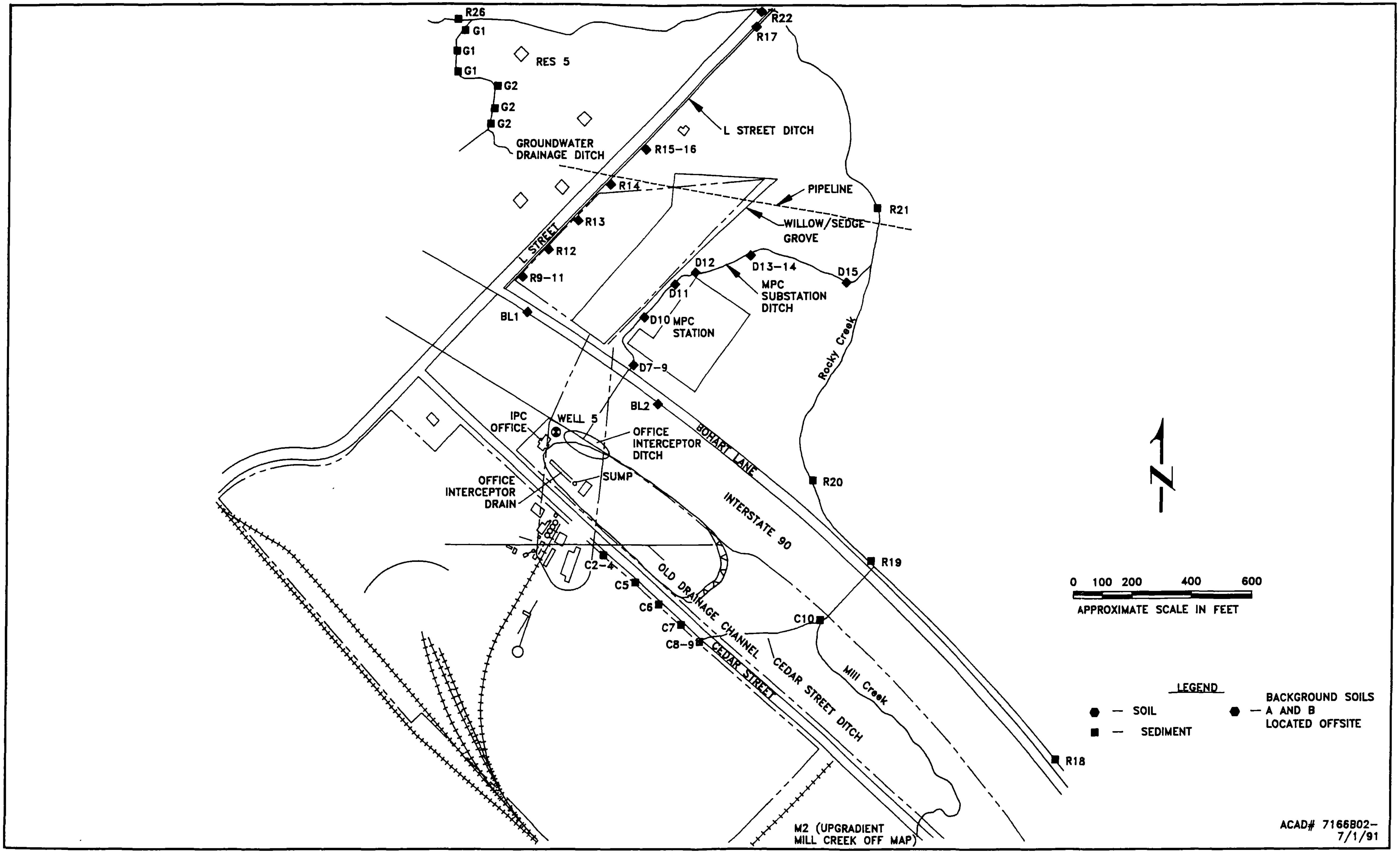


FIGURE 4-21 -- SOIL AND SEDIMENT INVESTIGATION STATIONS

TABLE 4-21

CEDAR STREET DITCH PCP AND TOTAL B2 CARCINOGENIC PAH CONCENTRATIONS (ppb)

SAMPLE NUMBER	FEET FROM DITCH HEAD	DEPTH (IN)	PCP	B2 PAHS
C2	0	0-4	2,200	1,030 J
C3	0	4-8	1,400	398 J
C4	0	8-12	52,000 D	1,856 J
C5	122.5	0-4	19,000 D	13,880 J
C6	245	0-4	22,000	3,450 J
C7	367.75	0-4	22,000	620 J
C8	490.5	0-4	13,000	540 J
C9	490.5	4-8	8,000	1,067 J
C10	981	0-4	ND	320

ND - None detected.
J - Estimated concentration.
D - Diluted concentration.

Nine sediment samples (D7, D8, D9, D10, D11, D12, D13, D14, and D15) were collected in the MPC Substation ditch (Figure 4-21) on April 9, 1991, and analyzed for phenols and PAHs. The nine samples were from six locations; one location had three depth composites, one location had two depth composites, and the remaining four locations had one depth composite. Table 4-22 summarizes the PCP and total B2 carcinogenic PAH concentrations. The complete phenols data are presented in Appendix E, phenols pages E-114 and E-115 and PAHs pages E-130 and E-131.

TABLE 4-22

MPC SUBSTATION DITCH PCP AND TOTAL B2 CARCINOGENIC PAH CONCENTRATIONS (ppb)

SAMPLE NUMBER	FEET FROM DITCH HEAD	DEPTH (IN)	PCP	B2 PAHS
D7	0	0-4	4,300	56 J
D8	0	4-8	4,000	78 J
D9	0	8-12	3,700	ND
D10	132	0-4	23,000	320
D11	262.5	0-4	3,900	ND
D12	393.75	0-4	25,000	1,500 J
D13	525	0-4	7,500	ND
D14	525	4-8	2,700	ND
D15	1,050	0-4	2,300	ND

ND - None detected.
J - Estimated concentration.

The data indicate that the MPC Substation ditch has contaminants associated with wood-treating waste. The contaminants occur at depth and appear until the ditch ponds northeast of the MPC Substation. The contamination is most likely from the surface overflow of the office interceptor ditch but may be partially attributed to the groundwater contaminant plume in downgradient sample locations (D13-D15).

Nine sediment samples (R9, R10, R11, R12, R13, R14, R15, R16, and R17) were collected in the L Street ditch (Figure 4-21) on April 9, 1991, and analyzed for phenols and PAHs. The nine samples were from six locations; one location had three depth composites, one location had two depth composites, and the remaining four locations had one depth composite. Table 4-23 summarizes the PCP and total B2 carcinogenic PAH concentrations. The complete data are presented in Appendix E, phenols pages E-114 through E-117 and PAHs pages E-130 through E-133.

TABLE 4-23

L STREET DITCH PCP AND TOTAL B2 CARCINOGENIC PAH CONCENTRATIONS (ppb)

SAMPLE NUMBER	FEET FROM DITCH HEAD	DEPTH (IN)	PCP	B2 PAHS
R9	0	0-4	360	375 J
R10	0	4-8	71 J	51 J
R11	0	8-12	35 J	ND
R12	190	0-4	1,100	ND
R13	379	0-4	2,400	ND
R14	569	0-4	1,600	600
R15	758	0-4	2,400	310 J
R16	758	4-8	640	519 J
R17	1,515	0-4	220	73 J

ND - None detected.
J - Estimated concentration.

The data indicate levels of contaminants associated with wood-treating waste in the L Street ditch. The contaminants are found at depth and decrease towards the ditch's confluence with Rocky Creek. The contamination is most likely from surface runoff from the plant site and groundwater interception into the ditch.

Two sediment samples (BL1 and BL2) were collected in the Bohart Lane ditch (Figure 4-21) and analyzed for phenols and PAHs. Each sediment sample was a discreet sample collected from surface to 4 inches. Table 4-24 summarizes the PCP and total B2 carcinogenic PAH concentrations. The complete data are presented in Appendix E, phenols pages E-114 and E-115 and PAHs E-130 and E-131.

TABLE 4-24

BOHART LANE DITCH PCP AND TOTAL B2 CARCINOGENIC PAH CONCENTRATIONS (ppb)

SAMPLE NUMBER	FEET FROM HEAD OF DITCH	DEPTH (IN)	PCP	B2 PAHS
BL1	95	0-4	410	473 J
BL2	657	0-4	ND	20 J

ND - None detected.
J - Estimated concentration.

The data indicate that some contamination associated with wood-treating waste is found in the Bohart Lane ditch. Because the gradient of this ditch is to the south, the source of this contamination could be the L Street ditch, which has an undersized culvert crossing Bohart Lane that is very susceptible to clogging from sedimentation.

Two sediment samples (G1 and G2) were collected in the groundwater drainage ditch west of L Street (Figure 4-21) and analyzed for phenols and PAHs. Each sediment sample was a composite of three locations. Table 4-25 summarizes the PCP and the total B2 carcinogenic PAH concentrations. The complete data are presented in Appendix E, phenols pages E-114 and E-115 and PAHs pages E-130 and E-131.

TABLE 4-25

GROUNDWATER DRAINAGE DITCH PCP AND TOTAL B2 CARCINOGENIC PAH CONCENTRATIONS (ppb)

SAMPLE NUMBER	FEET FROM ROCKY CREEK	DEPTH (IN)	PCP	B2 PAHS
G1	40-170	0-4	ND	361 J
G2	200-600	0-4	ND	ND

ND - None Detected.
J - Estimated concentration.

Because no PCP (or any other phenols) was detected in the groundwater drainage ditch, MSE believes the ditch is not intercepting contaminants from the dissolved groundwater plume (phenols are an important indicator of the plume). The low level PAHs in the ditch appear similar to background Rocky Creek PAH levels and may represent background PAH levels in sediment.

The objectives of the ditch sediment sampling were fulfilled because the ditch sediment sampling provided information on contaminant concentrations. Volumes of contaminated material based on concentrations can now be generated in the feasibility study.

4.3 GROUNDWATER INVESTIGATION

The objectives of the contaminant assessment include:

- identifying types and volumes of chemical contaminants;
- defining the areal extent of the dissolved contaminant plumes and the LNAPL;
- investigate the potential presence of a denser-than-water (DNAPL) phase; and
- determining rates of contaminant migration in both horizontal and vertical directions.

To accomplish these objectives, a staged approach was used in the groundwater investigation. Stage II of the groundwater investigation was to identify potential new contaminant sources within the site that were not addressed in previous studies. Stage III included regular groundwater sampling of all existing wells downgradient of the IPC Site with samples analyzed for specific compounds identified in Stage II. The results of this suite of samples provided data needed to delineate the contaminant plume(s). Stage IV included installing additional monitoring wells downgradient of the IPC Site and Stage V was the installation and sampling of a deep downgradient monitoring well.

All analytical data are located in Appendix E and Quality Assurance/Quality Control (QA/QC) data are presented in Appendix F. Data validation is presented in Appendix F.

4.3.1 Source Area Sampling

This stage of the investigation investigated potential sources of contamination not included in previous investigations. Included in this stage were the installation of two upgradient well nests (18A, 18B, 19A, 19B) to be used for establishing background water quality. Three sites were selected to investigate possible sources of contamination: the former roundhouse (MW-20), a DNAPL downgradient of the treatment operation (MW-22), and the historic surface water bodies now under the bark pile (MW-21). Results of this stage of the investigation were used to identify target analytes and to determine the placement of additional monitoring wells in Stage IV.

Selected groundwater monitoring wells in the potential source areas of the IPC Site were sampled on May 22 and 23, 1990. The area sampled is bounded by I-90 on the north, Mill Creek to the east, BNRR to the south, and L Street on the west. A total of 17 wells were sampled, including: existing IPC wells 2A, 3A and B, 4B, 5A, B, and C, 6A and B and 15A; and new MDHES wells 18A and B, 19A and B, 20, 21, and 22 (see Figure 4-22). All samples were submitted to the EPA CLP for TCL and TAL analyses and to the contractor laboratory for anions analyses. Table 4-3 presents the compounds in the TCL and TAL.

The complete volatile data are presented in Appendix E, pages E-50 through E-53. No volatile organic compounds were detected above CLP detection limits. A few volatile compounds detected in samples but not in the blank are at very low concentrations (below the CLP detection limits but above the instrument

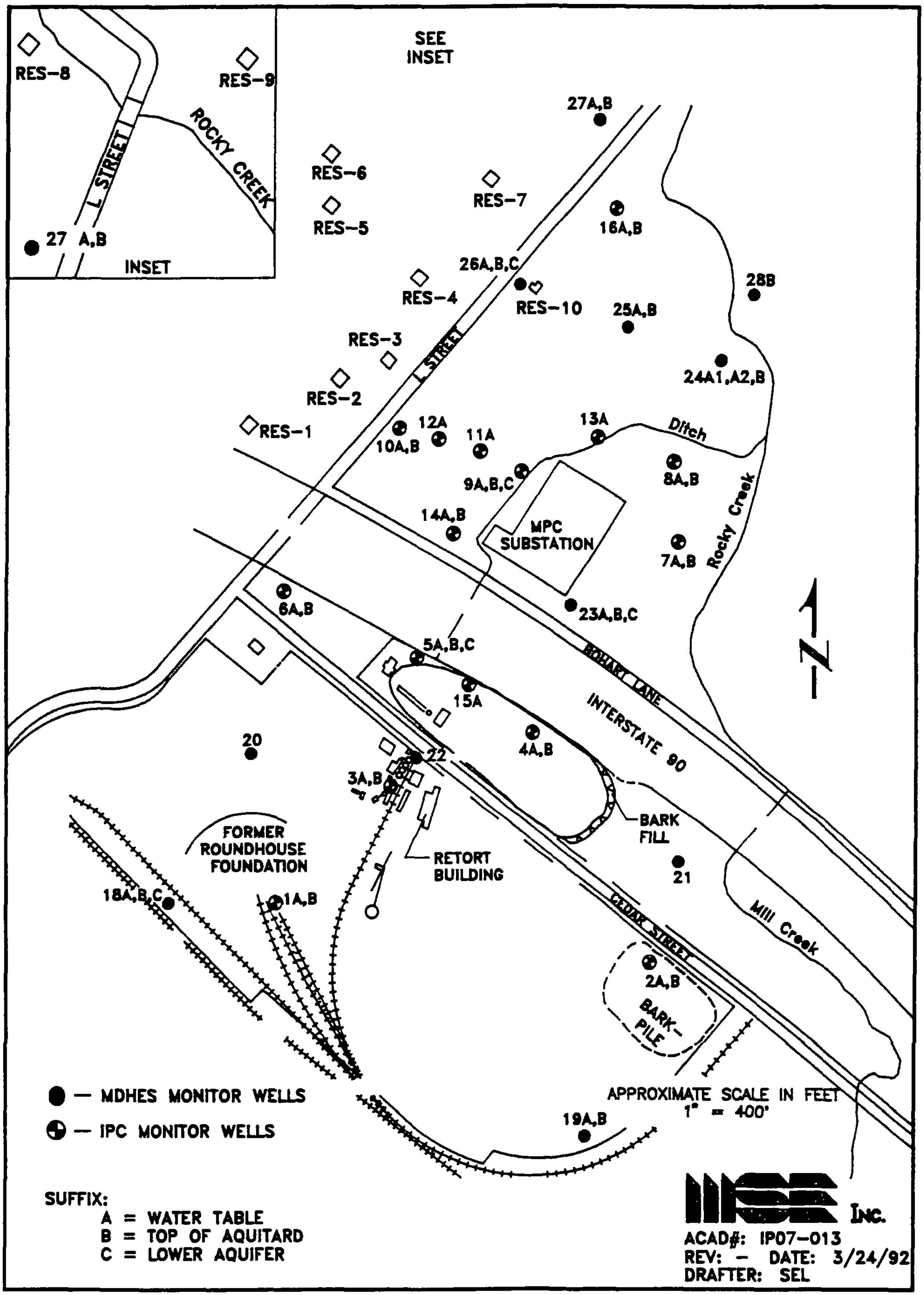


FIGURE 4-22 -- LOCATION OF MONITOR WELLS AND RESIDENTIAL WELLS GROUNDWATER INVESTIGATION detection limits) and correspond to those wells that had previously shown contamination during IPC sampling events (although the IPC data is unvalidated) in 1984, 1985, and 1986 (monitoring wells 3A, 3B, 15A, and 5A).

The complete semivolatile data are presented in Appendix E, pages E-43 through E-49. Several semivolatile organic compounds were detected above the CRDL. PCP was found in high concentrations in wells 3A, 5A, 5B, 22, and 15A (Figure 4-22). Associated PAH compounds and dibenzofuran were detected in wells 3A, 5A, 5B, and 15A. The compound 2-nitroaniline was also detected in well 5A.

The complete trace metals data are presented in Appendix E, pages E-54 through E-56. The trace metals analytical data showed a few anomalous results. Zinc was elevated in wells 18B and 19B (4690 and 2560 ppb, respectively), and manganese was very high in wells 15A and 5A (2700 and 1850 ppb, respectively). Iron was very high in well 15A (5680 ppb). The elevated zinc concentrations in wells 18B and 19B are probably due to the galvanized steel casings used to complete these wells; both wells have some casing submerged in the water column. Well 2A near the bark pile, had high iron, calcium, and magnesium probably due to the organic acids generated by the decomposing bark; water in the well was brownish yellow.

The complete conventional parameter data are presented in Appendix E, page E-57. Anions data (chloride and sulfate) had anomalous levels as follows: elevated chloride in wells 5A and B; high specific conductance (SC) in wells 2A, 15A, 5A and B; and low pH in wells 2A, 3A, 15A, and 5A. High SC and low pH in Well 2A are likely due to organic acids generated by decomposing bark

(2A is in the bark pile). The remaining wells with high SC, low pH, and elevated chlorides are the wells within the LNAPL plume. Elevated chloride is likely related to contaminant decomposing by dechlorination. Elevated SC and low pH are likely by-products of microbial decomposition of the associated petroleum hydrocarbons.

The observed suite of contaminants and the wells in which they are present follow the known extent of the LNAPL near and to the north of the treatment facilities. PCP, associated PAH compounds, and dibenzofuran are restricted to wells 3A and 5A (LNAPL in wells), and 15A (formerly LNAPL in well). Wells 22 (observed LNAPL) and 5B and C had PCP, indicating possible vertical contaminant migration. The Well 5 nest has LNAPL in 5A and PCP in 5B and C at decreasing concentrations with depth. Well 5C is partially completed in a fine-grained material, which corresponds with the "B" zone of the surficial aquifer. In addition to the organic contaminants, several other related parameters are anomalous in these wells, including: low pH, high SC, and elevated chloride, manganese and sodium.

No other suspected source areas (the bark pile, the historic surface water bodies, or the roundhouse area) had detectable groundwater contaminants. The only source areas identified are those previously known at the treatment area and the associated LNAPL plume. A LNAPL was observed during drilling of Well 22, but when the sample was collected no LNAPL was observed and the sample contained high concentrations of dissolved PCP. No additional suspected sources of contaminants to groundwater were identified, including the bark pile area, the eastern historic surface water bodies, and the former roundhouse area.

Contaminant groups detected include PCP and its potential degradation products and PAH's. Dibenzofuran was also found in association with the PAHs. No volatile compounds were detected at significant concentrations; hence, the soil vapor study designated for Stage III was deleted from the investigation. Additional groundwater sampling concentrated on two groups of analytes: PAH's and phenols. Major cations and anions also continued to be analyzed.

Discrete interval vertical profiling (DIVP) was performed during drilling of wells 20 and 22. Water samples from discrete portions of the aquifer were screened for volatile organics. No compounds were detected in Well 20; however, several PAH compounds were detected in Well 22.

The objective of Well 22, immediately downgradient of the retort building, was to explore the subsurface for a DNAPL. The potential for a DNAPL existed due to the many spills and leaks of treating fluid, the past use of creosote treatment, and the discovery of DNAPL at other similar National Priority List (NPL) sites with alluvial geologic settings.

Upon drilling Well 22, a LNAPL was observed at the first contact with the water table, as expected. In order to protect lower aquifer zones, the water table LNAPL was isolated by using double casing, with the larger diameter casing from the surface to the first 'less permeable zone' as outlined in the Work Plan. However, upon reaching the first less permeable zone at approximately 25 feet bgs (a clayey silt), NAPL material was observed coming from the borehole. It was believed at the time that this NAPL represented DNAPL that had migrated to the silty-clay surface and remained there. Well 22 was completed on top of the silty clay zone to monitor the possible DNAPL and the borehole was not drilled deeper to prevent dragging the suspected DNAPL to lower zones. Subsequent sampling (3 rounds) and monthly monitoring has not detected any DNAPL in Well 22; however, analyses have consistently shown high levels of PCP in the well. The initial observation of NAPL upon reaching the silty-clay surface during drilling of Well 22 may have two explanations: there may have been only a small pool of DNAPL at this location and it was entirely removed during the drilling and completion of Well 22, or; the NAPL material observed while drilling at 25 feet was actually LNAPL (observed higher up, on the water table) that may have come up the outside of the driven casing due to the air pressure from the drilling. Other pertinent observations during drilling of Well 22 were that once at the surface, the NAPL material floated on the surface of the water, and the color of the NAPL was greenish, not reddish brown as observed at other surface LNAPL locations. It is unclear what this material was (LNAPL or DNAPL) and whether a DNAPL is present at the IPC Site. If a DNAPL exists, it may have collected on this clayey-silt lens, the two lower silty-clay units, a lower aquitard (as yet undiscovered), or gone further down. Several wells have been installed on top of the two lower silty-clay units and none showed any evidence of DNAPL on top of these units. High concentrations of PAH compounds have not been detected in downgradient deeper wells, which indicates no DNAPL in the vicinity of those wells. However, without further exploratory work, the possibility of the existence of a DNAPL at the IPC Site is unresolved.

4.3.2 Trimesterly Monitoring Well Sampling

The objectives of the trimesterly sampling were to characterize the lateral and vertical extent of groundwater contamination, identify pathways or routes of preferred migration in the subsurface using concentration gradients, and seasonal variations in concentrations or pathways. Results of this stage were used to determine the placement of additional monitoring wells in Stage IV of the groundwater investigation and to study the interactions of groundwater with Rocky Creek.

Three rounds of monitoring well sampling were conducted: August 1990; November 1990; and March 1991. Stage IV monitoring wells installed in November 1990 were sampled a third time in June 1991. The Stage V well was sampled in September 1991.

Samples were analyzed for PAH's (EPA Method 8310) and phenols (EPA Method 8040), as well as major cations and anions. PCP concentrations for all groundwater sampling rounds are presented in Table 4-26. Other compounds detected are presented in Appendix E.

The first round of sampling (August 6 to 9, 1990) included 37 groundwater monitoring wells: IPC wells 1A and B, 2A and B, 3A and B, 4A and B, 5A, B, and C, 6A and B, 7A and B, 8A and B, 9A, B, and C, 10A and B, 11A, 12A, 13A, 14A and B, 15A and 16A and B; and MDHES wells 18A and B, 19A and B, 20, 21, and 22. Compounds detected include PCP, 2,4,6-Trichlorophenol, and PAHs. PCP was found in high concentrations (above 1,000 μg/l) in wells 5A, 9A, 3A, 22,

TABLE 4-26

PCP CONCENTRATIONS FOR GROUNDWATER SAMPLING AT THE IPC SITE

IPC SITE AREA	WELL #	PENTACHLOROPHENOL CONCENTRATIONS (μg/L)[a] MAY 1990	AUGUST 1990	NOVEMBER 1990	MARCH 1991	JUNE 1991[b]
Upgradient Wells	18A	50u	5.9u	370u	25u	ns
Upgradient Wells	18B	50u	5.9u	7.4u	25u	ns
Upgradient Wells	18C	ns	ns	7.4u	25u	0.1u
Upgradient Wells	19A	50u	5.9u	7.4u	25u	ns
Upgradient Wells	19B	50u	5.9u	7.4u	25u	ns
Upgradient Wells	1A	ns	5.9u	7.4u	25u	ns
Upgradient Wells	1B	ns	5.9u	7.4u	25u	ns
Plant Area Wells	20	50u	5.9u	7.9x	25u	ns
Plant Area Wells	21	50u	5.9u	7.4u	25u	ns
Plant Area Wells	2A	50u	5.9u	7.4u	25u	ns
Plant Area Wells	2B	ns	5.9u	7.4u	25u	ns
Plant Area Wells	4A	ns	5.9u	7.4u	25u	ns
Plant Area Wells	4B	50u	5.9u	7.4u	25u	ns
Plant Area Wells	6A	50u	5.9u	7.4u	25u	ns
Plant Area Wells	6B	50u	5.9u	7.4u	25u	ns
LNAPL Area Wells	3A	13,000	3,079	575	1,900	ns
LNAPL Area Wells	3B	50u	5.9u	877	25u	ns
LNAPL Area Wells	22	50u	3,079	575	1,900	ns
LNAPL Area Wells	5A	14,000	63,454	964	11,000	ns
LNAPL Area Wells	5B	800	35	370u	51.1	ns

TABLE 4-26 (Cont'd)

PCP CONCENTRATIONS FOR GROUNDWATER SAMPLING AT THE IPC SITE

		PENTACHLOROPHENOL CONCENTRATIONS ($\mu g/L$)[a]				
IPC SITE AREA	WELL #	MAY 1990	AUGUST 1990	NOVEMBER 1990	MARCH 1991	JUNE 1991[b]
LNAPL Area Wells	5C	68	241	7.4u	32.7	ns
LNAPL Area Wells	15A	420	1,299	67.2	870	ns
LNAPL Area Wells	14A	ns	5,900u	210.0	710	ns
LNAPL Area Wells	14B	ns	65.8	7.4u	48	ns
LNAPL Area Wells	9A	ns	5,920	44.0	980	ns
LNAPL Area Wells	9B	ns	5,900u	16.3x	750	ns
LNAPL Area Wells	9C	ns	5,900u	26.0x	270	ns
Downgradient Wells	23A	ns	ns	7.14	200	236.0
Downgradient Wells	23B	ns	ns	7.4u	130	139.0
Downgradient Wells	23C	ns	ns	7.4u	40	60.0
Downgradient Wells	7A	ns	5.9u	22.3	25u	ns
Downgradient Wells	7B	ns	32.9	7.4u/7.4u	9.0j/26.8	ns
Downgradient Wells	8A	ns	158	7.4u	31.2	ns
Downgradient Wells	8B	ns	1,331	7.4u/7.4u	160/150	ns
Downgradient Wells	13A	ns	744	7.4u	5.4j	ns
Downgradient Wells	11A	ns	5.9u	7.4u	25u	ns
Downgradient Wells	12A	ns	5.9u	7.4u	25u	ns
Downgradient Wells	10A	ns	5.9u	7.4u	25u	ns
Downgradient Wells	10B	ns	5.9u	7.4u	25u	ns
Downgradient Wells	24A1	ns	ns	7.4u	70	39.9

TABLE 4-26 (Cont'd)

PCP CONCENTRATIONS FOR GROUNDWATER SAMPLING AT THE IPC SITE

		PENTACHLOROPHENOL CONCENTRATIONS (μg/L)[a]				
IPC SITE AREA	WELL #	MAY 1990	AUGUST 1990	NOVEMBER 1990	MARCH 1991	JUNE 1991[b]
Downgradient Wells	24A2	ns	ns	7.4u	60	31.0
Downgradient Wells	24B	ns	ns	7.4u	250	218.0
Downgradient Wells	25A	ns	ns	7.4u	500	549.0
Downgradient Wells	25B	ns	ns	52/7.4u	830/586	927.0
Downgradient Wells	26A	ns	ns	7.4u	25u	4.3
Downgradient Wells	26B	ns	ns	7.4u	24.3j	54.0
Downgradient Wells	26C	ns	ns	7.4u	67.5	28.0
Downgradient Wells	16A	ns	337	7.4u	25u	ns
Downgradient Wells	16B	ns	5,900u	7.4u	340	ns
Downgradient Wells	27A	ns	ns	7.4u	25u	14.0
Downgradient Wells	27B	ns	ns	38.5	600	647/655
N. of Rocky Creek	28B	ns	ns	7.4u	25u	0.1u
Residential Wells	Res-1	ns	5.9u	74u	25u	0.1u
Residential Wells	Res-2	ns	5.9u	74u	25u	0.51j
Residential Wells	Res-3	ns	5.9u	74u	50u	0.1u/0.11
Residential Wells	Res-4	ns	5.9u	7.4u	25u	0.1u
Residential Wells	Res-5	ns	5.9u	7.4u	25u	0.1u
Residential Wells	Res-6	ns	5.9u	7.4u	25u	0.1u
Residential Wells	Res-7	ns	5.9u	370u	25u	0.1u/0.1u
Residential Wells	Res-8	ns	590u	7.4u	27.6	99.0

TABLE 4-26 (Cont'd)

PCP CONCENTRATIONS FOR GROUNDWATER SAMPLING AT THE IPC SITE

		PENTACHLOROPHENOL CONCENTRATIONS (μg/L)[a]				
IPC SITE AREA	WELL #	MAY 1990	AUGUST 1990	NOVEMBER 1990	MARCH 1991	JUNE 1991[b]
Residential Wells	Res-9	ns	5.9u	7.4u	25u	0.24
Residential Wells	Res-10	ns	321	7.4u	25u	ns

Notes: [a] Data qualifier codes used are as follows: ns = not sampled; u = analyzed, but was not detected at the concentration listed; j = an estimated quantity; and x = suspected false positive -- concentration listed may be a result of carryover during the laboratory analysis.

[b] Determination made using EPA Method 515.1.

8B, and 15A; moderate concentrations (above 100 µg/l) were detected in wells 13A, 16A, Res-10, 5C, and 8A. Lower concentrations were reported for wells 14B, 5B, and 7B. Wells 9B, 9C, and 14A required dilutions, since the data reported was off scale. However, the lab did a 1,000X dilution resulting in the signal being indistinguishable from background. As a result of the dilution the PCP detection limit was raised from 5.9 µg/L to 5,900 µg/L and it was not possible to tell whether these wells contain PCP or not. The laboratory error in raising the detection limits caused the data to be questionable and further sampling rounds had to be relied upon to provide data for these wells. Since both wells are located in the observed LNAPL plume, it can be assumed that PCP is present, but at concentrations less than 5,900 µg/L. 2,4,6-Trichlorophenol was detected only once in Well 5A. PAH compounds were detected in significant concentrations (above 10 µg/L) in wells 5A, 3A, 14A and B, 15A and 22. Appendix E presents the complete data, phenols pages E-1 through E-4, PAHs pages E-15 through E-18, conventional parameters page E-57, dioxins page E-35, and furans page E-36.

The second round of sampling (November 27 to 30, 1990) included sampling the Stage IV wells (MW-23 through MW-28) for the first time. A total of 52 groundwater monitoring wells were sampled: IPC wells 1A and B, 2A and B, 3A and B, 4A and B, 5A, B, and C, 6A and B, 7A and B, 8A and B, 9A, B, and C, 10A and B, 11A, 12A, 13A, 14A and B, 15A and 16A and B; and MDHES wells 18A, B and C, 19A and B, 20, 21, 22, 23A, B, and C, 24A1, A2, and B, 25A and B, 26A, B, and C, 27A and B, and 28B.

Several phenol and PAH compounds were detected in this round of sampling; however, several data qualifications apply to these analytical results, which directly affect their usability. The most significant analytical qualifier is a result of possible contaminant carryover, causing several samples that were run after a contaminated sample to have similar contaminants at lower levels. The samples with probable carryover concentrations were flagged with an "X" by the data reviewers to alert the data user of these suspected problems; carryover was evident in both the PAH and phenol data packages although the problem had the most impact on the PAH data. The data qualified with the "X" flag were only used for screening purposes. Pentachlorophenol data presented in Table 4-26 are those data that were above the detection limit.

PCP was detected in wells 3A, 3B, 5A, 7A, 9A, 14A, 15A and 22. Other phenolic compounds were detected in wells 5A and B, 3A and B, and 7A; presumably these represent degradation or byproducts of PCP. Wells 3A, 3B, 5A, 9A, and 14A are within the LNAPL contaminated area and have previously had much higher concentrations of PCP. Wells 15A (67.2 μg/L) and 22 (25.7 μg/L) are very close to the NAPL contaminated area and have also had much higher concentrations of PCP in previous sampling rounds. Well 7A (22.3 μg/L) has not previously had detectable concentrations of PCP.

Stage IV wells that had detectable PCP concentrations were 23A, 25B, and 27B. The concentration detected in 23A (7.14 μg/L) was below the reported detection limit of 7.4 μg/L, the concentration in 25B (52 μg/L) was not reproduced in the field duplicate (not detected), and the PCP reported in 27B may be due to carryover from non-Idaho Pole RI/FS samples. PAH compounds detected include: chrysene, fluoranthene, phenanthrene, fluorene, pyrene, benzo(k)fluoranthene, benzo(a)pyrene, and naphthalene. Chrysene and benzo(k)fluoranthene were detected in many samples, including blanks, and are the two most frequent carryover compounds described earlier. Wells that exhibited contamination by one or more PAHs and are not flagged "X" include 3A and B, 4B, 5A, 10B, 12A, 13A, 14 A and B, 15A, 16A and B, 18B and C, 22, 23A, 24B, 25A and B, 26B, 27A and B, and 28B. Though these PAH data cannot be rejected per the CLP SOW data validation requirements, all groundwater PAH data from this sampling should be treated as suspect and not relied upon for interpretation. Appendix E presents the complete data, phenols pages E-5 through E-15, PAHs pages E-17 through E-32, dioxins page E-35, and furans page E-36.

The third round of sampling (March 5 to 7, 1991) included sampling of 52 groundwater monitoring wells: IPC wells 1A and B, 2A and B, 3A and B, 4A and B, 5A, B, & C, 6A and B, 7A and B, 8A and B, 9A, B, and C, 10A and B, 11A, 12A, 13A, 14A and B, 15A, and 16A and B; and MDHES wells 18A, B and C, 19A and B, 20, 21, 22, 23A, B, and C, 24A1, A2, and B, 25A and B, 26A, B, and C, 27A and B, and 28B.

Thirteen phenol compounds and 15 PAH compounds were detected in this round of sampling. Examination of the data shows many wells with high concentrations of contaminants. This may be due to the relatively high groundwater elevation during this sampling round, causing resaturation of contaminated soils, or it may be due to high spring precipitation mobilizing contaminants from the surface soils into the groundwater.

PCP was detected in wells 3A, 5A, B, and C, 7B, 8A and B, 9A, B, and C, 13A, 14A and B, 15A, 16B, 22, 23A, B, and C, 24A1, A2 and B, 25A and B, 26B and C, and 27B. Tetrachlorophenol was detected in wells 5A, 8B, 9A, 14A, 15A, 25B, and 27B. Trichlorophenol, dichlorophenols and other phenolic compounds were detected in wells 3A, 5A, 14A, and 15A. Phenol was detected at low concentrations in wells 5B, 15A, and 23C. Presumably, these phenolic compounds are either co-produced with or degradation products of PCP.

PAH compounds detected include: chrysene, fluoranthene, phenanthrene, fluorene, pyrene, benzo(k)fluoranthene, anthracene, acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, naphthalene, dibenzo(a,h)anthracene, benzo(g,h,i)perylene, and indeno(1,2,3-cd)pyrene. Wells that exhibited contamination by one or more PAHs include: 3A, 5A and B, 8A and B, 9A, B and C, 13A, 14A and B, 15A, 16B, 22, 23A, and B, 25A and B, and 27 B. These PAH data correlate well with those wells exhibiting higher concentrations of PCP contamination. The complete data are presented in Appendix E, phenols pages E-1 through E-16, PAHs pages E-17 through E-32, dioxins page E-35, furans page E-36, and conventional parameters E-57 through E-64.

The final round of sampling was conducted on June 4 and 5, 1991. The June sampling included only the 15 monitoring wells installed in November 1990, during the Stage IV groundwater investigations including: MDHES wells 18C, 23A, B, and C, 24A1, A2, and B, 25A and B, 26A, B, and C, 27A and B, and 28B.

The phenols (Method 8040) data package was returned to the CLP laboratory per the instructions of SMO. These data were determined to be unusable because the lab performed unnecessary dilutions that caused no phenols to be detected and because the lab used the incorrect analysis method. These data were not entered into the IPC RI/FS database.

Although the PAH data meet all CLP SOW data validation requirements, the data are suspect due to poor performance on QC samples (lab duplicates, a field blank, and a standard reference material), and a possible degradation of the gas chromatograph (GC) system performance during the sample run. These PAH data were not used in preparing the risk assessments.

The PCP analysis (Method 515.1) had acceptable QA/QC results and PCP concentrations were reported with a much lower detection limit (0.1 μg/L) than previously obtained in the phenols (EPA Method 8040) analytical suite (5.9-25 μg/L). The lower PCP detection limit was required due to the change in the MCL for PCP to 1.0 μg/L in 1991.

The PCP analysis detected PCP in 13 of the 15 monitor wells sampled. These PCP results closely resemble the March 1991 PCP data (PCP was reported in the March 1991 phenols analyses). Wells 25A and B and 27B had high PCP concentrations (>500 μg/L); wells 23A and B and 24B had moderate concentrations (100 to 500 μg/L); and wells 24A1 and A2, 26A, B, and C, 23C, and 27A had lower concentrations (<100 μg/L). Two wells detected PCP in June 1991 but did not in March 1991 (26A and 27A). The division of high, moderate, and low concentrations was made for the convenience of discussing this data set and does not reflect a risk grouping.

The only PAH compound detected was benzo(a)anthracene and it was detected in 10 of the 15 monitor wells sampled. The "X" flag associated with the Well 18C benzo(a)anthracene data is a qualifier assigned by the data reviewer because of suspected carryover (the matrix spike sample was analyzed prior to the Well 18C sample). The lab generated QA/QC samples, which are required for the PAH analysis (laboratory control standard, MS/MSD, and laboratory blank), were all performed prior to analyzing field samples. These lab generated QA/QC are all within required guideline samples according to the Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses (EPA, 1988). It appears, however, that the instrument degraded (retention time windows shifted) during the analysis of field samples. The standard reference material (quality control sample) submitted with the batch was not within specified ranges; the laboratory duplicates and the field blank analyzed later in the sequence also performed poorly. These QC samples alone cannot, however, qualify these data. The PAH data do not compare with the historical PAH results in these 15 Stage IV monitor wells. The only Stage IV monitor well that contained benzo(a)anthracene in the March 1991 sampling round was Well 25B; benzo(a)anthracene has always been associated with monitor wells in the LNAPL plume. Also, other PAHs (fluorene, anthracene, and fluoranthene) detected in the March sampling round of the Stage IV Wells were not detected in the June sampling round. The complete data are presented in Appendix E, no phenols data are reported, PAHs pages E-25 and E-26, PCP page E-33, dioxins page E-39, and furans page E-40.

The Stage V sampling of well 29D was performed in September 1991. This stage involved sampling the "C" zone (GW-29C) using the DIVP method during drilling (described earlier) and collecting a sample from the underlying "D" zone (GW-29D) where the deep well was completed as described in the Stage V Groundwater Investigation Plan (MSE, 1991n). The samples were analyzed for phenols (Method 8040), PCP (Method 515.1), PAHs (Method 8310) and cations/anions.

PCP was detected in GW-29C at 17 μg/L using EPA method 515.1. The reported concentration is less than other downgradient "C" zone wells (the other downgradient "C" zone wells at the site are 9C, 23C, and 26C). In the June 1991 monitoring well sampling, well MW-23C had 60 μg/L PCP (EPA method 515.1) and well MW-26C had 28 μg/L PCP (EPA method 515.1); well 9C was not sampled in June 1991. PCP was also detected in GW-29C using the phenols analysis (EPA method 8040) at 110 μg/L. The discrepancy between the two analyses (17 μg/L vs. 110 μg/L) cannot be determined from the data package provided. The PCP method (515.1) has a lower detection limit and is supposed to be more sensitive than the Phenols method (8040). However, 2 surrogates were run with the 8040 method and only 1 surrogate with the 515.1 method, all of which were in control (no internal standards were run on this sample). This QA/QC lends more credibility to the higher value, as does the higher concentration of PCP appearing at the center of the dissolved plume in the "C" zone. No other phenols and no PAHs were detected in GW-29C.

PCP was also detected in GW-29D at 0.53 μg/L and in the duplicate of GW-29D at 0.35 μg/L (EPA method 515.1). PCP was analyzed in the phenols method (EPA method 8040) and it was not detected (detection limit 4 μg/L). No other phenols and no PAHs were detected in GW-29D during the Stage V groundwater investigation.

4.3.3 Quarterly Residential Well Sampling

The objective of residential well sampling was to monitor contaminant levels that may result in possible health risks to residents utilizing shallow groundwater for domestic purposes. Data is presented in Appendix E. PCP data are presented in Table 4-26. Residential wells, Res-01 through Res-10 (unoccupied), were sampled in August 1990, November 1990, March 1991, and June 1991. Analyses were for those analytes identified in the source area sampling (PAH's and Phenols) and occasionally for dioxins/furans.

Ten residential wells (Res-01 through Res-10) were sampled from August through 9, 1990, and analyzed for PAHs and phenols (Figure 4-22). The analytical data show no detectable compounds of either analyses group in the residential wells, except the Res-10 well, the shallow stock well at a residence which is no longer inhabited. Res-10 had PCP (321 μg/L) and 2,4,6-Trichlorophenol (31.8 μg/L) at detectable concentrations. The complete data are presented in Appendix E, phenols pages E-1 through E-4, PAHs E-19 and E-20, dioxins page E-39, and furans page E-40.

Residential wells (Res-01 through Res-10) were also sampled during the November sampling. All samples were analyzed for phenols and PAHs and one sample (Res-03) was sampled for dioxin/furans. An additional well, Res-8A located in the Res-08 pasture, was added as a sampling point, though it is not used for residential drinking water. Again, only Res-10, currently unoccupied, had detectable contaminants (PAHs) that were not flagged "X". The "X" qualifier was used to indicate suspected contaminant carryover, causing several samples that were run after a contaminated sample to have similar contaminants at lower levels. The residential well that was sampled for dioxin/furans (Res-03) had no dioxin/furan compounds detected in that sample or its duplicate (Res-3A). The complete data are presented in Appendix E, phenols pages E-5 through E-8, PAHs pages E-19 through E-22, dioxins page E-35, and furans page E-36.

The third round of residential well sampling included residential wells Res-01 through Res-10 which were sampled during March 1991. For the first time since residential well sampling began, Res-08 had detectable PCP (27.6 μg/L). No other compounds were detected; the other residential wells were all below detection. The residential wells (Res 01 through Res-09) were also analyzed for dioxins/furans. The only dioxin/furan detected was PeCDD at 0.0013 μg/L in Res-02. No dioxin/furan compounds were detected in the other residential wells. The complete data are presented in Appendix E, phenols pages E-7 through E-8, PAHs pages E-23 through E-24, dioxins page E-37, and furans page E-38.

A total of nine residential wells were sampled on June 4 and 5, 1991, including Res-01 through Res-09. All samples were analyzed for PAHs (EPA Method 8310), phenols (EPA Method 8040 was requested), PCP (EPA Method 515.1), and one sample, Res-02, was analyzed for dioxins/furans (EPA Method 8280).

The phenols data package was determined to be unusable because the lab performed unnecessary dilutions that caused no phenols to be detected and because the lab used the incorrect analysis method. It was returned to the laboratory per instructions from SMO.

The only PAH compound detected was benzo(a)anthracene and it was detected in five of the nine residential wells sampled. The lab generated QA/QC samples that are required for the PAH analysis (laboratory control standard, matrix spike/matrix spike duplicate, and laboratory blank) were all performed prior to analyzing field samples. These lab generated QA/QC samples are all within required guidelines according to the Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses (EPA, 1988). It appears, however, that the instrument degraded (retention time windows shifted) during the analysis of field samples. The standard reference material (quality control sample) submitted with the sample batch was not within specified ranges; the laboratory duplicates and the field blank analyzed later in the sequence also performed poorly. These QC samples alone cannot, however, qualify these data. The PAH data do not compare with the historical PAH results in the residential wells. For example, no benzo(a)anthracene was detected in any residential wells in the March 1991 sampling round.

The PCP analyses detected PCP in three of the nine residential wells. Res-08 (99.0 μg/L) had PCP previously detected in the March 1991 sampling round (27.6 μg/L); the two additional wells Res-02 (0.51J μg/L) and Res-09 (0.24 μg/L) have not had contamination detected previously. The "J" flag associated with Res-02 is a qualifier given by the data reviewer because the surrogate in sample Res-02 had a low recovery indicating a possible underestimation of PCP.

The dioxin/furan results for sample Res-02 did not detect any compounds. Although, the non-detect value for total octachlorodibenzo-p-dioxin (OCDD) in Res-02 was flagged "J" because of a high recovery for the internal standard, which indicates a possible underestimation. The complete data are presented in Appendix E, no phenols data are reported, PAHs pages E-27 through E-28, PCP page E-33, dioxins page E-39, and furans page E-40.

4.4 SURFACE WATER INVESTIGATION

4.4.1 Seasonal Surface Water Sampling

Sampling and flow monitoring station locations were chosen to characterize surface water quality and quantity in the vicinity of the IPC Site, assist in determining zones of discharge for potentially contaminated groundwater, and impacts to surface water from storm runoff water leaving the IPC Site. Surface water investigation stations are presented in Figure 4-23. Stations were selected on Rocky Creek, Mill Creek, the L Street ditch, the MPC Substation ditch, and the Cedar Street ditch.

Due to actual site conditions, the following amendments were made to the station locations proposed in the field sampling plan:

> Station ID-3 (adjacent to office interceptor ditch) was deleted due to lack of flow during the spring, high-flow sampling episode.

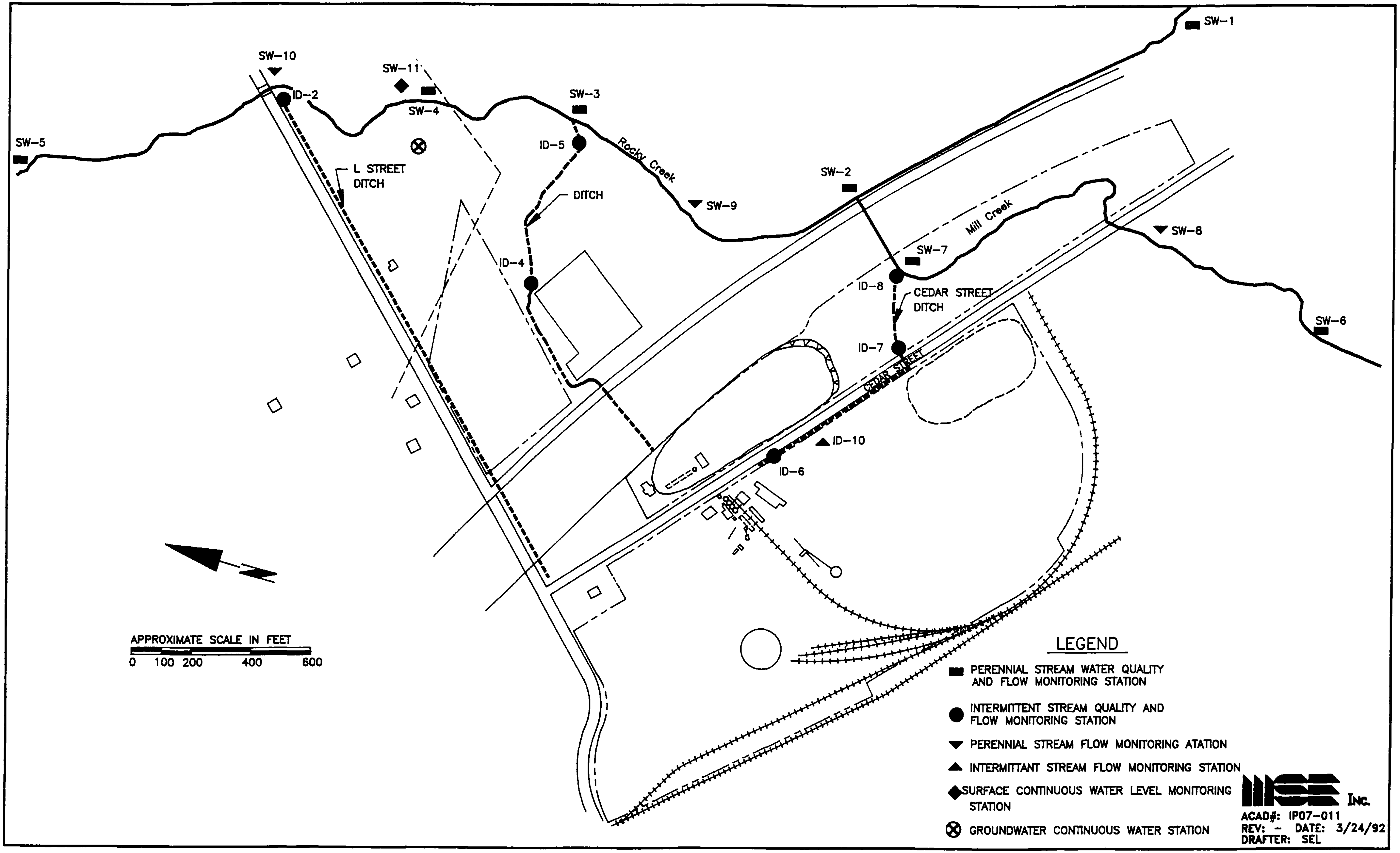


FIGURE 4-23 -- SURFACE WATER INVESTIGATION STATIONS

Station ID-1 (start of L Street ditch) was deleted due to lack of flow during the spring, high-flow sampling event.

Station ID-9 (L Street ditch, midpoint) was deleted due to lack of flow during the spring, high-flow sampling event.

Station SW-6 (upgradient Mill Creek) was relocated from the railroad bridge to approximately 200 feet downstream. Relocation of this station was necessary due to repeated vandalism of the staff gauge. SW-6 was relocated on July 11, 1990.

Three surface water sampling episodes were conducted. The episodes were conducted in conjunction with the spring peak-flow event, the late summer low-flow event and the mid-winter low-flow event. A mid-summer low-flow storm event sampling episode could not be conducted because a storm of great enough intensity did not occur. Details of each sampling episode are presented in the following subsections.

4.4.1.1 Spring Peak Flow

The peak flow surface water sampling episode at the IPC Site was conducted on April 17, 1990, by a four-person sampling team, including: Bill Bullock, Kevin Kissell, John Ruth, and David Tuesday, MSE. Two members of the team collected samples while the other two simultaneously measured stream flow rates. Visitors included Steve Lind, USGS, and Carol Vega, MSE. The sample stations included the perennial stream water quality monitoring stations on Rocky Creek and Mill Creek and the intermittent ditch water quality stations on the Cedar Street ditch, the L Street ditch, and the MPC Substation ditch. A total of 13 stations were sampled, including the following stations in sequence of collection: SW-5, SW-10, ID-2, SW-4, ID-5, ID-4, SW-2, SW-1, SW-

7, ID-8, ID-7, ID-6, and SW-6 (see Figure 4-23). Sample collection methods are outlined in the FSP, sample number designation is outlined in Table 4-2. SW-10, originally proposed as a stream flow monitoring station, replaced SW-3 as a water quality monitoring station for the following reasons: 1) the ditch between the IPC pasture and the MPC Substation does not flow into Rocky Creek prior to SW-3 and the ditch water is lost to the subsurface in the area between SW-3 and SW-4, and 2) groundwater is collected in the L Street ditch and released to Rocky Creek at SW-10 during spring high water levels. All samples were submitted for TCL analysis (volatiles, semivolatiles, and dissolved metals, anions, and sediment load); Table 4-3 lists the compounds included in the TCL.

The volatile organic analyses are presented in Appendix E, pages E-93 through E-95. Two compounds were detected without being estimated quantities (no J flag), including chloroform detected at ID-7 (9 ppb) and 1-2-dichloroethane detected at ID-6 in one sample (37 ppb). Two compounds were detected as being estimated quantities, including chloroform detected in ID-8 (4 ppb) and methylene chloride detected in SW-1 (2 ppb), SW-4 (4 ppb), and ID-4 (2 ppb).

The semivolatile organic analyses are presented in Appendix E, pages E-86 through E-92. PCP was detected at ID-4 (140 ppb) without being an estimated quantity (no J flag). Pentachlorophenol was detected as an estimated quantity (J flag) at the following stations: ID-5 (36 ppb), ID-6 (16 ppb), and ID-7 (6 ppb).

The trace element metals analyses are presented in Appendix E, pages E-96 and E-97. There appears to be no significant trends of increasing heavy metal concentrations from upstream to downstream monitoring stations, or any significant releases of heavy metals from the IPC Site. No exceedences of drinking water standards or aquatic life standards are present.

Anions (chloride and sulfate) and dissolved cation data (Ca, Mg, K, Na) are presented in Appendix E, page E-98.

The objectives of this sampling episode were to identify contaminants potentially impacting the water quality of Mill and Rocky creeks and to assist in determining the interaction between groundwater and surface water. PCP was the only semivolatile compound detected and was only detected in the intermittent ditches. PCP in ditches is probably due to releases from the site.

4.4.1.2 Late Summer Low-Flow Surface Water Sampling

The late summer, low-flow surface water sampling episode at the IPC Site was conducted on September 13, 1990, by a three-person sampling team, including: Bill Bullock, Meg Babits, and Kim Connors, MSE. Visitors included Dan Marsh, Hydrometrics. The sample stations included the perennial stream water quality monitoring stations on Rocky Creek and Mill Creek and two intermittent ditch water quality stations on the Cedar Street ditch. Stations located on the L Street ditch and MPC Substation ditch were dry and therefore could not be sampled. A total of nine stations were sampled, including the following (in sequence of collection): SW-5, SW-10, SW-4, SW-2, SW-1, SW-7, ID-8, ID-6, and SW-6A (6A replaced SW-6 which was destroyed by vandals). All samples were submitted to the contract lab program (CLP) for analysis of phenolics and PAHs.

The PAH analyses are presented in Appendix E, pages E-80 and E-81. Benzo(k)fluoranthene was detected at ID-08 (1.1 ppb) above the IDL.

The phenolics analyses are also presented in Appendix E, pages E-74 and E-75. There were no phenolic compounds detected above the IDL.

Field parameters (pH, SC, temperature, dissolved oxygen, flow, and stage) are presented in Appendix E, page E-101.

Analytical results from this low flow sampling episode indicate that dissolved contaminants in the groundwater plume are diluted to below detectable concentrations in the surface water during summer low flow. Surface migration potential of contaminants via storm water runoff and transport in ditches cannot be evaluated from this data due to the absence of flow in the intermittent ditches.

4.4.1.3 Mid-Winter Low Flow

The mid-winter low flow sampling episode at the IPC Site was conducted on February 7, 1991. Three MSE personnel completed this task: Meg Babits, Bill Bullock, and Shawn Bisch. Weather conditions were calm and clear with temperatures ranging from approximately 25 °F in the morning to 45 °F in the late afternoon. Samples were collected from 10 surface water stations (in order of collection): SW05, SW10, SW04, SW03, SW02, SW01, SW13C (SW01 duplicate), SW07, ID08, SW06A, and ID06. A field blank, SW11C, was also collected. All samples were submitted to the CLP for analysis of phenolics and PAH.

The surface water phenolic analytical data is presented in Appendix E, pages E-74 and E-77. The following briefly states the detected compound, sample identifier, and quantity:

- Phenol	ID06	4.6	µg/L
- 4-Chloro-3-methylphenol	SW04	1.5	µg/L
- 2,4,6-Trichlorophenol	SW10	1.6	µg/L
	SW04	0.36	µg/L
	ID06	5.8	µg/L
- 2,4-Dinitrophenol	SW10	1.2	µg/L
	SW02	0.66	µg/L
	SW06A	1.3	µg/L
	ID08	1.8	µg/L
	SW11C(blnk)	0.74J	µg/L
- 4-Nitrophenol	SW10	3.8	µg/L
	SW02	0.48	µg/L
	SW06A	0.49	µg/L
	ID08	0.45	µg/L
	ID06	25	µg/L
- 4,6-Dinitro-2-methylphenol	SW10	1.2	µg/L
- Pentachlorophenol	ID06	38	µg/L

The following data qualification must be noted for the phenolic analysis: the lab could not achieve the lowest possible detection limit for the compound phenol and, therefore, samples indicating non-detection of phenol (all surface water samples except ID06) are flagged as X.

Surface water PAH analytical data is also presented in Appendix E, pages E-80 through E-85. The following list briefly states the detected compound, sample identifier, and quantity.

Anthracene	SW05	0.032 B	μg/L
	SW03	0.006 BJ	μg/L
	SW06A	<0.001B	μg/L
	ID08	0.066 B	μg/L
	ID06	0.580 BJ	μg/L
	SW11C(blnk)	0.0970 B	μg/L
Benzo(a)anthracene	ID08	0.010	μg/L
	ID06	0.005 J	μg/L
Benzo(a)pyrene	SW04	0.037	μg/L
Benzo(b)fluoranthene	SW06A	0.0024	μg/L
Benzo(g,h,i)perylene	SW04	0.0138	μg/L
Benzo(k)fluoranthene	SW04	0.0024	μg/L
Chrysene	SW04	0.0069	μg/L
	ID06	0.0103 J	μg/L
Dibenzo(a,h)anthracene	SW04	0.0042	μg/L
Fluorene	SW05	0.102 B	μg/L
	SW10	0.100 B	μg/L
	SW01	0.100 B	μg/L
	SW13C(dup)	0.100 B	μg/L
	SW07	0.138 B	μg/L
	ID06	0.068 BJ	μg/L
Phenanthrene	SW04	0.0550	μg/L
	SW-06A	0.0019	μg/L
Pyrene	SW04	0.0400	μg/L

The following data qualifications must be noted for the PAH analysis: the sample concentrations for anthracene and fluorene are flagged with a B, indicating that the compound was detected in the associated laboratory blank; and, surrogate recoveries for ID06 and SW03 were high, indicating possible over estimation of target compounds, thus flagging the data as an estimated quantity (J flag).

Anions (chloride and sulfate) and field parameter data are presented in Appendix E, pages E-98 through E-103.

The mid-winter, low-flow sampling detected more contaminants and higher concentrations of contaminants than any other surface water sampling episode.

This may be attributed to the following factors:

- Unseasonably warm temperatures caused significant amounts of snow melt runoff from the site, potentially carrying contaminants from site surface soils.
- Stream flow rates were slightly lower than those measured during the summer low flow sampling event, which would account for less dilution of contaminants.
- Detection limits were lower than those achieved in the previous two sampling episodes.

The only intermittent ditch, which had water flowing during the mid winter low flow sampling episode, was the Cedar Street ditch. The two locations that detected contamination were ID-6 and 8. The contamination is most likely from a surface runoff from the IPC operation.

The surface water stations which detected contamination were SW-2, 4, 6, and 10. The surface water stations SW-4 and 10 had the most contaminants and the higher concentrations of contaminants. The contamination is most likely from the dissolved groundwater plume. SW-6, the upgradient Mill Creek sample, had detected levels of the following phenols: 2,4-dinitrophenol (1.3 ppb) and 4-nitrophenol (0.49 ppb). The 2,4-dinitrophenol was also detected in the field blank at 0.75 ppb and should be regarded as suspect; the 4-nitrophenol was reported at very near the detection limit. The following PAHs were detected in SW-6: benzo(b)fluoranthene (.0024 ppb) and phenanthrene (.0019 ppb) both near the detection limit (.002 and .001 ppb, respectively). MSE believes upgradient Mill Creek does not contribute significant contamination to downgradient Mill Creek. Data from this sampling episode were used to conduct the surface water loading calculations presented in Section 6.4.2 as part of the Surface Water/Groundwater Interaction Study.

4.4.2 Groundwater Drainage Ditch

One surface water sample (SWG1) was collected in the groundwater drainage ditch; located approximately 40 feet upstream from where the groundwater drainage ditch enters Rocky Creek (Figure 4-24). This sampling was conducted on April 11, 1991, by Bill Bullock and Shawn Bisch, MSE. The purpose of this sample was to determine if the ditch was intercepting the groundwater dissolved contaminant plume and acting as a secondary contaminant transport route. The sample was analyzed for phenols and PAHs. There were no phenols

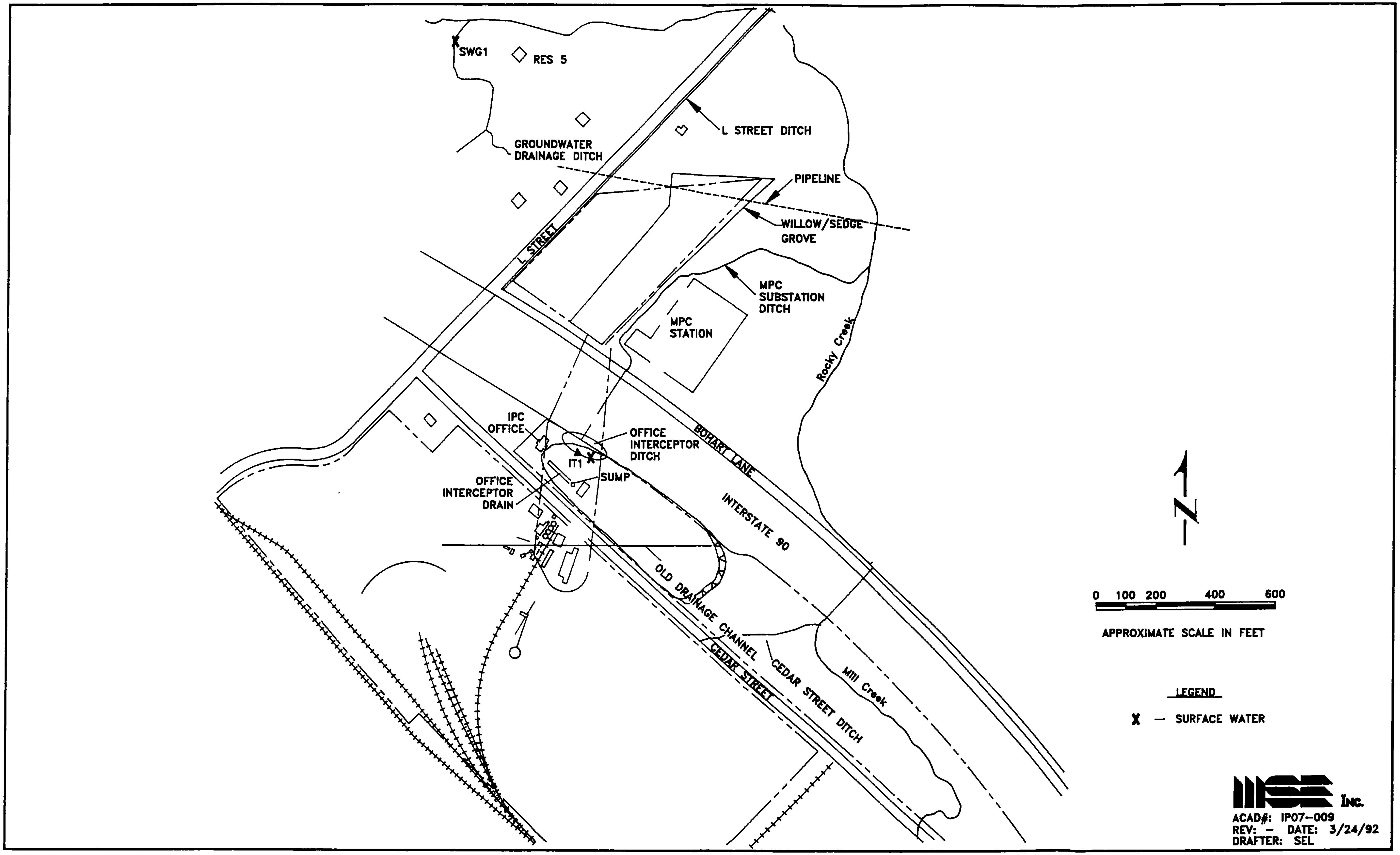


FIGURE 4-24 -- SURFACE WATER INVESTIGATION STATIONS detected (limit of detection 10 μg/L) and no PAHs detected (limit of detection 3 μg/L). The complete phenols and PAH data are presented in Appendix E, phenols pages E-78 and E-79 and PAHs pages E-84 and E-85.

4.4.3 Office Interceptor Ditch

One surface water sample (IT1) was collected on April 11, 1991, in the office interceptor ditch; located just east of the metal shed in the ditch (Figure 4-24). This sample was collected on April 11, 1991, by Bill Bullock and Shawn Bisch, MSE. The purpose of this sample was to determine contaminant concentrations of water from the overflow of the office interceptor trench. The sample was analyzed for phenols and PAHs. PCP was the only phenol detected at 740 D μg/L (D equals sample diluted due to exceedence of calibration range) and no PAHs were detected (limit of detection 3 μg/L). The complete phenols data are presented in Appendix E, phenols pages E-78 and E-79 and PAHs pages E-84 and E-85. Low dissolved concentrations may be partially attributed to dilution of the interceptor ditch water due to large influxes of precipitation prior to sampling.

4.5 AIR INVESTIGATION

4.5.1 Presentation of Air Quality Data

No ambient air quality measurements have been made to date onsite or away from the IPC Site. However, RI/FS derived surface soil (0 to 12 inch) contaminant concentration data from the historic roundhouse area, wood treating area, and

IPC yard area have been used to assess potential airborne contaminant transport both onsite and into the adjacent residential and light industrial areas. The approach utilized is summarized in the following discussion.

Arithmetic average PCP and benzo(a)pyrene concentrations were calculated for the three source areas delineated for modeling purposes and presented in Figure 4-25. Concentrations for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TeCDD) toxicity equivalent (TE) are estimated for the three areas because limited amounts of analytical data available. Values used are presented in Table 4-27.

Next, fugitive dust emissions inventory was performed for the entire IPC Site. Emissions from various vehicular activities and from wind erosion of exposed ground were calculated using standard emission factors. Emissions from vehicular sources were assumed to occur only during working hours (2088 hours) while emissions from wind erosion occurred continuously. Results from the emissions inventory and the equation used are presented in Table 4-28 and 4-29, respectively.

Contaminant-specific emission factors were derived using the average RI/FS surface soil contaminant concentrations for three discrete areas: the BNRR roundhouse area, the treating plant area, and the treated-wood storage area. Concentrations used and calculated contaminant-specific emission factors are presented in Table 4-30.

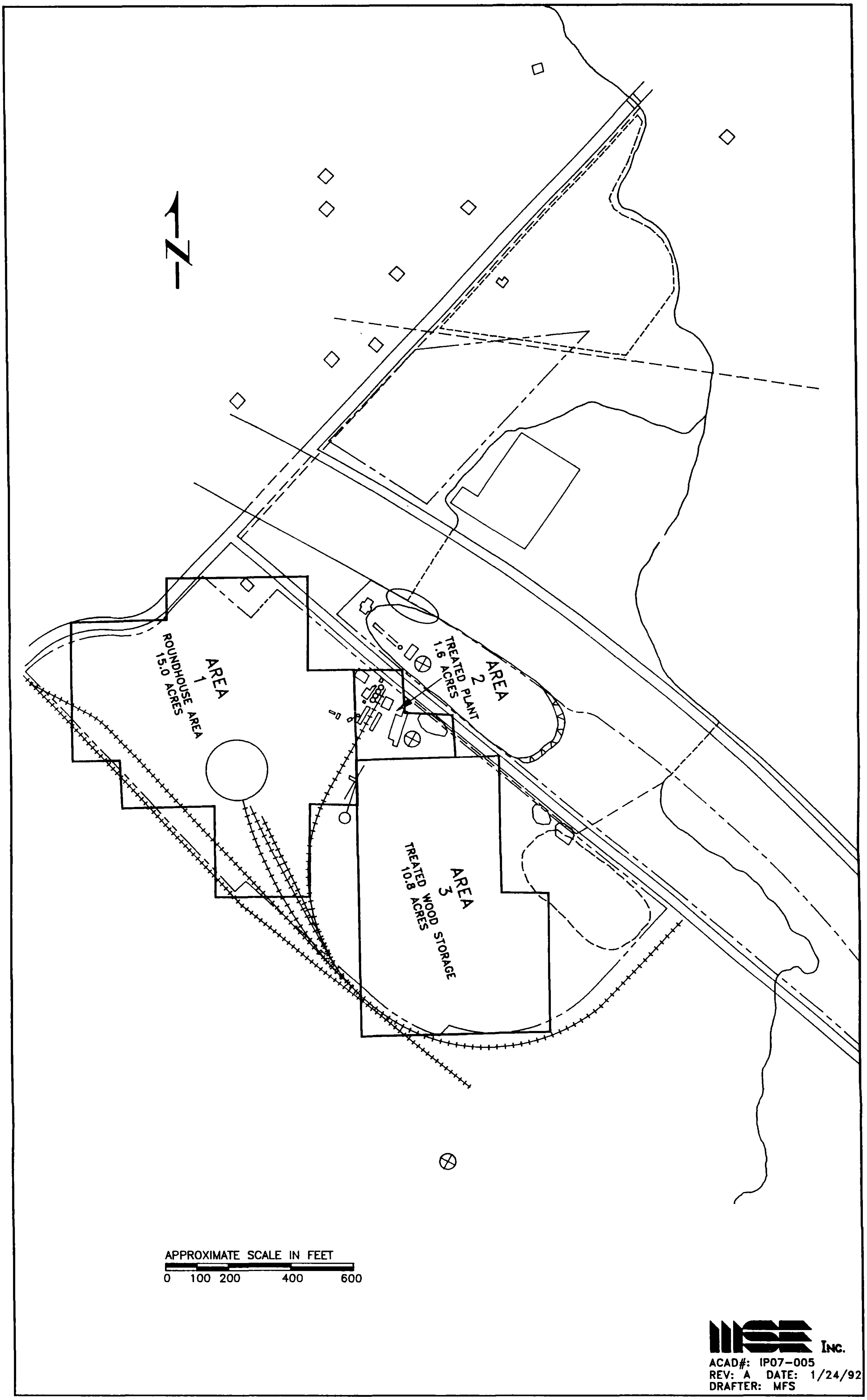


FIGURE 4-25 -- SOURCE AREA DELINEATIONS FOR AIR MODELING

TABLE 4-27

AVERAGE CONTAMINANT CONCENTRATIONS FOR AREAS DELINEATED FOR AIR MODELING
(μg/kg)

AREA 1 - ROUNDHOUSE

Contaminant	Ave (S.D.)	Freq.	Min.	Max.
PCP	272(222)J	6/12	73J	650J
B(A)P	1,066(1,561)	12/12	44J	4,800
2,3,7,8-TeCDD TE	2			

AREA 2 - TREATING PLANT

Contaminant	Ave (S.D.)	Freq.	Min.	Max.
PCP	50,456(101,297)	30/30	110J	380,000
B(a)P	657(1,068)	14/30	59J	4,100
2,3,7,8-TeCDD TE	2			

AREA 3 - TREATED WOOD STORAGE

Contaminant	Ave (S.D.)	Freq.	Min.	Max.
PCP	713(506)	3/3	190J	1,200
B(a)P	89J	1/3	--	89J
2,3,7,8-TeCDD TE	2			

TABLE 4-28

FUGITIVE DUST EMISSIONS INVENTORY FOR IDAHO POLE SITE-VEHICULAR SOURCES

Vehicle Type	Silt Content of Soil, % (s)	Vehicle Speed, mph (S)	Days with Precip. Per Year (W)	Number of Tires (T)	Fraction of Particulate Suspended (P)	Emissions per Vehicle Mile, lb. (E)	Miles Traveled per Year	Total Emissions per Year, lbs.	Total Emissions per Working Hour lbs.
Pettybone	49	11	100	4	0.24	2.32	22,968	53,285	25.52
Pettybone	49	11	100	4	0.24	2.32	8,800	20,416	0.78
Grader	49	5	100	6	0.24	0.72	100	72	0.03
Dozer	49	5	100	4	0.24	0.48	125	60	0.03
Log Truck	49	5	100	18	0.24	2.16	750	1,620	0.78
Logging Trucks	49	5	100	20	0.24	2.40	120	288	0.14
Total	--	--	--	--	--	--	--	75,741	36.28

Emission per vehicle mile (E) for each type were calculated as follows:

$$E = 0.81(s)\left(\frac{S}{30}\right)_2 \left(\frac{365-W}{365}\right)\left(\frac{T}{4}\right)(P)(2.5)$$

Total emissions per working hour were calculated based on 2088 working hours per year.

TABLE 4-29

FUGITIVE DUST EMISSIONS INVENTORY FOR IDAHO POLE SITE-WIND EROSION

Emissions per acre per year were calculated using the soil loss equation as follows:

$$EF = aIKCL'V'$$

Where EF = Emission rate, tons/acre/year
a = Portion of loss suspended as particulate, = 0.025
I = Soil erodability in tons/acre/year, = 93
K = Surface roughness factor, = 1
C = Climatic factor, = 0.10
L' = Unsheltered field width factor, = 1
V' = Vegetative cover, = 1 (worst case).

$$EF = (0.025)(93)(1)(0.10)(1)(1)$$

$$= 0.2325 \text{ tons/acre/year}$$

Factors used for a and I were calculated assuming the soil to be 50% sand and 50% fine. The respective factors for these types were therefore averaged.

Based on a total area of 38 acres this gives 8.84 tons/year, or 2.02 lb/hour.

TABLE 4-30

DERIVATION OF EMISSION FACTORS FOR IDAHO POLE

Area Source Number	Contaminant	Fraction of Contaminant in Soil (FS)	Fraction of Total Site Area (FS)	Total Sitewide Dust Emissions (T) lb/hr	Area (A) ft^{2}	Emission Rate (E) lb/ft^{a}/hour
1	PCP	2.72x10^{-7}	0.3942	38.30	652,500	6.29x10^{-12}
1	B(a)P	1.066x10^{-6}	0.3942	38.30	652,500	2.467x10^{-11}
1	TeCDD	1.8x10^{-9}	0.3942	38.30	652,500	4.165x10^{-14}
2	PCP	5.0456x10^{-5}	0.0408	38.30	67,500	1.168x10^{-9}
2	B(a)P	6.57x10^{-7}	0.0408	38.30	67,500	1.5[illegible]10^{-11}
2	TeCDD	1.8x10^{-9}	0.0408	38.30	67,500	4.16[illegible]4
3	PCP	7.13x10^{-7}	0.2853	38.30	472,500	1.649x10[illegible]
3	B(a)P	8.9x10^{-8}	0.2853	38.30	472,500	2.058x10^{-12}
3	TeCDD	1.8x10^{-9}	0.2853	38.30	472,500	4.165x10^{-14}

Emission Rate (E) for each contaminant for each area was calculated as follows:

$$E = \frac{(FS)(FA)(T)}{A} \text{ in lb/ft}^2\text{/hr}$$

Estimation of air contaminant concentrations (in units of $\mu g/m^3$) were obtained using EPA's Industrial Source Complex Short-Term (ISCST) Gaussian dispersion model, area source option.

One year (1988) of meteorological data was used in the model including: surface observations from the Bozeman airport and upper air data from Great Falls. Emission source height was assumed to be 3 feet above ground level.

Tabular and graphic depictions of the annual average concentrations for all three contaminants, plus 8 hour maximum for PCP only, were generated by the ISCST model (MSE, 1990c). Results for these compounds are presented in Table 4-31, while the graphics output for the above four model runs are presented in Figures 4-26 through 4-29. The calculated results were multiplied by various powers of 10 to facilitate better contour labeling. The emission source area used for this modeling is delineated on each figure, as is the location of the offsite receptor (Res-10).

Inspection of the modeling results indicate the following:

- that for PCP the maximum air contaminant concentrations occur just north and northeast of the source area's center, reflecting the prevailing southerly and southwesterly winds; and
- the concentration gradients are much steeper for PCP than for the PAHs because the PCP source area covers a much smaller portion of the site soils.

TABLE 4-31

INDUSTRIAL SOURCE COMPLEX SHORT-TERM MODEL OUTPUT FOR THE IPC CERCLA SITE AND VICINITY[a]

Concentrations-in-Air ($\mu g/m^3$)

	Benzo(a)pyrene		2,3,7,8-TCDD(Dioxin)Equiv.		Pentachlorophenol	
Averaging Period	Onsite	Offsite	Onsite	Offsite	Onsite	Offsite
8-hour maximum	1.22E-03	0.31E-03	2.75E-06	2.75E-06	2.35E-02	3.42E-02
24-hour maximum	2.47E-04	2.50E-04	5.79E-07	6.24E-07	4.87E-03	7.27E-03
Annual average	6.23E-05	6.45E-05	1.45E-07	1.57E-07	1.26E-03	1.72E-03

Note: [a] Based on a;rithmetic average concentrations (per CoC) present within the upper one ft. of soils on the IPC plant site.

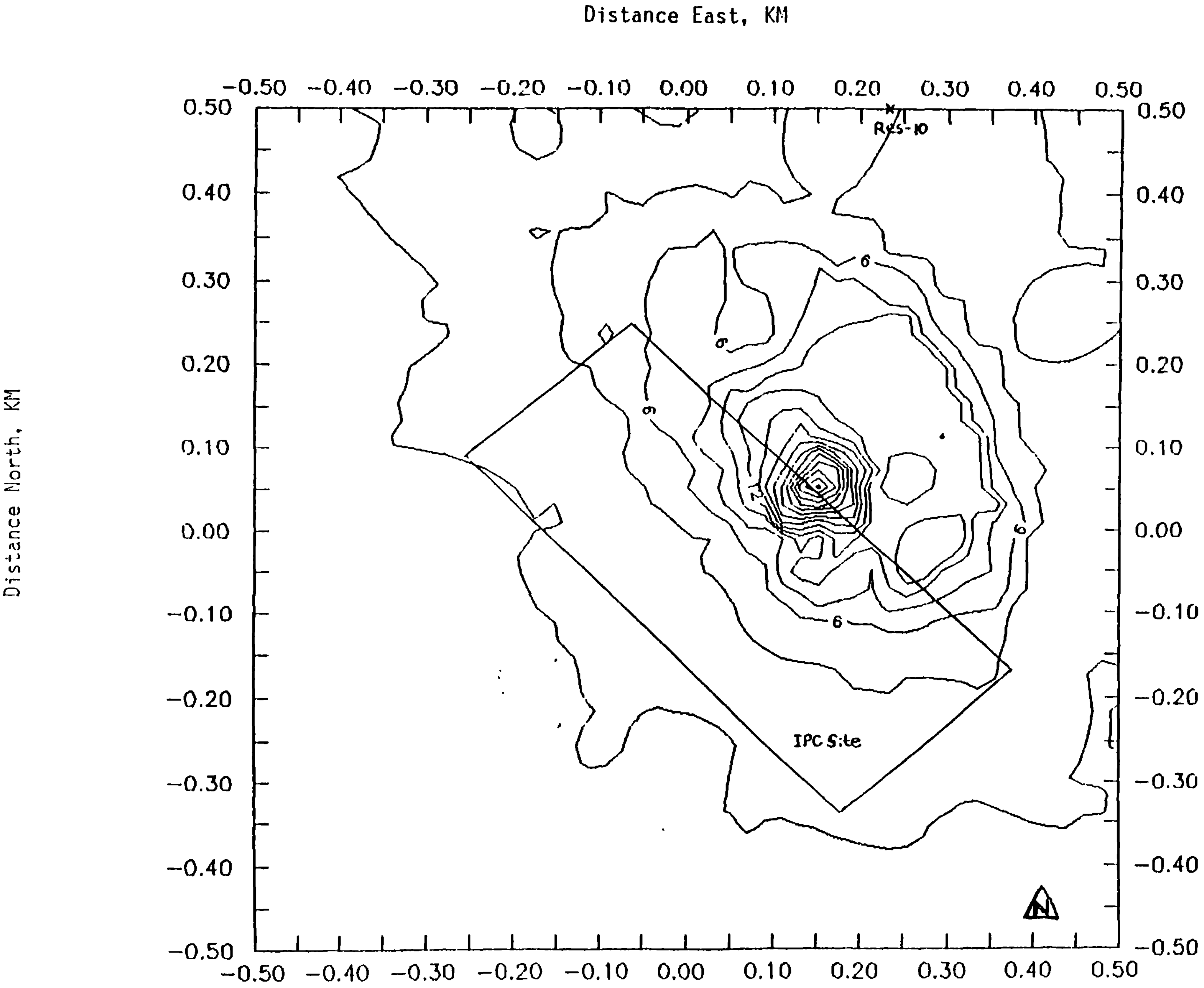


FIGURE 4-26

8-Hour Maximum Penta Concentrations, Micrograms/m^3 x 100

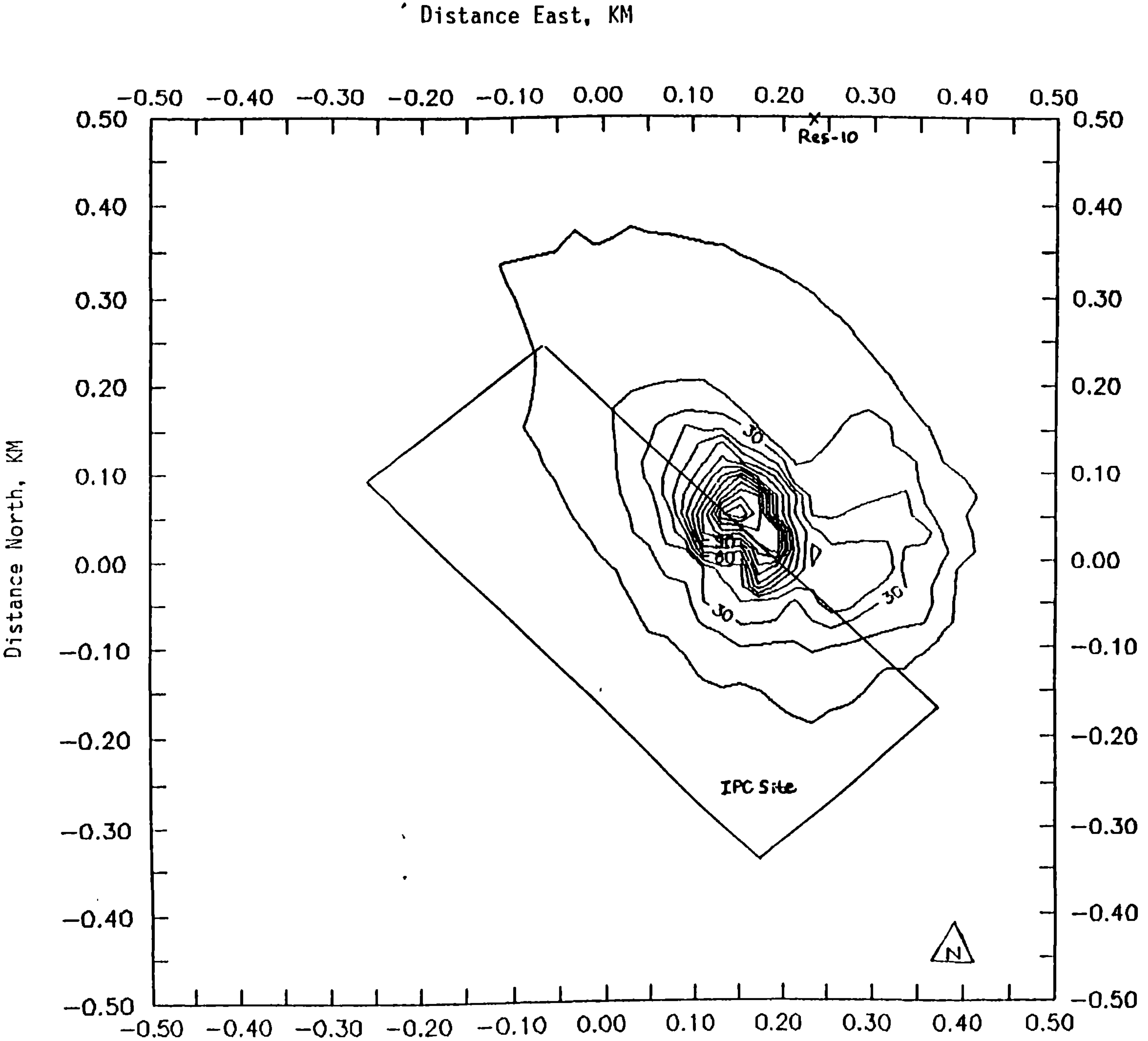
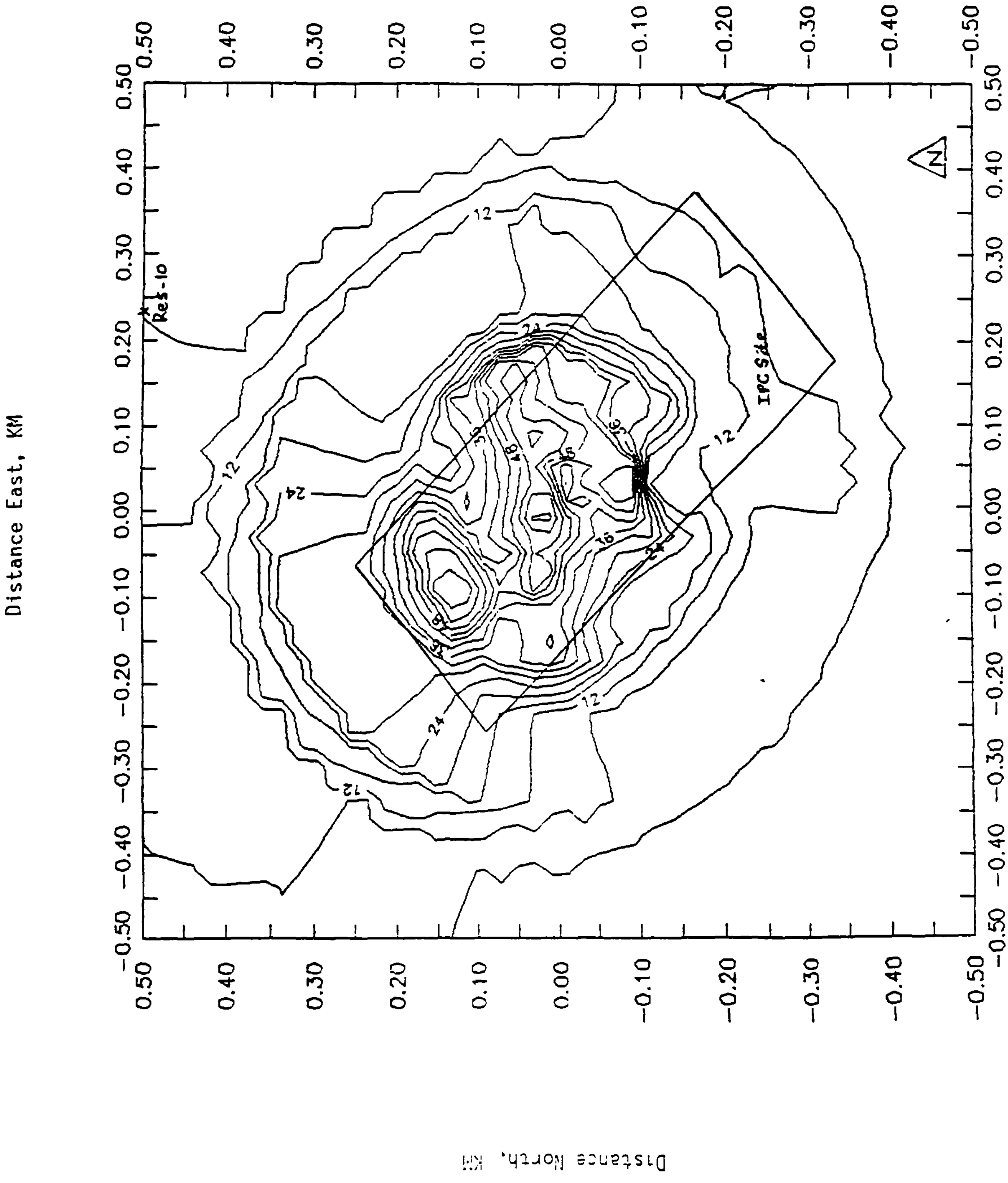


FIGURE 4-27
Annual Average PCP Concentrations, Micrograms/m^3 x 100,000

FIGURE 4-28

Annual Average Benzo(a)pyrene Concentrations, Micrograms/m^3 x 1E+06



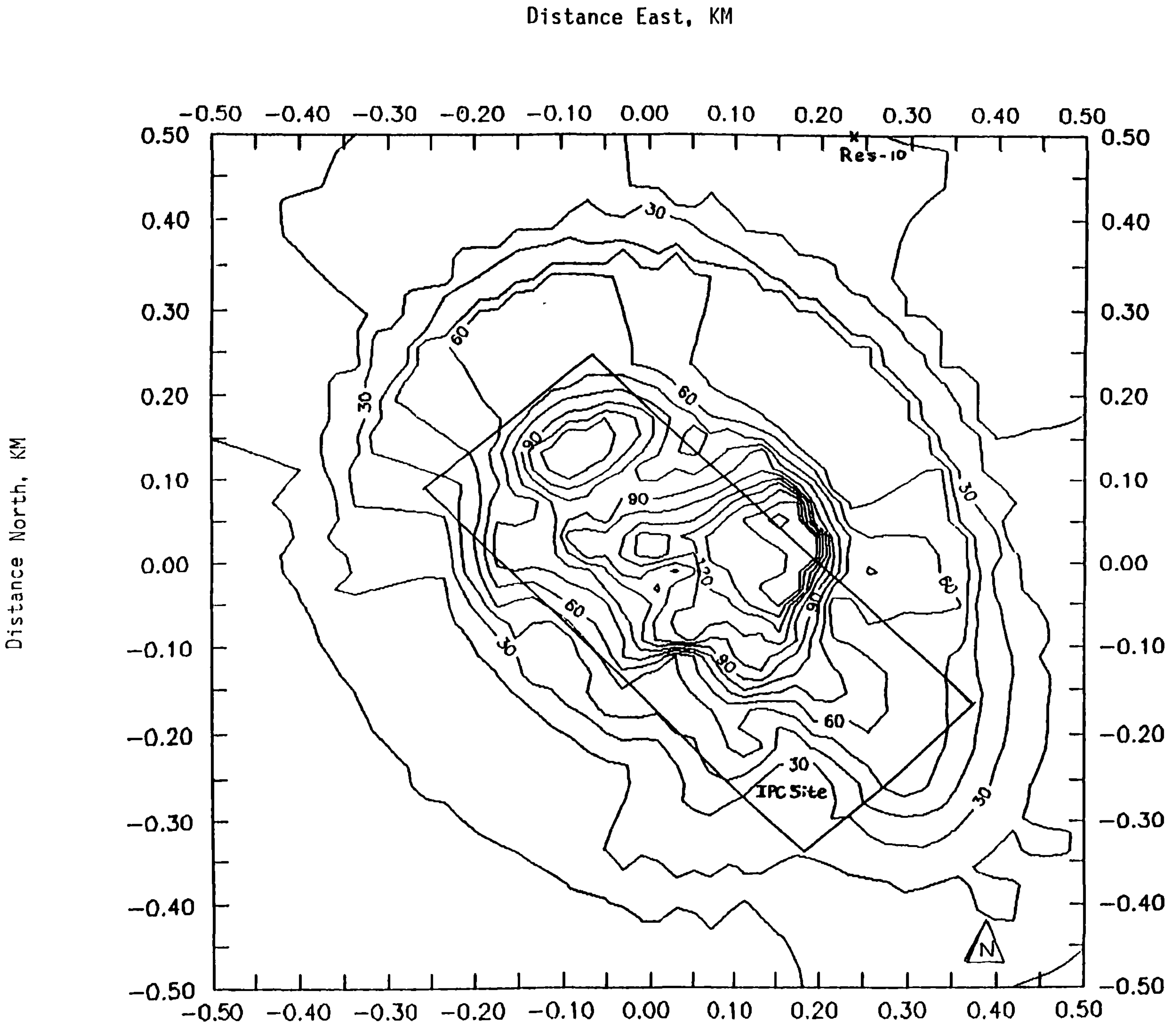


FIGURE 4-29

Annual Average Dioxin Equivalent Concentrations, Micrograms/m^3 x 1E+09

5.0 NATURE AND EXTENT OF CONTAMINATION

5.1 REVIEW OF DATA FOR THE CONTAMINANTS OF CONCERN

5.1.1 Evaluation of the Soils and Sediment Data

Volatiles and heavy metals were deleted from consideration as potential contaminants of concern (CoC) as described in Technical Memorandum 3 (MSE, 1992a), Baseline Human Health Risk Assessment. The semivolatile contaminant data appendicized in Technical Memoranda 2 (MSE, 1990c), and 5 (MSE, 1991g) were tabulated by media type (e.g., roundhouse soils). Initially, the tables were searched for those contaminants that met one of the two criteria below:

- Probable release: those contaminants quantitated in at least three of the four onsite soil areas (former roundhouse area, other potential source areas, IPC yard areas, and wood-treating area) sampled, plus at least three of the four ditch (Cedar Street, L Street, MPC Substation, and Bohart Lane ditches) systems (excluding the groundwater drainage ditch) and also quantified in Rocky Creek sediments; or
- Potential release: those contaminants quantitated as described above but not in Rocky Creek sediments.

Those contaminants which met either criterion and which possessed an inhalation and/or oral reference dose (RfD) or carcinogenic slope factor (CPF) were then identified as CoCs. The results of this evaluation process for surface soils are presented in Table 5-1. Contaminant-specific interpretations are discussed below.

TABLE 5-1

CANDIDATE CONTAMINANTS OF CONCERN FOR SURFACE SOILS, IDAHO POLE COMPANY CERCLA SITE^{a,b}

DATA SUMMARY (UG/KG)

	BNRR Soils				Wood Treating Soils (WTS)			
Contaminant	Avg.(S.D.)	Freq.	Min.	Max.	Avg.(S.D.)	Freq.	Min.	Max.
Pentachlorophenol	272(222)J	6/12	73J	650J	50,456(101,297)	30/30	110J	380,000
Fluoranthene	1,444(1,958)	12/12	83J	5,300	2,093(3,275)	18/30	37J	12,000
Benzo(a)pyrene	1,066(1,561)	12/12	44J	4,800	657(1,068)	14/30	59J	4,100
Anthracene	552(585)	7/12	48J	1,500	864(1,860)	21/30	11J	8,100
Pyrene	2,233(3,160)	12/12	120J	8,500	1,654(2,714)	23/30	24J	10,000
	Other Potential Sources (OPS)				IPC Yard Areas (IYA)			
Pentachlorophenol	4,487(6,241)	2/6	74J	10,000	713(506)	3/3	190J	1,200
Fluoranthene	96J	1/6	--	96J	122(94)J	3/3	63J	230
Benzo(a)pyrene	49J	1/6	--	49J	89J	1/3	--	89J
Anthracene	--	0/6	370U	1,00U	28(13)J	2/3	19J	37J
Pyrene	200(99)J	2/6	130J	270J	119(70)J	3/3	73J	200

Notes:

[a] BNRR Roundhouse, wood treating area, and other potential source soils were all collected within the upper 12 inches of each profile while sampling depth intervals for the IPC yard areas were 0-2 inches bgs.

[b] Data qualifier codes used in Part A are defined as follows (MSE 1990b, EPA 1988a): D = compound was identified in an analysis at a secondary dilution factor, J = estimated concentration (value is <CRQL), U = compound was analyzed for but was not detected, and (_) = data with no qualifiers attached.

PCP was observed in surface (0 to 12 inches) soils sampled at sites B-3 (73J μg/kg), B-7 (650J μg/kg), B-8 (430J μg/kg), B-9 (150J μg/kg), B-10 (150J μg/kg), and B-11 (180J μg/kg) within the historic roundhouse area. PCP is also present in surface soils sampled near the wood-treating area and within the upper 2 inches of soils throughout the IPC yard ("Y"-site) area. Subsurface soil contamination by PCP is detected at 36 inches bgs in the historic roundhouse area and at the water table, PP2.

Inspection of Table 5-1 indicates that the greatest variety and highest concentrations of PAHs are associated with: 1) oil-stained surface (0 to 12 inches) soils in the former roundhouse area, and 2) in wood-treating (0 to 12 inches) soils. The collective PAH maximum concentrations observed in these soils/sediments exceed the 4 to 8 mg/kg global mean level proposed by Blumer et.al. (1977), implying that local contaminant source(s) is (are) present. This hypothesis appears to be supported by the data for background soils.

The candidate CoCs for sediments are shown in Table 5-2 for both ditches (Part A) and creeks (Part B). All four ditches on or adjacent to the IPC Site are contaminated with PCP. However, PCP is observed in Rocky Creek sediments (Figure 4-20 and 21) only at R22 (760J ppb), R8 (2,400J ppb), and D5 (3,000J ppb). It is hypothesized that such contaminants are associated with influx of contaminated groundwater, rather than from discharge of ditch sediment into the creek. However, the presence of 420J μg/kg of PCP in sediments at site M1 (Figure 4-20) indicates that contaminant transport to Rocky Creek via the ditch systems is possible. In addition to those PAHs shown in Tables 5-1 and 5-2, a number of others are present in soils and sediments (Table 5-3).

TABLE 5-2

CANDIDATE CONTAMINANTS OF CONCERN FOR SEDIMENTS, IDAHO POLE COMPANY CERCLA SITE[a,b]

PART A. DATA SUMMARY (UG/KG) FOR DITCH SYSTEMS

Contaminant	Cedar St. Avg (S.D.)	Freq.	Min.	Max.	MPC Substation Avg (S.D.)	Freq.	Min.	Max.
Pentachlorophenol	15,640 (8,363)	5/6	2,200	22,000	10,667 (9,783)	6/6	2,300	25,000
Fluoranthene	725 (620)J	6/6	42J	1,700J	55J	1/6	--	55J
Benzo(a)pyrene	410 (439)J	2/6	99J	720J	410 (127)J	2/6	320	500J
Anthracene	346 (204)J	4/6	66J	520J	65 (17)J	2/6	53J	77J
Pyrene	4,257 (7,783)J	6/6	33J	20,000J	84 (37)J	2/6	58J	110J

Contaminant	Bohart Lane Avg (S.D.)	Freq.	Min.	Max.	L St. Avg (S.D.)	Freq.	Min.	Max.	Groundwater Drainage (GWD) Avg.(S.D.)	Freq.	Min	Max.
Pentachlorophenol	410	1/2	--	410	1,330 (936)	6/6	360	2,400	--	0/2	400U	640U
Fluoranthene	88 (88)J	2/2	26J	150	166 (69)J	6/6	47J	260J	75 (27)J	2/2	56J	94J
Benzo(a)pyrene	62J	1/2	--	62J	85J	1/6	--	85J	110J	1/2	--	110J
Anthracene	27J	1/2	--	27J	38 (16)	2/6	27J	50J	32J	1/2	--	32J
Pyrene	84 (93)J	2/2	19J	150	270 (136)	6/6	65J	460	100J	1/2	--	100J

PART B. DATA SUMMARY (UG/KG) FOR CREEKS

Contaminant	Rocky Creek Avg (S.D.)	Freq.	Min.	Max.	Mill Creek Avg (S.D.)	Freq.	Min.	Max.
Pentachlorophenol	760J	1/8	--	760J	420J	1/2	--	420J
Fluoranthene	175 (98)	6/8	60J	310	205 (120)J	2/2	120J	290
Benzo(a)pyrene	--	0/8	180U	730U	--	0/2	280U	940U
Anthracene	180J	1/8	--	180J	--	0/2	280U	940U
Pyrene	118 (58)J	7/8	68J	210	170 (0)J	2/2	170J	170J

Notes:

[a] Ditch sediments were collected within the upper four inches of the material, except for the groundwater drainage ditch @ 0-2 inches; creek sediments were collected from the upper two inches of the material.

[b] Data qualifier codes are as follows: J = an estimated quantity, U = compound was analyzed for, but was not detected.

TABLE 5-3

ADDITIONAL PAH ANALYTICAL DATA (IN SURFACE SOILS AND SEDIMENTS) UTILIZED IN THE RISK ASSESSMENT PROCESS (UG/KG)[a,b]

PART A. SOILS

	BNRR Soils				Wood Treating Soils (WTS)			
Contaminant	Avg (S.D.)	Freq.	Min.	Max.	Avg (S.D.)	Freq.	Min.	Max.
Benzo(a)anthracene	1,272(1,846)	12/12	63J	5,700	768 (1,410)	16/30	59J	5,800
Benzo(b)fluoranthene	1,588(2,367)	12/12	74J	6,700	1,574(2,978)	23/30	13J	13,000
Benzo(k)fluoranthene	1,552(2,363)	12/12	68J	6,700	54(40)J	2/30	25J	82J
Benzo(g,h,i)perylene	553(652)J	10/12	48J	1,700	462(616)	12/30	37J	2,200
Chrysene	1,555(2,096)	11/12	88J	5,900	1,368(2,427)	16/30	32J	10,000
Indeno(1,2,3-cd)	462(552)J	10/12	41J	1,500	536(754)	12/30	48J	2,700
Phenanthrene	1,312(2010)	12/12	58J	6,500	3,266(9,276)	25/30	12J	46,000

	Other Potential Sources (OPS)				IPC Yard Area (IYA)			
Contaminant	Avg (S.D.)	Freq.	Min.	Max.	Avg (S.D.)	Freq.	Min.	Max.
Benzo(a)anthracene	59J	1/6	--	59J	64(50)	2/3	29J	100
Benzo(b)fluoranthene	120J	1/6	--	120J	116(98)J	3/3	59J	230
Benzo(k)fluoranthene	120J	1/6	--	120J	--	0/3	89U	98U
Benzo(g,h,i)perylene	--	0/6	370U	1,800U	68J	1/3	--	68J
Chrysene	80J	1/6	--	80J	108(87)	2/3	47J	170
Indeno(1,2,3-cd)	--	0/6	370U	1,800U	68J	1/3	--	68J
Phenanthrene	--	0/6	370U	1,800U	102(67)	3/3	58J	180

TABLE 5-3 (Cont'd)

ADDITIONAL PAH ANALYTICAL DATA (IN SURFACE SOILS AND SEDIMENTS) UTILIZED IN THE RISK ASSESSMENT PROCESS (UG/KG)[a,b]

PART B. DRAINAGE DITCH SEDIMENTS

	Cedar St.				MPC Substation				Bohart Lane			
Contaminant	Avg (S.D.)	Freq.	Min.	Max.	Avg (S.D.)	Freq.	Min.	Max.	Avg (S.D.)	Freq.	Min.	Max.
Benzo(a)anthracene	1,910(2,361)J	3/6	180	4,600J	--	0/6	90U	510U	80J	1/2	--	80J
Benzo(b)fluoranthene	766(364)J	5/6	370	1,200J	228(243)J	2/6	56J	400J	95(106)J	2/2	20J	170
Benzo(k)fluoranthene	--	0/6	94U	1,900U	380J	1/6	--	380J	--	0/2	95U	97U
Benzo(g,h,i)perylene	168(144)J	2/6	67J	270J	210J	1/6	--	210J	54J	1/2	--	54J
Chrysene	2,920(3,664)J	3/6	260	7,100J	--	0/6	90U	510U	120	1/2	--	120
Indeno(1,2,3-cd)pyrene	172(124)J	2/6	84J	260J	220J	1/6	--	220J	41J	1/2	--	41J
Phenanthrene	1,001(947)	6/6	56J	2,300	205(78)J	2/6	150J	260(_)	69(72)J	2/2	18J	120

	L St.				Groundwater Drainage			
Contaminant	Avg (S.D.)	Freq.	Min.	Max.	Avg (S.D.)	Freq.	Min.	Max.
Benzo(a)anthracene	115J	1/6	--	115J	66J	1/2	--	66J
Benzo(b)fluoranthene	259 (144)	5/6	73J	440	120	1/2	--	120
Benzo(k)fluoranthene	--	0/6	94U	320U	--	0/2	120U	190U
Benzo(g,h,i)perylene	54J	1/6	--	54J	--	0/6	120U	190U
Chrysene	197 (70)J	3/6	130	270J	65J	1/2	--	65J
Indeno(1,2,3-cd)	--	0/6	94U	320U	--	0/2	120U	190U
Phenanthrene	182 (89)J	5/6	39J	280J	128 (88)	2/2	66J	190

PART C. CREEK SEDIMENTS

	Rocky Creek				Mill Creek			
Contaminant	Avg (S.D.)	Freq.	Min.	Max.	Avg (S.D.)	Freq.	Min.	Max.
Benzo(a)anthracene	62J	1/8	--	62J	94J	1/2	--	94J
Benzo(b)fluoranthene	82 (23)J	5/8	59J	120J	190 (14)J	2/2	180J	200J
Benzo(k)fluoranthene	--	0/8	180U	730U	180J	1/2	--	180J
Benzo(g,h,i)perylene	--	0/8	180U	730U	--	0/2	280U	940U

TABLE 5-3 (Cont'd)

ADDITIONAL PAH ANALYTICAL DATA (IN SURFACE SOILS AND SEDIMENTS) UTILIZED IN THE RISK ASSESSMENT PROCESS (UG/KG)[a,b]

PART C. CREEK SEDIMENTS, cont'd

	Rocky Creek				Mill Creek			
Contaminant	Avg (S.D.)	Freq.	Min.	Max.	Avg (S.D.)	Freq.	Min.	Max.
Chrysene	91 (34)J	4/8	58J	120J	114 (23)J	2/2	98J	130J
Indeno(1,2,3-cd)	--	0/8	180U	730U	--	0/2	280U	940U
Phenanthrene	200 (105)J	7/8	90J	400	182 (124)J	2/2	94J	270J

Notes: [a] Ditch sediments were collected within the upper four inches of the material, except for the groundwater drainage ditch @ 0-2 inches; creek sediments were collected from the upper two inches of the material.

[b] Data qualifier codes are as follows: J = an estimated quantity, U = compound was analyzed for, but was not detected.

Collectively, the PAH data in Tables 5-1 to 5-3 indicate the potential for movement of PAHs from onsite soils or sediments to Rocky Creek sediments.

The phthalate esters were eliminated from the assessment due to their ubiquitous nature and unlikely association with historic or current site operations. The compound 4-methylphenol was quantified in four of the five samples from Rocky Creek (i.e., at D5 and R8A-C). Average contaminant concentration was 1,630 ± 828 μg/kg; minimum and maximum values were 920 and 2,800 μg/kg, respectively (MSE, 1991c). Given the uncertain origin of 4-methylphenol, it was not considered further in the assessment.

Only one 2,3,7,8-TeCDD TE value is available for on-site soils. "Non-U" data for 2,3,7,8- isomers of PCDD and PCDFs acquired at treatment pit T-07 (at 4-7 ft bgs) were used to calculate a TE value of 1.79 μg/kg. Surface soils sampled in the IPC pasture have an average TE value of 0.42 μg/kg. This value is similar in magnitude to the estimated maximum probable TE value of 0.5 μg/kg for background soils. However, as higher chlorinated congeners of dioxin/furan were detected in pasture soils, and not in background soils, low levels of contamination by these compounds probably exist in portions of the IPC pasture. Consequently, the 0.42 μg/kg and 1.79 μg/kg TE values are used in the off-site and on-site risk assessments, respectively.

5.1.2 Evaluation of the Groundwater Data

Volatiles and heavy metals were deleted from consideration as potential contaminants of concern as described in Technical Memorandum 3 (MSE, 1992a).

The semivolatiles data appendicized in Technical Memoranda 2 (MSE, 1990c) were searched for those compounds which met one of the two following criteria:

- Probable release: those compounds that were quantitated in at least one of the two LNAPL samples and/or in at least two of the three A well sampling episodes as well as in at least one of the three B well sampling episodes, plus the compound-specific average concentration must be at least 10 times the likely "upgradient/background" concentrations; while
- Possible release includes those compounds that were quantitated in at least one of the two LNAPL samples, in two of the three A well sampling episodes and one of the three B well episodes, plus the compound-specific average concentration must be at least twice the likely "upgradient/background" concentration.

The above criteria and the data presented in Table 5-4 were utilized to identify and categorize the semivolatile CoCs as follows:

- Probable CoCs: PCP, phenanthrene, pyrene, chrysene, fluorene, benzo(k)fluoranthene, benzo(a)anthracene and anthracene; and
- Possible CoCs: 2,4,6-TCP, fluoranthene, benzo(a)pyrene, naphthalene, furans and dioxins.

5.1.3 Evaluation of the Surface Water Data

Volatile organic compounds and heavy metals were deleted from consideration as potential contaminants of concern as described in Technical Memorandum 3 (MSE, 1992a). Various phenols (e.g., PCP) and PAHs (e.g., benzo(k)fluoranthene) are present in onsite ditch water during both high flow and low flow conditions. When these data are reviewed in conjunction with offsite sediment data (e.g., MPC Substation ditch), the IPC ditch system appears to serve as a conduit for

TABLE 5-4

CANDIDATE CONTAMINANTS OF CONCERN IN GROUNDWATER (UG/L)^{a,b}

A WELLS

Contaminants	NAPL^{c}	Upgrad. AUB	Freq.	Downgrad. Avg.	Freq.
PCP	1.4E06(_)	≤0.10	1/20	3,799(_)	34/65
2,4,6-TCP	≤1E06U	≤0.005	1/20	769J	7/59
Fluoranthene	3.6E05J	≤0.050	1/20	360(_)	7/59
Phenanthrene	1.6E06(_)	≤0.030	0/20	515(_)	16/59
Pyrene	3.8E05J	≤0.020	2/20	386(_)	8/59
Chrysene	1.7E05J	≤0.005	5/20	198J	24/59
Benzo(b)fluoranthene	1.0E05J	≤0.001	2/20	46J	8/59
Benzo(k)fluoranthene	4.2E02J	≤0.003	2/20	94J	21/59
Benzo(a)anthracene	1.1E05J	≤0.002	0/20	146J	9/59
Fluorene	7.8E02J	≤0.010	0/20	165(_)	21/59
Anthracene	2.6E05J	≤0.010	0/20	154J	12/59
Benzo(a)pyrene	2.0E02J	≤0.005	0/20	74J	6/59
Naphthalene	3.6E05J	≤0.020	0/20	140J	8/59
2,3,7,8-TeCDD TEF	No Data	≤0.0005	0/0	≤0.05^{d}	0/1

B WELLS

Contaminants	Upgrad. AUB	Freq.	Downgrad. Avg.	Freq.
PCP	≤3	0/14	321(_)	29/59
2,4,6-TCP	≤2	0/14	4.8J	1/53
Fluoranthene	≤3	1/14	8.0J	9/53
Phenanthrene	≤5	1/14	8.9J	6/53
Pyrene	≤3	1/14	13.3J	8/53
Chrysene	≤5	4/14	82.4J	14/53
Benzo(b)fluoranthene	≤4	1/14	0.30J	2/53
Benzo(k)fluoranthene	≤2	2/14	3.1J	17/53
Benzo(a)anthracene	≤2	1/14	6.4J	5/53
Fluorene	≤3	0/14	5.2J	12/53
Anthracene	≤3	0/14	5.3J	10/53
Benzo(a)pyrene	≤2	0/14	0.57J	3/53
Naphthalene	≤5	0/14	4.0J	1/53
2,3,7,8-TeCDD TEF	≤0.05	0/0	≤0.1^{e}	1/1

TABLE 5-4 (Cont'd)

CANDIDATE CONTAMINANTS OF CONCERN IN GROUNDWATER (UG/L)[a,b]

	C WELLS			
Contaminants	Upgrad. AUB	Freq.	Downgrad.Avg.	Freq.
PCP	≤0.10	0/2	03.1(_)	5/6
2,4,6-TCP	≤0.005	0/1	(5.8U-12U)	0/4
Fluoranthene	≤0.050	0/1	(0.25U-2-1U)	0/4
Phenanthrene	≤0.030	0/1	(0.25U-6.4U)	0/4
Pyrene	≤0.020	0/1	(0.50U-2.7U)	0/4
Chrysene	≤0.005	0/1	(0.38U-1.5U)	0/4
Benzo(b)fluoranthene	≤0.001	0/1	(0.03U-0.18U)	0/4
Benzo(k)fluoranthene	≤0.003	0/1	(0.01U-0.17U)	0/4
Benzo(a)anthracene	≤0.002	0/1	0.13±0U	0/4
Fluorene	≤0.010	0/1	2.3J	2/4
Anthracene	≤0.010	0/1	(0.01U-6.6U)	0/4
Benzo(a)pyrene	≤0.005	0/1	(0.05U-0.23U)	0/4
Naphthalene	≤0.020	0/1	4.0(_)	1/4
2,3,7,8-TeCDD TEF	≤0.0005	0/0	No data (ND)	ND

NOTES:

[a] Based upon validated data from the May and August 1990 sampling plus the March and June 1991 sampling episodes; AUB = assumed upper bound for contaminant-specific background level, based upon literature review; freq. = quantitated levels ÷ total number of samples analyzed.

[b] J = estimated quantity, (_) = data with no qualifications attached, U = compound was analyzed for, but was not detected.

[c] NAPL = nonaqueous phase liquid observed in well 5A and test pit-5; EO_ = exponential power (e.g., 1.4E06 = 1,400,000).

[d] Based upon August 1990 data from monitoring Well 9A.

[e] Based upon May 1987 data from Well 16B.

offsite transport of contaminants to surface water via the sediment and water phases.

2,4,6-TCP was detected at three surface water monitoring sites. The respective concentrations (in µg/L) observed at these stations are as follows: ID-06, 5.8J; SW-4, 0.36; and SW-10, 1.6. The two monitoring sites along Rocky Creek have an arithmetic average concentration of 0.98 µg/L of 2,4,6-TCP. These sites are within the groundwater interception zone. Although PCP was detected at ID-06 (at 38 µg/L), it was not detected elsewhere at concentrations exceeding the 1 µg/L method detection limit. Furthermore, this average level of PCP is less than the USEPA's (1986a) chronic exposure criterion of 3.2 µg/L for the protection of freshwater aquatic life.

The maximum total PAHs concentration observed in March 1991 was 0.159 µg/L and occurred at monitoring site SW-04 (MSE, 1991b). Deleterious sublethal responses are sometimes observed in (presumably freshwater) aquatic life at concentrations in the range of 0.1 to 5.0 µg/L (Eisler, 1987). Thus, there is a remote possibility of localized and seasonally adverse effects occurring to aquatic biota in the vicinity of SW-04.

Rocky Creek also appears to be intercepting contaminated groundwater between monitoring sites SW-03 and SW-10, which is particularly evident during low flow conditions. Given the mg/sec loading estimates shown in Tables 5-5 and 5-6, it appears as though contaminated groundwater (inflow) exerts a greater effect on Rocky Creek water quality than does discharge from the IPC ditch system. Therefore, the following three compounds have been designated as

TABLE 5-5

MG/SEC LOADING ESTIMATES FOR SELECT CATIONS AND ANIONS IN SURFACE WATERS ON AND ADJACENT TO THE IPC SITE, HIGH FLOW (APRIL 1990) SAMPLING EPISODE.

Station No.	4/90 cfs[a]	Al	Ca	Mg	Mn	Na	Cl^-	SO_4^{-2}
SW-1	160.23	14,521.	152,467.	40,975.	358.5	32,082.	≤4,538.	90,754.
SW-2	150.23	10,466.	141,675.	37,652	321.6	28,675.	≤4,254.	85,090.
SW-4	165.11	15,243.	156,175	42,083.	384.6	32,544.	≤4,676.	84,166.
SW-10	160.88	14,853.	153,541.	41,415	393.2	32,029.	18,244.	91,122.
SW-5	168.13	16,570.	156,650.	42,519.	429.0	35,377.	≤4,761.	95,229.
SW-6	0.131	0.40	351.3	92.0	0.52	59.7	81.0	139.9
ID-6	0.01	0.44	7.26	2.13	0.02	1.22	1.40	2.2
ID-7	0.004	0.08	6.86	1.55	0.06	1.17	0.90	1.06
ID-8	0.086	0.88	165.9	42.1	0.01	30.0	39.0	34.1
SW-7	0.33	1.77	843.0	227.1	0.09	210.3	259.3	448.6
ID-4	0.015	0.05	49.3	12.1	0.16	10.4	39.1	11.5
ID-5	0.008	0.18	34.3	6.63	0.24	5.61	21.7	6.6
ID-2	0.01	0.26	32.3	7.92	0.02	4.90	9.60	13.3

Note: [a] cfs = cubic feet per second.

TABLE 5-6

MG/SEC LOADING ESTIMATES FOR SELECT ANIONS IN SURFACE WATERS ON AND ADJACENT TO THE IPC SITE, LOW FLOW (SEPTEMBER 1990) SAMPLING EPISODE

Station No.	9/90cfs[a]	Cl^-	SO_4^{-2}
SW-1	10.74	608.3	10,950.
SW-2	5.07	287.2	4,595.
SW-4	14.26	807.7	14,134.
SW-5	13.93	1,578.	13,018.
SW-6a	0.894	50.6	149.1
SW-7	1.17	66.3	235.2
SW-10	15.42	1,747.	14,411.
ID-6	0.010	0.57	0.008
ID-8	0.008	9.51	7.70

Note: [a] CFS = cubic feet per second.

potential CoCs in surface water: PCP; 2,4,6-TCP; and, benzo(a)pyrene as the surrogate compound for total PAHs observed at monitoring site SW-04.

5.1.4 Evaluation of the Offsite (IPC Pasture) Data

The data presented in Section 4.0 supports the following conclusions:

- that PCP occurs in both the visually contaminated surface soils (i.e., R23 at 1,100 µg/kg) and in on-surface LNAPL spots (255,350J µg/kg, avg.) at least of environmental/public health concern;
- that B2-type PAH levels in on-surface LNAPL average 255,350J µg/kg -- while average benzo(a)pyrene concentration of 11,350J µg/kg -- are of concern to public health and the environment; as is
- the average 2,3,7,8-TeCDD TE value of 375 µg/kg in the on-surface LNAPL.

Therefore, the following contaminants of concern were selected:

- PCP in surface (0 to 12 inch bgs) soils situated within the probable area of subsurface contamination by LNAPL; and
- PCP, benzo(a)pyrene and 2,3,7,8-TeCDD TE in on-surface LNAPL spots located within the southern portion of the IPC pasture.

The potential for transfer of PCP from soils to vegetation, and then up through the food chain, will be assessed in Section 8.0 via use of transfer coefficients acquired from literature review.

5.2 MEDIA SPECIFIC CONTAMINANTS OF CONCERN

The media-specific data evaluations presented in Section 5.1 were utilized to select those CoC shown in Table 5-7. PCP, several of the PAHs, plus the dioxins and dibenzofurans are designated constituents of concern in those wood-preserving process residues associated with the IPC Site operations (55FR235: p. 50451; December 6, 1990). In general, the contaminants shown in Table 5-7 exhibit the following characteristics:

- they are environmentally persistent;
- they are sufficiently mobile to have contaminated surface and subsurface soils, surface water and sediment plus groundwater; and
- they occur in these media at concentrations that are potentially toxic to humans and other biota.

Further discussions of these CoCs follow.

5.2.1 Surface/Subsurface Soils

The CoCs for surface (0 to 12 inches bgs) soils are apportioned as follows:

- PCP and PAHs in onsite soils associated with the wood treating area, IPC yard area, and historic BNRR roundhouse area; and
- PCP in IPC pasture soils situated within the probable distribution of subsurface LNAPL.

TABLE 5-7

SUMMARY TABLE OF CONTAMINANTS OF CONCERN SELECTED FOR QUANTITATIVE AND QUALITATIVE RISK ASSESSMENT AT THE IDAHO POLE CERCLA SITE

PART A. QUANTITATIVE RISK ASSESSMEN[a]

	Media				
Contaminants of Concern	Surface/Subsurface Soils	Surface Water/Sediment	Groundwater	Air	IPC Pasture NAPL/Soils
Pentachlorophenol	x	x	x	x	x
2,4,6-trichlorophenol	-	x	x	-	-
Anthracene	x	x	x	Tentative(T)	-
Benzo(a)pyrene	x	x	x	x	x
Fluoranthene	x	x	x	-	-
Fluorene	-	-	x	-	-
Naphthalene	-	-	x	-	-
Pyrene	x	x	x	-	-
Dioxins(2,3,7,8-TeCDD Eqiovalent)	x	x	-	x	x
Dibenzofurans(2,3,7,8-TeCDD Eqiovalent	x	x	-	x	x

PART B. QUALITATIVE RISK ASSESSMENT[b]

	Media				
Contaminants of Concern	Surface/Subsurface Soils	Surface Water/Sediment	Groundwater	Air	IPC Pasture NAPL/Soils
Benzo(a)anthracene	x	x	x	T	x
Benzo(b)fluoranthene	x	x	x	T	x
Benzo(k)fluoranthene	x	x	x	T	x
Benzo(g,h,i)perylene	x	x	-	T	x
Chrysene	x	x	x	T	x
Indeno(1,2,3-cd)pyrene	x	x	-	T	x
Dibenzo(a,h)anthracene	x	x	x	x	x

Notes: [a] Compounds for which inhalation and/or oral reference doses plus inhalation and/or oral cancer potency factors exist in IRIS or HEAST.

[b] Compounds for which the above factors do not exist in IRIS or HEAST.

PCP/PAH contamination of subsurface soils exists at the groundwater table within the wood-treating area but appears limited to the vadose zone at the other onsite areas (above).

Only one 2,3,7,8-TeCDD TE value is available for onsite soils. "Non-U" data for 2,3,7,8-isomers of polychlorinated dibenzo-p-dioxin(PCDD) and polychlorinated dibenzofuran (PCDFs) acquired at treatment area pit T-07 (at 4 to 7 feet bgs) were used to calculate a TE value of 1.79 μg/kg. Surface soils sampled in the IPC pasture, overlying the LNAPL plume, have an average TE value of 0.42 μg/kg. This value is similar in magnitude to the estimated maximum probable TE value of 0.5 μg/kg for background soils. However, as higher chlorinated congeners of dioxin/furan were detected in pasture soils, and not in background soils, low levels of contamination by these compounds probably exist in portions of the IPC pasture. Consequently, the 0.42 μg/kg and the 1.79 μg/kg TE values will be used in the offsite and onsite risk assessments, respectively.

5.2.2 Surface Water/Sediment

The CoCs for drainage ditch and creek sediments are apportioned as follows:

- strong contamination of the MPC Substation and Cedar Street ditches with PCP and PAHs, with lesser contamination by these compounds evident in the Bohart Lane and L Street ditches; while
- relatively low (and apparently localized) contamination of creek sediments by PCP and PAHs are observed at Mill Creek site M1 and at sites D5, R8 and R22 along Rocky Creek.

Furthermore, non-"U" data were utilized to calculate 2,3,7,8-TeCDD TE values for several of the ditches. The results for the Cedar Street, MPC Substation, and L Street ditches are 2.33, 34.2 and 0.055 µg/kg, respectively. The analysis of creek sediments for only 2,3,7,8-TeCDD resulted in no detection of this isomer.

The data indicates that groundwater is a stronger source of potential contamination of Rocky Creek than is the onsite/offsite drainage ditch system. Thus, the above three compounds were selected as indicators of groundwater/surface water interactions for quantitative risk assessment.

5.2.3 Groundwater

The preliminary, conceptual model of offsite transport of contaminated groundwater in the upper portion(s) of aquifer is presented in Section 6.0. PCP (321 µg/L) and 2,4,6-TCP (31.8 µg/L) were observed at Res-10 only from the August 1990 sampling episode; the November, 1990 (screening level) data indicates the potential presence of benzo(k)fluoranthene (5.9 µg/L) and chrysene (23.6 µg/L) at this site. PCP was observed at Res-08 (at 27.6 µg/L), when sampled in March 1991, and at 99 µg/L when sampled in June, 1991. The observation of phenols/PAHs at Res-10 is explained by its likely position within the contaminated groundwater plume. However, PCP at Res-08 may indicate deeper (i.e., "B" zone) contamination of the shallow aquifer some distance from the IPC Site. Such contamination appears possible, given the indications from the computerized flow/fate modeling of PCP away from the IPC Site.

Total OCDDs were observed in Res-03 water (0.961 µg/L) but not in the duplicate sample, collected in August 1990; no dioxin/furan homologues were detected in either sample or duplicate sample taken from Res-03 during the November 1990 sampling episode. Finally, only total PeCDD was detected (0.0013 µg/L) at Res-02 during the March 1991 sampling episode. Follow up dioxin/furan analyses performed at Res-02 for the June 1991 sampling episode showed no detectable dioxins or furans.

Consequently, residential groundwater CoCs will be limited to PCP.

5.2.4 Air Quality

PCP, benzo(a)pyrene and 2,3,7,8-TeCDD TE are CoCs associated with air quality. PCP and benzo(a)pyrene are present at environmentally significant concentrations in surface soils throughout the IPC Site. Subsurface (4 to 7 feet bgs) soils onsite contain dioxins/furans at levels exceeding those of background soils (i.e., 1.8 vs 0.5 µg/kg TE, respectively). Thus, two conservative assumptions were made:

- that chlorinated dioxin/furan compounds present in the wood-treating solution have been introduced into surface (0 to 12 inches bgs) soils via accidental spills and drips from treated logs; and
- that the average TE concentration within surface soils is also 1.8 µg/kg.

5.2.5 Offsite (IPC Pasture) Media

PCP is the CoC in on-surface LNAPL spots and in LNAPL-contaminated soils and benzo(a)pyrene and 2,3,7,8-TeCDD TE in the LNAPL spots.

The potential for transfer of PCP from soils to vegetation, and then up through the foodchain, will be assessed in Section 8.0 via use of transfer coefficients acquired from literature review.

5.3 VOLUMES OF CONTAMINANTS

5.3.1 Volume and Surface Area of Contaminated Surface Soil

Soils contaminated with PCP and PAH compounds were identified during the potential sources investigation. Further characterization of contaminated soils was conducted during the Additional Sampling Activities and data were presented in the associated report (MSE, 1991f). PCP contamination was found in surface soils in close proximity to the active wood-treating process areas and is likely due to past "boil-overs" of the butt vat and spills from the retort facility. Additional PCP contaminated surface soils were identified in the treated-wood storage area. PAH contamination was detected near the former roundhouse area, as well as in the treatment area and the treated-wood storage area. The concentration data available was gridded and isopleths were plotted (Figure 5-1). Soils containing PCP concentrations of 100 ppb or higher cover approximately 12 acres at a depth range of 0 to 12 inches bgs, equating to an approximate volume of 19,360 cubic yards. The soils above 100 ppb were

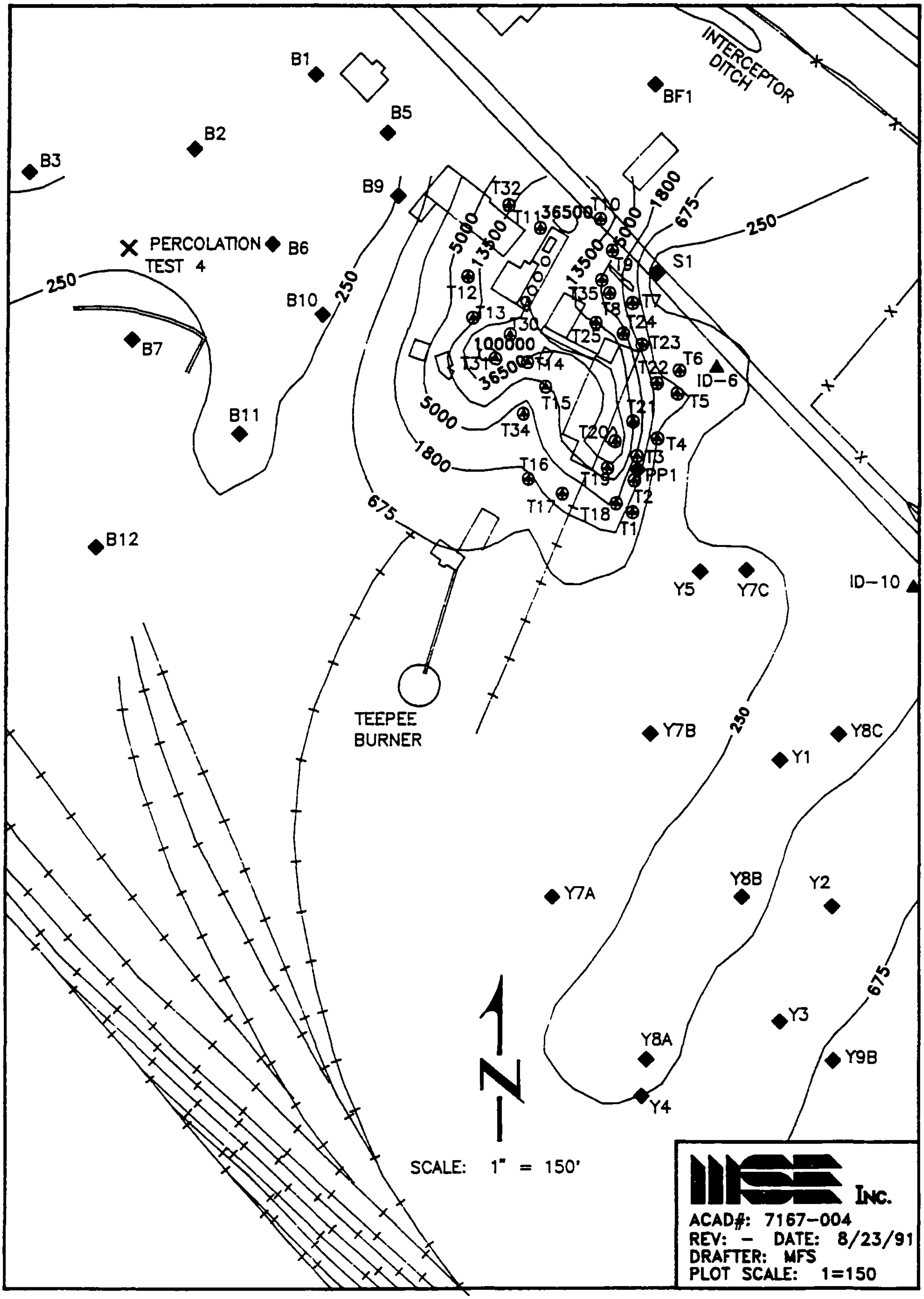


FIGURE 5-1 -- SURFACE SOIL PCP CONCENTRATION MAP (ppb) grouped because 100 ppb represents the lower (conservative) end of the cleanup range for PCP in sediment for protection of freshwater aquatic biota. This does not represent a defined clean-up level for the site, nor is it a risk-based contaminant level; the actual clean-up level may be higher or lower.

PAH contamination was estimated by gridding and plotting concentration isopleths of total B2 PAH concentrations found during the potential sources investigation and the Additional Sampling Activities (Figure 5-2). The two primary areas of surface contamination were found in the active wood-treating process area and in the vicinity of the former roundhouse. Soils containing B2 PAHs at concentrations of 1,000 ppb or higher cover approximately 7 acres at a depth range of 0 to 12 inches bgs, equating to an approximate volume of 11,293 cubic yards. Approximately 30 percent of the PAH contaminated soils do not overlap with the soils containing PCP contamination. Therefore, 3,400 cubic yards of PAH contaminated soils have been summed with the volume of PCP-contaminated soils to derive the total volume of contaminated surface soils: equating to approximately 23,000 cubic yards. The soils above 1,000 ppb were grouped for volume because 1,000 ppb represents the lower (conservative) end of cleanup range for benzo(a)pyrene in sediment for protection of aquatic biota. This does not represent a defined clean-up level for this site, nor is it a risk-based contaminant level; the actual clean-up level may be higher or lower.

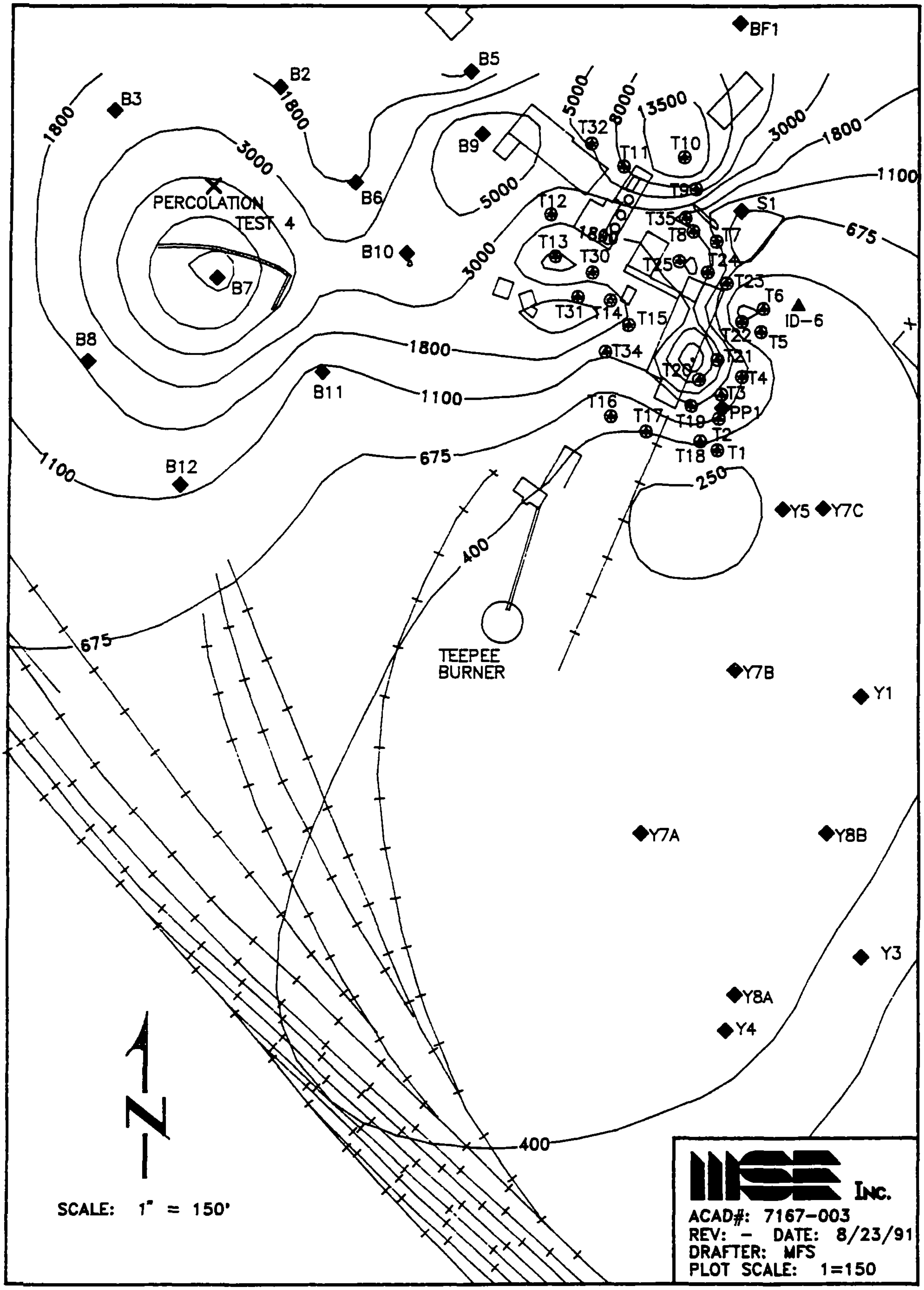


FIGURE 5-2 -- SURFACE SOIL PAH(B2) CONCENTRATION MAP (ppb)

5.3.2 Extent and Volume of Contaminated Surface Sediments

Sediments containing PCP concentrations at 100 ppb or more have been detected in the MPC Substation ditch, the L Street ditch, and the Cedar Street ditch. Areas and volumes of contaminated sediments have been calculated using conservative values for the dimensions presented below; depth of contamination was assumed to be 3 feet for each ditch based on analytical results from the Additional Sampling Activities:

Ditch Segment	Length (feet)	Average Width (feet)	Area (acres)	Volume (Cubic yards)
Cedar St.	950	20	0.44	2,111
L St.	1,642	10	0.38	1,822
Substn	1,032	5	0.12	572
			Total	4,505

5.3.3 Volume and Areal Extent of Contaminated Saturated Soils Associated with the LNAPL Contamination Area and Free Product Volume Estimate

Based on results of the Potential Sources Investigation and the Additional Sampling Activities, MSE has determined that the majority of contaminated subsurface soils at the IPC Site are within the treating area extending northward offsite in close association with the LNAPL contamination area. Contamination of subsurface soils within the bounds of the LNAPL contamination area is due to smearing of LNAPL caused by the seasonally fluctuating water table. The approximate bounds of the observed LNAPL contamination area and associated contaminated subsurface soils are presented in Figure 5-3. This

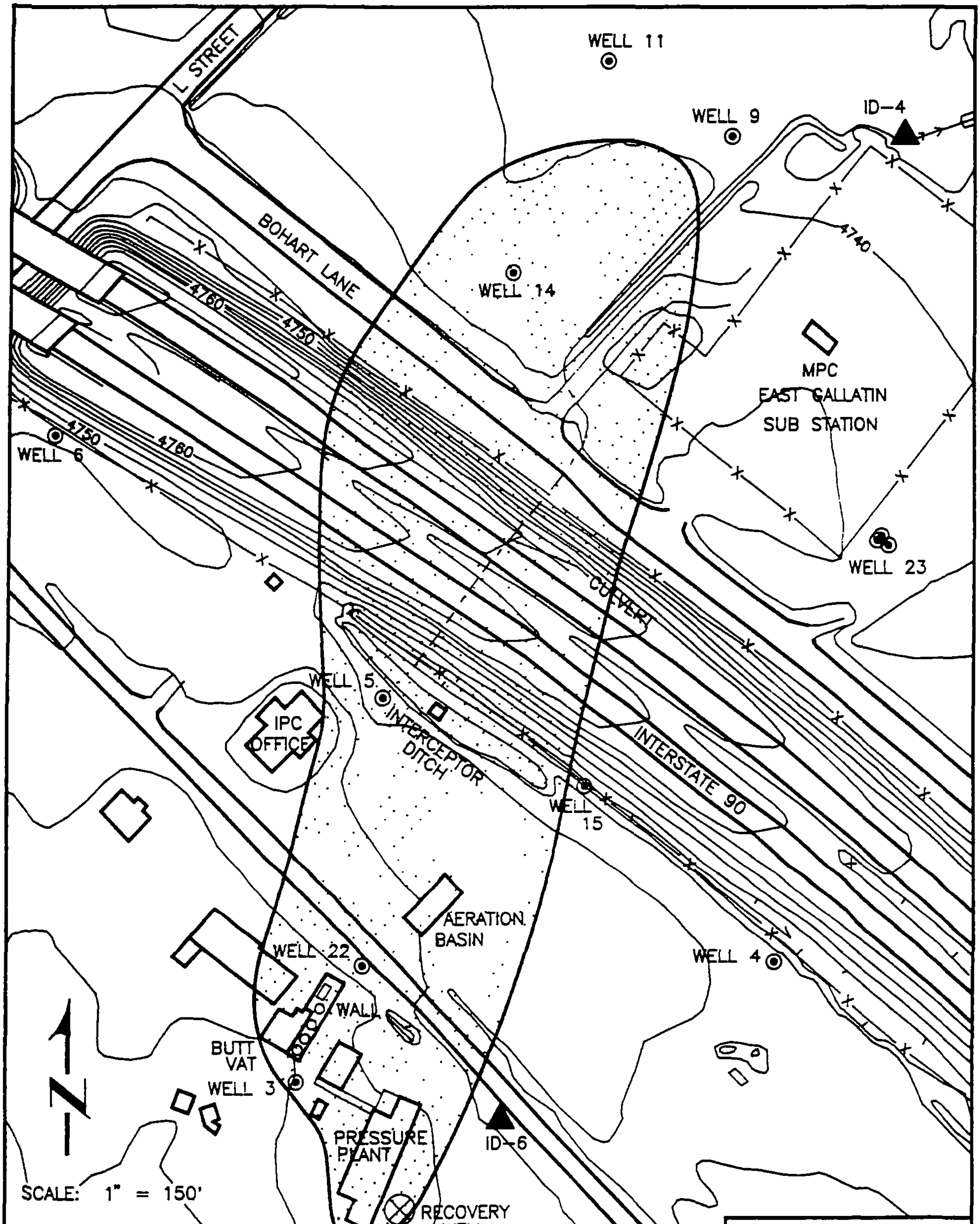


FIGURE 5-3 -- APPROXIMATE LNAPL CONTAMINATION AREA

area has been determined to be approximately 6.7 acres. Given the potential for a 3-feet seasonal fluctuation in the static water level in this area, approximately 32,410 cubic yards of soil are likely to be contaminated with the wood-treating product. Based on the results of an LNAPL plume investigation conducted as part of the Additional Sampling Activities, the average thickness of the LNAPL area has been determined to be approximately 0.5 foot. This value weighs free product pockets exceeding 1 foot in thickness in some areas and practically no product in others, as well as taking into account significant amounts of product suspended in the soils smearing effect. Given the LNAPL contamination area, a porosity of 0.3 and the 0.5 foot layer thickness, the roughly approximated volume of LNAPL present is 327,000 gallons. This volume may be an overestimation due to ongoing product recovery efforts.

5.3.4 Extent and Volume of the Groundwater Dissolved Plume

For the purposes of this groundwater data discussion, data from both the trimesterly monitor well sampling and the quarterly residential well sampling will be combined. PCP is the most wide spread contaminant found in IPC Site groundwater. Since it is fairly soluble (10-14 mg/L) and fairly mobile under the IPC Site conditions, it is most useful for describing the extent and geometry of the contaminant plume, as well as the pathways of contaminant migration in the subsurface. Other contaminants found in groundwater at the IPC Site (PAHs and other phenolics) are not as widespread and are usually found associated with LNAPL or as downgradient degradation products.

The highest levels of PCP in groundwater are associated with LNAPL material immediately to the north of the treatment plant area. Some of the analyses do not represent dissolved concentrations since some LNAPL material was in the samples. PCP has a solubility of 12.5 mg/L (12,500 μg/L) at 10 °C, the average groundwater temperature at IPC Site. This includes groundwater in the source area (treatment plant) as well as groundwater to the northeast in the LNAPL plume. The LNAPL acts as an additional source area, supplying PCP to groundwater via contact with LNAPL-soaked soils.

The lateral extent of the PCP plume is controlled primarily by lateral variations in hydraulic conductivity. Slug test results show a zone of higher conductivity generally trending from the IPC treatment area northeast, including wells 9, 23, 13, 24, 25, 16, and 27 downgradient.

The general pattern of PCP contamination is presented schematically in Figures 5-4 through 5-7 both in plan view and cross sections. The highest PCP concentrations originate in the LNAPL-soaked soil area and tend to follow the willow/sedge grove toward the north-northeast. Beyond Well 25, the plume intersects the Rocky Creek alluvial groundwater system and heads more northerly, paralleling the creek toward Well 27. No contaminants were found in Well 28B, demonstrating that PCP is not crossing the hydrologic boundary created by Rocky Creek in the upper aquifer (A & B zones). However, a low concentration of PCP was detected in Res-09 on the north side of Rocky Creek (the well is 57 feet deep). This well is below the "C" zone and may indicate that the hydrologic boundary created by Rocky Creek may not extend to lower

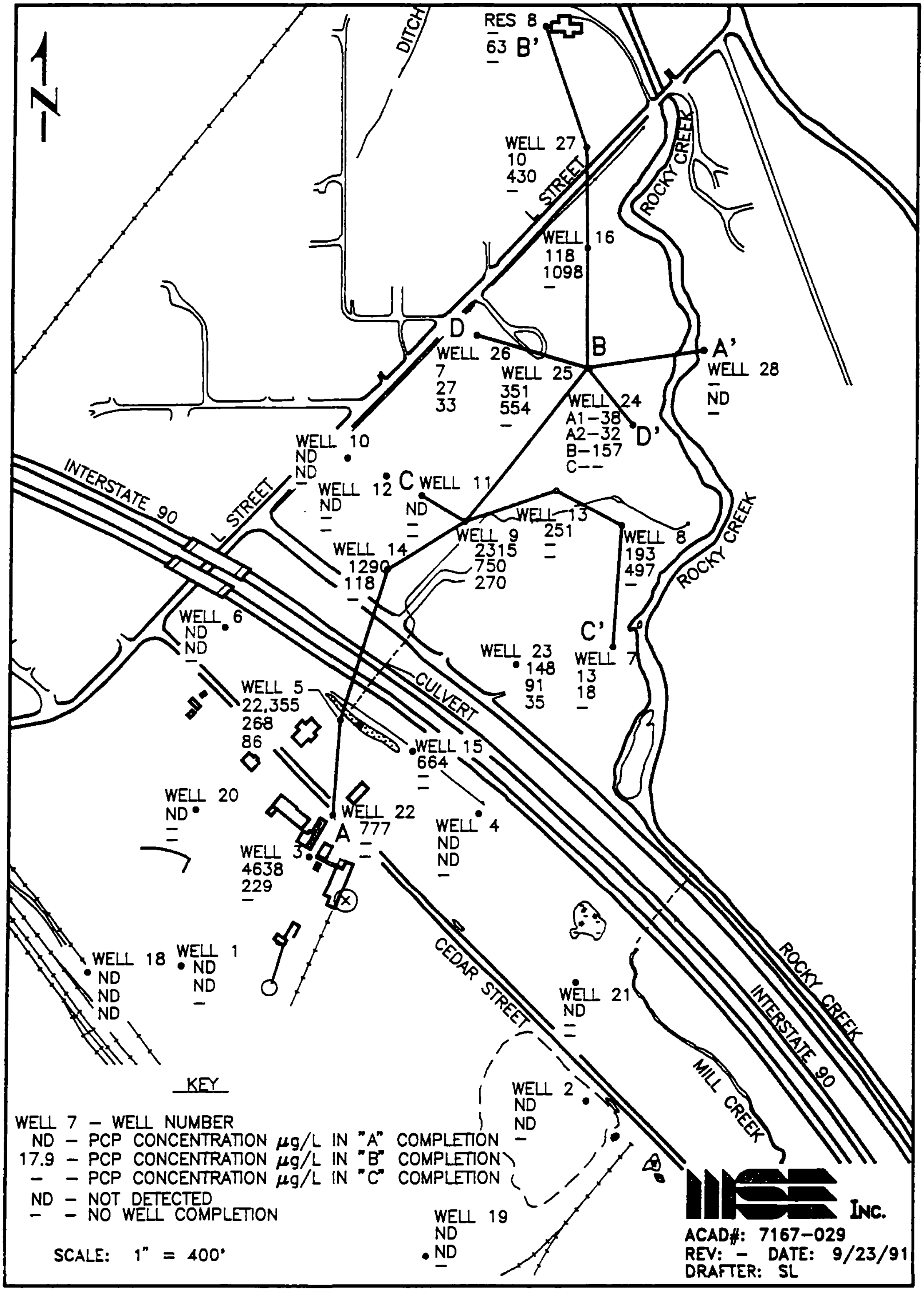


FIGURE 5-4 -- PLAN VIEW OF MEAN PCP CONCENTRATIONS IN GROUNDWATER AND CROSS-SECTION LINES

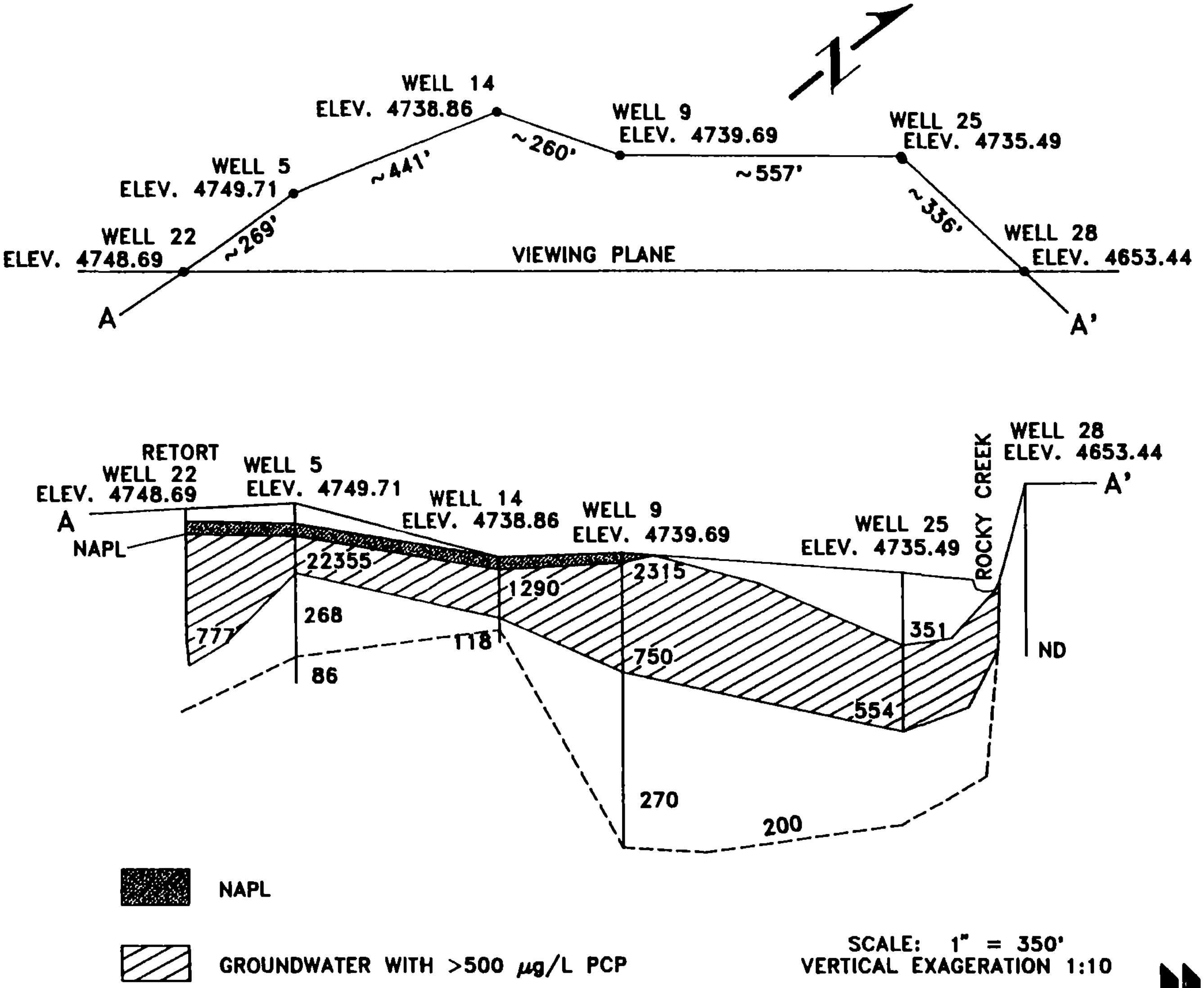


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FIGURE 5-5 -- CROSS SECTION OF MEAN PCP CONCENTRATIONS, SECTION A-A'
PCP IN µg/L.

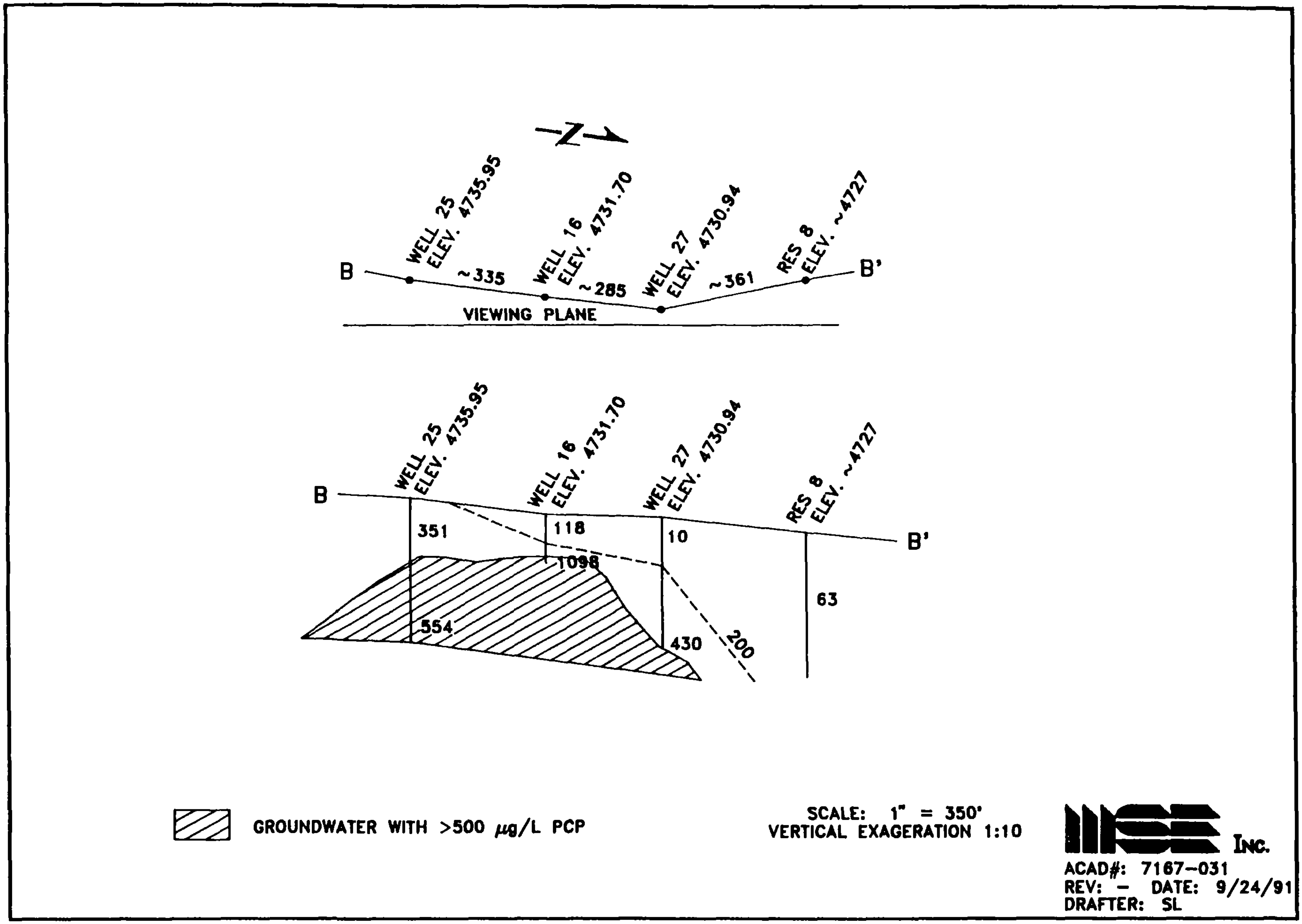


FIGURE 5-6 -- CROSS SECTION OF MEAN PCP CONCENTRATIONS, SECTION B-B'
PCP IN µg/L.

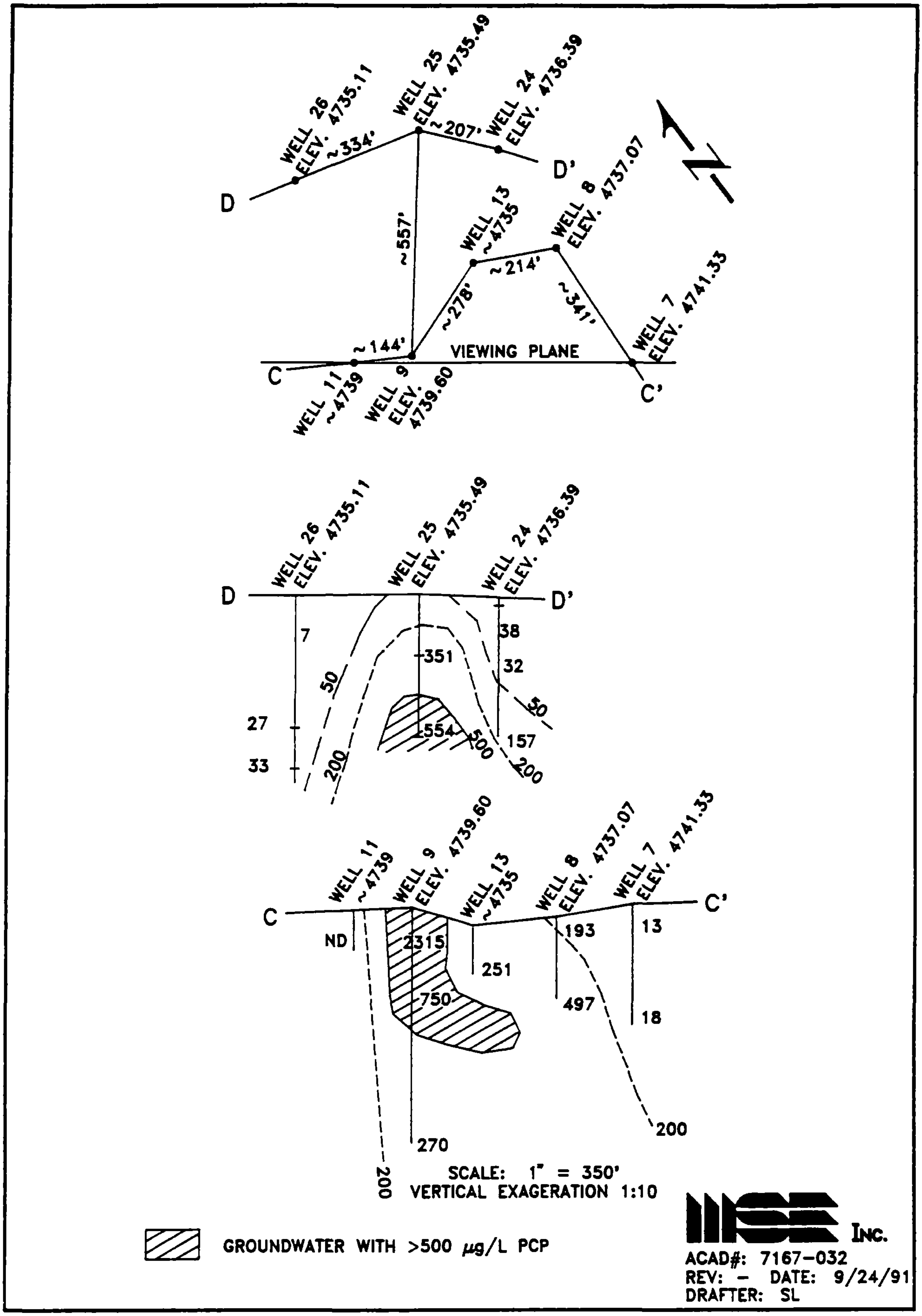


FIGURE 5-7 -- CROSS SECTION OF MEAN PCP CONCENTRATIONS, SECTIONS C-C' & D-D' PCP IN µg/L.

zones (below the "B" zone) or may not be vertical. Subsequent monitoring by MDHES has not detected PCP at Res-09 (detection limit = 0.05 μg/L).

The PCP plume extends northerly to at least the vicinity of Res-08, where PCP was detected. The Res-08 well is at 28 to 30 feet bgs and corresponds to the "B" zone of the aquifer system. Res-02, to the west, had a very low concentration of PCP (0.51J μg/L) in one sampling event (June 1991). Limited information is available for the well at Res-02, though it is believed to be shallow, somewhere between 8 and 12 feet deep. The well is located among other wells (residential and monitoring) that have had no PCP detected, but both nearby residential wells are deeper (approximately 30 feet deep); the nearby shallow monitoring Well 10A has not shown any detectable PCP in previous sampling rounds though the detection limits were higher (5.9 to 74 μg/L). The PCP concentration at Res-02 is very low and may not be reliable, although it is above the detection limit of 0.1 μg/L. Subsequent monitoring by MDHES has detected no PCP in Res-02 (<0.05 μg/L).

Vertical distribution of PCP is also controlled by variations in hydraulic conductivity. Four aquifer zones are identified at the IPC site: the "A" zone is at the groundwater table and any LNAPL floating on it; the "B" zone is the same unit as the "A" zone though at the lower bound, a silty-clay unit; the "C" zone is beneath the silty-clay and above another silty-clay unit; and the "D" zone is beneath the second silty-clay unit. Both the "A" and "C" zones have been identified as less conductive units in most areas downgradient of the IPC Site. The "B" zone has higher hydraulic conductivity and the "D" zone has not been tested, though lithology was similar to the "C" zone.

Analytical results indicate higher concentrations of PCP in the "B" zone and lower concentrations in the "A" zone (with the exception of well cluster 23). This phenomenon has several possible explanations: the upper "A" zone could be diluted by Rocky Creek, where the creek may be locally recharging the shallow groundwater; or, the major part of the PCP plume may descend because of geologic controls (e.g., more transmissive or faster groundwater movement in the "B" zone) or chemical processes (differences in density, biodegradation rates, or adsorption). PCP was also detected in the "C" zone, underlying the first silty-clay horizon. This indicates that the first silty- clay unit is not limiting the downward migration of contaminants but is either discontinuous or sufficiently permeable to allow PCP to reach lower zones. The concentrations in the downgradient "C" wells are fairly low and are probably approaching the depth limit of contaminant migration. The "D" zone at the well 29D location has PCP concentrations an order of magnitude lower than the "C" zone indicating that deeper zones probably have no detectable PCP. The "D" zone may contain the vertical fringe of the dissolved plume. One sample from the "D" zone cannot be considered enough data to conclude that the "D" zone is isolated from the dissolved plume. However, this sample was collected in the center of the known dissolved plume and should have the highest concentration of PCP in the "D" zone.

The groundwater data collected also indicate seasonal variations in concentrations. Lower PCP concentrations and smaller plume size are present during late summer and autumn (August and November sampling events). Two explanations for the seasonal variation are possible: snowmelt and precipitation increases in spring and may cause additional PCP to be leached into groundwater via direct infiltration through near surface contaminated soils; and/or due to increased precipitation and recharge, groundwater levels rise, bringing groundwater into direct contact with LNAPL-soaked subsurface soils. Other explanations are possible, relating to LNAPL distribution or movement in response to changing groundwater levels, or geologic controls that are not apparent at this time.

The areal extent and volume of contaminated groundwater associated with the dissolved plume has been determined using groundwater modeling results presented in Technical Memorandum 2, Addendum C (MSE, 1991d). The dissolved plume containing PCP at 1 ppb or greater is approximately 61.4 acres. The estimate of contaminated groundwater volume is based on the forthcoming MCL for PCP. This does not represent a defined clean-up level for the site, nor is it a risk-based contaminant level; the actual clean-up level may be higher or lower. The average thickness of the contaminated aquifer has been estimated at 35 feet, which includes the lower "C" zone. The average porosity value is 0.3. Based on these values, approximately 2.1×10^8 gallons of groundwater are contaminated with PCP concentrations at or above 1 ppb. Groundwater above 1 ppb was used for the volume estimate because this level represents the drinking water standard for PCP, which will become law on January 1, 1993.

6.0 CONTAMINANT FATE AND TRANSPORT

6.1 IPC SITE CONCEPTUAL MODEL

The information presented in Section 4.0 was used to develop the site model shown in Figure 6-1. Figure 6-2 provides a conceptual IPC Site cross section that illustrates contaminant source areas and suspected contaminant fate and transport information related to the specific pathways. Degradation activity boundaries shown are theoretical only, with some support received from existing analytical data. Additional discussion of these figures is provided below.

6.1.1 Contaminant Sources

The primary sources of contaminant releases from the IPC Site include subsurface soils, LNAPL, and to a lesser extent surface soils. The subsurface contaminated soils and LNAPL are due to past spills and leaks of wood-treating fluids from the wood-treating process equipment. Idaho Pole Company past disposal practices are unknown. Currently, the company complies with RCRA requirements regarding the generation, transfer, storage and disposal of hazardous wood treating wastes. Surface soil contamination has been partially mitigated through the annual placement of fill material on the site. The possibility of a DNAPL layer or small DNAPL pools as a primary source also exists, but no data obtained to date substantiates such occurrence(s).

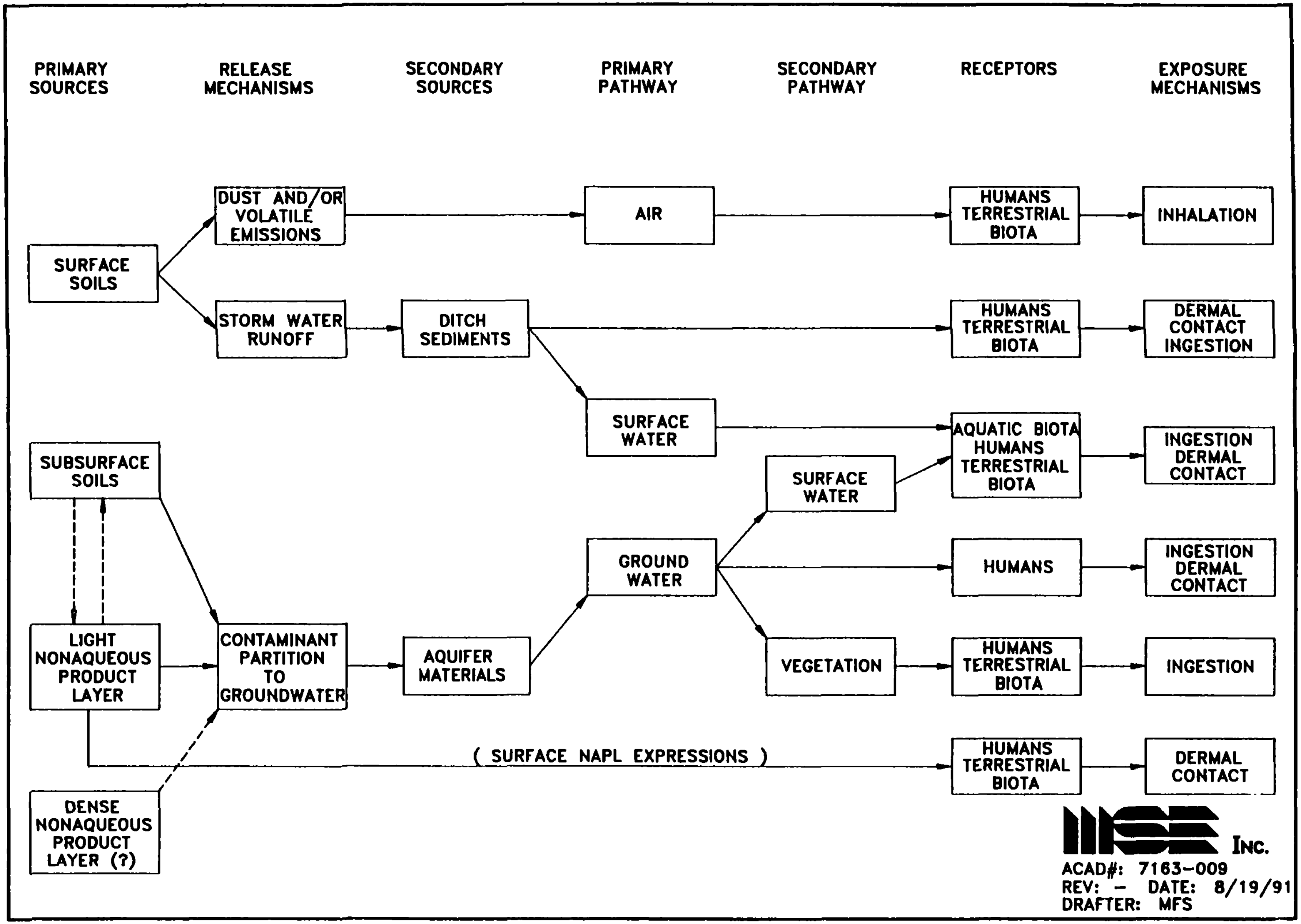
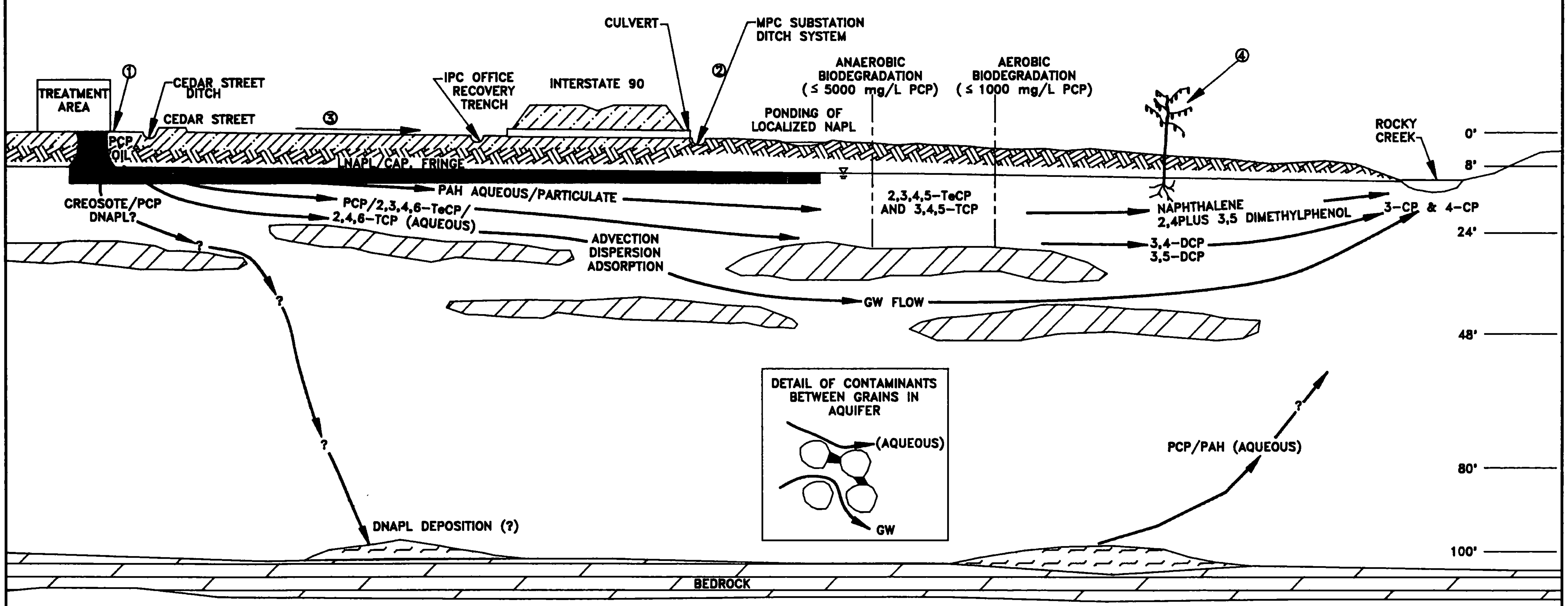


FIGURE 6-1
IPC SITE CONCEPTUAL MODEL



1. SURFACE SOILS AS SOURCE OF PARTICULATE (VIA FUGITIVE AND MECHANICAL ENTRAINMENT)

2. SPILLS OF PCP INTO ONSITE DITCH SYSTEM AND RECEPTOR POINT OF CONTAMINATED SEDIMENT DURING FUNOFF EVENTS AND OFF SITE TRANSPORT

3. STORMWATER, MELTWATER RUN OFF WITH SEDIMENT

4. GROUNDWATER/SOIL/PLANT PATHWAY WITH RODENT-RAPTOR, COW/MILK/HUMAN AND GARDEN PRODUCE/ HUMAN "FOOD CHAINS"

HORIZONTAL SCALE: 1"=100'
(APPROXIMATE)
VERTICAL SCALE: 4X OF HORIZONTAL
(APPROXIMATE)

LEGEND

FILL ▨
EARTH ▨
CLAY ▨

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PLOT SCALE: 1 = 100

FIGURE 6-2 -- IPC SITE CONCEPTUAL MODEL CROSS SECTION

The secondary contaminant sources include ditch sediments and aquifer materials. Ditch sediments have been contaminated by direct releases of wood-treating fluids, receipt of eroded (contaminated) surface soils, contact with the LNAPL plume or dissolved contaminant plume, and by over-topping of the office interceptor ditch. Aquifer materials that have either trapped (adsorbed, absorbed) contaminants or been coated by contaminants act as secondary sources by slowly releasing these pollutants into groundwater.

6.1.2 Contaminant Pathways

The primary pathways include surface soils, groundwater, surface water, and air. Based on available data, groundwater acts as the most significant pathway by carrying dissolved forms of the contaminants to potential receptors. Surface water acts as a primary pathway during storm runoff or snow melt events, carrying eroded surface soils. Air can carry volatilized or particulate forms of contaminants.

The secondary pathways include surface water receiving contaminated groundwater and vegetation uptaking contaminants from groundwater and from subsurface soils.

6.1.3 Contaminant Receptors

Receptors potentially affected by sources from the IPC Site include humans, mainly comprised of local residents; terrestrial biota including domestic animals and wildlife; and aquatic biota, including fish species and macroinvertebrates. Inhalation, ingestion, and dermal contact act (to varying degrees) as exposure routes to the potential receptors.

6.2 CONTAMINANT BEHAVIOR

6.2.1 Waste Description

The primary contaminants of concern at the IPC Site result from spills and leaks of wood-treating fluids and compounds during operation of the facility. Contaminants of concern include PAHs, PCP/other phenolic compounds, and dioxins/furans.

Important chemical and physical characteristics for the contaminants of concern have been compiled from the available literature and include molecular weight, solubility, sorption, volatility, and biodegradability. Molecular weight provides an indication of the mobility of a specific compound. Molecular weight increases with the number of condensed rings. Generally, the higher molecular weight compounds exhibit lower mobility potential due to lower solubilities. Chlorinated phenols and PAHs are found in association with groundwater as solutes. The solubility of organic compounds depend on the nature of the functional groups present. As the organic compounds dissolve, their sorptive properties begin to control the fate and transport of the contaminants. Compounds are classified as hydrophilic if their solubility in water is greater than 10 mg/L at 25 °C. The sorptive behavior of the compounds can be predicted by using the organic carbon-based partition coefficient (K_{oc}) and/or the octanol-water partition coefficient (K_{ow}) along with the fractional organic carbon content of the contaminated soil material(s). Compounds with K_{ow}'s greater than 100 are classified as hydrophobic. Volatility of the contaminants of concern is an important parameter regarding their fate in the environment; standard vapor pressure provides a predictive measurement of the compound's volatility. Compounds having vapor pressures greater than 5 torrs are generally classified as volatile.

6.2.1.1 PAHs

Sixteen PAH compounds have been listed as priority pollutants by EPA; 13 of these compounds have been identified at the IPC Site. The majority of the compounds do not contain active groups and have low solubilities in water. Table 6-1 shows the PAH compounds, their physical and chemical characteristics, as well as their cancer group designations. The low molecular weight PAHs are comparatively more soluble in water than higher molecular weight PAHs, and have lower organic carbon partition coefficients. This indicates that these compounds will be more mobile in the environment than the high molecular weight PAHs. Sorption of PAHs to soils and sediments increases with increasing organic carbon content, and as particle size decreases; PAH binding to clay-size particles can be 1,000 times greater than to sand-size particles. In general, the strength of sorption also increases with molecular weight; several fold more anthracene (178 gm/mole) and about twice as much benzo(a)anthracene (228 gm/mole) and benzo(a)pyrene (252 gm/mole) are retained in organics-rich marsh sediment than by sand.

TABLE 6-1

PAH COMPOUNDS

Compounds	Cancer Group	Molecular Weight (grams/mole)	in Water at 25 C (mg/L)	K_{OC} (mL/g)	Log K_{OW}	Vapor Pressure at 20 C (torrs)
Fluorene	D	116.15	1.98	$7.3x10^{3}$	4.18	10^{-3} - $1-^{2}$
Naphthalene	D	128.19	34.4	No Data	3.37	0.0492
Anthracene	D	178.23	0.073	$1.4x10^{4}$	4.45	1.95×10^{-4}
Fluoranthene	D	202.26	0.26	$3.8x10^{4}$	5.33	$10^{-6} \times 10^{-4}$
Phenanthrene	D	178.23	1.29	$1.4x10^{6}$	4.46	6.8×10^{-4}
Benzo(a)anthracene	B2	228.28	0.014	$1.38x10^{6}$	5.61	5×10^{-9}
Benzo(b)fluoranthene	B2	252.32	$1.2x10^{-3}$	$5.5x10^{5}$	6.57	10^{-11} - 10^{-6}
Benzo(k)fluoranthene	B2	252.32	$5.5x10^{-4}$	$5.5x10^{5}$	6.84	9.59×10^{-11}
Chrysene	B2	228.28	0.002	$2.0x10^{5}$	5.61	10^{-11} - 10^{-6}
Pyrene	D	202	0.14	$3.8x10^{4}$	5.32	6.85×10^{-7}
Benzo(a)pyrene	B2	252	$3.8x10^{-3}$	$5.5x10^{6}$	6.04	5×10^{-9}
Indeno(1,2,3-cd)pyrene	B2	276	$6.2x10^{-2}$	$1.6x10^{6}$	7.66	1.0×10^{-10}
Dibenz(a,h)anthracene	B2	278	$5.0x10^{-4}$	$3.3x10^{6}$	6.80	1.0×10^{-10}

PAH compounds are known to be biodegradable under both aerobic and anaerobic conditions. The rate of transformation of PAH compounds by soil microorganisms is related to the compound's molecular weight as well as the acclimation of the soil microbes to the PAH compounds.

Microbial metabolism is the major process for degradation of PAHs in soils; photolysis, hydrolysis, and oxidation play lesser roles in PAH degradation. The rates of PAH degradation are affected by soil temperature, pH , and moisture, plus availability of contaminant-acclimated microorganisms. Bacterial metabolism of PAHs to arene oxide intermediates is environmentally significant, since these intermediates have been linked to the carcinogenicity of some of the PAHs (e.g., benzo(a)pyrene). However, the arene oxides are often further degraded to innocuous organic acids (e.g., acetic acid) and ultimately to CO_2 and water vapor.

Volatilization of lower molecular weight PAHs (e.g., anthracene, phenanthrene) from soils and sediments may be substantial; this process is not significant for the higher molecular weight compounds (e.g., benzo(a)pyrene). Photooxidation and biodegradation can be significant processes in the degradation of PAHs in natural aquatic systems; hydrolysis is not considered to be an important process in degrading PAHs. The rate and extent of photodegradation varies widely among the PAHs, generally decreasing as molecular weight increases. Factors such as water depth, turbidity and temperature also affect the rate of photodegradation. Microbial degradation of PAHs in aquatic environments is significant under oxygenated, but not in anaerobic, conditions. Aquatic microbes also generate the arene oxide intermediates prior to metabolizing these compounds to organic acids, etc.

PAHs have been detected in groundwater either as a result of migration directly from contaminated surface water or through the soil. PAHs have also been shown to be transported laterally within contaminated aquifers.

PAHs released into the air as vapors can be photochemically oxidized via reactions with ozone, nitrogen oxides, sulfur dioxide and peroxyacetyl nitrate. The rate and extent of such processes is generally slower for PAHs sorbed to particulate matter (e.g., soot).

Terrestrial plants can uptake PAHs via the roots or foliage; such rates are dependent upon the concentration, solubility, and molecular weight of the PAH and on the plant species. For example, the ratio of benzo(a)pyrene levels in vegetation to those in soil ranged from 0.002 to 0.33. PAHs may accumulate slightly in terrestrial animals through the food chain or via direct ingestion of soil; whole body concentrations of PAHs in herbivores may be up to 10 to 30 times the levels observed in soil. In general, PAHs show little tendency for bioconcentration--despite their high lipid solubility--because most PAHs are rapidly metabolized, with consequent excretion of the degradation products. Fish and crustaceans can sorb/bioaccumulate PAHs from aqueous and sediment sources, resulting in bioconcentration factors ranging from 100 to 2,000-fold. However, fish species rapidly metabolize PAHs while the higher molecular weight compounds do not seem to accumulate in fish. This ability to metabolize PAHs may explain why benzo(a)pyrene is frequently not detected (or found at only very low levels) in fish collected from environments heavily contaminated with PAHs.

6.2.1.2 PCP

PCP is a mild acid with an hydroxy group, and it ionizes in solution to form pentachlorophenate anion. The pH-dependent ionization leads to higher solubility for PCP than its normal aqueous solubility of 14.0 ppm. Once PCP dissolves in water, its adsorptive behavior begins to control its fate. As aqueous solubility decreases, the adsorption increases. The physical and chemical characteristics of PCP are as follows:

Molecular Weight:	266.35 grams/mole
Solubility in Water	14.0 mg/L at 25 °C
K_{oc}	5.3×10^4 ml/gram
K_{ow}	5.01
Vapor Pressure	1.1×10^{-4} torrs at 25 °C

PCP is known to be biodegradable under both aerobic and anaerobic conditions. Anaerobic degradation rates are generally 10 to 100 times slower than aerobic degradation; therefore, if remediation time is critical, a method of oxygen enhancement is recommended (Woodward-Clyde, 1988).

PCP released into soil exhibits limited mobility, and is metabolized rapidly by most acclimated microorganisms. PCP is most readily degraded when soil moisture and organic matter content are high and when soil temperature approaches the optimum for microbial activity (i.e., 30±°C). Under such conditions, PCP is dechlorinated sequentially to tetra-, tri-, di- and mono-chlorinated compounds; under aerobic conditions, PCP is ultimately mineralized to CO_2, water vapor and chloride ion.

PCP is strongly adsorbed onto soil or sediment particles under acidic pH (≤ 5) and high organic matter conditions; however, the compound is very mobile in its ionized state at pH ≥ 7. Further, the ionic form of PCP is less volatile than the unionized form, while PCP released into the atmosphere is rapidly photolyzed by ultraviolet (UV) radiation (sun light). Thus, volatilization from soils (or aqueous systems) is not likely to be a significant transport mechanism under ambient conditions.

Given PCP's octanol/water partition coefficient (log K_{ow}) value of 5.01±, PCP may bioaccumulate to some degree in the environment; the likelihood of bioaccumulation increases with increasing pH due to the consequent dissociation of PCP to the more water soluble pentachlorophenate anion. Biomagnification of PCP in the food chain has not been observed. However, it is assumed that PCP bioconcentrates by 11-fold in the edible portion of fresh water aquatic organisms (EPA, 1980a).

6.2.1.3 Dioxins/Furans

Polychlorinated dioxins and furans are families of aromatic compounds that appear to be primarily by-products of chemical manufacturing or combustion processes involving precursor compounds and heat. The presence of dioxins at the IPC Site is a result of impurities in the PCP used at the site as a wood-treating fluid. Concern about chlorinated dioxins has been primarily directed to the tetra-, penta-, and hexachlorinated forms of the dioxin isomers. Because it is the most toxic of the dioxin/furan isomers, 2,3,7,8-TeCDD has been of primary concern. The chemical characteristics of TeCDD are as follows:

Molecular Weight	332 grams/mole
Solubility in Water	$2x10^{-7}$ mg/L at 25 °C
K_{oc}	$3.3x10^{6}$ ml/gram
K_{ow}	6.64
Vapor Pressure	$1.7x10^{-6}$ torrs at 20 °C

The biological degradation rate of this isomer appears to be very slow when compared to other organic compounds. Because it has a very low vapor pressure, it does not readily evaporate or volatilize into the atmosphere. The compound adheres tightly to soil particles. TeCDD does not migrate readily or leach into groundwater or surface water unless the contaminated soil particles themselves migrate via erosion processes (Freeman, 1989).

PCDDs/PCDFs released into soils or aquatic sediments will sorb strongly to these media; only a small portion of that added will dissolve or volatilize. However, mobility can be significant in soils having very low organic carbon content, or when the compounds are dissolved in an organic (carrier) solvent. PCDDs/PCDFs present in surface soils undergo rapid photodegradation, forming tri- and lesser chlorinated homologs within hours of exposure to sunlight.

More deeply buried compounds, or those contained in creek sediments, degrade more slowly; the estimated half-life for 2,3,7,8-TeCDD varies from more than 10 years down to 1.5 years.

PCDDs/PCDFs in air tend to exist in vapor and particulate-bound forms, with the latter phase predominating. Photochemical (e.g., ozone-mediated) reactions convert the PCDDs/PCDFs to di- or trichlorinated (and biologically inactive) homologs within hours of release; atmospheric half-lives of particle-bound forms are probably measured in days (or longer).

Biodegradation of PCDDs/PCDFs in soils and in water is probably slow, possibly due to the tightly bound nature of these compounds to particulate matter. Ground dwelling herbivores tend to have whole body dioxin concentrations equal to, or slightly greater than, those observed in accompanying soils. Although fish contain fewer PCDD/PCDF isomers than in the associated sediments, the fish tend to contain the more toxic 2,3,7,8-TeCDD and -PeCDD isomers.

6.3 GROUNDWATER FLOW AND FATE AND TRANSPORT MODELING

6.3.1 Groundwater Flow Modeling

Groundwater flow at the IPC Site was modeled using the USGS Modular Three-Dimensional Finite Difference Groundwater Flow Model (Modflow). Modflow was selected due to its capability to model two or three dimensional groundwater flow and its acceptability in the regulatory and scientific communities. The purpose for modeling the IPC Site is to aid the evaluation of groundwater remedial alternatives and to support a contaminant transport model.

6.3.1.1 Model Assumptions

To model the IPC Site, a number of assumptions were made concerning the hydrogeologic system. The assumptions that went into the groundwater flow model are discussed below.

The IPC Site is roughly triangular in shape, bounded on two sides by Rocky Creek and Bozeman Creek. The two creeks are considered to be hydrogeologic boundaries and were simulated as constant head boundaries. Both streams have surveyed elevation points to accurately measure surface water elevations. The third side of the model served as a constant flux boundary, based on the fact that groundwater is flowing into the model area along this boundary. The constant flux boundary was simulated by a series of injection wells, supplying the necessary volumes of water to calibrate the model.

The groundwater system has been modeled as a single layer aquifer, with zones of differing hydraulic conductivity. A two layer system was considered early in the modeling effort, but more recent data seems to indicate that only a single layer system exists at the site. The results of chemical analyses from the Stage IV ("C") wells show that the "C" zone is contaminated. The results of the pneumatic slug tests also showed that there is some connection between the "B" and "C" wells, once thought to be isolated by an aquitard.

The model was selected to anticipate both confined and unconfined conditions across the IPC Site. Aquifer bottom elevations were used, based on drilling information from the deeper wells across the site. The model could be changed to accommodate a thicker aquifer section if it becomes necessary. As the model stands now, it represents groundwater flow in the upper 30 to 40 feet of saturated material.

Assumed values of hydraulic conductivities used in the model ranged from 50 feet/day to 700 feet/day. Generally, a value of 500 feet/day was used across the site, except for special areas. These values were based on results of slug tests conducted by MSE and pumping tests conducted by IPC on monitoring wells across the site. Hydraulic conductivity multiplied by the thickness of the aquifer results in the transmissivity values used in the model.

6.3.1.2 Model Setup

The model was started by first superimposing a regular spaced grid over the map of the modeled area. Grid spacing was set at 100 feet. Grid size was 53 rows by 46 columns (5,300 feet by 4,600 feet) as shown in Figure 6-3. Once the grid was ready, each grid block (or node) was assigned values of head value, hydraulic conductivity, and aquifer thickness. The nodes not in the areas of interest, not effecting the model, were switched off. Boundaries were setup as previously discussed using two constant head boundaries (streams) and one constant flux boundary (injection wells) to define the system. A computer software package called ModelCad was used to set the model up so it could be run using the USGS Modflow model.

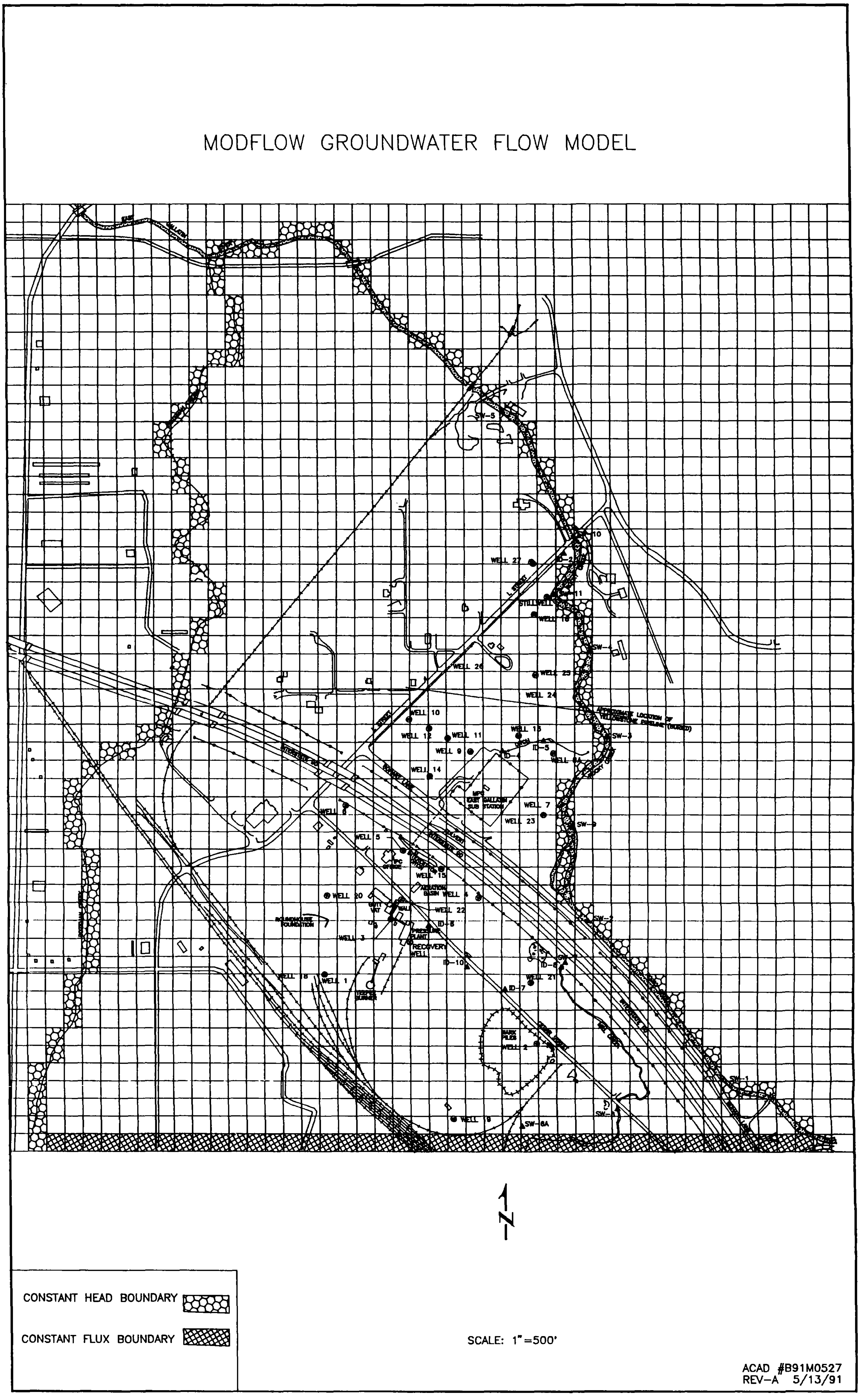

FIGURE 6-3
GROUNDWATER FLOW MODEL GRID AND BOUNDARIES SELECTED
TO REPRESENT THE IPC SITE

6.3.1.3 Model Calibration

Once the model was ready, several runs were required for its calibration. The model was calibrated to February 1991 water levels (Table 6-2) collected for both the two streams and groundwater. For the most part, calibration involved adjusting the constant flux boundary along the southern border. Calculated water flux (using hydraulic conductivity, aquifer thickness, and hydraulic gradient as key parameters) was approximately 17,000 feet^3/day per node. Several nodes were adjusted upward during subsequent model runs for improved calibration; zones of higher flux were expected due to the heterogeneous nature of the aquifer. In addition, zones of higher or lower hydraulic conductivity were added. Water elevations in wells close to Rocky Creek were consistently too high in the model, so the hydraulic conductivity was increased from 500 feet/day to 700 feet/day. Water levels then shifted downward, as expected. Texture of materials closer to the streams are likely to be more coarse, necessitating the increase in hydraulic conductivity. Additional adjustment of hydraulic conductivity was needed in nodes surrounding MW-3, MW-22, MW-4, and for the group of wells in the IPC pasture, including nests MW-14, MW-10, MW-11, MW-12, MW-9, and MW-26. Hydraulic conductivities were lowered in these areas as water levels calculated by the model were lower than actual field data.

Once the above adjustments were made, the water levels calculated by the model under steady state conditions were in good agreement with actual field data.

TABLE 6-2

FEBRUARY, 1991 WATER LEVELS RECORDED IN MONITORING WELLS

Well #	Static Water Level Elevation	Well #	Static Water Level Elevation
MW-1A	4749.06	MW-14A	4738.04
MW-2A	4747.14	MW-15A	4742.06
MW-3A	4746.15	MW-16A	4726,36
MW-4A	4743.07	MW-18A	4750.20
MW-5A	4742.67	MW-19A	4753.83
MW-6A	4741.19	MW-20	4745.63
MW-7A	4734.95	MW-21	4744.72
MW-8A	4732.65	MW-22	4744.93
MW-9A	4735.83	MW-23	4737.37
MW-10A	4735.56	MW-24A1	4729.77
MW-11A	4735.82	MW-25A	4729.92
MW-12A	4735.79	MW-26A	4731.21
MW-13A	4733.16	MW-27A	4724.32

Figure 6-4 shows the elevation and direction of groundwater flow based on the computer (Modflow) model.

6.3.2 Groundwater Fate and Transport Modeling

Contaminant transport modeling was applied to simulate the fate and transport of PCP in the aquifer system beneath the IPC Site. PCP was selected as the single miscible contaminant to be modeled due to its mobility and carcinogenic risk following exposure. The model used for this task was MT3D, a computer model for the simulation of advection, dispersion, and chemical reactions of contaminants in groundwater flow systems in either two or three dimensions. MT3D uses a mixed Eulerian-Lagrangian approach to the solution of the advective-dispersive-reactive equation, based on a combination of the method of characteristics (MOC) and the modified method of characteristics (MMOC). This approach combines the strength of MOC for eliminating numerical dispersion and the computational efficiency of MMOC.

The MT3D transport model was developed for use with any block-centered finite-difference groundwater flow model and is based on the assumption that changes in the concentration field will not significantly affect the flow field. The groundwater flow model used to support this effort was Modflow as described in Section 6.3.1. Cell-to-cell groundwater flow was computed within the groundwater flow model and was then incorporated into the contaminant transport model.

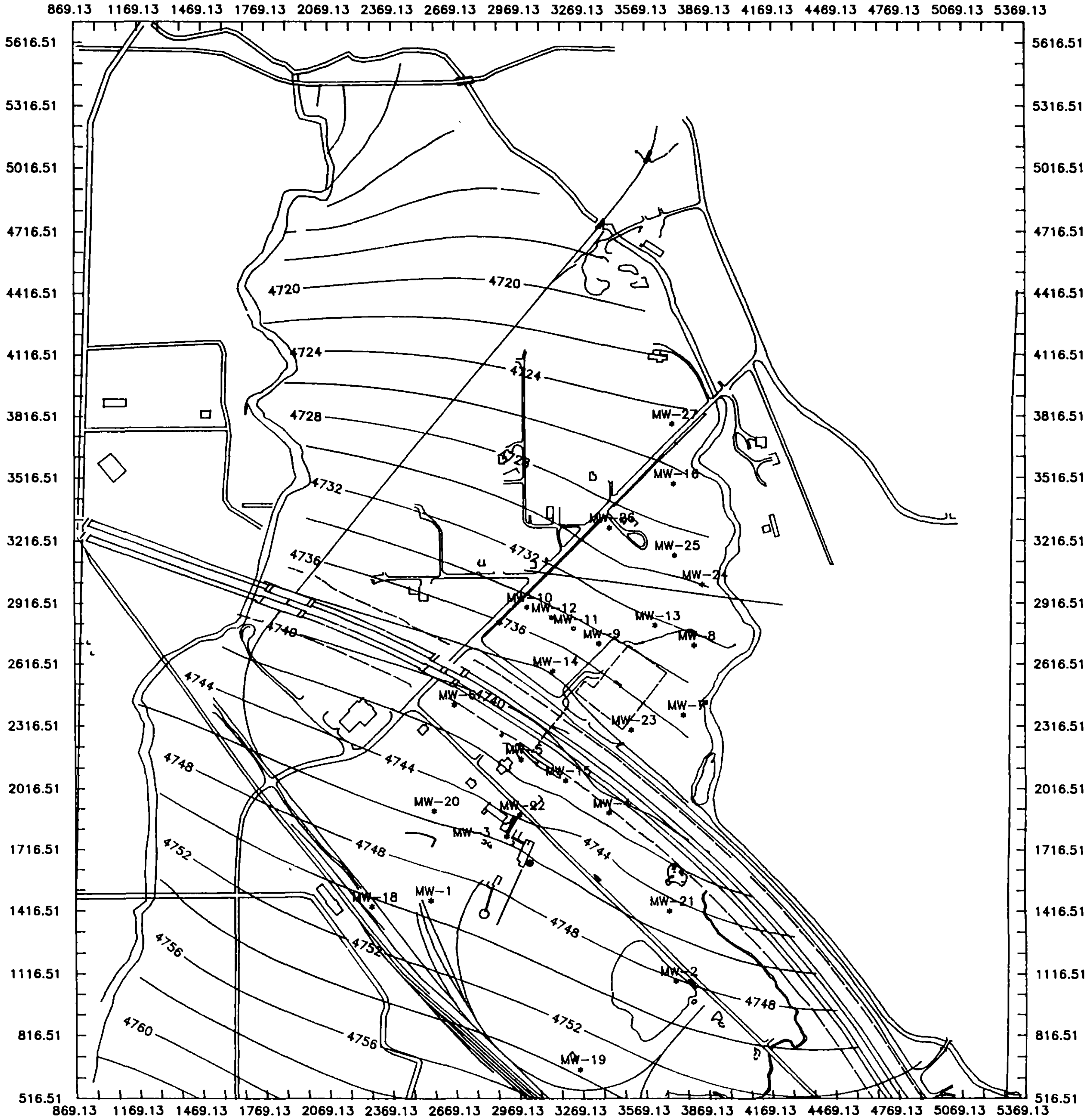

FIGURE 6-4 -- IDAHO POLE GROUNDWATER CONTOUR MAP FROM CALIBRATED USGS MODFLOW GROUNDWATER MODEL

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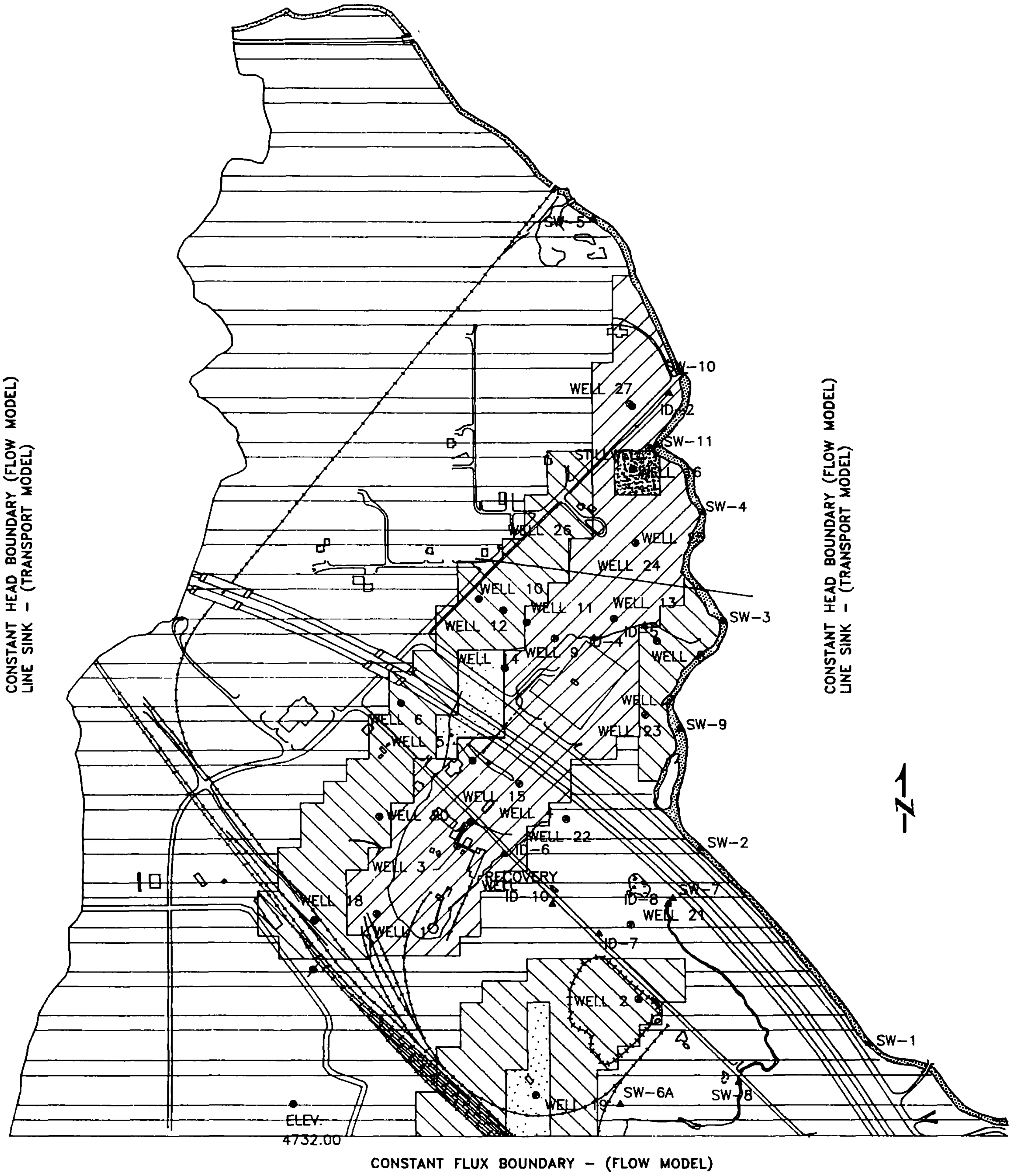
6.3.2.1 Contaminant Transport Modeling

This section describes the application of the MT3D transport model to the IPC Site, including transport of contaminants in a two-dimensional, heterogeneous aquifer. The aquifer system under the IPC Site is simulated by a two-dimensional model, a simplification based on what is known about the subsurface geology. Major lateral zones of differing hydraulic conductivity have been incorporated into the flow model, controlling contaminant migration. Vertical variations in hydraulic conductivity were used as modifiers for the lateral hydraulic conductivity distribution. This produced a reasonable two dimensional model in which to assess overall contaminant migration, given the allotted time and budget. The configuration of the simulation is shown in Figure 6-5. The flow and transport models consist of a single layer with 46 columns and 53 rows. The boundary conditions for the transport model are lines of "point sinks" along the east and west boundaries which take aqueous mass out of the aquifer, thus simulating discharge to Rocky Creek. The south (upgradient) boundary was treated as a no-mass flux boundary. Advection, dispersion, and chemical interaction simulations were all incorporated into the model to simulate the fate and transport of PCP. The flow domain is bounded by constant head boundaries on the east side (Rocky Creek) and west side (Bozeman Creek), and a constant flux boundary on the south. Zones of differing hydraulic conductivity are shown, determined by aquifer testing at various well clusters across the site. PCP leaching (loading) was simulated via a number of injection wells, each injecting a constant volume of water at a constant concentration. The parameters used in the simulation follow:



▨ K = 10FT/DAY
▨ K = 100FT/DAY
▤ K = 200FT/DAY
▨ K = 300FT/DAY
▩ K = 1400FT/DAY

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FIGURE 6-5 -- GENERAL CONTAMINANT TRANSPORT MODEL CONFIGURATION

Cell width along rows (ΔX) = 100 ft

Cell width along columns (ΔY) = 100 ft

Layer thickness (ΔZ) = 35 ft

Porosity (θ) = 0.30

Longitudinal dispersivity = 5 ft

Ratio of horizontal transverse to longitudinal dispersivity = 0.1

Simulation time (t) = 7,300 days (20 years)

Time = day

Length = feet

Mass = μg (micrograms)

6.3.2.2 Advection Simulation

Advection is the physical movement of the contaminant by the motion of groundwater. Contaminant travel is believed to be dominated at the IPC Site by advective transport due to the relatively high speed of groundwater movement (approximately 2.3 feet/day). A number of solution techniques are offered by MT3D to solve the advective portion of the transport equation. The technique selected for the simulation was the hybrid method of characteristics (HMOC). This solution technique uses both MOC and MMOC as required. When sharp concentration fronts are present, the advective term is solved by the MOC technique through the use of moving particles dynamically distributed around each front. Away from these fronts, the advective term is solved by the MMOC technique with particles placed at the nodal points and directly tracked in time. Particle tracking was achieved by selecting 10 particles in a fixed pattern on a single, vertical plane. The finite difference solution technique was also used for the advection term, but was found to distort the results due to numerical dispersion. In comparing the finite difference solution to the observed data, it was obvious that the results were less than satisfactory due to the "smearing" of the concentrations because of the numerical distortion. The hybrid MMOC/MOC solutions were much closer to the analytical data.

6.3.2.3 Dispersion

Dispersion refers to mixing and spreading due mainly to heterogeneity of the medium; minor amounts are caused also by molecular diffusion. For the IPC Site simulation, a longitudinal dispersivity of 5 feet was used. Five feet was used because it compared reasonably to actual site conditions; typical longitudinal dispersivity values range from 30 to 300 feet for sands, 3 to 30 feet for silts, and 0.3 to 3 feet for clays (Yeh, 1981). The ratio of horizontal transverse dispersivity to the longitudinal dispersivity was 0.1 (.5 foot). The same value (0.1) was set for the vertical transverse dispersivity to longitudinal dispersivity ratio. Molecular diffusion was set to zero, as it was considered an unimportant factor in this simulation.

6.3.2.4 Sorption Isotherm and Biodegradation

Sorption of the contaminant to aquifer matrix material is simulated through a retardation factor. The retardation factor is incorporated into the transport equation in such a way that it becomes a basic parameter in transport simulations. For this simulation, a linear isotherm was selected where the retardation factor is calculated as: $R = 1 + \frac{(Pb*Kd)}{\theta}$

Where: R = retardation factor

Pb = bulk density

θ = porosity

Kd = partitioning coefficient for the contaminant being modeled.

The partitioning coefficient, Kd, is calculated using the following equation.

$$Kd = K_{oc} * f_{oc}$$

Where: K_{oc} = partition coefficient for organic carbon

f_{oc} = fraction of organic carbon found in the matrix material.

The value of K_{oc} for PCP is pH dependent (Lee, et. al., 1990). At pH values (7.2) measured for groundwater at the IPC Site, K_{oc} values were found to be 500 cm^3/gm. An average value for organic carbon in soils is 0.1 percent. Given the depositional environmental and material type (silts, sands, and gravels) of the aquifer system beneath the IPC Site, it is estimated that the organic carbon content would be lower. Therefore, a value of .075 percent organic carbon was assumed. Using the formula for calculating a retardation factor, a value of 2.0 is obtained for insertion into the model.

Half-life values for the biodegradation of PCP were found to be very wide ranging in the literature, depending on site-specific conditions. Therefore, adding the parameter of microbial activity (based on literature values) to the model did not reflect necessarily conditions onsite. The uncertainty of whether biological breakdown of PCP occurs and how such rate varies over the site (depending on hydraulic conductivity) prevented this portion of the transport model from being used. If biodegration is occurring at the IPC Site, it is at a slow rate; thus, its exclusion from the model should not significantly affect modeling results.

6.3.2.5 Contaminant Sources

The first objective of the transport model was to obtain a "steady-state" condition based on current conditions. Thirty injection wells were used in the model to simulate PCP moving into the groundwater system (Figure 6-6). Contaminant loading was based on the following assumptions and estimates.

- Solubility of PCP at the IPC Site is 9.0 mg/l, based on a temperature/solubility plot, for 10 °C (Crosby, 1981).
- Present day areal extent of the contaminant source(s) has remained approximately the same for the last 15 to 20 years.
- LNAPL is effectively being dammed behind shallow clays in the IPC pasture area and is not continuing to migrate downgradient, spreading the source area.
- Contaminant loading rates vary from cell to cell due to differing amounts of contamination contained in the vadose zone or in the LNAPL.
- Recharge rate is .42 feet/year (5 inches/year) based on 1.5 feet (18 inches) annual precipitation. Water percolating through the contaminated soils and LNAPL become totally saturated with PCP (9.0 mg/L at 10 °C). From the preceding assumptions, contaminant loading rates were calculated for each cell for input to the model.

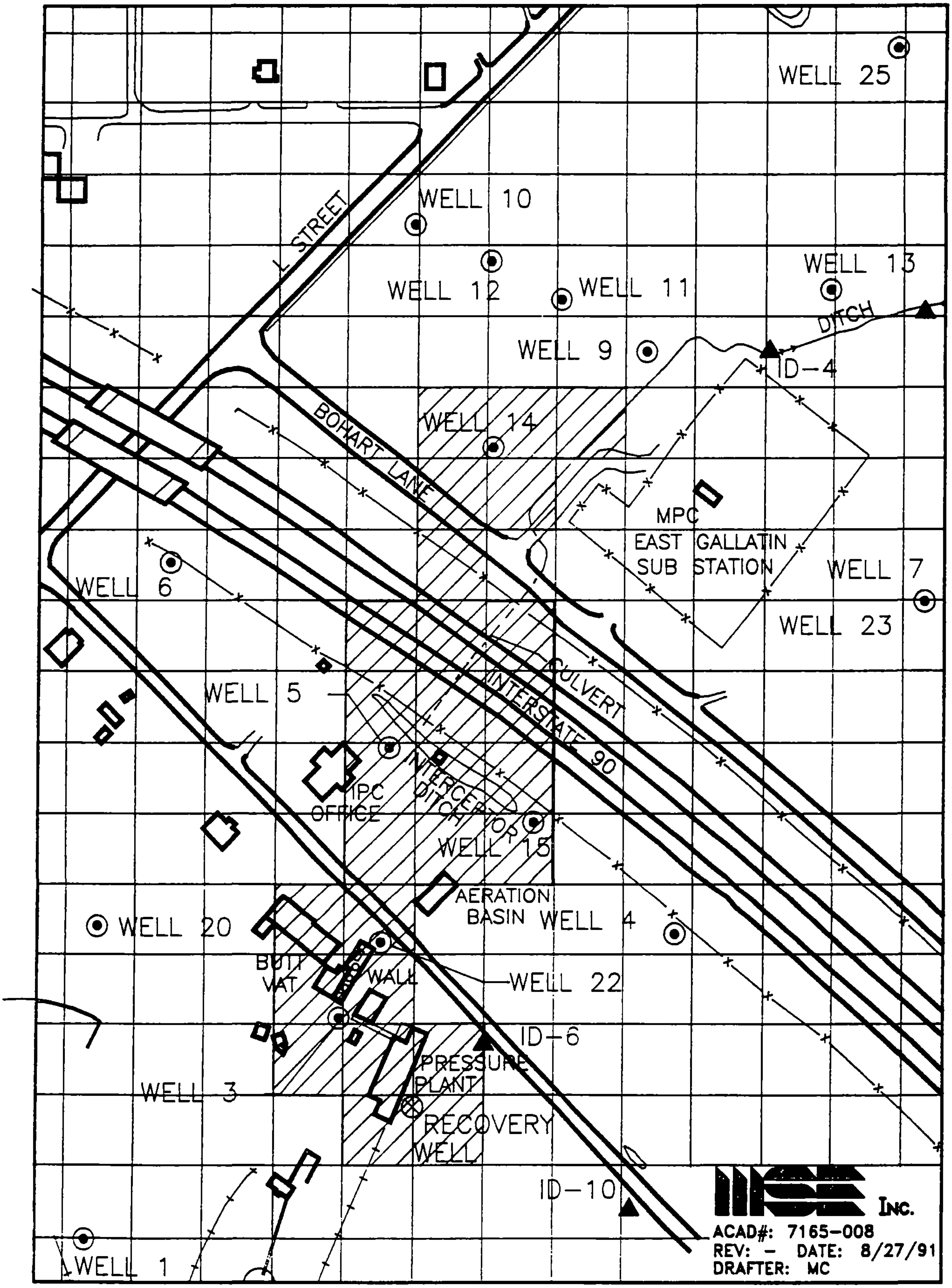

FIGURE 6-6 -- THIRTY CELLS USED TO SIMULATE SOURCE AREA FOR PCP CONTAMINANT LOADING.

6.3.2.6 Model Calibration

Several model runs were conducted to calibrate the transport model. Actual laboratory analytical data from the IPC Site groundwater samples were used to evaluate model results. The average PCP concentration for each well nest was used where wells are completed at different levels within the aquifer. For the IPC Site, advection is the dominant factor in controlling the transport of contaminants. For that reason, the more rigorous solution techniques (MOC and MMOC) were compared to the finite difference solution. It was obvious that the more rigorous techniques were much more accurate. The simpler, finite difference solution appeared to cause an artificial smearing of the plume due to numerical dispersion in the solution technique. Therefore, only the hybrid MOC/MMOC solution was used.

Once the general advection solution approximated actual field conditions, the remaining input packages (dispersion, chemical reactions, and sources) were adjusted to calibrate the model. Because these parameters are difficult to measure directly, values are estimated from the literature and inserted into the model. The estimates were adjusted in an iterative process until the model results fit the actual observed conditions. The calibrated model inputs that best fit the observed PCP concentrations used a 5.0 feet longitudinal dispersivity, 0.5 foot transverse and vertical dispersivities, a retardation factor of 2.0, and a PCP loading rate of 13.3 gms/day (2.2×10^{-2} lbs/day). The loading rate was calculated assuming that water percolating through PCP contaminated LNAPL and soils attains saturation with respect to dissolved PCP. To best calibrate the model, several runs were made on the computer using various loading rates. Individual loading rates for each cell were changed until the model agreed closely with actual observed data. The final calibrated model is presented in Figure 6-7. Actual averaged PCP values from the March 1991 results are given next to each well location with multiple completion zones (which represent the whole aquifer thickness), so that a comparison can be made to the model results (which simulated the full thickness of the aquifer). As can be seen, the model's predicted concentrations are in general agreement with the actual concentrations. Well nests 27, 16, 25, and 9 all have actual concentrations higher than predicted, but all fall in the zone predicted to have the highest concentrations. The high concentrations measured in these wells could be attributed to aquifer heterogeneities, where zones of preferential flow are transmitting groundwater having higher concentrations of PCP. These transmissive zones are probably smaller than the grid areas used in the modeling effort.

Mass budget calculations summarize information on the total mass into or out of the groundwater system. The difference between the total mass in and out is calculated as a percent error. Generally, the mass balance error is an indication of the validity of a numerical solution and it should be small for the numerical solution to be acceptable. The calibrated model's mass balance error averaged 0.85 percent for the full simulation (1,281 steps). This is well within acceptable limits (10 %; Zheng, pers. comm.) and indicates that the mass injected into the aquifer is conserved.

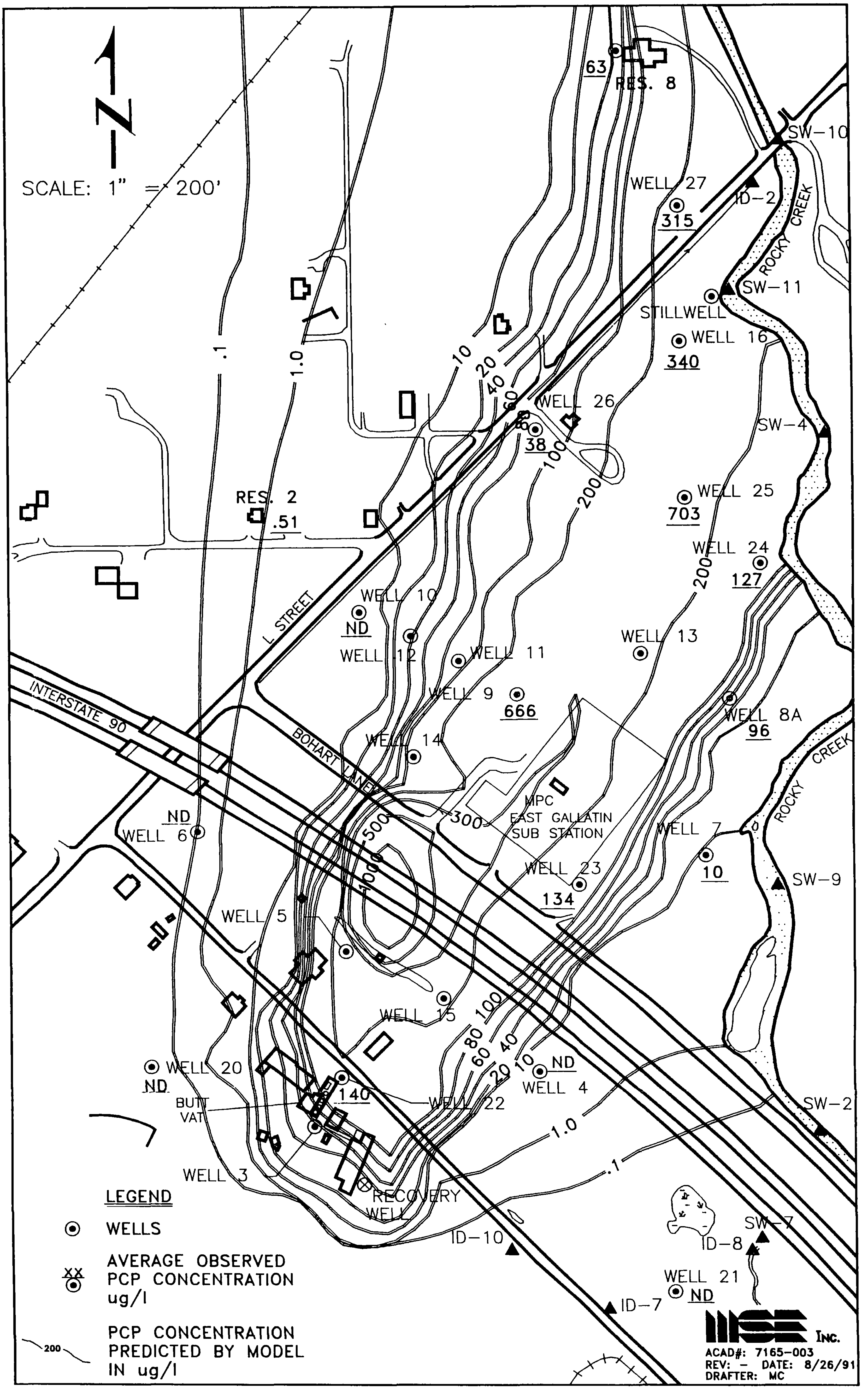

FIGURE 6-7 -- CALIBRATED TRANSPORT MODEL

6.3.2.7 Predictive Modeling

The calibrated model can be applied to predict the effects of remedial (or lack of) action. The model was used to predict the movement of dissolved PCP after all the contaminant sources were cleaned up and eliminated. The next series of Figures, 6-8 through 6-11, show the transport sequence for 1 year, 2 years, 3 years, and 4 years after source removal. As seen from the figures, it appears that the groundwater system may flush itself clean after a 4- to -5 year period, after removal of all the source materials.

6.4 SURFACE WATER/GROUNDWATER INTERACTION STUDY

The purpose of this investigation was to characterize and quantify interaction between the shallow alluvial aquifer and Rocky Creek at the IPC Site. Rocky Creek appears to form a hydrogeological boundary into which groundwater flows from either side. Due to the high probability that groundwater containing contaminants originating at the IPC Site is entering Rocky Creek, a data collection effort was undertaken to assist in determining the interaction between groundwater and surface water. Later groundwater modeling indicated that Rock Creek should indeed receive groundwater discharge from the IPC site (Section 6.3).

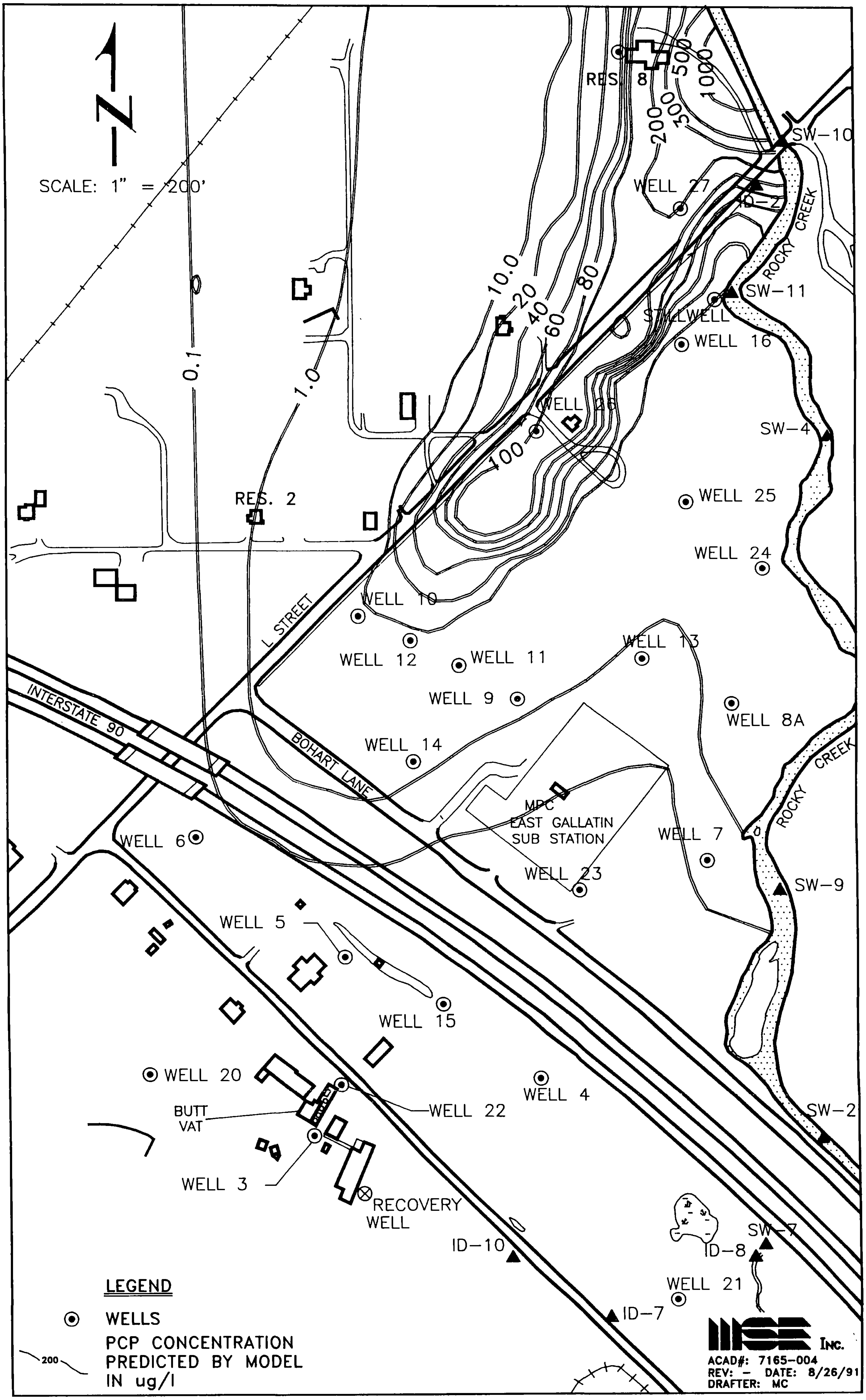

FIGURE 6-8 -- PREDICTED PCP CONCENTRATIONS IN THE GROUNDWATER ONE YEAR AFTER COMPLETE SOURCE REMOVAL.

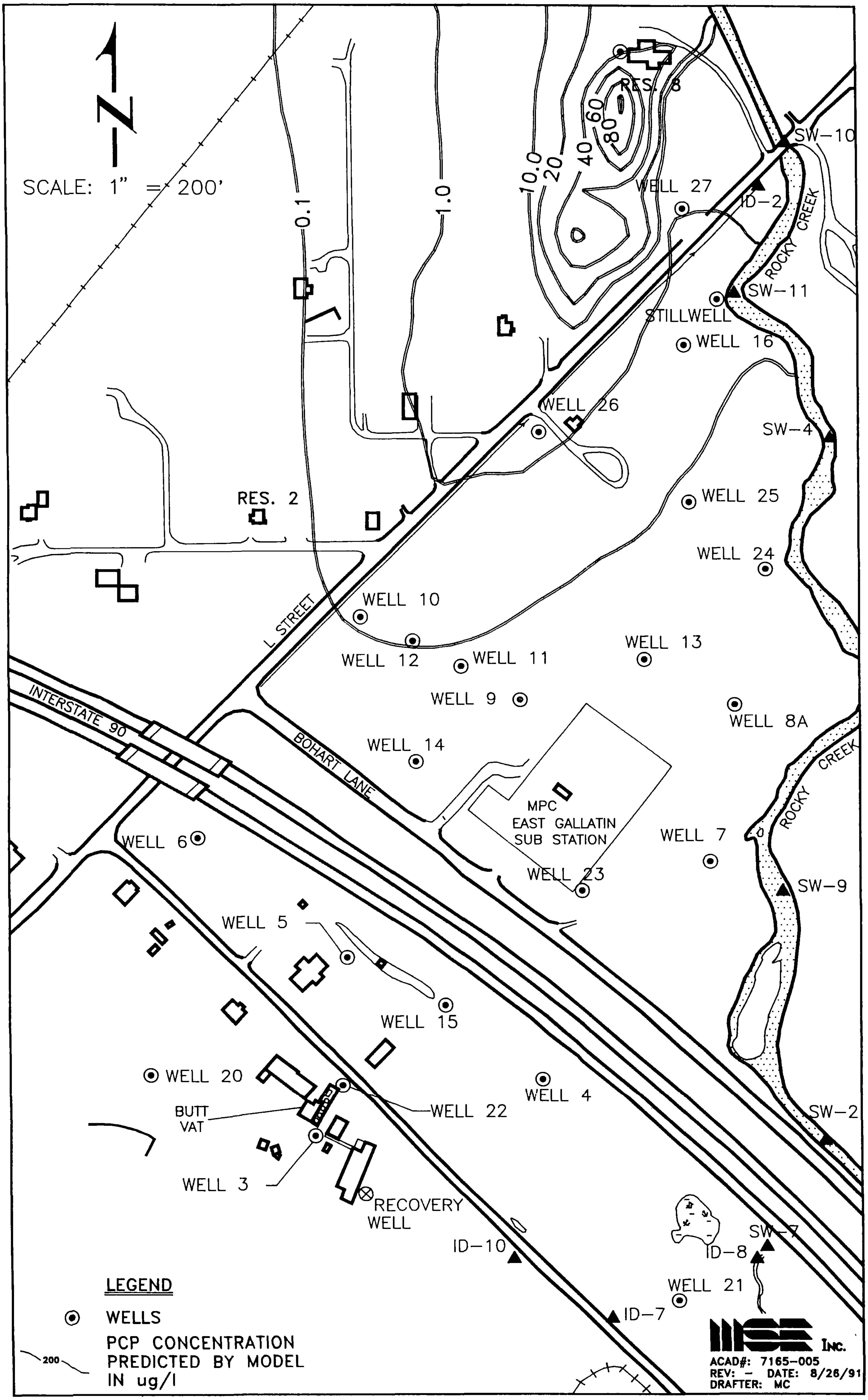

FIGURE 6-9 -- PREDICTED PCP CONCENTRATIONS IN THE GROUNDWATER TWO YEARS AFTER COMPLETE SOURCE REMOVAL.

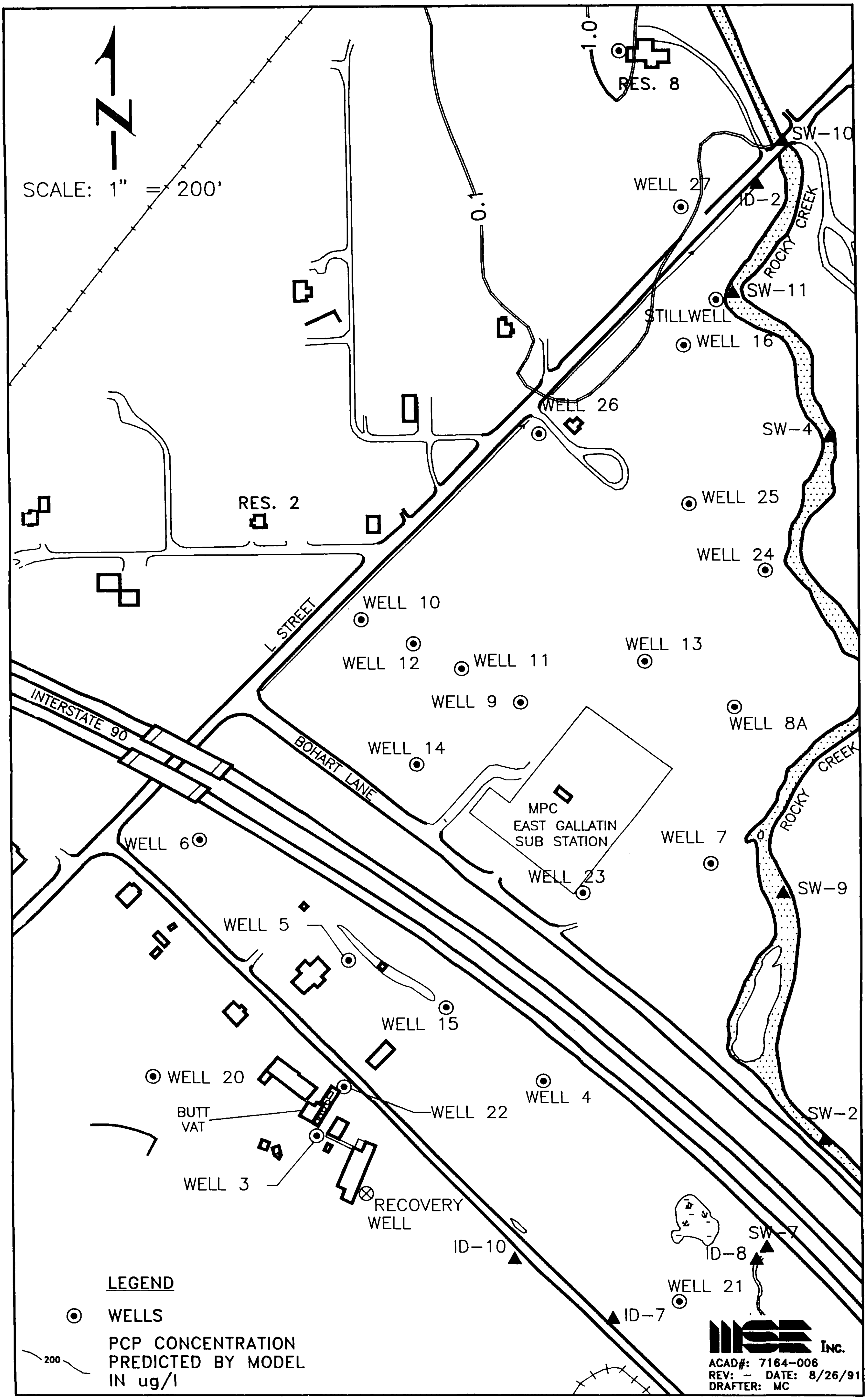

FIGURE 6-10 -- PREDICTED PCP CONCENTRATIONS IN THE GROUNDWATER
THREE YEARS AFTER COMPLETE SOURCE REMOVAL.

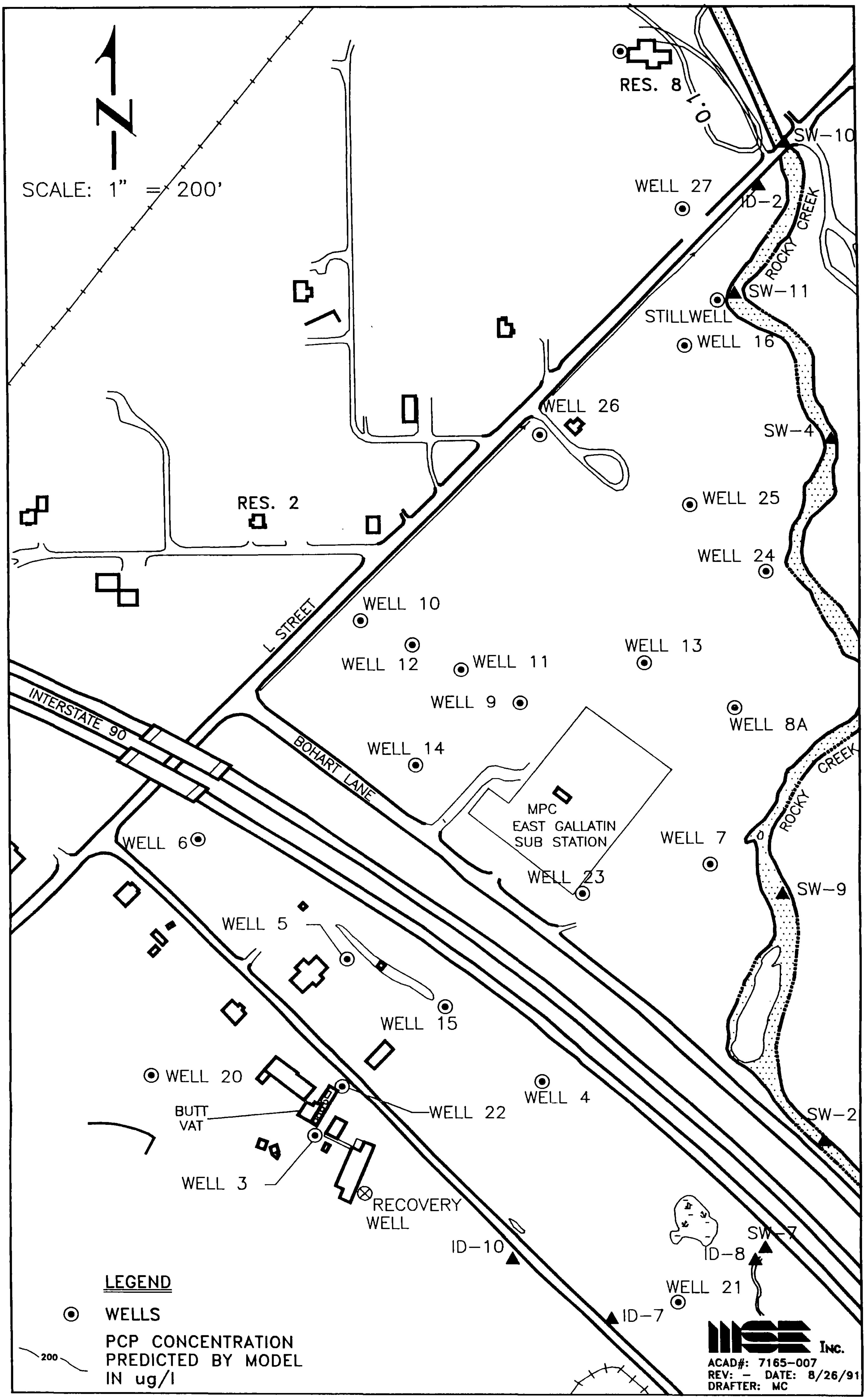

FIGURE 6-11 -- PREDICTED PCP CONCENTRATIONS IN THE GROUNDWATER FOUR YEARS AFTER COMPLETE SOURCE REMOVAL.

6.4.1 Surface Water Flow Measurements

During the remedial investigation, seven surface water monitoring stations were installed on Rocky Creek. These stations were designed to monitor stage (water level) then generate stage/discharge relationships, and/or determine contaminant concentrations.

Flow monitoring results presented in Section 3.5.2 are estimates of flow rates based on biweekly stage measurements (weekly in August and September). These data are of limited usability in determining where Rocky Creek gains and loses flow due to errors associated with both the flow measurement method used and errors associated with regression of the stage/discharge relationship. However, this information does indicate that flows increase from SW-01 to SW-10 with consistent increases between SW-03 and SW-04; flow consistently returns to approximately base flow conditions at SW-05 (the furthest downstream flow monitoring station).

To supplement the routine discharge data collected, an intensive discharge measurement episode was conducted on Rocky Creek February 22, 1991, and on February 27, 1991. Rocky Creek was gaged at approximately 200-feet intervals with minor variation to account for stream bed characteristics. Interval measurements were collected starting at SW-02 to SW-04 on February 22, 1991. Measurement was resumed on February 27 at station 14+50 (i.e., 1,450-feet downstream of SW-02) to SW-10; SW-05 was also measured. The results of these flow measurements are presented in Figure 6-12. These data indicate that slight gains are achieved as one proceeds downstream, with the most consistent

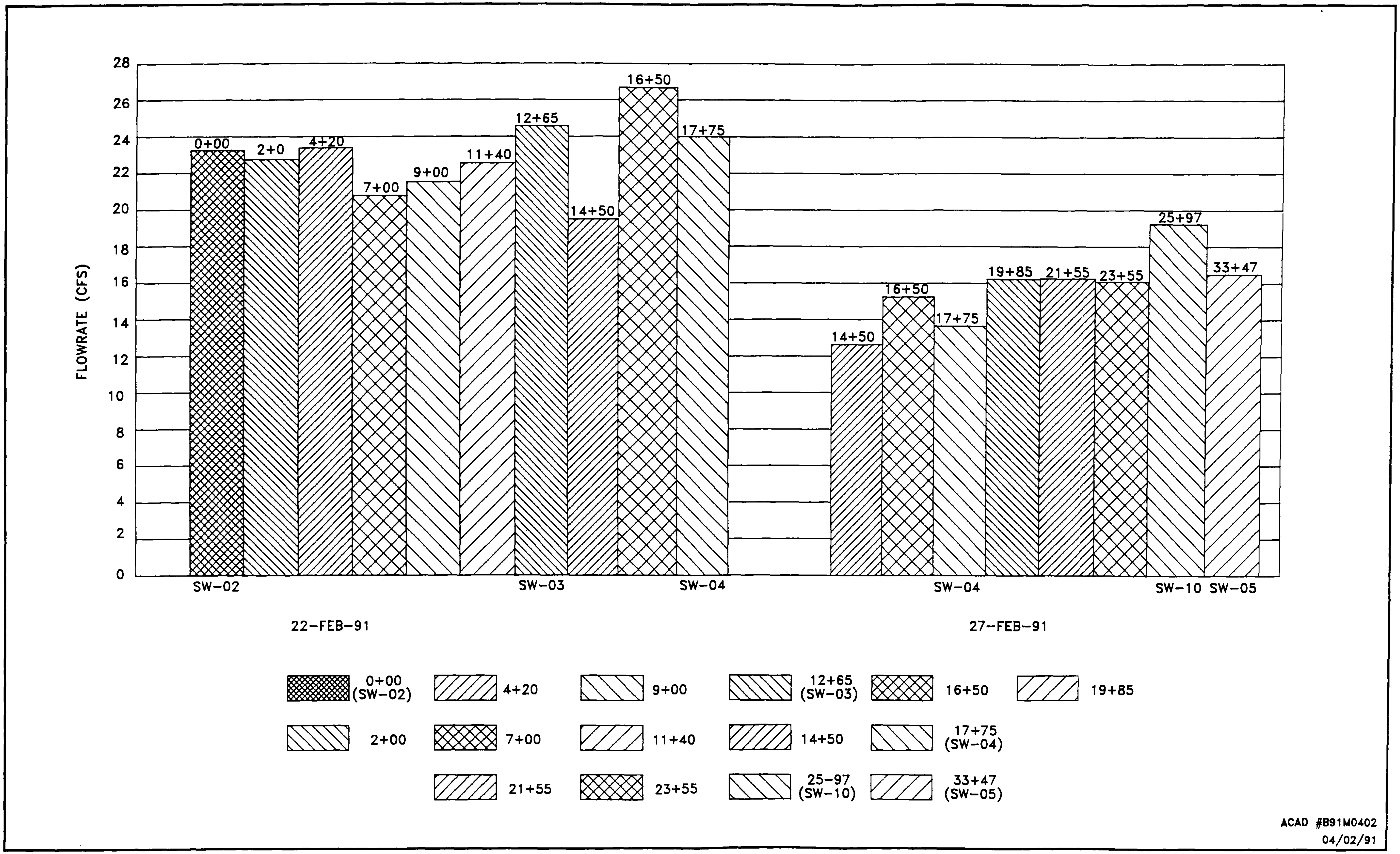

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FIGURE 6-12 DETAILED FLOW ANALYSIS DATA

and significant gain occurring between SW-03 (12+63) and SW-10 (25+97). Two factors are necessary for consideration when evaluating this data. First, data generated by the Velocity-Area Method for gaging stream flows may have measurement error which often approaches 5 percent; second, the baseflow of the stream changes as the flow monitoring activities are conducted. Inspection of continuous stage data measured at SW-11 indicated that on February 22, 1991, stage dropped 0.032 foot from the baseline by 2:00 p.m. and returned to baseflow by 5:00 p.m. This variability may account somewhat for lower discharges measured at stations 7+00, 9+00, and 11+40. Stage fluctuation measured on February 27, 1991 was much less than on February 22, with a maximum decrease of 0.015 foot in the mid-afternoon (between 2:00 p.m. and 3:00 p.m.). This decrease may have slightly dampened the observed increasing discharge measurements taken at stations 21+55 and 23+55.

Higher influx of groundwater to Rocky Creek between SW-03 and SW-10 may be attributed to four factors: the underground Yellowstone pipeline that crosses Rocky Creek between SW-03 and SW-04, which may have created a zone of higher permeability thereby facilitating groundwater discharge; the MPC Substation ditch, which carries and loses some water to the alluvial aquifer in this area; a small canyon drainage north of Rocky Creek, which probably discharges groundwater to this stretch of Rocky Creek; and Rocky Creek changes direction in this area, from travelling parallel with groundwater flow to perpendicular, also facilitating groundwater discharge.

Based on biweekly water elevation measurements in selected wells and stage measurements at the surface water monitoring stations, there is a good correlation between water elevations measured at the surface water monitoring stations and in the wells. This relationship was expected; as groundwater levels drop, the volume of groundwater contributed to the base flow of Rocky Creek also decreases.

Water levels were continuously monitored at MW-16A and SW-11 on Rocky Creek for a period of one year. The surface water monitoring station became operational at the end of May 1990, during the falling limb of the peak flow hydrograph. During this short period, it appeared that groundwater rises precede increases in surface water stage; however, lag times were very short, averaging one hour or less. This trend continued through the summer and fall of 1990. Occasional sharp increases in stage measured at SW-11 would then be followed by dampened (smaller) increases at MW-16A. The conclusion from this information is that groundwater typically discharges to Rocky Creek in the vicinity of MW-16A and SW-11. This relationship is reversed somewhat during the rising limb of the peak flow period, where bank storage is evident.

6.4.2 Surface Water Loading Calculations

Contaminant loading values were calculated for PAH and phenolic compounds detected in surface water at the IPC Site (Tables 6-3 and 6-4). The loading values provide a means of normalizing for the difference in flow from sampling site to sampling site. A loading value describes how much of a contaminant moves past a given point in a given time increment; loading units used were

TABLE 6-3

PAH ANALYTICAL (MG/L) AND LOADING (MG/SEC) DATA FOR THE FEBRUARY 1991 LOW FLOW SURFACE WATER SAMPLING

Surface Water Station	ft^3	L/Sec	Phenanthrene Conc.	Phenanthrene Loading	Pyrene Conc.	Pyrene Loading	Benzo(a)Anthracene Conc.	Benzo(a)Anthracene Loading
SW-4	11.70	331.30	$2.5x10^{6}$	.018	$4.0x10^{5}$	.013		
SW-6	0.165	4.67	$2.0x10^{6}$	$9.3x10^{-6}$				
ID-6	0.01	0.28					$5.0x10^{6}$	$1.4x10^{-6}$
ID-6	0.067	1.90					$1.0x10^{5}$	$1.9x10^{-5}$

Surface Water Station	Chrysene Conc.	Chrysene Loading	Benzo(b)-Fluoranthene Conc.	Benzo(b)-Fluoranthene Loading	Benzo(k)-Fluoranthene Conc.	Benzo(k)-Fluoranthene Loading	Benzo(a)-Pyrene Conc.	Benzo(a)-Pyrene Loading	Dibenzo(a,h)-Anthracene Conc.	Dibenzo(a,h)-Anthracene Loading	Benzo(g,h,i)-Perylene Conc.	Benzo(g,h,i)-Perylene Loading
SW-4	$7.0x10^{-6}$	.002			$2.4x10^{6}$	.0008	$3.7x10^{5}$	.012	$4.2x10^{-6}$	.001	$1.4x10^{-5}$	.005
SW-6			$2.4x10^{-6}$	$1.1x10^{5}$								
ID-6	$1.0x10^{-5}$	$2.8x10^{6}$										

TABLE 6-4

PHENOLIC ANALYTICAL (MG/L) AND LOADING (MG/SEC) DATA FOR THE FEBRUARY 1991 LOW FLOW SURFACE WATER SAMPLING

Surface Water Station	2/91 Flow		4,6-Dinitro-2-Methylphenol		2,4-Dinitrophenol		4-Nitrophenol		Pentachlorophenol		Phenol		2,4,6-Trichlorophenol		4-Chloro-3-Methylphenol	
	ft^3/sec	L/sec	Conc.	Loading	Conc.	Loading	Conc.	Loading	Conc.	Loading	Conc.	Loading	Conc.	Loading	Conc.	Loading
SW-2	12.25	346.87			.00066	.229	0048	.166								
SW-4	11.70	331.30											.00036	.119	.0015	.497
SW-6	0.165	4.67			.0013	.006	.00049	.002								
SW-10	14.99	424.46	.0012	.509	.0012	.509	.0038	1.613					.0016	.679		
ID-6	0.01	0.28					0.25	.007	0.38	.011	.0046	.001	.0058	.002		
ID-8	0.067	1.90			.0018	.003	.00045	.001								

milligrams per second (mg/sec). Low loading values do not necessarily imply low contaminant concentrations. For example, at station ID-6, a ditch with intermittent flow, the loading value for 4-nitrophenol is .007 mg/sec. The contaminant concentration (4-nitrophenol) in the sample, however, is 25 µg/l, the highest of any surface water sample. Figure 6-13 shows the loading values for compounds discussed below, plotted at the respective sampling stations.

An evaluation of the loading data suggests that a significant amount of the contamination found in Rocky Creek between monitoring stations SW-04 and SW-10 is derived from the dissolved groundwater plume. Contaminant release into Rocky Creek from the dissolved groundwater plume is based on a lack of detection of most contaminants at upstream sampling sites on Rocky Creek and Mill Creek. Furthermore, contaminants were detected in highest levels generally at sampling sites SW-4 and SW-10; these sites are directly downgradient from the IPC pole treatment plant. Groundwater flow direction at the IPC Site flows in a north-northeasterly direction.

The chlorinated phenols exhibit the above mentioned type of contaminant (spatial) distribution. For example, at surface water stations SW-4 and SW-10 on Rocky Creek, chlorinated phenols were detected (2,4,6-TCP at SW-4 and SW-10; 4-chloro-3-methylphenol at SW-4). No chlorinated phenols were detected upstream in Rocky Creek or Mill Creek. The only other detection of 2,4,6-TCP was at station ID-6 on the Cedar Street ditch. Station ID-6 is a drainage ditch that had a very low flow at the time of sampling. Surface drainage from station ID-6 does not appear to be the source of contamination found at

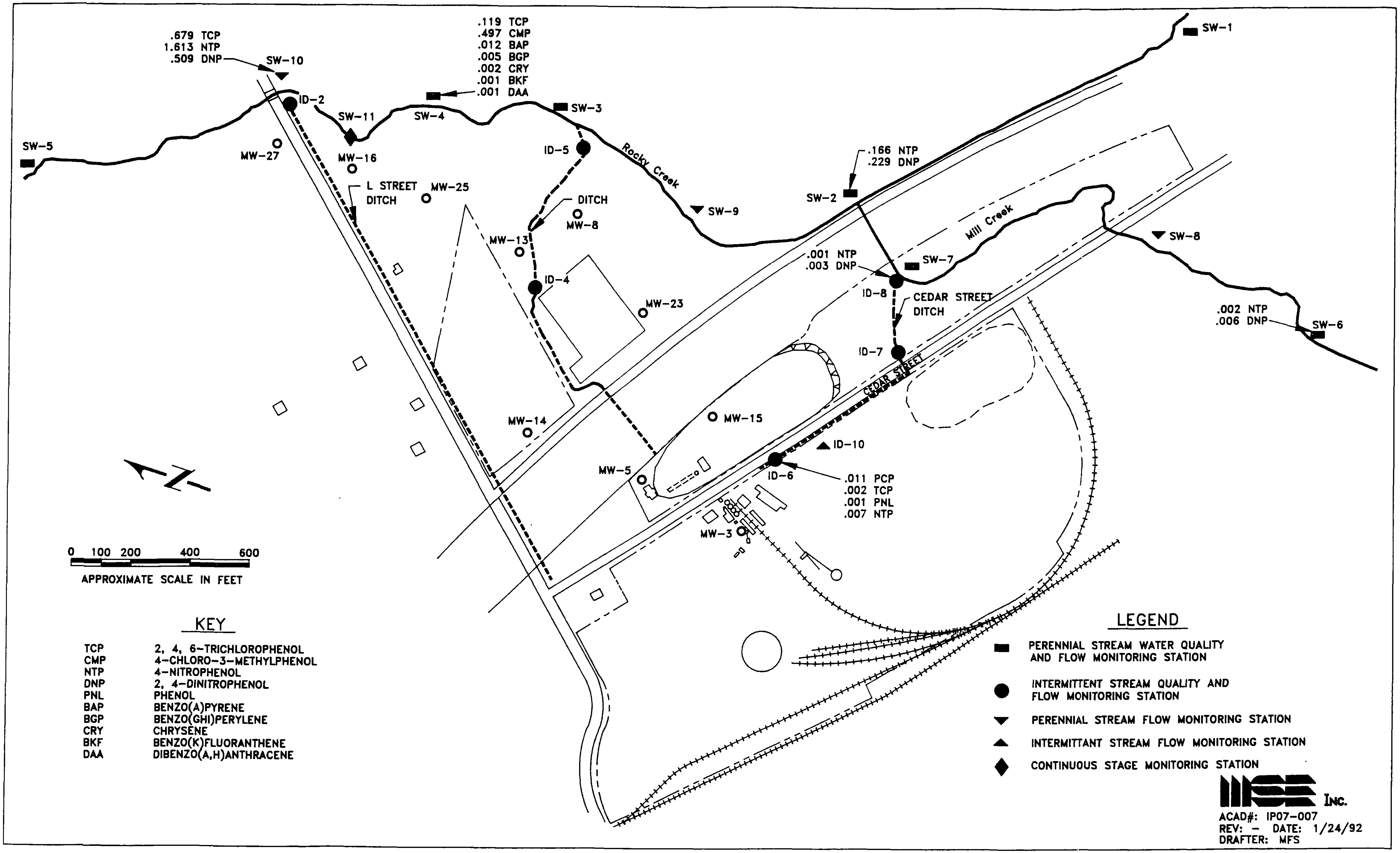

FIGURE 6-13 -- SURFACE WATER LOADING VALUES IN MG/SEC FOR SELECTED PHENOLIC AND PAH COMPOUNDS surface water stations SW-4 and SW-10; station ID-6 and stations SW-4 and SW-10 are separated by four sampling sites (ID-8, SW-7, SW-2, and SW-3) at which no chlorinated phenols were detected. Hence, the apparent source of phenols at stations SW-4 and SW-10 is groundwater discharging to Rocky Creek.

Other compounds show distributions influenced by groundwater discharge to Rocky Creek. PAHs in general exhibit the same pattern as for the chlorinated phenols. In particular, high molecular weight PAH data suggest a groundwater source with no input from upstream surface water. High molecular weight PAHs are those compounds weighing 228 to 278 grams/mole. High molecular weight PAHs detected at station SW-4 are benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, benzo(k)fluoranthene, and dibenzo(a,h)anthracene. These compounds are present in monitoring wells in the IPC plant area and in MW-14 at the south end of the IPC pasture. Of significance is that these compounds were detected only at SW-4 and not SW-3 or SW-10. This supports the theory that a contaminant zonation exists in the groundwater plume at the IPC Site. This zonation is discussed and illustrated in Technical Memorandum 3 (MSE, 1992a). The basic zonation is PAHs in the center of the plume and phenolic compounds distributed in a band outside of the plume's center. Groundwater discharging near SW-4 is dominated by PAH compounds; groundwater discharging near SW-10 is dominated by chlorinated and non-chlorinated phenolic compounds.

The compounds 4-nitrophenol and 2,4-dinitrophenol were detected at station SW-10 on Rocky Creek. They were also detected upstream at station SW-2 on Rocky Creek, SW-6 on Mill Creek, and ID-8 on the Cedar Street ditch. The loading value for 4-nitrophenol at SW-10 is an order of magnitude greater than at SW-2, implying that the groundwater discharging near SW-10 contains significant 4-nitrophenol. Non-chlorinated phenols from the IPC Site are also entering Rocky Creek via the Cedar Street ditch and Mill Creek, although the loading values imply this is a small contribution. Mill Creek, upstream of the IPC Site, is also a source of non-chlorinated phenols.

Monitoring wells in the IPC pasture show elevated levels of PCP; however, PCP was not detected at surface water stations on Rocky Creek. TCP was not detected in monitoring wells downgradient of MW-14 yet it shows up in Rocky Creek. There are several factors which may possibly explain this disparity in contaminant detection. TCP is 50 times more soluble in water than PCP. The affinity of PCP for organic carbon (K_{oc}) is 25 times greater than that of TCP. A possible scenario for PCP occurring in groundwater but not in Rocky Creek is that most of the groundwater discharging to Rocky Creek flows upward out of the aquifer and enters the creek through the creek bottom. Any PCP in this groundwater will have a strong tendency to adsorb to organic particles in the stream sediment. Potentially, the proportion of PCP being bound up is great enough that the amount of PCP that actually enters the stream flow is below detection limits. The detection limit for PCP in this data set was 1 μg/L which is significantly below any chronic exposure criterion for protection of fresh water aquatic life. Stream sediments at SW-10 (sample R22 and R8) contained 760 μg/L of PCP and were the only stream sediments showing chlorinated phenolic contamination. The PCP in the sediments degrades, thereby releasing TCP and other compounds. The TCP readily goes into solution with less likelihood of binding to organics in the sediments. Thus, as the groundwater discharges to Rocky Creek it carries with it a concentration of TCP greater than the amount contained within the aquifer.

Although there is evidence of the IPC groundwater plume contributing contaminants to Rocky Creek, the impact on surface water quality appears to be negligible. Contaminants from the dissolved plume at the IPC Site are found in a stretch of Rocky Creek less than 1,000 feet long. Dilution of these contaminants to below detection levels by the influx of relatively clean surface water (from upstream) occurs rather rapidly. Phenolic compounds were not detected at station SW-5, which is 900 feet downstream of SW-10. Dilution of surface water contaminant levels would also occur during much of the year, when Rocky Creek has higher flows. The data used to conduct this loading assessment were obtained during the winter low flow period. Because the extent of surface water contamination is limited in both space and time, there does not appear to be an ecologically significant risk posed to surface water quality or to the associated aquatic biota.

6.4.3 Groundwater Inflow Modeling

Groundwater contributions to Rocky Creek were calculated using the same configuration as for the calibrated groundwater computer flow model (Section 6.3). Zones of differing hydraulic conductivity were considered along with groundwater flow paths in determining quantities of groundwater recharging Rocky Creek. These values were then compared to field data as an independent verification of flow contributions. Groundwater influx to Rocky Creek was calculated using the following Darcy's equation:

$Q = -KIA$

where Q = flow rate (L^3/t)

K = Hydraulic conductivity (L/t)

I = Hydraulic Gradient (unitless)

A = Area (L^2)

The hydraulic conductivity values ranged from 100 feet/day to 300 feet/day as presented in Figure 6-5 in Section 6.3, while the hydraulic gradient remained relatively constant at .0095 foot/foot. The area was calculated by assuming the aquifer depth to be 40 feet and the width based on the Rocky Creek frontage perpendicular to groundwater flow. Groundwater contribution calculations were divided into six segments, with each segment bounded by two established surface water stations. Results of each segment are presented in Table 6-5. The sum total of all the segments for groundwater flux into Rocky Creek is 1.12 cubic feet/sec. It should be noted that one of the segments appears to be losing surface water to the groundwater system; this occurrence is between SW-11 and SW-10 and was assigned a negative value. From the values presented in Table 6-5, it appears that from station SW-2 to SW-5, groundwater from the south side of Rocky Creek provides approximately 1.12 cfs to the stream. Based on a low flow of approximately 15 cfs, this approaches roughly 7.5 percent of that flow.

Dilution effects would be at a minimum during low flow where groundwater supplies a greater percentage of the total flow. Based on the contaminant transport computer model for the IPC Site, it appears that groundwater having the highest concentrations of PCP would be entering Rocky Creek between SW-4

TABLE 6-5

GROUNDWATER CONTRIBUTION SUMMARY TABLE

Segment	K(ft/day)	I(ft/ft)	Width (ft)	A(ft^2)	Q(ft^3/d)[ft^3/sec]
SW-2 to SW-9	180	.0095	400	16,000	27,360 [.32]
SW-9 to SW-3	100	.0095	200	8,000	7,600 [.09]
SW-3 to SW-4	225	.0095	400	16,000	34,200 [.40]
SW-4 to SW-11	300	.0095	140	5,600	15,960 [.18]
SW-11 to SW-10	300	.0095	-160	6,400	-18,240 [-.21]
SW-10 to SW-5	280	.0095	280	11,200	29,792 [.34]
Totals					96,672 [1.12]

and 250 feet downstream of SW-10. Total calculated groundwater flux to the stream for this section is approximately 0.5 foot^3/sec. At a stream flow rate of 15 cfs, 0.5 cfs represents a 3.33 percent increase. If groundwater PCP concentrations averaged 330 μg/L for the water recharging the stream, the dilution effect would tend to lower concentrations to approximately 11 μg/L in Rocky Creek. At high flow events, concentrations would drop an order of magnitude to 1.0 μg/L, based on a flow rate of 150 cfs. Analytical data on surface water has not detected measurable amounts of PCP. However, laboratory analysis conducted on sediment samples from Rocky Creek detected PCP at SW-10. Therefore, the organic carbon found in the streambed may be adsorbing most of the PCP as described in the surface water loading section (Section 6.4.2).

7.0 BASELINE RISK ASSESSMENT

7.1 EXPOSURE ASSESSMENT

7.1.1 Current and Future Exposure Scenarios

7.1.1.1 Current Land Use

Reasonable maximum exposure (RME) scenarios were developed for both onsite and offsite receptors to the CoCs for current (and future) land use conditions (MSE, 1992a). The current land use scenario assumes that media-specific CoC concentrations observed during site characterization are the result of releases to the environment occurring over the past 40 years (i.e., ca. 1950 to 1990).

Given the ongoing pole treatment operations, two onsite RME populations were considered: an occupational scenario and a trespasser scenario. Table 7-1 presents the assumed characteristics and RME conditions associated with representative individuals from both of these populations (i.e., Part A for workers and Part B for trespassers).

Ingestion of CoC-contaminated food, groundwater or surface water was not included in the onsite exposure assessment. The 200 mg/day rate of incidental ingestion of soils is assumed to include soils transferred from hands-to-food prior to swallowing. The IPC Site is plumbed for city (potable) water, while

TABLE 7-1

ASSUMED CHARACTERISTICS OF THE CURRENT LAND USE, ONSITE RME INDIVIDUALS.[a]

PART A. OCCUPATIONAL (IPC WORKERS)

Individual	Parameter	Assigned Value (Units)	Comments
Adults working on-site	Body weight	70 (kg)	By convention (EPA, 1991a); adult males between the ages of 18-65 yrs. avg. 78.6 kg.
	Surface area exposed	3,120(cm^2).	50th percentile for male adults' hands and forearms.
	Ingestion rate	200(mg/day)	Twice the conventional value, but less than the 480 mg/day "construction site" value (EPA, 1991a).
	Inhalation rate	2.3(m^3/hr)	Assures 2.5m^3/hr during 8 hrs of work and 0.7m^3/hr. during lunch break and changeout before and after shift (EPA, 1989a).
	Exposure frequencies	129 days/yr. for 25 yrs. (direct contact) 9hrs/day, 240 days/yr for 25 yrs (inhalation, and ingestion)	Based on 5 days/wk during the 6 months (180 days)/yr having unfrozen soils; 25 yrs is by convention (EPA, 1991a).
	Soil contaminant concentrations.	Table 7-3 (mg/kg), Part A	Derivation of on-site soil concentrations is discussed in Section 7.1.2.
	Air contaminant concentrations	Table 7-3(mg/m^3), Part A	Derivation of on-site air contaminant concentrations is discussed in Section 7.1.2.

TABLE 7-1 (Cont'd)

ASSUMED CHARACTERISTICS OF THE CURRENT LAND USE, ONSITE RME INDIVIDUALS.[a]

PART B. TRESPASSER

Individual	Parameter	Assigned Value (units)	Comments
Intruders 6 through 18yrs. of age	Body weight	43 (kg)	Time-weighted avg. (EPA, 1989a)
	Surface areas exposed.	2,512 (cm^2) for soils/ sediments and as associated with interceptor ditch.	Hands and arms associated with a male individuals (EPA, 1989a).
	Ingestion rate	100 (mg/d)	FI=0.07, based on 15 waking hrs/day and one of these hrs spent onsite.[b]
	Inhalation rate	2.5(m^3/hr)	EPA (1989a) as source.
	Exposure frequency	1hr/day, 2 days/wk, 51 days/yr. for 12 yrs	Assumes trespassing occurs usually on weekends and during the frost-free-soils period.
	Soil contaminant concentrations	Table 7-3(mg/kg),Part A	Derivation of on-site soil concentrations is discussed in Section 7.1.2.
	Air contaminant concentrations	Table 7-3 (mg/m^3),Part A	Derivation of on-site air contaminant concentrations is discussed in Section 7.1.2

Note: [a] The following parameters are constant for both scenarios: 70-year lifespan; dermal absorption factor of 10 percent for all contaminants (by convention) times a 15 percent matrix effect (i.e., contaminant preparation desorbed from soil particle onto skin; Hawley, 1985); a soil adherence factor of 1.45 mg/cm^2, by convention (EPA, 1989).

[b] FI = proportion of soil ingested while at the IPC site, relative to the total daily soil ingestion rate; in this case, the proportion equal to 1 hr/day onsite divided by a 15 waking hours/day.

ingestion of contaminated surface water (e.g., in melt water puddles) would occur very infrequently, if ever. The potential adverse effects associated with annual maintenance of the onsite drainage ditch system (i.e., ingestion of or direct contact with contaminated sediments) are incorporated into the conservative assumptions made in Table 7-1. Direct contact with, and incidental ingestion of, wood-treating solution or process residues are viewed as occupational hazards more relevant to Occupational Safety and Health Administration (OSHA) or Resource Conservation and Recovery Act (RCRA) than to Superfund (55 Fed. Reg. 235:50450-50490; December, 1990).

Ingestion of contaminated soils/sediments (eg., via food consumption) and direct contact with contaminated surface water by trespassers was addressed in the same manner as for the workers. However, direct contact with contaminated groundwater via the interceptor ditch was incorporated into the exposure assessment for intruders. It is assumed that such exposure is associated only with dissolved phase contaminant concentrations, even though LNAPL is present occasionally in these waters. Finally, the potential exists for direct contact with -- and even ingestion of -- treating solution and process residues. Given the difficulty in assigning exposure frequencies, it is assumed these routes have been incorporated into the (more frequent) association with 95th upper confidence limit (UCL) soil/sediment contaminant concentrations.

The assumed characteristics for hypothetically exposed offsite adults and children are provided in Parts A and B, respectively, of Table 7-2. The receptor point is centered at Residence-10 (Figure 2-2), as this house was

TABLE 7-2

ASSUMED CHARACTERISTICS OF THE CURRENT LAND USE, OFFSITE RME INDIVIDUALS.[a]

PART A. ADULTS

Individual	Parameter	Assigned Value (Units)	Comments
Adult(s) residing at Residence-10 (Figure 2-4) from *ca*. 1955 to 1985	Body weight	70(kg)	50th percentile value, both genders (EPA, 1989a)
	Surface areas exposed	3,120(cm^2) while gardening and 18,200 (cm^2) while showering	Hands and forearms *vs*. whole body areas (EPA, 1989a)
	Ingestion rates	100(mg/d), 200(g/d) fresh weight consumption of garden produce, and 2(L/d) of "B" zone groundwater.	By convention (EPA, 1991c) plus assumed subsistence gardening (i.e., no consumption of store-bought vegetables).
	Inhalation rate	1.4(m^3/h)	EPA, 1989a as source
	Exposure frequencies	51 days/yr direct contact while gardening; 350 days/yr, 12hr/day ingestion of soils and household dust; 77days/yr for consumption of garden produce; 0.2hr/day 350d/y for 30yrs regarding direct contact via showering and 12hrs/day, 350d/y for 30yrs regarding inhalation of respirable dust.	Derivations are discussed in the text.

TABLE 7-2 (Cont'd)

ASSUMED CHARACTERISTICS OF THE CURRENT LAND USE, OFFSITE RME INDIVIDUALS[a]

PART A. ADULTS, cont'd.

Individual	Parameter	Assigned Value (Units)	Comments
Adults Residing at residence-10 (Figure 2-2) from ca. 1955 to 1985	Soil contaminant concentrations	Table 7-3 (mg/kg),Part B	Derivation of off-site soil concentrations is discussed in Section 7.1.2.
	Air contaminant concentrations	Table 7-3(mg/m^3),Part B	Derivation of off-site air contaminant concentrations is in Section 7.1.2.
	Groundwater contaminant concentrations	Table 7-3(mg/L), Part B	Deprivation of off-site groundwater contaminant concentrations for "A" and "B" zone wells is discussed in Section 7.1.2.

PART B. CHILDREN

Individual	Parameter	Assigned Value (Units)	Comments
Children, 6 - 12yrs of age who live at Residence-10	Body weight	29.2(kg)	50th percentile avg. for both genders.
	Surface areas exposed	1,851(cm^2) while playing in soils/sediments and 10,475(cm^2) while showering	Hands and arms vs whole body areas (EPA, 1989a)

TABLE 7-2 (Cont'd)

ASSUMED CHARACTERISTICS OF THE CURRENT LAND USE, OFFSITE RME INDIVIDUALS[a]

PART B. CHILDREN, cont'd.

Individual	Parameter	Assigned Value (Units)	Comments
Children, 6-12 yrs of age who live at Residence-10	Ingestion rates	100(mg/d) while playing 200(g/d) freshweight consumption of garden produce, and 2(L/d) of "B" zone groundwater.	By convention (EPA, 1991a) plus assumed subsitence gardening (i.e., no consumption of store-bought vegetables).
	Inhalation rate	2.5(m^3/hr)	EPA, 1989a as source.
	Soil, air, and groundwater contaminant concentrations.	Table 7-3, Part B	Derivation of these concentration values is discussed in Section 7.1.2.
	Exposure frequencies	103 days/yr ingestion of, and direct contact with contaminated soils/sediments/NAPL; 247 days/yr ingestion of and inhalation of soil based house dust; 77 days/yr for consumption of garden produce; 0.12 hr/day, 250 d/yr for 7 yrs regarding direct contact via showering and 12 hrs/day, 350 days/yr for inhalation of respirable dust	Derivations are discussed in the text.

Note: [a] The following parameters are constant for both scenarios: 70-yr lifespan; dermal absorption factor of 10 percent for all contaminants (by convention) times a 15 percent matrix effect (Hawley, 1985); and a soil adherence factor of 1.45 mb/cm^2, by convention (EPA, 1989d); 70kg - 50th percentile value, both genders (EPA, 1989a).

occupied for most of the period from 1955 to 1985. The following assumptions not presented in Table 7-2 were also incorporated into the exposure assessment:

- soil-to-garden produce transfer coefficients of 0.001 for PCP (Bellin et.al., 1990), 0.01 for PAHs (particularly benzo(a)pyrene; Edwards, 1983) and an assumed value of 0.001 for chlorinated p-dioxins/furans;
- permeability constants (through skin) of 1 cm/hour for PCP -- extrapolated from other chlorinated phenols -- and the "water default" value of 8.0E-04 cm/hour for both PAHs and dioxin/furans (EPA, 1988b); and
- the inhaled dose of contaminants received during showering is equivalent to that associated with consumption of 2 L of water per day (EPA, 1989b).

The exposure frequencies for adults were derived as follows:

- soil ingestion/direct contact while gardening -- 2 days/week over the assumed 6-month growing season (i.e., 2/7*180=51d/yr);
- consumption of garden produce 3 days/week over a 180-day/year period (i.e., 3/7*180=77d/yr); and
- an assumed 12-minute shower taken every day while home (EPA, 1989a).

7.1.1.2 Future Land Use

It is assumed that a trailer court is constructed within that portion of the IPC Site located west of Cedar Street, starting in 1995 and consequently occupied for 30 years thereafter. It was also assumed that:

- wood-treating structures are demolished/removed and the interceptor ditch filled in during site cleaning/preparation;

- excavation of subsurface contaminated soils is of minimal areal extent (i.e., for sewer/water lines) and of very short duration (i.e., as measured in weeks); and
- roadways within the court are not paved and the areas around the trailers are not grassed over.

Adults and children 1 through 6 years of age were selected as the onsite RME populations. Children of this age group are particularly contaminant-sensitive due to their relatively low body weight, reduced metabolic/physiologic defenses and behavior patterns (e.g., mouthing behavior). Table 7-3 presents the assumed characteristics and RME conditions associated with representative individuals from both of these hypothetical populations (i.e., Part A for adults and Part B for young children).

Soils and Cedar Street ditch sediments are assumed to remain onsite and be relatively accessible. Adult exposure to the CoCs is largely associated with ingestion of, direct contact with, and inhalation of contaminated soils; children would be exposed to both soils and sediments via the above routes.

It is also assumed that exposure to contaminated groundwater or surface water is negligible; the site is plumbed for city water, while exposure to meltwater puddles, etc., will be of less frequent occurrence -- and at lower concentrations -- than that associated with the soil/sediments.

The assumed characteristics for offsite adults and older children (6 through 12 years of age) are provided in Table 7-4, Parts A and B (respectively). The values presented in this table are the same used in Table 7-2, current offsite scenario. The critical difference is the assumed reduction in exposure point

TABLE 7-3

ASSUMED CHARACTERISTICS OF THE FUTURE LAND USE, ONSITE RME INDIVIDUALS[a]

PART A. ADULTS

Individual	Parameter	Assigned Value (Units)	Comments
Adult(s) residing in the trailer park from *ca*. 1995 to 2025.	Body weight	70(kg)	50th percentile value, both genders (EPA, 1989a.
	Surface area exposed	3,120(cm^2) while gardening	Avg. value for hands and forearms (EPA, 1989a.
	Ingestion rates	100(mg/d) of soil/housedust and 80(g/d) freshweight consumption of garden produce.	By convention (EPA, 1991a)
	Inhalation rate	1.4(m^3/hr)	Assumes resting or light activities predomonate while at home (EPA, 1989a).
	Exposure frequencies	51 days/yr direct contact with soils while gardening; 350 days/yr., 12 hr/d. ingestion of soils or household dust; 77 days/yr for consumption of garden produce; and inhalation of respirable particulate 12 hrs/day, 350 d/yr for 30 yrs.	Derivations are discussed in Section 7.1.1.1.
	Soil contaminant concentrations	Table 7-6, Part A (in mg/kg).	Derivation of on-site soil concentrations is discussed in Section 7.1.2.
	Air contaminant concentrations	Table 7-6, Part A (in mg/m^3)	Derivation of on-site air contaminant concentrations is discussed in Section 7.1.2.

TABLE 7-3 (Cont'd)

ASSUMED CHARACTERISTICS OF THE FUTURE LAND USE, ONSITE RME INDIVIDUALS[a]

PART B. YOUNG CHILDREN

Individual	Parameter	Assigned Value (Units)	Comments
Young children, 1 through 6 yrs. of age, exposed during the period 1995 to 2001	Body weight	16(Kg)	50th percentile value, both genders (EPA, 1989a).
	Surface area ex-	3,535(cm^2)	Avg. value for hands, forearms and legs (EPA, 1989a).
	Ingestion rates	200(mg/d) of soil/household dust and 40(g/d) freshweight consumption of garden produce.	By convention (EPA, 1991a)
	Inhalation rate	0.84(m^3/hr)	Time-weighted avg. for resting, eating, and playing (EPA, 1989a).
	Exposure frequencies	103days/yr direct contact with, and ingestion of, soils/sediments 247d/yr. ingestion of household dust; 77days/yr for consumption of garden produce; and inhalation of respirable particulate 12hrs/day, 350 d/yr. for 30 yrs.	Derivations are discussed in Section 7.1.1.1.
	Soil/sediment concentrations	Table 7-6, Part A	Derivation of these concentrations is discussed in Section 7.1.2.
	Air contaminant concentrations	Table 7-6, Part A	Derivation of air contaminant concentrations is discussed in Section 7.1.2.

Note: [a] The following parameters are constant for both individuals: 70 yr. lifespan; dermal absorption factor of 10 percent for all contaminants (by convention) times as 15 percent matrix effect (Hawley, 1985); and a soil adherenc factor of 1.45 mg/cm^2, by convention (EPA, 1989a).

TABLE 7-4

ASSUMED CHARACTERISTICS OF THE FUTURE LAND USE, OFFSITE RME INDIVIDUALS[a]

PART A. ADULTS

Individual	Parameter	Assigned Value (Units)	Comments
Adult(s) residing at Residence-10 (Figure 2-4) from *ca*. 1995 to 2025	Body weight	70(kg)	50th percentile value, both genders (EPA, 1989d).
	Surface areas exposed	3,120(cm^2) while gardening and 18,200(cm^2) while showering	Hands and forearms *vs*. whole body areas (EPA, 1989d).
	Ingestion rates	100(mg/d), 200(g/d) freshweight consumption of garden produce, and 2(L/d) of "B" zone groundwater	By convention (EPA, 1991a) plus assumed subsistence gardening (i.e., no consumption o store-bought vegetables).
	Inhalation rate	1.4(m^3/hr)	Time-weighted avg. of resting and active periods (EPA, 1989a).
	Exposure frequencies	51days/yr direct contact with garden soils; 350days/yr, 12hr/day ingestion of soils and household dust; 77days/yr for consumption of garden produce; 0.2 hr/day, 350d/yr for 30yrs regarding direct contact with "B" zone groundwater via showering; and 12hr/d, 350d/yr for 30yrs. regarding inhalation of respirable dust.	Derivations are discussed in Section 7.1.1.1.
	Soil contaminant concentrations	Table 7-6, Part B (in mg/kg)	Derivation of offsite soil concentrations is discussed in Section 7.1.2.
	Air contaminant concentrations.	Table 7-6, Part B (in mg/m^3)	Derivation of off-site air contaminant concentrations is discussed in Section 7.1.2.

TABLE 7-4 (Cont'd)

ASSUMED CHARACTERISTICS OF THE FUTURE LAND USE, OFFSITE RME INDIVIDUALS[a]

PART A. ADULTS, cont'd.

Individual	Parameter	Assigned Value (Units)	Comments
Adult(s) residing at Residence-10 (Figure 2-4) from *ca*. 1995 to 2025	Groundwater contaminant concentrations	Table 7-6, Part B (in mg/L)	Derivation of off-site "A" and "B" zone groundwater concentrations is discussed in Section 7.1.2.

PART B. CHILDREN

Individual	Parameter	Assigned Value (Units)	Comments
Children, 6 through 12 yrs of age who live at Residence-10 and exposed during the period 1995-2001)	Body weight	29.2(kg)	50th percentile avg. for both genders (EPA, 1 1989a)
	Surface areas exposed	1,851(cm^2) while playing in soils/ sediments/NAPL and 10,475(cm^2) while showering.	Hands and arms *vs*. whole body areas (EPA, 1989a).
	Ingestion rates	100(mg/d) while playing, 200(g/d) freshweight consumption of garden produce, and 2(L/d) of "B" zone groundwater	By convention (EPA, 1991a) plus assumed subsistence gardening (i.e., no consumption of store-bought vegetables).
	Inhalation rate	1.1(m^3/hr)	Time-weighted avg. of resting and active periods (EPA, 1989a).

TABLE 7-4 (Cont'd)

ASSUMED CHARACTERISTICS OF THE FUTURE LAND USE, OFF-SITE RME INDIVIDUALS[a]

PART B. CHILDREN, cont'd.

Individual	Parameter	Assigned Value (Units)	Comments
Children, 6 through 12 yrs of age who live at Residence-10 and exposed during the period 1995-2001)	Exposure frequencies	103 days/yr. ingestion of, and direct contact with, contaminated soils/sediments/NAPL; 247 d/yr ingestion and inhalation of soil-based house dust; 77 days/yr for consumption of garden produce; 0.12 hr/d, 250 d/yr for 7 yrs regarding direct contact with "B" zone groundwater via showering; and 12 hrs/d, 350 d/yr for inhalation of respirable dust.	Derivations are discussed in Section 7.1.1.1.
	Soil, sediment, NAPL, air and groundwater contaminant concentrations	Table 7-6, Part B	Derivation of these concentration values is discussed in Section 7.1.2.

Note: [a] The following parameters are constant for both individuals: 70yr life-span; dermal absorption factor of 10 percen for all contaminants (by convention) times a 15 percent matrix effect (Hawley, 1985); and a soil adherence factor of 1.45 mg/cm^2, by convention (EPA, 1989a).

concentrations due to a modest reduction in the LNAPL plume volume and lowered CoC concentrations in the various environmental media, all due to various abiotic and biologic processes.

7.1.2 Determination of Exposure Point Concentrations

The EPA's (1989d) Risk Assessment Guidance for Superfund (RAGS) recommends use of the 95th percent UCL on the arithmetic average when calculating CoC-specific concentrations in a given environmental medium. However, convention allows use of the upper 95th UCL based on the geometric mean, if the data are distributed log-normally. Furthermore, sample size may be sufficiently small and the analytical results sufficiently variable to produce a UCL value exceeding the maximum detected value. In these cases, EPA recommends use of the maximum detected value in the risk estimate calculations (1989). Although EPA regards this approach as conservative and reasonable, MSE believes the use of either the arithmetic or geometric mean is a more realistic indicator of long-term receptor point concentrations, especially for degradable organic CoCs.

The following approach was applied to each sample batch (e.g., May 1990 downgradient monitoring wells, "A" zone, meeting the data quality objectives for use in risk assessment) and pooled data (eg., all validated downgradient monitoring well data, "A" zone) to generate CoC-specific statistics for consequent estimation of receptor point concentrations. The approach used is threefold and is based upon the number of detects (n) observed with a total number of samples (N):

- if n/N is <0.30, calculate the geometric mean (x_g) using blank concentration values divided by 2 for all nondetect values and converting all values to log normal ones;
- if n/N is less than 0.999 but greater than 0.30, a random number between 0 and the blank concentration ("U" value) is assigned to each undetect -- all values are then log normalized and x_g and the 95th UCL calculated using the method described in Perkins et.al., (1990); while
- if n/N is ≥ 0.999, calculate the 95th UCL using the following equation: UCL = $e^{(x+y)}$ where x = ln of x_g, y = ln $(1.96*s_g/\sqrt{N})$, e ~ 2.718 and s_g = geometric standard deviation.

Note that sampling episodes (e.g., for groundwater) were not included in the calculation of "grand" means if such episodes had frequency of detect values <30 percent. The above approach is somewhat more involved than the conventional scheme of assigning "U/2" values to all undetects. However, MSE's review of the literature concludes that the applied method (above) makes better use of all the data and also results in more realistic estimates of exposure point concentrations (Helsel, 1990).

In particular, Helsel and Gilliam (1986) evaluated various approaches to estimating statistical parameters (e.g., the sample mean) from censored water quality data. The lognormal maximum likelihood method -- similar to that used by Perkins et.al., (1990) -- produced acceptable estimates of the sample mean. This approach can also be applied to multiply censored data sets (i.e., given varying MDLs) without incurring unacceptable degrees of estimation error (Helsel and Cohn, 1988). Given the generally lognormal distribution of the IPC data sets, the MSE approach probably overestimates, by 20 ± percent, the 95th UCL of the mean <u>vs</u> that value resulting from the U/2 approach (Perkins et.al., 1990). However, as the U/2 method provides biased estimate of the standard deviation, no information can be obtained on the uncertainty associated with the estimated mean (Rao et.al., 1991); consequently, no estimation of the 95th UCL is possible.

7.1.2.1 <u>Current Land Use Scenario</u>

Section 7.1.1.1 states that onsite workers will be exposed to contaminated soils and inhale particulate matter generated by mechanical entrainment of soils and from fugitive dust emissions. It is assumed that exposure to soil contaminants will occur on the following time-weighted basis: 6 hours/day in the wood- treating area and 1 hour/day each in the historic BNRR roundhouse and IPC yard areas. This is not an excessive estimate of exposure, as all but one worker spend all of their time in the (more contaminated) wood-treating area.

The annual average particulate air (contaminant) concentrations are results of the air quality modeling effort discussed in Section 5.2.4. No values were generated for anthracene, fluoranthene, or pyrene due to the lack of EPA-verified inhalation reference doses for these noncarcinogens (EPA, 1991b).

The intruders are assumed to apportion their time onsite as follows: around the wood treating structures, 73.5 percent; IPC yard areas, 24.5 percent; and along the Cedar Street ditch, 2 percent. In essence, MSE judged the treating plant to be the most attractive place to visit, with lesser attraction offered by the storage yard and cattail ditch. These values were utilized to calculate the time-weighted soil/sediment values shown in Table 7-5, Part A.

The air quality values are the same as used for the workers, as the concentrations are annual averages; it did not seem realistic to assume that trespassing occurs only during that 1 hour per day when air contaminant concentrations are at maximum levels.

The onsite garden soil contaminant concentrations were calculated using the analytical data from the pasture soil samples R23 through R25 (Section 5.1.4). The analytical values reported as undetected were converted to estimated values via dividing the "U" values by two. The contaminant concentrations in garden produce were then estimated using the following soil-to-produce transfer coefficients: 0.001 for PCP (Bellin et.al., 1990), 0.01 for PAHs (particularly for benzo(a)pyrene; Edwards, 1983) and an assumed value of 0.0001 for chlorinated p-dioxins/furans.

The "A" and "B" zone groundwater contaminant values for benzo(a)pyrene and for PCP are 95th UCL based upon the respective geometric mean concentrations.

Given the relatively low frequency of detects for the other three PAHs and the rationale discussed in subsection 7.1.2, the respective arithmetic mean values from Table 5-4 are presented in Table 7-5 as receptor point concentrations. Although the dioxin equivalent values are based on one sample per zone, they are assumed to be the average concentrations throughout the downgradient groundwater.

TABLE 7-5

SUMMARY OF EXPOSURE POINT CONCENTRATIONS FOR THE CURRENT LAND USE RME SCENARIOS

PART A. ON-SITE INDIVIDUALS

		Receptor Point Concentrations[a]					
Individual	Medium(ia)	Anthracene	Benzo(a)pyrene	Dioxin Equiv.	Fluoranthene	PCP	Pyrene
Adult worker	Soils	0.27	0.219	0.0018	1.16	14.27	0.68
	Air (particulate)	-[b]	5.4E-08	1.1E-10	-[b]	2.0E-07	-[b]
Intruder	Soils and sediments	0.28	0.25	0.0018	1.16	14.3	0.77
	Air (particulate)	-[b]	5.4E-08	1.1E-10	-[b]	2.0E-07	-[b]
	Interceptor ditch[c] water	0.007	0.007	No Data	0.007	0.74	0.007

PART B. OFF-SITE INDIVIDUALS

Individual	Medium(ia)	Anthracene	Benzo(a)pyrene	Dioxin Equiv.	Fluoranthene	PCP	Pyrene
Adults	Garden soils	0.12	0.12	0.003	0.11	0.55	0.082
	Garden produce[d]	0.0012	0.0012	3E-08	0.0011	0.00055	0.0008
	"A" Zone groundwater (for irrigation)	0.154	0.074	5E-05[e]	0.36	0.12	0.386
	"B" Zone groundwater (potable uses)	0.0053	0.0057	5E-05[f]	0.008	1.005	0.013
	Air particulate	-[b]	4E-09	1E-11	-[b]	3E-08	-[b]
Children	Soil/sediment/NAPL	0.76	0.24	0.0061	4.3	3.03	0.26

TABLE 7-5 (Cont'd)

SUMMARY OF EXPOSURE POINT CONCENTRATIONS FOR THE CURRENT LAND USE RME SCENARIOS

Notes:

[a] Concentration units are mg/kg for soils, mg/m^3 for air particulates and mg/L for water.

[b] No values were generated for anthracene, fluoranthene and pyrene due to the lack of EPA-verified inhalation reference doses for these noncarcinogens (EPA, 1991b).

[c] Based on one surface water sample (IT-1) collected by MSE in April, 1991 (MSE, 1991b). The PCP data has no qualifiers attached, while the PAH data are based on "15U" µg/L divided by two and no PCDD/PCDF analyses were performed on this sample.

[d] Expressed on a fresh weight basis.

[e] Based upon August 1990 data from monitoring well 9A.

[f] Based upon May 1987 data from monitoring well 16B.

The annual average particulate air (contaminant) concentrations are results of the air quality modeling effort discussed in Section 5.2.4. No values were generated for anthracene, fluoranthene or pyrene due to the lack of EPA-verified inhalation doses for these noncarcinogens (EPA, 1991b).

The soil/sediment/LNAPL exposure point concentration was estimated by the following approach:

- calculation of CoC-specific, geometric mean-based 95th UCL values for the pasture soils, MPC Substation ditch sediments and surface LNAPL (i.e., samples N1 and N2; then
- calculation of a time-weighted average concentration, assuming the following: soils, 97 percent; ditch sediments, 2 percent; and surface LNAPL, 1 percent.

Exposure to garden soils/produce, air particulate and "B" zone groundwater by children utilized the same CoC-specific concentrations as presented for offsite adults.

7.1.2.2 Future Land Use Scenarios

The two RME, onsite populations are assumed to be adults and young children living in the trailer court beginning in 1995 (Section 7.1.1.2). CoC concentrations relevant to adult exposure routes were generated via the following approach:

- calculation of <u>area</u>-weighted, 95th percent UCL concentrations (not time-weighted values as used in the current onsite adult scenarios); then

- adjusting these concentrations downward to reflect abiotic/biotic degradation processes acting over time.

Given the 30-year-exposure period, a mid-point concentration was estimated for each CoC/soil combination by assuming passage of the following number of half-lives ($t_{1/2}$s) (Howard, 1991): for PCP, $t_{1/2}$ = 2.5 yrs.* 4; for benzo(a)pyrene, fluoranthene and anthracene, $t_{1/2}$ = 3 yrs.*3; and pyrene and dioxin equivalent, $t_{1/2}$ = 10 yrs.*1. For example, the assumed time-adjusted concentration of benzo(a)pyrene in trailer court soils is equal to [$0.423*(0.5)^3$] or 0.053 mg/kg; this value is presented in Table 7-6, Part A, and represents the assumed, area-weighted concentration in soil after passage of three half-lives (i.e., 3*3=9 years) into the future. The CoC air particulate concentrations were similarly adjusted; for example, the assumed value for benzo(a)pyrene is equal to [0.053/0.423*5.4E-08] = 6.8 E-09 mg/m^3 (Table 7-6, Part A). Estimation of CoC concentrations in garden produce assumed the same CoC-specific soil-to-produce transfer coefficients as utilized in the current land use scenarios.

Estimation of soil/sediment exposure point concentrations for young children assumed 98 percent and 2 percent of the outdoor playtime being spent in trailer court soils vs. Cedar Street ditch sediments, respectively. However, only one half-life (per CoC) was utilized, as such exposure is assumed to occur within the first 6 years of the scenario (i.e., from 1995-2001). The resulting values were utilized in calculating risk associated with dermal contact and ingestion routes during the assumed 103 "freeze free" days/year. However, these concentrations were further adjusted to account for ingestion of household dust (of the same composition as soils) for the other 247

TABLE 7-6

SUMMARY OF EXPOSURE POINT CONCENTRATIONS FOR THE FUTURE LAND USE RME SCENARIOS

PART A. ON-SITE INDIVIDUALS

		Receptor Point Concentrations[a]					
Individual	Medium(ia)	Anthracene	Benzo(a)pyrene	Dioxin Equiv.	Fluoranthene	PCP	Pyrene
Adult	Soils	0.01	0.053	0.0009	0.09	0.13	0.44
	Air (particulate)	-[b]	6.8E-09	5.5E-11	-[b]	1.3E-08	-[b]
	Garden produce[c]	1.3E-04	5.3E-04	9.0E-09	9.0E-04	1.3E-04	4.4E-03
Young children	Soils/sediment	0.054	0.22	9.0E-04	0.36	1.06	0.46
	Air (particulate)	-[b]	6.8E-09	5.5E-11	-[b]	1.3E-08	-[b]
	Garden produce[c]	1.3E-04	5.3E-04	9.0E-09	9.0E-04	1.3E-04	4.4E-03

PART B. OFF-SITE INDIVIDUALS

		Receptor Point Concentrations[a]					
Individual	Medium(ia)	Anthracene	Benzo(a)pyrene	Dioxin Equiv.	Fluoranthene	PCP	Pyrene
Adults	Garden soils	0.03	0.03	1.5E-04	0.28	0.069	0.041
	Garden produce	3E-04	3E-04	1.5E-08	2.8E-04	6.9E-05	4.1E-04
	"A" Zone groundwater (for irrigation)	0.038	0.018	1.2E-05	0.09	0.03	0.19
	"B" Zone groundwater (for potable uses)	0.0013	1.4E-04	1.2E-05	0.002	0.25	6.6E-03
	Air (particulate)	-[b]	5.0E-10	5.0E-12	-[b]	1.9E-09	-[b]

TABLE 7-6 (Cont'd)

SUMMARY OF EXPOSURE POINT CONCENTRATIONS FOR THE FUTURE LAND USE RME SCENARIOS

PART B. OFF-SITE INDIVIDUALS, cont'd.

		Receptor Point Concentrations[a]					
Individual	Medium(ia)	Anthracene	Benzo(a)pyrene	Dioxin Equiv.	Fluoranthene	PCP	Pyrene
Children[d]	Soil/sediment/NAPL (103 day/yr. avg.)	0.70	0.32	4.9E-03	4.5	3.3	0.61
	Solids ingestion (350 day/yr. avg.)	0.24	0.24	2.1E-03	1.6	1.7	0.49

Notes:

[a] Concentration units are in mg/kg for soils, sediments and garden produce; mg/m^3 for air particulates and in mg/L for water.

[b] No air quality estimates were generated for anthracene, fluoranthene and pyrene due to the lack of EPA-verified inhalation reference doses for these noncarcinogens (EPA, 1991).

[c] Expressed on a fresh weight basis.

[d] All other media/CoC-specific concentrations are the same as for the adults.

days/year the children are home. Such annual-based values are presented in Table 7-6, Part A. Exposure to contaminants in air particulate and in garden produce are the same as for onsite adults.

Groundwater contaminant exposure point concentrations at Residence-10 were estimated on the basis that some anaerobic (or aerobic) degradation would occur over the period 1995-2025. The data contained in Howard (1991) was utilized to estimate CoC-specific concentrations in both "A" and "B" zone groundwater. For pyrene, the current concentrations were divided by two (i.e., the $t_{1/2}$ could be as long as 21 years); and, for the other CoCs, the current concentrations were divided by four (i.e., the $t_{1/2}$ could be as long as 10 years). Given these assumed reductions in groundwater contaminant levels, the CoC-specific concentrations in garden soils were also lowered. Degradation rates in soils are assumed to be generally faster than those in groundwater, given the aerobic nature of soils. Consequently, future concentrations were estimated by dividing current concentrations by the following factors: by two for dioxin equivalent and pyrene, by four for the other PAHs, and by eight for PCP. Furthermore, these soil values were multiplied times the CoC-specific transfer coefficients to arrive at assumed freshweight concentrations of CoCs in garden produce.

The annual average air contaminant concentrations given in Table 7-6, Part B have been adjusted for the assumed degradation of CoC levels in onsite (source) soils over time.

Exposure point concentrations for groundwater, air, and garden produce are taken to be the same for adults and children living hypothetically at Residence-10. The major difference between these two populations is the time-weighted ingestion of, direct contact with, and inhalation of contaminated solids by children. The approaches utilized to calculate exposure point concentrations via these routes are discussed below.

For dermal contact, it was assumed that exposure occurs 4 hrs/day, 103 day/year wherein: contact with soils and MPC Substation ditch sediments is apportioned 98 and 2 percent of the time, respectively; and CoC-specific contaminant levels in both media have undergone one half-life of degradation since the end of the assumed time period for current exposure.

Exposure point concentrations for ingestion of contaminated solids was calculated as follows:

- by using the dermal contact-related value (above) for 103 days of the 350 days/year spent at home; and
- by assuming ingestion of household dust--having the same CoC-specific concentrations as estimated in garden soil--for the remaining 247 days of the year spent at home.

The resulting time-weighted CoC values used in calculating ingestion intakes are shown in Table 7-6, Part B.

7.1.3 Estimation of RME Intakes

The information contained in Section 7.1.1 and 7.1.2 was incorporated into EPA approved algorithms for calculation of daily or lifetime intake of noncarcinogenic or carcinogenic CoCs. The results of these calculations are presented and discussed below.

7.1.3.1 Current Land Use Scenario

The worksheets used to estimate intakes (MSE, 1992a) are summarized in Tables 7-7 and 7-8 for noncarcinogens and carcinogens, respectively.

7.1.3.2 Future Land Use Scenarios

The same process as described in Section 7.1.3.1 was applied to the future land use scenarios. Intake estimates for onsite and offsite RME individuals are summarized in Table 7-9 for noncarcinogens and in Table 7-10 for carcinogens.

7.2 TOXICITY ASSESSMENT

The toxicity assessment examines the potential for CoCs to cause adverse effects in exposed individuals; it also provides an estimate of the dose-response relationship between the extent of exposure to a particular contaminant and adverse effects. CoC-specific adverse effects may include noncarcinogenic and/or carcinogenic health effects in humans. Sources of

TABLE 7-7

SUMMARY OF ESTIMATED INTAKE OF NONCARCINOGENIC CoCs ASSOCIATED WITH THE CURRENT LAND USE SCENARIOS (MG/KG-D).[a]

PART A. ONSITE INDIVIDUALS

	Ingestion		Inhalation		Direct Contact	
CoC	Adults	Intruders[b]	Adults	Intruders[b]	Adults	Intruders[b]
Anthracene	5.07E-07	6.10E-09	Not calculated (NC)	NC	9.25E-08	5.42E-08
Fluoranthene	2.18E-06	2.53E-08	NC	NC	3.97E-07	2.10E-07
PCP	2.68E-05	3.11E-07	3.89E-08	1.62E-09	4.89E-06	5.95E-04
Pyrene	1.28E-06	1.68E-08	NC	NC	2.33E-07	1.41E-07

PART B. OFFSITE INDIVIDUALS

	Ingestion		Inhalation		Direct Contact	
COC	Adults	Children[c]	Adults	Children[c]	Adults	Children[c]
Anthracene	2.97E-04	7.13E-04	Not calculated (NC)	NC	2.28E-07	4.21E-07
Fluoranthene	4.48E-04	1.08E-03	NC	NC	3.34E-07	1.86E-06
PCP	5.62E-02	1.35E-01	NC	NC	5.01E-02	2.96E-02
Pyrene	7.45E-04	1.79E-03	NC	NC	5.42E-07	4.15E-07

Notes:
[a] Source of these values are presented in Technical Memoranda 3 (MSE, 1991c).
[b] Between the ages of 6 through 18 yrs.
[c] Between the ages of 6 through 12 yrs.

TABLE 7-8

SUMMARY OF ESTIMATED LIFETIME INTAKE OF CARCINOGENIC CoCs ASSOCIATED WITH THE CURRENT LAND USE SCENARIOS (MG/KG-D).[a]

PART A. ONSITE INDIVIDUALS

	ROUTE OF EXPOSURE					
	Ingestion		Inhalation		Direct Contact	
CoC	Adults	Intruders[b]	Adults	Intruders[b]	Adults	Intruders[b]
Benzo(a)pyrene	1.47E-07	9.28E-10	3.75E-09	7.52E-11	2.68E-08	8.38E-09
Dioxin(2,3,7,8-TCDD) Equiv.	1.21E-09	6.68E-12	7.64E-12	1.53E-13	2.20E-10	5.48E-11
PCP	9.57E-06	5.31E-08	1.39E-08	2.79E-10	1.75E-06	1.02E-04

PART B. OFFSITE INDIVIDUALS

	ROUTE OF EXPOSURE					
	Ingestion		Inhalation		Direct Contact	
COC	Adults	Children[c]	Adults	Children[c]	Adults	Children[c]
Benzo(a)pyrene	2.33E-05	4.30E-05	3.95E-10	2.60E-10	1.67E-08	1.07E-08
Dioxin(2,3,7,8-TCDD) Equiv.	2.02E-06	3.75E-06	9.86E-13	6.50E-13	8.72E-10	3.55E-10
PCP	4.05E-02	7.54E-02	2.96E-09	1.95E-09	2.15E-02	2.69E-03

Notes:
[a] Source of these values are presented in Technical Memorandum 3 (MSE, 1991c).
[b] Between the ages of 6 through 18 yrs.
[c] Between the ages of 6 through 12 yrs.

TABLE 7-9

SUMMARY OF ESTIMATED INTAKE OF NONCARCINOGENIC CoCs ASSOCIATED WITH THE FUTURE LAND USE SCENARIOS (MG/KG-D).[a]

PART A. ONSITE INDIVIDUALS

	ROUTE OF EXPOSURE					
	Ingestion		Inhalation		Direct Contact	
CoC	Adults	Young Children[b]	Adults	Young Children[b]	Adults	Young Children
Anthracene	3.82E-08	4.63E-07	Not calculated (NC)	NC	1.35E-09	8.14E-08
Fluoranthene	2.79E-07	3.11E-06	NC	NC	1.22E-08	4.88E-07
PCP	1.20E-07	7.82E-06	2.99E-09	1.18E-08	1.76E-08	1.57E-06
Pyrene	1.36E-06	5.68E-06	NC	NC	5.96E-08	6.64E-07

PART B. OFFSITE INDIVIDUALS

	ROUTE OF EXPOSURE					
	Ingestion		Inhalation		Direct Contact	
COC	Adults	Children[c]	Adults	Children[c]	Adults	Children[c]
Anthracene	7.30E-05	1.75E-04	Not calculated (NC)	NC	5.59E-08	3.03E-07
Fluoranthene	1.12E-04	2.72E-04	NC	NC	8.36E-08	1.80E-06
PCP	1.40E-02	3.35E-02	4.37E-10	1.24E-09	1.25E-02	7.37E-03
Pyrene	3.70E-04	8.87E-04	NC	NC	2.69E-07	3.93E-07

Notes:
[a] Source of these values are presented in Technical Memorandum 3 (MSE, 1991c).
[b] Between the ages of 1 through 6 yrs.
[c] Between the ages of 6 through 12 yrs.

TABLE 7-10

SUMMARY OF ESTIMATED LIFETIME INTAKE OF CARCINOGENIC CoCs ASSOCIATED WITH THE FUTURE LAND USE SCENARIOS (MG/KG-D).[a]

PART A. ONSITE INDIVIDUALS

	ROUTE OF EXPOSURE					
	Ingestion		Inhalation		Direct Contact	
CoC	Adults	Children[b]	Adults	Children[b]	Adults	Children[b]
Benzo(a)pyrene	7.03E-08	1.62E-07	6.71E-10	5.28E-10	3.08E-09	2.67E-08
Dioxin(2,3,7,8-TCDD) Equiv.	2.65E-10	5.64E-10	5.42E-12	4.27E-12	5.22E-11	1.05E-10
PCP	5.16E-08	6.70E-07	1.28E-09	1.01E-09	7.55E-09	1.35E-07

PART B. OFFSITE INDIVIDUALS

	ROUTE OF EXPOSURE					
	Ingestion		Inhalation		Direct Contact	
COC	Adults	Children[c]	Adults	Children[c]	Adults	Children[c]
Benzo(a)pyrene	5.73E-06	1.06E-05	4.93E-11	3.25E-11	4.13E-09	1.28E-08
Dioxin(2,3,7,8-TCDD) Equiv.	4.84E-07	9.76E-07	4.93E-13	3.25E-13	2.14E-10	2.21E-10
PCP	1.01E-02	1.88E-02	1.87E-10	1.24E-10	5.34E-03	7.37E-04

Notes:
[a] Source of these values are presented in Technical Memorandum 3 (MSE, 1991c).
[b] Between the ages of 1 through 6 yrs.
[c] Between the ages of 6 through 12 yrs.

toxicity data include EPA's Integrated Risk Information System (IRIS), Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profiles, Health Effects Assessment Summary Tables (HEAST), and EPA criteria documents.

Brief toxicity profiles are presented in Section 7.2.2.

7.2.1 Toxicity Criteria for Chemicals of Concern

Table 7-11 presents the toxicity criteria that were used to characterize risks from exposure to CoCs. Weight of Evidence Classification, Cancer Slope Factors, and RfDs are presented for each CoC. Weight of Evidence classification groups indicate the amount and type of data available to support an assessment of carcinogenicity for a specific chemical. The classifications are as follows: Group A -- Human Carcinogen; Group B -- Probable Human Carcinogen (B1 indicates limited human data are available; B2 indicates sufficient evidence in animals and inadequate evidence in humans); Group C -- Possible Human Carcinogen; Group D -- not classifiable as to human carcinogenicity; and Group E -- evidence of noncarcinogenicity for humans. A Cancer Slope Factor is a plausible upper-bound estimate of the probability of a response per unit intake of a chemical over a 70-year lifetime. It is used in risk assessments to estimate an upper-bound lifetime probability of an individual developing cancer as a result of exposure to a particular level of a carcinogen. A chronic RfD is an estimate of a daily exposure level for individuals, including sensitive individuals, that is not likely to result in adverse health effects over a lifetime.

TABLE 7-11

TOXICITY VALUES FOR CoCs

Carcinogenic Compound	EPA Classification/ CPF (mg/kg/day)$^{-1}$		RfDs (Chronic/ Subchronic) (mg/kg/day)	
	Oral	Inhalation	Oral	Inhalation
PCP	B2/1.2E-01	B2/ND	--	--
2,3,7,8 TCDD Dioxin Equiv.	B2/1.5E+05	B2/1.5E+05	--	--
Benzo(a)pyrene	B2/1.15E+01	B2/6.1E+00	--	--
Noncarcinogenic Compounds				
Fluoranthene	ND	ND	4E-02/4E-01	ND/ND
Anthracene	NC	NC	3E-01/3E+00	ND/ND
Pyrene	NC	NC	3E-02/3E-01	ND/ND
Pentachlorophenol	--	--	3E-02/3E-02	ND/ND

ND - Not Determined
NC - Non Carcinogenic via this route

Source: EPA, 1991b.

Risks associated with exposure to carcinogenic (B2) PAHs were evaluated qualitatively using the cancer potency factors for benzo-(a)-pyrene as "benchmark values". Toxicity criteria values for PCP have recently been verified by EPA's Cancer Risk Assessment Verification Effort (CRAVE) Group. Toxicity equivalent values for dioxins and furans were used according to the procedures recommended by the Chlorinated Dibenzo-p-dioxin/Chlorinated Dibenzofuran (CDD/CDF) Technical Review Panel for the Risk Assessment Forum (EPA, 1989c).

7.2.2 Toxicity Profiles

7.2.2.1 PCP

PCP is readily absorbed into the bloodstream following oral, inhalation, and dermal exposures (EPA, 1984a). Acute exposure of humans to PCP results in intoxication that can produce prof[illegible] fever, weight loss, gastrointestinal irritation, lung, eye, [illegible] and kidney damage, convulsions, heart failure, and even death. Longer-term health effects observed in workers occupationally exposed to PCP include a higher incidence of low-grade infections or inflammation of the kidneys, and depressed kidney function. PCP has been demonstrated to be fetotoxic in rats and hamsters (Hinkle, 1973). EPA (1991c) reported an oral RfD for PCP of 0.03 mg/kg/day based on liver and kidney pathology in rats administered PCP by gavage (Schwetz et.al., 1978). A safety factor of 100 was used in the derivation (EPA, 1991c). The cancer slope factor for PCP via the oral route has been verified by EPA as being 1.2 x 10^{-1} $(mg/kg/day)^{-1}$.

7.2.2.2 PAHs

Limited cancer slope factor information is available on many of the B2 PAHs with the exception of benzo(a)pyrene; this compound is considered one of the most toxic of the PAHs. Consequently, it has been used as the "benchmark" B2 PAH to evaluate relative cancer "potency" exhibited by the other B2 PAHs (e.g., benzo(b)fluoranthene). Due to their lipid solubility, PAHs are easily absorbed via the lungs, skin and digestive tract. Once absorbed, these compounds distribute to all tissues but are particularly concentrated in those with high lipid content. PAH metabolism may lead to reactive, carcinogenic metabolites or follow mechanisms that act to remove PAH as nontoxic byproducts. The major route of excretion for PAH is in the feces, while enterohepatic recirculation is not believed to be important.

Acute effects from direct contact with PAHs are limited to phototoxicity and include skin reddening, itching and burning (NIOSH, 1977). PAHs have also been shown to cause cytotoxicity in rapidly proliferating cells throughout the body; the hematopoietic system, lymphoid system, and testes are frequently noted as targets also (Santadonato et.al., 1981). These effects appear to be due to inhibition of DNA replication by the PAHs. A number of PAHs have been shown to be potent carcinogens, producing tumors both at the site of application and systemically, in different animal species, when administered by any of a number of routes. Rigdon and Neal (1969) reported gastric tumors, pulmonary adenomas and leukemias in mice fed benzo(a)pyrene; intratracheal instillation of a number of PAHs has been shown to cause lung tumors in both mice and hamsters (Santodonato et.al., 1981).

Not all PAHs have been shown to be carcinogenic in animals, and some carcinogenic PAHs are more potent than others (IARC, 1983). A number of factors have been shown to influence the relative carcinogenic potencies of the PAHs; factors specific to the host animal affect carcinogenic potency as well. Therefore, the PAHs are often separated into two categories, the "carcinogenic" and the "noncarcinogenic" PAHs. Table 7-12 presents these two categories. This categorization may be somewhat misleading as many of the "noncarcinogenic" PAHs have been shown to have some carcinogenic activity or to act as a promotor or cocarcinogen. Another factor that complicates the assessment of risks posed by the PAHs is that they do not occur alone in nature, but rather are present as complex mixtures containing numerous PAHs of varying carcinogenic potencies. In order to take these issues into consideration, EPA (1980b, 1984b) has recommended using the carcinogenic slope factor calculated from assays on benzo(a)pyrene for the subclass of carcinogenic PAHs within the mixture that is to be assessed. This approach assumes that all carcinogenic (B2) PAHs have the same "potency" as benzo(a)pyrene. This assumption is unlikely to underestimate risk. However, this approach also assumes that: 1) the effects of PAHs are additive and; 2) that the noncarcinogenic PAHs do not contribute to carcinogenic effects of the mixture. Presently there is little empirical evidence to support the last two assumptions. In response to the above concerns, EPA intends to publicly release interim, relative toxicity factors (using benzo(a)pyrene as the reference compound) in the spring of 1992. These values will be used in developing preliminary remediation goals for the IPC Site.

TABLE 7-12

CLASSIFICATION OF PAHs ACCORDING TO EVIDENCE FOR CARCINOGENICITY

Chemicals for which there is sufficient evidence that they are carcinogenic in animals: (B2)

Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(j)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Dibenzo(a,h)acridine
Dibenzo(a,j)acridine
Dibenzo(a,h)anthracene
7H-Dibenzo(c,g)carbazole
Dibenzo(a,e)pyrene
Dibenzo(a,h)pyrene
Dibenzo(a,i)pyrene
Dibenzo(a,l)pyrene
Indeno(1,2,3-c,d)pyrene
5-Methylchrysene

Chemicals for which there is limited evidence that they are carcinogenic in animals: (C)

Anthranthrene
Benzo(c)acridine
Carbazole
Chrysene
Cyclopenta (c,d)pyrene
Dibenzo(a,c)anthracene
Dibenzo(a,j)anthracene
Dibenzo(a,e)fluoranthene
2-, 3-, 4-, and 6-Methylchrysene
2- and 3-Methylfluoranthene

Chemicals for which the evidence is adequate to assess their carcinogenicity: (D)

Benzo(a)acridine
Benzo(g,h,i)fluoranthene
Benzo(a)fluorene
Benzo(b)fluorene
Benzo(c)fluorene
Benzo(g,h,i)perylene
Benzo(c)phenanthrene
Benzo(e)pyrene
Coronene
1,4-Dimethylphenanthrene
Fluorene
1-Methylchrysene
1-Methylphenanthrene
Perylene
Phenanthrene
Triphenylene

Chemicals for which the available data provide no evidence they they are carcinogenic: (E)

Anthracene
Fluoranthene
Pyrene

Source: IARC, 1983

Benzo(a)pyrene is representative of [illegible]ogenic PAHs and is classified by EPA (1986a) in Group B2 -- Potenti[illegible] Carcinogen. EPA (1980b, 1984b) calculated a value of 11.5 mg/kg[illegible] as the carcinogenic slope factor for oral exposure to the benzo(a)pyrene; this value is based on the study by Neal and Rigdon (1969) in which oral administration of benzo(a)pyrene led to forestomach tumors in mice. A cancer slope factor of 6.11 mg/kg/day for inhalation of benzo(a)pyrene was calculated by EPA (1984b), and is based on a study by Thyssen et.al., (1981).

This assay evaluated the production of respiratory tract tumors in hamsters using benzo(a)pyrene at concentrations of 2.2-[illegible]/m^3.

EPA's Carcinogen Assessment Group (CAG) has not reported a risk assessment for dermal exposure to carcinogenic PAHs. Santodonato et.al., (1981) performed risk assessments for both dermal and oral exposures; the results indicated that benzo(a)pyrene was more potent when applied dermally than when administered orally.

7.2.2.3 Dioxins and Furans

CDDs and CDFs are a set of compounds that are found in trace amounts as impurities in the manufacture of chemicals, primarily chlorophenols. Dioxins and furans may be present in soils, incinerator ash and industrial wastes. EPA's CAG has determined that, based on demonstrated effects in animals, there is sufficient evidence to consider 2,3,7,8-TCDD and a mixture of two 2,3,7,8-HxCDDs as probable human carcinogens. The CAG quantitative assessment further implicates TCDD as one of the most potent animal carcinogens evaluated by the Agency to date. The exact biochemical mechanisms leading to the toxic response resulting from exposure to CDDs and CDFs are not known in detail. Experimental data suggest that an important role in the development of systemic toxicity (resulting from exposure to these chemicals) is played by an intracellular protein, the Ah receptor. In several mouse strains, the expression of toxicity of TCDD-related compounds includes: cleft palate formation, liver damage, effects on body weight gain, thymic involution and chloracnegenic response. These effects have been correlated with TCDD binding affinity for the Ah receptor and with their ability to induce several enzyme systems; induction of several of these systems has been linked to the expression of carcinogenicity (Poland and Knutson, 1982). Because significant data gaps exist regarding toxicity of CDDs and CDFs to humans, the CDD/CDF Technical Review Panel of the Risk Assessment Forum has recommended an interim method to aid in the assessment of human health risks posed by exposure to CDDs and CDFs until data gaps are filled. The procedure for estimating risks from exposure to CDDs and CDFs involves obtaining information on the concentration of homologues and/or congeners in a mixture of CDDs and CDFs. Then, using the available toxicological and structure-activity data, the exposure to each compound is estimated and expressed as an "equivalent amount of TCDD." Combining this information with hazard information on TCDD, and assuming additivity of effects, the risks associated with the mixture of CDDs and CDFs can be estimated. The key to this approach is the use of 2,3,7,8-TCDD Toxicity Equivalence Factors (TEFs). Because many CDDs and CDFs have similar toxicological properties as TCDD, and similar structure-activity relationships, they are compared to TCDD and assigned a TEF value relative to

TCDD. TCDD is assigned a value of one and other congeners are assigned values ranging from 0.001 to 0.5 based on compound-specific carcinogenic, reproductive, and/or in vitro test data. Table 7-13 presents TEFs for the CDD/CDF isomers of the most concern. These values reflect an international consensus reached by a working group of the North Atlantic Treaty Organization (NATO) Committee on the Challenges of Modern Society (CCMS), and were adopted in principle in April 1988. The values should be reviewed as rough approximations that are "interim" in nature, and which require periodic updating (EPA, 1989c).

7.3 RISK CHARACTERIZATION

7.3.1 Current Land Use Scenario

The onsite receptors are assumed to be children 6 through 18 years of age who trespass onsite and adults who work at the treating facility onsite. These persons are potentially subject to multiroute exposure to contaminated soils, sediments and air (respirable) particulate associated with a number of sources.

The offsite receptors are assumed to be children (6 through 12 years of age) and adults living hypothetically at Residence-10. These individuals would be exposed potentially to contaminated soils, sediments, surface LNAPL, groundwater, garden produce and to respirable particulate matter.

TABLE 7-13

TOXICITY EQUIVALENCY FACTORS FOR CHLORINATED DIBENZO-P-DIOXINS AND -DIBENZOFURANS

Compound	TEF
Mono, Di, and TriCDDs	0
2,3,7,8-TCDD	1
Other TCDDs	0
2,3,7,8-PeCDD	0.5
Other PeCDDs	0
2,3,7,8-HxCDD	0.1
Other HxCDDs	0
2,3,7,8-HpCDD	0.01
Other HpCDDs	0
OCDD	0.001
Mono, Di-, and TriCDFS	0
2,3,7,8-TCDF	0.1
Other TCDFs	0
1,2,3,7,8-PeCDF	0.05
2,3,4,7,8-PeCDF	0.5
Other PeCDFs	0
2,3,7,8-HxCDF	0.1
Other HxCDFs	0
2,3,7,8-HpCDF	0.01
Other HpCDFs	0
OCDF	0.001

Source: EPA, 1989c.

7.3.1.1 Onsite Scenarios

The multimedia contaminant database and exposure assumptions were utilized to estimate dose and consequent health "risk" values for the contaminants of concern (EPA, 1989a). The algorithms used to calculate route-specific contaminant intake are summarized in Table 7-14. The available subchronic and chronic reference doses for noncarcinogens and slope factors (q_1^*) for carcinogens are summarized in Table 7-11. As a Superfund Program guideline, subchronic values are utilized for exposures ranging from 2 weeks to 7 years (EPA, 1989a). The results of these calculations, for the noncarcinogenic and carcinogenic CoCs, are summarized in Part A of Tables 7-15 and 7-16, respectively.

Two important observations follow from inspection of Table 7-15. First, no hazard quotient (HQ) values of one or greater result from exposure to PAHs by onsite or offsite RME individuals via the ingestion or direct contact routes. HQ values greater than one are taken to indicate the potential for harm to the CoC-specific target organ(s). However, the PCP-related HQ value of 1.9 in offsite adults is of concern, as adverse effects to liver and kidney--plus fetotoxic effects in pregnant women--are possible outcomes following ingestion of PCP-contaminated water (EPA, 1991b). The possibility of adverse effect is increased by the direct contact-related HQ of 1.7 (in offsite adults), assuming the same target organ effects as for the oral route. Finally, the HQ of 4.5 for offsite children ingesting contaminated water, etc., also indicates the possibility of adverse health effects.

TABLE 7-14

ALGORITHMS UTILIZED TO CALCULATE ROUTE-SPECIFIC CONTAMINANT INTAKE[a,b]

PART A. CALCULATION OF DAILY INTAKES FOR NONCARCINOGENS

$$\text{Inhalation} = \frac{\text{CA(mg/m}^3\text{)*IR(m}^3\text{/h)*ET(h/d)*(d/yr)*ED(yr)}}{\text{BW(\_kg)*AT(365d/y*ED)}}$$
(mg/kg.d)

$$\text{Ingestion} = \frac{\text{CS(mg/kg)*SR(mg/d)*CF(10}^{-6}\text{kg/mg)*FI(0.)*EF(d/yr)*ED(yr)}}{\text{BW(\_kg)*AT(365d/y*ED)}}$$
(mg/kg·d)

$$\text{Direct Contact, Solids} = \frac{\text{CS(mg/kg)*CF(10}^{-6}\text{kg/mg)*SA(cm}^2\text{/d)*Ad.F(2.11mg/cm}^2\text{)*AF(0.)*EF(d/yr)*ED(yr)}}{\text{BW(\_kg)*AT(365d/y*ED)}}$$
(mg/kg·d)

PART B. CALCULATION OF LIFETIME INTAKE FOR CARCINOGENS

Modify the above route-specific equations' denominator as follows"

$$\frac{1}{\text{BW*365d/y*70years}}$$

Notes: [a] Where CA = contaminant concentration in air, IR = inhalation rate, FI = fraction ingested from contaminated source (unitless), ET = exposure frequency, ED = exposure duration, BW = body weight, AT = averaging time period over which exposure occurs; CW = contaminant concentration in water, CR = consumption rate; CS = contaminant concentration in soil, SR = daily ingesting rate, CF - conversion factor; PC = permeability constant associated with aqueous exposures only (through the skin), AD.F = absorption factor (soil adherence to skin surface); and SA = surface area exposed.

[b] Dermal contact absorption factors for the indicator chemicals (contaminants of concern) are assumed to be 25 percent for volatile compounds (e.g., benzene) and 10 percent for semivolatile compounds (e.g., benzo(a)pyrene).

Source of algorithms: EPA 1989a.

TABLE 7-15

SUMMARY OF HEALTH HAZARD QUOTIENTS FOR NONCARCINOGENIC CoCs ASSOCIATED WITH THE CURRENT LAND USE SCENARIOS.[a]

PART A. ONSITE INDIVIDUALS

	Route of Exposure					
	Ingestion		Inhalation		Direct Contact	
CoC	Adults	Intruders[b]	Adults	Intruders[b]	Adults	Intruders[b]
Anthracene	1.7E-06	2.0E-08	No RfD Available (NA)	NA	3.1E-07	1.8E-07
Fluoranthene	5.4E-05	6.3E-07	NA	NA	9.9E-06	5.3E-06
PCP	8.9E-04	1.0E-05	NA	NA	1.6E-04	2.0E-02
Pyrene	4.3E-05	5.6E-07	NA	NA	7.8E-06	4.7E-06

PART B. OFFSITE INDIVIDUALS

	Ingestion		Inhalation		Direct Contact	
CoC	Adults	Children[c]	Adults	Children[c]	Adults	Children[c]
Anthracene	9.9E-04	2.4E-03	No RfD Available (NA)	NA	7.6E-07	1.4E-06
Fluoranthene	1.1E-02	2.7E-02	NA	NA	8.4E-06	4.6E-05
PCP	1.9E+00	4.5E+00	NA	NA	1.7E+00	9.9E-01
Pyrene	2.5E-02	6.0E-02	NA	NA	1.8E-05	1.4E-05

Notes:
[a] Source of these values are presented in Technical Memorandum 3 (MSE, 1991c); HQ values are calculated by dividing the exposure estimates (Table 7-7) by CoC/route-specific reference dose values (Table 4-1).
[b] Between the ages of 6 through 18 yrs.
[c] Between the ages of 6 through 12 yrs.

TABLE 7-16

SUMMARY OF EXCESS INCIDENCE OF CANCER ESTIMATES FOR CARCINOGENIC CoCs ASSOCIATED WITH THE CURRENT LAND USE SCENARIOS[a]

PART A. ONSITE INDIVIDUALS

	Route of Exposure					
	Ingestion		Inhalation		Direct Contact	
CoC	Adults	Intruders[b]	Adults	Intruders[b]	Adults	Intruders[b]
Benzo(a)pyrene	1.7E-06	1.1E-08	2.3E-08	4.6E-10	3.1E-07	9.6E-08
Dioxin(2,3,7,8-TCDD)Equiv.	1.8E-04	1.0E-06	1.2E-06	2.3E-08	3.3E-05	8.2E-06
PCP	1.2E-06	6.4E-09	No CPF Available (NA)	NA	2.1E-07	1.2E-05

PART B. OFFSITE INDIVIDUALS

CoC	Adults	Children[c]	Adults	Children[c]	Adults	Children[c]
Benzo(a)pyrene	2.7E-04	4.9E-04	2.4E-09	1.6E-09	1.9E-07	1.2E-07
Dioxin(2,3,7,8-TCDD)Equiv.	3.0E-01	5.6E-01	1.5E-07	9.8E-08	1.3E-04	5.3E-05
PCP	4.9E-03	9.0E-03	No CPF Available (NA)	NA	2.6E-03	3.6E-04

Notes: [a] Source of these values are presented in Appendix A of the report; excess cancer risk values are calculated by multiplying the lifetime exposure estimates (Table 3-8) by coC/rate-specific carcinogenic potency factors (Table 4-1).

[b] Between the ages of 6 through 18 yrs.

[c] Between the ages of 6 through 12 yrs.

Inspection of Table 7-16, Part A reveals that long-term exposure of workers to the assumed, but likely average, concentration of 1.8 ppb 2,3,7,8-TeCDD toxicity equivalent results in excess risk of soft tissue sarcomas at rates exceeding one per million (1E-06) exposed individuals. The U.S. EPA utilizes this 1E-06 value as a point of departure in assessing the need for contaminant-specific cleanup at a particular site. Thus, the worker-related risk estimates of 1.8E-04 via ingestion and 3.3E-05 via direct contact with dioxin contaminated soils are of some concern. This is true also for the intruder/direct contact risk of 1.2E-05 for PCP; such risk is due to dermal exposure to contaminated soils (especially around the treatment plant) and to the Cedar Street ditch sediments.

7.3.1.2 Offsite Scenarios

The offsite evaluations were accomplished through use of the same methods as discussed in Section 7.3.1.1. The results of these calculations, for the noncarcinogic and carcinogenic CoCs, are summarized in Part B of Tables 7-15 and 7-16, respectively.

Part B of Table 7-16 indicates that considerable risk to adults and children living hypothetically at Res-10 is posed by all three carcinogens, especially via the ingestion route. The dioxin estimates are based upon one data point in each of the "A" and "B" groundwater zones, although both were in the vicinity of Residence-10. The ingestion route estimates for all CoCs include that amount absorbed during showering (Section 7.1.1.1), which was assumed equivalent to consuming two (extra) L/day of groundwater. This factor was developed for showering-related exposure to such volatile organic contaminants as trichloroethylene. Thus, it may have marginal applicability to the low vapor pressure CoCs evaluated in the IPC assessment; consequently, cancer risks posed by CoC exposure(s) via this route may be overestimated.

7.3.2 Future Land Use Scenario

The onsite receptors are assumed to be young children through 6 years of age and adults, all of whom live in an unpaved, ungrassed trailer court. These persons would be potentially subject to multiroute exposure to contaminated soils, sediments, garden produce, and respirable particulate matter.
The hypothetical offsite receptors are assumed to be children (6 through 12 years of age) and adults living at Residence-10. These individuals are exposed potentially to contaminated soils, sediments, surface LNAPL, groundwater, garden produce, and to respirable particulate matter.

The methodology discussed in Section 7.3.1 was used to prepare Tables 7-17 and 7-18. The first summarizes the noncarcinogenic health threat evaluation, while the second presents the estimated risks of elevated incidence of cancer. Note that the information in Parts A of these tables pertains to onsite individuals, while Parts B are for the offsite scenarios.

Inspection of Table 7-17 indicates only one HQ value being greater than one; this instance is for ingestion of contaminated water, etc., by children living offsite. Consequently, adverse effects to these children's kidney and liver

TABLE 7-17

SUMMARY OF HEALTH HAZARD QUOTIENTS FOR NONCARCINOGENIC CoCs ASSOCIATED WITH THE FUTURE LAND USE SCENARIOS[a]

PART A. ONSITE INDIVIDUALS

	Route of Exposure					
	Ingestion		Inhalation		Direct Contact	
CoC	Adults	Young Children[b]	Adults	Young children[b]	Adults	Young Children[b]
Anthracene	1.3E-07	1.5E-07	No RfD Available (NA)	NA	4.5E-09	2.7E-08
Fluoranthene	7.0E-06	7.8E-06	NA	NA	3.0E-07	1.2E-06
PCP	4.0E-06	2.6E-04	NA	NA	5.9E-07	5.2E-05
Pyrene	4.5E-05	1.9E-05	NA	NA	2.0E-06	2.2E-06

PART B. OFFSITE INDIVIDUALS

	Ingestion		Inhalation		Direct Contact	
CoC	Adults	Children[c]	Adults	Children[c]	Adults	Children[c]
Anthracene	2.4E-04	5.8E-04	No RfD Available (NA)	NA	1.9E-07	1.0E-06
Fluoranthene	2.8E-03	6.8E-03	NA	NA	2.1E-06	4.5E-05
PCP	4.7E-01	1.1E+00	NA	NA	4.2E-01	2.5E-01
Pyrene	1.2E-02	3.0E-02	NA	NA	9.0E-06	1.3E-05

Notes: [a] Source of these values are presented in MSE 1991c Technical Memorandum 3; values are calculated by dividing the exposure estimates (Table 7-8) by CoC/route-specific reference dose values (Table 7-11).

[b] Between the ages of 1 through 6 yrs.

[c] Between the ages of 6 through 12 yrs.

TABLE 7-18

SUMMARY OF EXCESS INCIDENCE OF CANCER ESTIMATES FOR CARCINOGENIC CoCs ASSOCIATED WITH THE FUTURE LAND USE SCENARIOS[a]

PART A. ONSITE INDIVIDUALS

	Route of Exposure					
	Ingestion		Inhalation		Direct Contact	
CoC	Adults	Young Children[b]	Adults	Young children[b]	Adults	Young Children[b]
Benzo(a)pyrene	8.1E-07	1.9E-06	4.1E-09	3.2E-09	3.5E-08	3.1E-07
Dioxin(2,3,7,8-TCDD)Equiv.	4.0E-05	8.5E-05	8.1E-07	6.4E-07	7.8E-06	1.6E-05
PCP	6.2E-09	8.0E-08	No CPF Available (NA)	NA	9.1E-10	1.6E-08

PART B. OFFSITE INDIVIDUALS

CoC	Adults	Children[c]	Adults	Children[c]	Adults	Children[c]
Benzo(a)pyrene	6.6E-05	1.2E-04	3.0E-10	2.0E-10	4.8E-08	1.5E-07
Dioxin(2,3,7,8-TCDD)Equiv.	7.3E-02	1.5E-01	7.4E-08	4.9E-08	3.2E-05	3.3E-05
PCP	1.2E-03	2.2E-03	No CPF Available (NA)	NA	6.4E-04	8.8E-05

Notes: [a] Source of these values are presented in MSE 1991c Technical Memorandum 3; values are calculated by multiplying the lifetime exposure estimates (Table 7-9) by CoC/route-specific carcinogenic potency factors (Table 7-11).

[b] Between the ages of 1 through 6 yrs.

[c] Between the ages of 6 through 12 yrs.

systems are possible (EPA, 1991b), even if degradation of PCP in the contaminated media occurs over time.

Table 7-18 (Part A) indicates that future risk to onsite residents centers on ingestion of dioxin-contaminated soils and garden produce by adults, and these same media plus Cedar Street ditch sediments for the young children. Part B of this table indicates that ingestion of contaminated water, etc., remains as the major source of risk posed by all three carcinogens to both adults and children. Comparison of Parts B of Tables 7-16 and 7-18 indicates generally a four-fold reduction in risk due to the assumed degradation of contaminants over time. However, the "remaining" risk posed by those carcinogens is still one to several orders of magnitude greater than the 1E-06 "point of departure" value used by the U.S. EPA (NCP, 1990a) in assessing site cleanup needs.

7.3.3 Uncertainties Associated with the Risk Characterization Analysis

Table 7-19 summarizes the site-specific, toxicological, exposure, and risk characterization-related uncertainties associated with the IPC Site Baseline Risk Assessment (BRA). This table also presents a qualitative assessment of the effects these uncertainties may exert on the given risk estimates.

Overall, the database and EPA acceptable methodology used has probably generated a cancer risk estimate ranging within one or two orders of magnitude of the cumulative risk actually presented by onsite conditions. This assessment is based upon the following:

TABLE 7-19

LISTING OF PARAMETERS AFFECTING THE UNCERTAINTY OF, AND SEMI-QUANTITATIVE ESTIMATION OF THEIR EFFECT ON, THE PUBLIC HEALTH RISK CHARACTERIZATION

Parameter	Effect on Resulting Risk[a]		
	Over-Estimate	Under-Estimate	Either Way
A. Site Characterization			
- Sample numbers may not be sufficient to adequately quantify CoC levels in each of the media (air quality in particular).	Low (moderate for air quality)	--	--
- Systematic or random errors in the chemical analyses may yield erroneous data.	--	--	Low
- Meteorological data specific to the site was not available; screening-level model utilized very conservative assumptions, thus, PM_{10} estimates are definitely conservative.	Moderate	--	--
B. Toxicology			
- Cancer potencies are based on the upper 95 percentile slope, which represents the upper bound estimate of cancer incidence.	Low	--	--
- Extrapolation of RfD and potency factors from one species to another (e.g., rat-to-man), from high dose to low dose and/or from one route of exposure to another (e.g., oral-to-dermal).	--	--	Moderate
- Not all compounds selected as indicator chemicals (as well as others present onsite) have toxicity data of use in evaluating their contribution to overall public health (and environmental) risk.	--	Moderate	--

TABLE 7-19 (Cont'd)

LISTING OF PARAMETERS AFFECTING THE UNCERTAINTY OF, AND SEMI-QUANTITATIVE ESTIMATION OF THEIR EFFECT ON, THE PUBLIC HEALTH RISK CHARACTERIZATION

	Effect on Resulting Risk[a]		
Parameter	Over-Estimate	Under-Estimate	Either Way
B. Toxicology (cont'd)			
- The EPA-approved evaluation system, as a matter of practicality, assumes risks to be additive (i.e., synergistic or antagonistic interaction between contaminants are not accounted for).	--	--	Moderate
- Varying certainty in the RfD and q_1^* values plus indicator chemical-specific absorption factors for the various routes of exposure.	--	--	Low
C. Exposure Assumptions			
- Use of the arithmetic average concentration data (for onsite evaluations) and such as input to transport models (for offsite evaluations).	--	Low	--
- The sum interaction of assumed physical characteristics of the onsite and offsite maximally exposed individuals (e.g., body weight, surface area exposed, soil ingestion/inhalation rates, etc.).	--	--	Low

Note: [a] As a general guideline, assumptions marked as low may affect estimates of exposure by less than one order of magnitude; assumptions marked moderate may affect estimates of exposure by between one and two orders of magnitude; and assumptions marked high may affect estimates of exposure by more than two orders of magnitude (EPA 1989a).

- the assumption that contaminant data taken from probable "hot spots" considerably exceed the average (or "representative") contaminant level existing throughout the 50-acre site;
- the conservative (RME) nature of the land use scenarios; and
- the conservative nature of estimating contaminant/route-specific RfD and q_1^* values.

An enlarged, validated analytical database and application of more sophisticated risk assessment methodology (e.g., Monte Carlo computerized techniques) may reduce the margin between estimated and "true" risk to within an order of magnitude of each other. Nevertheless, the preliminary evaluation indicates exceedances of the upper bound (1E-04) of acceptable carcinogenic risk for offsite adults currently ingesting groundwater, food, and soil for PCP, 2,3,7,8-TCDD, and for benzo(a)pyrene. The conclusion of the human health risk analysis is that the above contaminants constitute a sufficient threat to public health to justify appropriate cleanup.

8.0 ECOLOGICAL RISK ASSESSMENT

By definition, the ecological risk assessment does not evaluate actual or potential effects of hazardous substances/wastes on humans or domesticated species (EPA, 1989a). However, health concerns regarding these receptors are linked inextricably to the quality of the environment shared with wildlife species (e.g., via food chain effects). Therefore, certain relevant human/domesticated animal food chain scenarios have been included in Section 8.0; in essence, these additional scenarios form a link with those evaluations presented in Section 7.0 of the RI Report.

8.1 DATA REVIEW AND EVALUATION

8.1.1 Terrestrial Data

Pertinent data for the terrestrial exposure assessment are shown in Table 8-1 (MSE, 1992). The pasture vegetation samples are "boot" stage grass leaves and stems, paired with 0 to 12 inches bgs soil samples. The soil from the most visually contaminated area of the pasture (i.e., R23) contained 1,100 μg/kg of PCP; no other PCP or benzo(a)pyrene values greater than their respective sample quantitation limits (SQLs) were observed. The TCDD TE values are very conservative, as "U" data were assumed to be equal to the "true" value (e.g., 1U = 1 μg/kg). The dioxin TE values in soils from the pasture and background areas are of similar magnitude. However, only one heptachloro-dioxin isomer

TABLE 8-1

TERRESTRIAL DATA UTILIZED IN THE ECOLOGICAL RISK ASSESSMENT FOR THE IPC CERCLA SITE[a,b]

PART A. PASTURE SOILS AND VEGETATION

Contaminants of Concern	V1/R23	Sample Site (Veg./Soil) V2/R24	V3/R25	Background Soils A/B
PCP	6,000U/1,100	5,000U/760U	10,000/350U	320U/370U
B(a)P	1,800U/200U	1,500U/230U	3,000U/260U	97U/110U
TCDD TE[c]	0.57/0.43	0.31/0.42	0.30/0.13	0.38/0.68

PART B. SURFACE NAPL

CoC	Sample Site N1	N2
PCP	280,000	170,000
B(a)P	1[illegible]0J	8,700J
TCDD TE[d]	[illegible].2J	342.8

Notes:

[a] All data are in units of μg/kg; sampling sites are shown in Figure 4, while detailed discussion of sampling methodology and consequent data presentation/interpretation are found in Section 2.1.5 of the public health risk assessment (MSE, 1992).

[b] Data qualifier codes used are as follows: U = compound was analyzed for, but was not detected, J = an estimated quantity; otherwise, no qualifications are attached to the above data.

[c] Calculated using the 1989 toxicity equivalent factors (EPA, 1989c) and assuming that "U" values represent actual concentrations (e.g., 1U = 1 μg/kg).

[d] Calculated using the 1989 TEFs (EPA, 1989c) and using "non-U" data only.

was detected in one of the "background" samples (i.e., 0.54 μg/kg of 1,2,3,4,6,7,8-HpCDD at the "B" site), while total octachloro-dioxin isomers were detected in all three pasture soils and in two of the three vegetation samples. The OCDD data for these sites are as follows: R23/V1 = 4.3/2.8, R24/V2 = 0.11/1.2 and R25/V3 = 0.078/0.35U μg/kg. Given these data, plus the presence of hexa-, hepta- and octachlorodibenzofurans in pasture soils only, MSE concludes that pasture soils have been slightly contaminated with dioxins/furans released from the IPC Site.

The southern boundary of the pasture includes a willow/sedge grove containing several three- to four-feet diameter spots of LNAPL present on ground surface. These shallow pools of contaminants probably occur where the water table intersects the ground surface during high water conditions. Table 8-1, Part B, indicates these seasonal pools contain considerable amounts of PCP, benzo(a)pyrene, and TCDD TE. The octachloro-p-dioxin and octachlorodibenzofuran levels in the two LNAPL samples average 32,300 μg/kg and 2,420 μg/kg, respectively. Furthermore, hundreds of ppb each of various isomers of hexachloro- and heptachloro-dioxins/furans were also observed in these samples.

8.1.2 Aquatic Data

Pertinent surface water/sediment data for Rocky Creek and the MPC Substation ditch are presented in Parts A and B of Table 8-2, respectively. Part C of this table gives pertinent groundwater data for the livestock watering well at Residence-10. In regards to the surface water data:

TABLE 8-2

AQUATIC DATA UTILIZED IN THE ECOLOGICAL RISK ASSESSMENT FOR THE IPC CERCLA SITE[a,b]

PART A. ROCKY CREEK DATA

CoC	Surface Water	Sediments
PCP	(1U-50U)	1,605±1,195J
B(a)P	0.037	(190U-510U)
TCDD TE	No Analysis (NA)	NA

PART B. MPC SUBSTATION DITCH DATA

CoC	Surface Water	Sediments
PCP	88±74J	10,667±9,783
B(a)P	10U	410±127J
TCDD TE	NA	34.2

PART C. GROUNDWATER QUALITY FOR LIVESTOCK WATERING

CoC	Res-10A	Downgradient Arithmetic Averages
PCP	(5.9U-25U)	3,799
B(a)P	(0.05U-0.23U)	74J
TCDD TE	NA	≤0.003

Notes:

[a] Surface water and groundwater data are in units of μg/L while sediment data are in μg/kg; sampling sites are shown in Figure 4. Detailed discussions of sampling methodologies and consequent data interpretation for these media are found in Section 2.1 of the public health risk assessment (MSE, 1992).

[b] Data qualifier codes used are the same as in Table 1; "U" data in parentheses indicates the range of undetects.

- the only detection of benzo(a)pyrene was at SW-4 during the February 1991 low-flow sampling event (165 cfs @ SW-4); while
- the PCP detects within the MPC Substation ditch were limited to the April 1990 high-flow event, even though flow in the ditch was only 0.01 cfs (MSE, 1991c).

PCP was quantified in the R8/R22 sediment "pair" acquired directly upstream of the L Street bridge; sampling depths were 0 to 2 inches and 0 to 4 inches, respectively. A set of six samples (D-7, -10 through -13 and -15) were taken within the MPC Substation ditch; the 0 to 4 inch sampling began just upstream of the MPC Substation and progressed downstream to the visible end of the ditch (but before any confluence with Rocky Creek), (MSE, 1992; Section 2.1.1). PCP was detected in all six ditch samples, while benzo(a)pyrene was quantified only upstream of (D10) and in the vicinity of (D12) water quality station ID-4. No dioxin/furan analyses were performed on that stretch of the substation ditch which borders the IPC pasture. However, the November 1990 sample from site D6 contained 0.04J μg/kg of 2,3,7,8-TeCDD, at least 7,600 μg/kg total octachloro-dioxin/furan congeners and has a TE value of 34.2 μg/kg TeCDD. MSE utilized the following information to conclude that dioxin/furan contamination probably exists farther downstream in MPC Substation ditch sediments:

- the presence of several hundred μg/kg TCDD TE associated with very high levels (relative to background) of PCP and benzo(a)pyrene (Table 8-1);
- the presence of 34.2 μg/kg TCDD TE plus 150,000 μg/kg PCP and 1,300J μg/kg benzo(a)pyrene in the D6 sediments (MSE, 1991c); and
- MSE field observations of near surface expression of LNAPL while soil coring east of the "N" sites, but adjacent to the substation ditch.

Res-10A is a hand dug well, about 10 feet to water, and located just southeast of Residence 10; in the recent past, this well was utilized for livestock watering. Inspection of Table 8-2, Part C indicates the following:

- PCP levels may be -- at times -- less than 5.9 μg/L (i.e., the lowest undetect value observed, and which occurred in August 1990);
- benzo(a)pyrene levels may be -- at times -- less than 0.05 μg/L (i.e., the lowest undetect value observed, and which occurred in March 1991); while
- no samples taken from this well were analyzed for chlorinated dibenzo-p-dioxins or dibenzofurans.

Part C also presents arithmetic average concentrations of PCP and benzo(a)pyrene for the "A" zone downgradient monitoring wells sampled during the site characterization effort. The TCDD equivalent estimate is based on conversion of total OCDD concentrations from monitoring wells 9A and 27A to TCDD TE estimates (EPA, 1989c). These two wells were selected for use as data were available for multiple sampling episodes and their locations bound Well 10-A.

8.2 EXPOSURE ASSESSMENT

8.2.1 Deer Mouse-Falcon Food Chain Scenario

8.2.1.1 Descriptions of the Exposed Organisms

The "typical" deer mouse residing in (or adjacent to) the IPC pasture is assumed to exhibit the following characteristics:

- weigh 25 gms (Burt and Grossenheider, 1976);
- drink 0.005 L/day of water (Sax and Lewis, 1989); and
- consume 3 gm/d of food (Sax and Lewis, 1989).

MSE further assumed that incidental ingestion of soils (due to grooming and feeding) is equivalent to one percent of its body weight (i.e., 0.25 g/day soils intake). This rate does not seem unreasonable, given the mouse's ground dwelling/burrowing and feeding habits.

The "typical" peregrine falcon preying on these mice is assumed to weigh 1,220 gms (Welty, 1966) and consumes prey at 12 percent of its body weight/day (Herman and Willard, *ca*. 1976). Although these falcons feed almost exclusively on birds, the RME assumes consumption of one mouse/day.

8.2.1.2 Exposure Point Concentrations

Soil contaminant concentrations are the same as used in the current offsite garden produce scenario (Section 7.1): PCP, 0.55 mg/kg; benzo(a)pyrene, 0.12 mg/kg; and TCDD TE, 0.0003 mg/kg. These concentrations were generated by dividing undetect ("U") values by two and then calculating arithmetic mean levels for each CoC (Table 8-1, Part A). Given the high "U" values for CoCs in vegetation -- relative to those in soils -- and the unlikelihood of significant bioconcentration of PCP and benzo(a)pyrene, the same soil-to-vegetation transfer coefficients (B_v) were used in both Sections 7.1 and 8.2. These values are 0.001 for PCP (Bellin and O'Connor, 1990) and 0.01 for benzo(a)pyrene (Edwards, 1983). Given the lack of correlation between TCDD TE levels in plant and soil materials (Table 8-1, Part A) and the low chance of significant bioaccumulation, MSE assumed a B_v of 0.0001 (as done also in Section 7.1). This assumed value could be low; for example, Travis and Arms (1988) cite a log B_v figure of 1.87 -- equivalent to 0.0135.

Contaminant concentrations in edible mouse tissue were estimated by use of the following B_t transfer coefficients: PCP, 0.05; benzo(a)pyrene, 0.001; and TCDD TE, 0.079. The PCP value is for male rats (Geyer et.al., 1980); the benzo(a)pyrene value is MSE's assumption, based on the rationale of rapid breakdown/excretion of this compound in mice (Eisler, 1987); and the lattermost value is derived from metabolism of OCDD in rodents (Trabalka and Garten, Jr., 1982).

The additional RME assumptions include the following:

- exposure to surface LNAPL would be a one time (acute) event, while no exposure to the MPC Substation ditch water/sediment occurs (i.e., any such attempt would probably result in drowning); and
- the mice drink only from around the livestock watering trough containing 25 μg/L PCP, 0.23 μg/L benzo(a)pyrene and 0.003 μg/L TCDD TE (Table 8-2, Part C).

The assumed PCP and benzo(a)pyrene concentrations in the livestock watering trough utilize the respective upper bound "U" values shown in Table 8-2, Part C. Given the lack of TCDD TE information specific to Well 10A, the upper bound estimate for downgradient average concentration of dioxin in shallow groundwater was assumed to be representative of livestock water quality. The 25 μg/L PCP level is compatible with the validated flow/transport model output. As 0.037 μg/L of benzo(a)pyrene was observed in Rocky Creek and, assuming higher concentrations in the contaminated ground water plume (Table 8-2, Part C), use of 0.23 μg/L does not seem unreasonable. In general, the above contaminant levels used are judged to be adequate for this ecological assessment.

8.2.1.3 Intake Estimates

Interpretations of the estimates in Table 8-3, Part A are discussed in Section 8.4, Risk Characterization.

8.2.2 Cow-Milk-Child Food Chain Scenario

8.2.2.1 Descriptions of the Exposed Organisms

The "typical" non-pregnant dairy cow grazing in the IPC pasture is assumed to exhibit the following characteristics:

- weighs 600 kg [National Academy of Sciences (NAS), 1978];
- consumes 10.0 kg/day (fresh weight) of plant material (NAS, 1978); and
- drinks 125 L/day for 180 day/year (i.e., throughout the warm season).

Incidental ingestion of soils was assumed to be 1.5 percent by weight of the herbage intake (i.e., 150 gm/day), (Healy, 1968).

TABLE 8-3

SUMMARY OF ORAL INTAKE ESTIMATES FOR THE THREE IPC RELATED EXPOSURE SCENARIOS (MG/KG.D)

PART A. DEER MOUSE-PEREGRINE FALCON SCENARIO[a]

	Contaminant Sources					
Indicator Species	Soil	Vegetation	Water	Σ	Mouse Tissue (mg/kg)	Falcon Intake
Deer Mouse						
- PCP	5.5E-03	6.6E-05	5.0E-03	1.1E-02	5.5E-04	--
- B(a)P	1.2E-03	1.4E-04	4.6E-05	1.4E-03	1.4E-06	--
- TCDD TE	3.0E-06	3.6E-09	6.0E-07	3.6E-06	2.8E-07	--
Peregrine Falcon						
- PCP	--	--	--	--	--	1.1E-05
- B(a)P	--	--	--	--	--	2.9E-08
- TCDD TE	--	--	--	--	--	5.7E-09

PART B. COW-MILK-CHILD SCENARIO[b]

	Contaminant Sources					
Indicator Species	Soil	Vegetation	Water	Σ	Milk (mg/L)	Child's Lifetime Intake
Dairy Cow						
- PCP	1.4E-04	9.2E-06	5.2E-03	5.4E-03	4.2E-06	--
- B(a)P	3.0E-05	2.0E-05	4.8E-05	9.8E-05	1.1E-06	--
- TCDD TE	7.5E-08	5.0E-10	6.2E-07	7.0E-07	6.8E-09	--
Young Child (1-7yrs)						
- PCP	--	--	--	--	--	2.2E-08[d]
- B(a)P	--	--	--	--	--	5.6E-09
- TCDD TE	--	--	--	--	--	3.5E-11

TABLE 8-3 (Cont'd)

SUMMARY OF ORAL INTAKE ESTIMATES FOR THE THREE IPC RELATED EXPOSURE SCENARIOS (MG/KG.D)

PART C. FISH-FISH FILLET-CHILD SCENARIO[e]

Indicator Species	Contaminant Sources Prey	 Water	 Σ	Fish Fillet (mg/kg)	Fish Intake by Child
Rainbow Trout					
- PCP	3.9E-04	7.8E-03	8.2E-03	1.6E-03	--
- B(a)P	7.2E-05	4.0E-07	7.2E-05	1.4E-05	--
- TCDD TE	7.5E-05	3.0E-08	7.5E-05	1.4E-05	--
Young Child (1-7yrs)					
- PCP	--	--	--	--	9.0E-08
- B(a)P	--	--	--	--	7.9E-10
- TCDD TE	--	--	--	--	8.0E-10

Notes:
[a] Based on data presented in Section 5.1.
[b] Based on data presented in Section 5.2.
[c] Concentration estimates in milk are from all sources (not just from plant material).
[d] Subchronic intake equals 2.5E-07 mg/kg.d.
[e] Based on data presented in Section 5.3.
[f] Subchronic intake equals 1.0E-06 mg/kg.d.

The young child is assumed to live at Residence-10 and exhibits the following characteristics:

- has an average body weight of 16 kg (EPA, 1989a); and
- drinks 1 L/day of milk for 350 days/year between the ages of 1 through 6 years.

These assumptions are compatible with those made in Section 7.1. of the RI.

8.2.2.2 Exposure Point Concentrations

The CoC-specific concentrations in pasture soils and plant material are the same as used in the deer mouse-falcon scenario (8.2.1). The vegetation-to-milk (fat) transfer coefficients (B_m) were calculated using the regression equation cited in Travis and Arms (1988): $\log B_m = -8.10 + \log K_{ow}$, where the $\log K_ow$ values for benzo(a)pyrene and TCDD TE were taken from Travis and Arms (1988), while the value for PCP (i.e., 5.0) was taken from Montgomery and Welkom (1990).

Finally, it was assumed that the cow drinks only from the water trough; thus, CoC levels are the same as derived in Section 8.2.1.2.

8.2.2.3 Intake Estimates

The resulting intake estimates are presented in Part B of Table 8-3. Interpretation of these estimates are discussed in Section 8.4, Risk Characterization.

8.2.3 Fish-Fish Fillet-Child Food Chain Scenario

8.2.3.1 Descriptions of the Exposed Organisms

The "typical" rainbow trout residing in Rocky Creek between monitoring stations SW-3 and SW-10 is assumed to exhibit the following characteristics:

- be about 20 cm long and weigh 350 gms (based on observations made by MSE field personnel); plus
- consume, on average throughout the legal fishing season, 5 percent of its body weight/day in macroinvertebrate prey (Lagler et.al., 1962).

The young child consuming these fish exhibits the same characteristics as described in Section 8.2.2. Consumption rate is assumed to be 4.8 gm of fish fillet per kg of body weight (EPA, 1989e), containing 1 percent by weight lipids (Norman and Greenwood, 1963); exposure frequency is assumed to be 50 days/year (i.e., 1 day/week for 350 days home/year) while exposure duration is for 6 years.

8.2.3.2 Exposure Point Concentrations

The time-average concentrations of PCP and benzo(a)pyrene in Rocky Creek are assumed to be 1 μg/L and 0.037 μg/L, respectively (Table 8-2, Part A). No dioxin/furan analyses were performed on water from this creek. However, the RME scenario assumed a TCDD TE level equal to the "upper bound" estimate for the contaminated groundwater plume, 0.003 μg/L (Table 8-2, Part C).

The water-to-fish lipid contaminant bioconcentration factors (B_f) utilized in this assessment are as follows: PCP, 776; benzo(a)pyrene, 389; and dissolved TCDD TE, 5000. The first two values were taken from Mackay (1982), wherein acenaphthene substitutes for benzo(a)pyrene; this substitution recognizes the rapid metabolism and excretion of benzo(a)pyrene in fish (Eisler, 1987). The TCDD value is one utilized by the USEPA and is cited in Rifkin and LaKind (1991). However, all three of the CoCs tend to sorb strongly onto organic matter (e.g., soils/sediments). Therefore, their overall bioaccumulation potential in lipids is relatively low (compared to certain PCBs) while the above B_f values may be too large (LaKind and Rifkin, 19901). Finally, it was assumed that B_f values for trout are applicable also to the macroinvertebrates that trout prey on (Bierman, 1990); based on discussions found in Lambert and Moore (1984) and in Comstock (1966), MSE assumed an average 10 percent by weight lipids in the insect foodstuffs consumed by the trout.

8.2.3.3 Intake Estimates

The resulting intake estimates are presented in Part C of Table 8-3. Interpretations of these estimates are discussed in Section 8.4, Risk Characterization.

8.3 TOXICITY ASSESSMENT

This assessment focused on exposure via the oral (ingestion) route; such approach was necessary, given the general lack of "reference dose" or "cancer slope factors" for the indicator species via the inhalation and direct (dermal) contact routes. The available CoC-specific data used in the risk characterization effort (Section 8.4) are shown in Table 8-4. U.S. Fish and Wildlife Service Contaminant Hazard Reviews for PCP (Eisler, 1989), B(a)P (Eisler, 1987) and dioxin (Eisler, 1986) provided key sources of information in this table. These documents were supplemented by toxicological data provided in Sax and Lewis (1989). Pertinent toxicological end-points are discussed in greater detail in Section 8.4.

8.4 RISK CHARACTERIZATION

8.4.1 Presentation of the RME Scenario-Specific Estimates

This section combines the intake estimates and toxicological data presented in Sections 8.2 and 8.3 to provide an estimate of population-level adverse impacts to the given indicator species. This was accomplished by way of an "environmental harm" (EQ) quotient. CoC-specific EQs were generated by dividing the particular intake estimate by the lowest toxicological end-point value available for the given indicator species. This approach is analogous to the health quotient (HQ) calculated for human exposure to noncarcinogens (EPA, 1989d). In both cases, if the quotient is less than one for a given chemical, adverse health effects are not expected. Subchronic HQs were calculated for young children exposed to PCP-contaminated milk and fish fillets. Cancer slope factors (CSFs) were also used to assess the risk of excess cancer associated with consumption of these foodstuffs. The subchronic reference dose used for PCP was 3E-02 mg/kg.d. The oral route CSFs utilized

TABLE 8-4

TOXICOLOGICAL DATA UTILIZED IN ECOLOGICAL RISK CHARACTERIZATIONS FOR THE IPC CERCLA SITE

PART A. MAMMALIAN SPECIES

Oral Route Toxicological End-Points (mg/kg.d)[a]

	Mice (M. musculus)					Dairy Cows (B. taurus)			
CoC	LD$_{50}$	LDLo(Rep.)	LDLo(Ter.)	LDLo(Eta.)	NOAEL	LD$_{50}$	TD$_{50}$	LOAEL	NOAEL
PCP	65-252	No Data (ND)	ND	ND	3-10	140	15-20	0.2-2.0	0.05-0.5
B(a)P	50	ND	ND	0.002	0.0002	ND	ND	0.002	0.0002
TCDD TE	0.114-2.57	ND	0.03	0.001	1E-06	ND	2E-06	ND	ND

PART B. AVIAN SPECIES[b]

	Oral Route Toxicological End-Points (mg/kg.d)[a]		
CoC	LD$_{50}$	LDLo	NOAEL
PCP	205-740	≥ 1	≤ 10
B(a)P	ND	0.002	ND
TCDD TE	0.01-0.8	0.001-0.010	1E-06

PART C. AQUATIC SPECIES

	Toxicological End-Points (µg/L)			
	Macroinvertebrates[c]		Trout (Salmo) Species	
CoC	LC$_{50}$(<24 hrs.)	TD(>96 hrs.)	LC$_{50}$(<24 hrs.)	TD(>96 hrs.)
PCP	48-55	<3.2	20-40	10-20
B(a)P	$\leq 1{,}000$	≤ 5.0	≥ 50	≥ 5
TCDD TE	≥ 0.2	<0.2	≤ 0.01	≥ 0.001

TABLE 8-4 (Cont'd)

TOXICOLOGICAL DATA (ORAL ROUTE) UTILIZED IN ECOLOGICAL RISK CHARACTERIZATIONS FOR THE IPC CERCLA SITE

Notes: [a] Toxicological end-point codes are as follows: LD_{50} = calculated dose of a CoC which is expected to cause the death of 50 percent of the exposed population; LDLo = the lowest dose (other than LD_{50}) of a CoC introduced by any route (other than inhalation) over any given period of time and reported to have caused death in the exposed population; TD = the dose which results in some quantifiable adverse effect, other than death, in the exposed individual; LOAEL = lowest observed adverse effect (dosage) level; NOAEL = no observed adverse effect (dosage) level; Rep. = reproductive effects (e.g., resorption of embryos); Ter. = teratogenic effects (e.g., cleft palate); Eta. = equivocal tumorigenic agent at the given dose, and often resulting in well defined neoplastic or carcinogenic effects at higher doses; LC_{50} = lethal concentration to 50 percent of the exposed population.

[b] Species include Northern bobwhite, ringed turtle-dove, mallards and domestic chickens.

[c] Species include freshwater snails, worms and <u>Daphnia</u> spp.

were as follows: PCP, 1.2E-01; benzo(a)pyrene, 1.15E+01; and TCDD TE, 1.5E+05 $(mg/kg.d)^{-1}$ (EPA, 1991c).

8.4.1.1 Deer Mouse-Prairie Falcon Scenario

Inspection of Table 8-5, Part A indicates the unlikelihood of population-level effects to either prey or predator species, given the assumptions presented in Section 8.2.1. However, EQ estimates for benzo(a)pyrene and TCDD exceed one if the respective no observed adverse effects level (NOAEL) values are used in the calculation(s) for mice. Thus, any particularly sensitive subpopulation (of presently unknown size) may be adversely affected via the oral route of exposure. This hypothesis could be tested via inspection of captured mice for gross evidence of tumorigenesis (i.e., due to oral and/or dermal exposures). If such neoplasms are observed, histologic and enzymatic assays (e.g., mixed function oxidase/aryl hydrocarbon hydroxylase) could be pursued to evaluate this hypothesis.

8.4.1.2 Cow-Milk-Child Scenario

The data in Table 8-5, Part B indicates the unlikelihood of adverse effects to dairy cattle herds grazing the pasture, given the assumptions presented in Section 8.2.2. Although the estimated doses may result in PCP levels in plasma rising above "background" (Eisler, 1989), whether resulting levels in raw milk would also exceed "background" is presently unknown.

TABLE 8-5

SUMMARY OF ECOLOGICAL RISK CHARACTERIZATION ESTIMATES FOR THE THREE EXPOSURE SCENARIOS, IPC CERCLA SITE[a]

PART A. DEER MOUSE-PEREGRINE FALCON SCENARIO

Indicator Species	Intake (mg/kg.d)	Toxicological End-Point (mg/kg.d)	EQ	Comments
Deer Mouse				
- PCP	1.1E-02	NOAEL, 3	3.7E-03	--
- B(a)P	1.4E-03	LDLo(Eta.), 2E-03	7.0E-01	EQ = 7E+00 for NOAEL, 2E-04.
- TCDD TE	3.6E-06	LDLo(Eta.), 1E-03	3.6E-03	EQ = 3.6E+00 for NOAEL, 1E-06.
Peregrine Falcon				
- PCP	1.1E-05	LDLo, 1	1.1E-05	--
- B(a)P	2.9E-08	LDLo, 2E-04	1.4E-04	--
- TCDD TE	5.7E-09	NOAEL, 1E-06	5.7E-03	--

PART B. COW-MILK-CHILD SCENARIO

Indicator Species	Intake (mg/kg.d)	Toxicological End-Point (mg/kg.d)	EQ	Excess Cancer Risk (Humans)
Dairy Cow				
- PCP	5.4E-03	NOAEL, 5E-02	1.1E-01	--
- B(a)P	9.8E-05	NOAEL, 2E-04	4.9E-01	--
- TCDD TE	7.0E-07	TD (monkeys), 2E-06	3.5E-01	--
Young Child (1-7yrs)				
- PCP	2.2E-08	Excess cancer incidence	HQ = 8.3E-06	2.6E-09
- B(a)P	5.6E-09	Excess cancer incidence	--	6.4E-08
- TCDD TE	3.5E-11	Excess cancer incidence	--	5.2E-06

TABLE 8-5 (Cont'd)

SUMMARY OF ECOLOGICAL RISK CHARACTERIZATION ESTIMATES FOR THE THREE EXPOSURE SCENARIOS, IPC CERCLA SITE[a]

PART C. FISH-FISH FILLET-CHILD SCENARIO

	µg/L				
Indicator Species	Conc. in Water	TD (>96 hrs.)	Intake (mg/kg.d)	Toxicological End-Point	Excess Cancer Risk (Humans)
Rainbow Trout					
- PCP	≤1	10	--	--	--
- B(a)P	0.037	≥5	--	--	--
- TCDD TE	≤0.003	≥0.0001	--	--	--
Young Child (1-7yrs)					
- PCP	--	--	9.0E-08	Excess cancer risk	1.1E-08
- B(a)P	--	--	7.9E-10	Excess cancer risk	9.1E-09
- TCDD TE	--	--	8.0E-10	Excess cancer risk	1.2E-04

Note: [a] Intake data are taken from Table 4, toxicological data are from Table 3 and Rocky Creek water quality data are from Table 2.

However, the excess incidence of cancer estimates for the young child drinking this milk are generally less than the EPA's "point of departure" (i.e., 1E-06) level for evaluating cleanup needs (EPA, 1990c). Given the conservative nature of the assumptions, no significant health/cancer threats via this route of exposure are foreseen -- including those for dioxins/furans.

8.4.1.3 Fish-Fish Fillet-Child Scenario

Taken at face value, the 0.003 µg/L TCDD TE concentration assumed for Rocky Creek waters could result in reduced growth of rainbow trout (Eisler, 1986). However, this assumed concentration represents the upper bound estimate of the arithmetic mean level present within the contaminated ground water plume (Section 8.1.2). As even seasonally low flows of Rocky Creek can dilute dissolved contaminant concentrations (relative to contaminated groundwater) by several orders of magnitude (Section 6.4.3), the "true" value is probably much lower than that utilized in the RME scenario. This caveat is applicable also to the elevated excess cancer risk for TCDD calculated for young children. Therefore, the overall conclusion is that no significant adverse environmental effects are foreseen, given the assumptions presented in Section 8.2.3.

8.5 UNCERTAINTIES ASSOCIATED WITH THE ECOLOGICAL RISK CHARACTERIZATION ANALYSIS

Table 8-6 summarizes the site-specific, toxicological, exposure and risk characterization-related uncertainties associated with the IPC Site's ERA. This table also presents a qualitative assessment of the effects these uncertainties may exert on the calculated ecological hazards and excess

TABLE 8-6

LISTING OF PARAMETERS AFFECTING THE UNCERTAINTY OF, AND SEMI-QUANTITATIVE ESTIMATION OF THEIR EFFECT ON THE IPC SITE ECOLOGICAL RISK CHARACTERIZATION

	Effect on Resulting Risk[a]		
Parameter	Over-Estimate	Under-Estimate	Either Way
A. SITE CHARACTERIZATION			
- Sample numbers having "non-U" values sufficient to adequately quantify CoC levels in each of the media.	Low (moderate for pasture vegetation)	--	--
- Systematic or random errors in the chemical analyses may yield erroneous data.	--	--	Low
B. TOXICOLOGY			
- Cancer slope factors are based on the upper 95 percentile slope, which represents the upper bound estimate of cancer incidence.	Low	--	--
- Extrapolation of RfDs and slope factors from one species to another (e.g., chicken-to-falcon), and from high dose to low dose.	--	--	Moderate
- Not all compounds selected as indicator chemicals (as well as others present onsite) have toxicity data of use in evaluating their contribution to overall environmental risk.	--	Moderate	--
- The EPA-approved evaluation system, as a matter of practicality, assumes risks to be additive (i.e., synergistic or antagonistic interaction between contaminants are not accounted for).	--	--	Moderate
- Varying uncertainty in the CoC-specific "benchmark" values (e.g., NOAELS).	--	--	Moderate

TABLE 8-6 (Cont'd)

LISTING OF PARAMETERS AFFECTING THE UNCERTAINTY OF, AND SEMI-QUANTITATIVE ESTIMATION OF THEIR EFFECT ON THE IPC SITE ECOLOGICAL RISK CHARACTERIZATION

Parameter	Effect on Resulting Risk[a]		
	Over-Estimate	Under-Estimate	Either Way
C. EXPOSURE ASSUMPTIONS			
- Selection of ecological receptors most sensitive (or representative of) exposure to the ecological contaminants of concern.	--	Low	--
- Letting undetect ("U") concentration data represent actual exposure point concentrations in the various environmental media.	Moderate	--	--
- The sum interaction of assumed physical characteristics of the offsite maximally exposed individuals (e.g., body weight, soil ingestion rates, bio-concentration factors, etc.).	--	--	Moderate
- The potential for adverse effects arising from exposure via the dermal and inhalation routes, not addressed due to unavailability of biological/toxicological/ environmental exposure data.	--	Low	--
D. ECOLOGICAL RISK CHARACTERIZATION			
- Calculation and interpretation of the "environmental harm" quotient, given the uncertainties associated with derivation of both exposure point and benchmark CoC concentrations.	Moderate	--	--

Note: [a] As a general guideline, assumptions marked as low may affect estimates of exposure by less than one order of magnitude; assumptions marked moderate may affect estimates of exposure by between one and two orders of magnitude; and assumptions marked high may affect estimates of exposure by more than two orders of magnitude (EPA, 1989a).

lifetime cancer risk estimates in humans. Overall, the analytical results available and EPA acceptable methodology utilized have probably generated "risk" estimates within one or two orders of magnitude greater than those actually presented by offsite conditions. Such assessment is based upon the following:

- the assumption that contaminant data taken from probable "hot spots" (e.g., visibly contaminated pasture soils and upper bound estimates of water quality based on "U" data) represent "typical" conditions within the IPC pasture, underlying groundwater and in the groundwater-affected stretch of Rocky Creek;
- the conservative nature of the three food chain scenarios; and
- the conservative nature of estimating CoC/route-specific cancer slope factors associated with the young children receptors.

An enlarged, validated analytical data base for pasture soils, vegetation, milk, deer mouse and fish fillet tissues -- and "non-U" values -- may reduce the margin between estimated and true risk(s) within an order of magnitude of each other. Application of more sophisticated methodologies (e.g., Monte Carlo simulations) could also improve the present estimates (e.g., McKone and Ryan, 1989). Nevertheless, the food chains evaluated indicate two important findings (Table 8-5). First, population-level effects on the given terrestrial and aquatic indicator species are not likely, at least via the oral route of exposure. However, adverse effects to particularly sensitive individuals cannot be ruled out (see comments, Part A of Table 8-5). Furthermore, uncertainties regarding areal magnitude and frequency of dermal exposure in deer mice and toxicological data gaps for dairy cows precluded evaluation of the dermal exposure route. This deficiency may be important for benzo(a)pyrene, given its tumorigenic potential via this route (Eisler, 1987).

There is also the possibility that more sensitive receptors (i.e., indicator species) and/or food chains were omitted, particularly due to the lack of necessary/quantitative data to perform such assessments.

The estimated excess cancer risks in children are generally at or below the EPA's (1991a) 1E-06 "point of departure" guideline for evaluating the need for site remediation. Thus, the IPC-specific estimates probably indicate no population-level risks to young children, particularly given the low population size exposed and consequent difficulty in statistical resolution of such magnitudes of elevated risk. Furthermore, considerable uncertainty exists with the CoC-specific bioconcentration factors, which are believed to be overestimates, especially for TCDD TE (Section 8.2.3.2).

Finally, CoC concentrations in the surface LNAPL (Table 8-1) and in MPC Substation ditch water/sediments (Table 8-2) are potential exposure points to the terrestrial indicator species. Given their small areal extent and, assuming no preferential attraction to these spots, their overall contribution to CoC intake may be of minor consequence. However, even if such exposure has been incorporated incidentally into the above RME estimates, these sources could pose significant risks to sensitive individuals within any -- or all -- of the exposed populations.

9.0 SUMMARY AND CONCLUSIONS

9.1 SUMMARY

9.1.1 Nature and Extent of Contamination

The review of the site characterization data for soils indicates that noncarcinogenic toxicity in decreasing order, is wood-treating area > BNRR roundhouse > other potential sources > IPC yard areas. The selected CoCs for surface soils for the quantitiative risk assessment are PCP, anthracene, benzo(a)pyrene, fluoranthene, pyrene, and 2,3,7,8-TCDD TE. There are approximately 23,000 cubic yards of surface soils contaminated with PCP higher than 100 ppb and PAHs higher than 1,000 ppb. These concentrations do not represent a defined clean-up level for the site, nor are they risk-based contaminant levels; the actual clean-up level may be higher or lower. There are approximately 32,410 cubic yards of contaminated subsurface soils, using the same contaminant levels.

The data for sediments indicates that noncarcinogenic toxicity in decreasing order, is Cedar Street ditch > MPC Substation ditch > L Street ditch > Rocky Creek > Mill Creek > Bohart Lane > groundwater drainage ditch. The selected CoCs for the quantitative risk assessment are PCP, 2,4,6-TCP, anthracene, benzo(a)pyrene, fluoranthene, pyrene, and 2,3,7,8-TCDD TE. Within the Cedar Street, L Street, and MPC Substation ditches there are 4,505 cubic yards of contaminated sediment.

The data for groundwater indicates that the selected CoCs for the quantitative risk assessment are PCP, 2,4,6-TCP, anthracene, benzo(a)pyrene, fluoranthene, fluorene, naphthalene, and pyrene based on compounds quantitated in downgradient wells. There are approximately 2.1×10^8 gallons of groundwater contaminated with PCP higher than 1 ppb.

9.1.2 Fate and Transport

The data indicated the primary sources of contaminant releases are subsurface soils, LNAPL, and to a lesser extent surface soils contaminated by spills and leaks of wood-treating fluid. The secondary contaminant sources are ditch sediments and aquifer materials. The primary pathways are groundwater, surface water, and air; secondary pathways are surface water and vegetation. Potentially impacted receptors include humans and terrestrial and aquatic biota.

PCP exhibits moderate mobility, undergoes rapid biotransformation, and volatilization does not significantly affect concentrations. Sorption of PAHs is significant and increases with increasing clay content; microbial metabolism is the major process for degradation of PAHs in soil, and volatilization of lower molecular weight PAHs may be substantial. Dioxins/furans will strongly sorb to soils and sediments (mobility can be significant in low organic carbon content soils); very little will volatilize, and biodegradation is probably slow.

The flow and contaminant transport model reasonably represents conditions at the IPC Site. The example of predictive modeling demonstrated that complete removal of all source material will potentially result in the groundwater system flushing itself clean (below 0.1 ppb) of PCP in approximately 4 to 5 years.

9.1.3 Human Health Risk Assessment

9.1.3.1 Selection of Contaminants of Concern

The chronology of media-specific field and laboratory data gathering by MSE is presented, and the results discussed, in Section 4.0 of the report. Information contained in this section was utilized to select media-specific CoCs; the rationale for each set of CoCs (e.g., for groundwater) is found in Section 5.2. Summary Table 7-7 indicates the widespread contamination of the IPC Site and offsite groundwater by PCP, benzo(a)pyrene and other PAHs, as well as lesser contamination by higher chlorinated forms of dibenzo-p-dioxins and dibenzofurans. For purposes of the assessment, the dioxin/furan contaminants were converted to TE levels of 2,3,7,8 TeCDD via use of the isomer-specific EPA TEFs (EPA, 1989c).

In addition, a number of additional B2 PAHs were selected for qualitative risk assessment; this approach was necessary as verified cancer slope factors are not presently available for these particular compounds.

9.1.3.2 Exposure Assessment

Section 6.1 presents the IPC Site conceptual model and an overview of CoC-specific environmental fate and transport characteristics. RME scenarios were then developed for onsite and offsite RME populations for both current and future land use conditions.

The exposed individuals associated with current land use are onsite (pole-treating) workers and occasional intruders (aged 6 through 18); offsite individuals include adults and children (6 through 12) who hypothetically live at Residence-10. The assumed characteristics of these individuals are found in Section 7.1.1.1; media-specific receptor point concentrations (per individual) are given in Section 7.1.2.

The future land use scenario assumes onsite occupancy by adults and young children (1 through 6 years) and continued occupancy of Residence-10 by adults and children (6 through 12 years). The assumed characteristics of these individuals are given in Section 7.1.1.2; media-specific receptor point concentrations are presented in Section 7.1.2.

EPA (1989a) algorithms were utilized to estimate CoC/individual-specific contaminant intakes for the relevant routes. Current land use results for noncarcinogens and carcinogens are summarized in Tables 7-7 and 7-8 respectively. Tables 7-9 and 7-10 present the noncarcinogenic and carcinogenic intake summaries, respectively, associated with the future land use scenarios.

9.1.3.3 Toxicity Assessment

General reviews of toxicological responses associated with exposure to the B2 PAHs (including benzo(a)pyrene), dioxins and PCP are discussed in Section 7.2. This section also presents the route-specific reference dose values available for the noncarcinogenic CoCs and available CSFs for the carcinogenic CoCs (Table 7-11) as well as the toxicity factors used to calculate 2,3,7,8-TeCDD TEs (Table 7-12) in the various media.

9.1.3.4 Risk Characterization

The RME individual/route-specific intake estimates (Section 7.1.3) were then divided by the pertinent RfD or multiplied by the pertinent CSF values discussed in Section 7.2. The resulting noncarcinogenic HQs and excess incidence of cancer estimates (for carcinogens) are presented and discussed in Section 7.3.

The HQ and excess cancer risks for the current land use scenarios are summarized in Tables 7-2 and 7-3 respectively. Inspection of Table 7-2 indicates the following:

- no adverse noncarcinogenic health effects are foreseen in onsite workers or intruders, as all HQ values are well under 1;
- ingestion of, and direct contact with, PCP-contaminated groundwater (and to a lesser extent, soils and garden produce) by offsite adults may result in adverse liver and kidney effects, and possibly fetotoxic effects in pregnant women; and

- ingestion of, and direct contact with, the same PCP-contaminated media--plus surface LNAPL and MPC Substation sediments--by offsite children may also result in adverse effects to their livers and kidneys.

The following key points are indicated by Table 7-16:

- ingestion of, and dermal contact with, dioxin contaminated soils by workers may result in excess cancer rates of 1.8E-04 and 3.3E-05, respectively; while
- intruders coming in dermal contact with PCP-contaminated soils and Cedar Street ditch sediments may result in a 1.2E-05 excess cancer risk.

Furthermore, offsite adults and children who ingest/dermally contact dioxin and PCP-contaminated media (especially groundwater), as well as ingest media contaminated with benzo(a)pyrene, may incur excess cancer risks ranging up to 5.6E-01 (i.e., almost 6 in 10 exposed individuals) in children.

These RME-based HQs and cancer risk estimates generally assume exposure to the 95th percentile UCL concentration for each CoC. Although this is conventional EPA (1989a) risk assessment guidance, such an approach will result in a very conservative estimate of risk. Despite the uncertainties associated with the overall evaluation, MSE concludes that excess risk estimates of the 1E-04 magnitude in onsite and offsite individuals are reasonable and realistic.

The future land use scenarios assumed some degradation of the CoCs in soils, sediments and groundwater over time (Section 7.1.2). This likely reduction in contaminant levels in environmental media is reflected in Tables 7-17 and 7-18 for the future land use scenarios. For example, only the ingestion of PCP-contaminated soils/sediments/surface LNAPL by offsite children exhibits an HQ value exceeding 1 (i.e., 1.1). However, Table 7-18 indicates that excess cancer rates greater than 1E-05 may occur in onsite adults who ingest dioxin-contaminated soils/sediments. Furthermore, significant risks (i.e., values ≥ 1E-04) remain in the offsite individuals exposed to all three CoC-carcinogens via the ingestion route.

Therefore, as these estimates collectively exceed the EPA's (1990) "point of departure" value of 1E-06, consideration should be given to removal of the LNAPL and contaminated soil/sediment sources, for protection of currently and potentially exposed persons on and adjacent to the IPC CERCLA Site.

9.1.4 Ecological Risk Assessment

The Ecological Risk Assessment (ERA) for the IPC Site evaluated the potential for harm to select terrestrial and aquatic populations and food chains following exposure to the CoCs: PCP, benzo(a)pyrene, and TCDD TE. A further distinction was made regarding the probability of exposure occurrence and biological/regulatory consequences of such exposure, if it were to happen.

The two terrestrial and one aquatic exposure scenarios were identified. The key ("indicator") species were placed in a sitewide context. The rationale for selecting the above three CoCs was presented in Section 8.1. Descriptions of each of the exposed organisms, exposure point concentrations and intake estimates (in mg/kg.d) are presented for each of the three scenarios in Section 8.2. These intake estimates (Table 8-3) were combined with the toxicological data using EPA acceptable methods to generate environmental health/excess cancer risk estimates (Table 8-4). Although the risk characterization is not comprehensive (e.g., does not address the dermal contact route), and required many (reasonable) assumptions, it appears as though the IPC Site poses no environmental threat requiring large-scale or immediate remediation. Details supporting this conclusion are found in Section 8.3.

9.2 CONCLUSIONS

9.2.1 Data Limitations

The overall assessment of the organics data reveals that all data except for four soil samples with compounds below the CRDL were valid with some limitations. All organics data are classified into the unrestricted category as defined by the MDHES Data Management System except some groundwater data flagged "X" which will be used as screening level only (restricted use).

The overall assessment of the inorganics data reveals that all the data are valid with some limitations. All inorganics data are classified into the unrestricted category as defined by the MDHES Data Management System.

MSE believes that the soil and water organic and inorganic data meet the data quality objectives (DQOs) that were outlined in the Final Quality Assurance Project Plan (QAPjP) for the IPC Site. The DQOs were met because the CLP Statement of Work (SOW) methods were used for the analysis which allowed an analytical support level (Level IV) of rigorous QA/QC protocols and documentation. The complete data validation are found in Appendix F.

9.2.2 Recommended Remedial Action Objectives

9.2.2.1 Soils

For human health protection the remedial objectives are to:

- prevent direct contact with/ingestion of soil that results in 1 in 1,000,000 excess incidence of cancer resulting from exposure to the carcinogens;
- prevent ingestion of/direct contact with noncarcinogens in soils that results in exposures in excess of contaminant-specific reference doses; and
- prevent inhalation of carcinogens posing a risk of 1 in 1,000,000 excess incidence of cancer.

For environmental protection the remedial objective is to:

- prevent migration of contamination that would result in groundwater contamination in excess of MCLs or 1 in 1,000,000 excess incidence of cancer.

9.2.2.2 Sediment

For human health protection the remedial objectives are to:

- prevent direct contact with/ingestion of sediments that results in 1 in 1,000,000 excess incidence of cancer resulting from exposure to the carcinogens; and

- prevent ingestion of/direct contact with noncarcinogens in sediments results in exposures that exceed the contaminant-specific reference doses.

For environmental protection the remedial objective is to:

- prevent migration of contaminants that would result in groundwater contamination in excess of MCLs or result in 1 in 1,000,000 excess incidence of cancer; and
- prevent contaminant leachate levels from exceeding contaminant-specific ambient water quality criteria.

9.2.2.3 LNAPL Contamination Area and Groundwater

For human health protection, the remedial objective is to:

- prevent ingestion of water having carcinogens in excess of MCLs and a total excess incidnece of cancer risk greater than 1 in 1,000,000; and
- prevent ingestion of water having noncarcinogens in excess of MCLs or results in exposures which would exceed contaminant-specific reference doses.

For environmental protection the remedial objective is to:

- restore groundwater to MCLs or aquatic water criteria.

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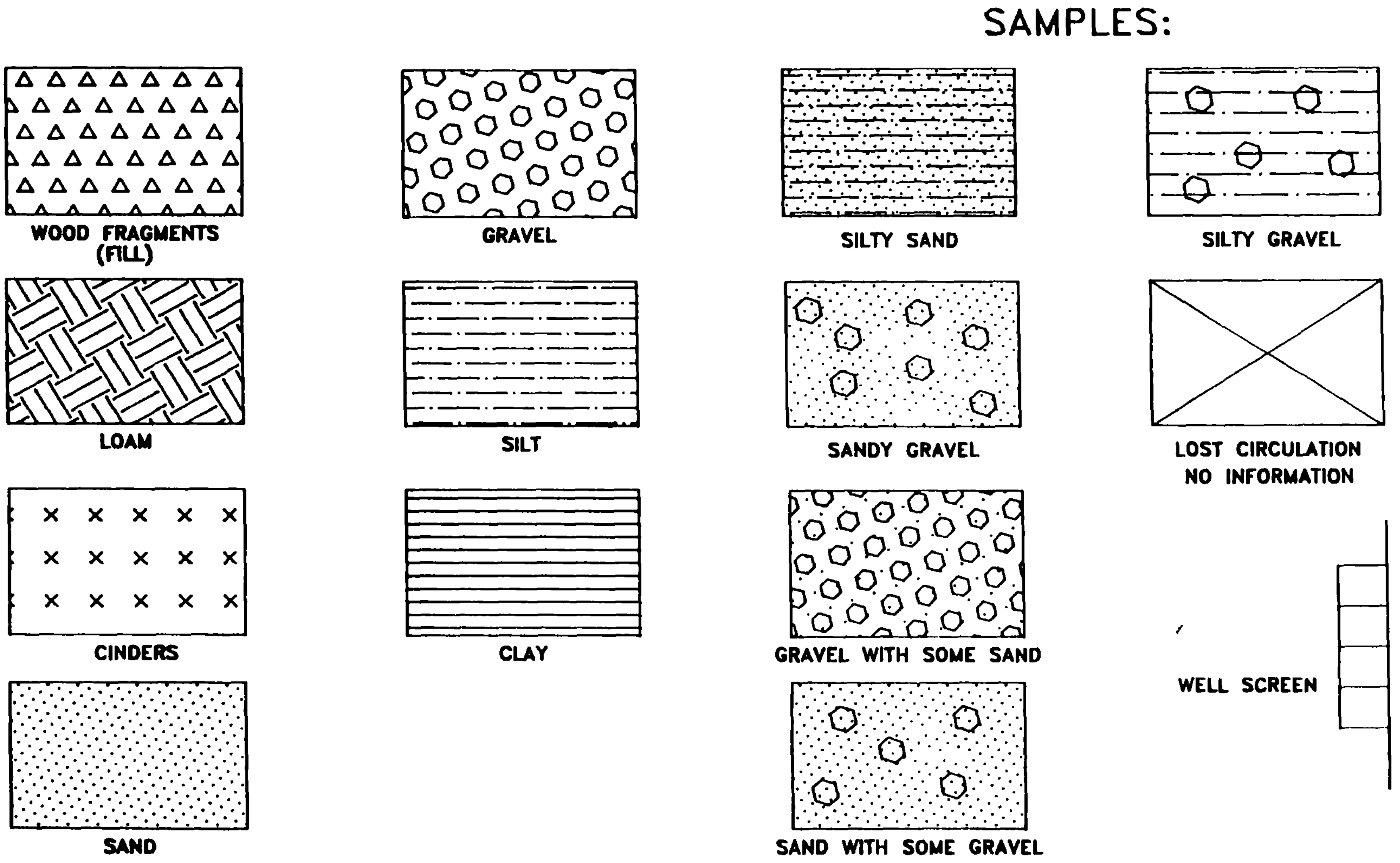
REMEDIAL INVESTIGATION REPORT
FOR IDAHO POLE SITE
BOZEMAN, MONTANA

APPENDICES A, B, C, D, E, F, AND G

APPENDIX A

WELL COMPLETION DIAGRAMS AND BORING/WELL LOG DATA

LITHOLOGY KEY



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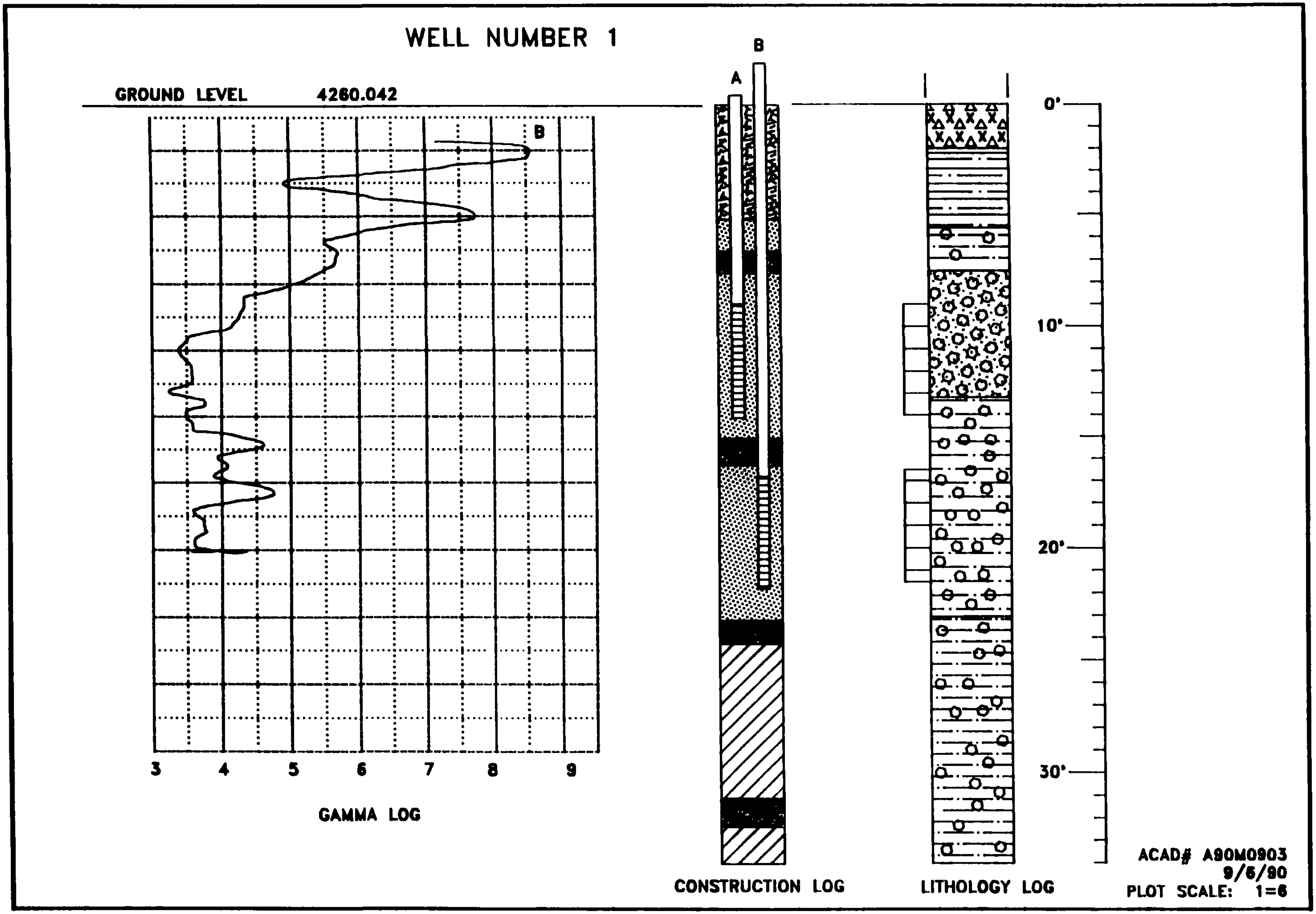
WELL NUMBER 1
GROUND LEVEL 4260.042
B
A
B
0'
10'
20'
30'
3
4
5
6
7
8
9
GAMMA LOG
CONSTRUCTION LOG
LITHOLOGY LOG
ACAD# A90M0903
9/6/90
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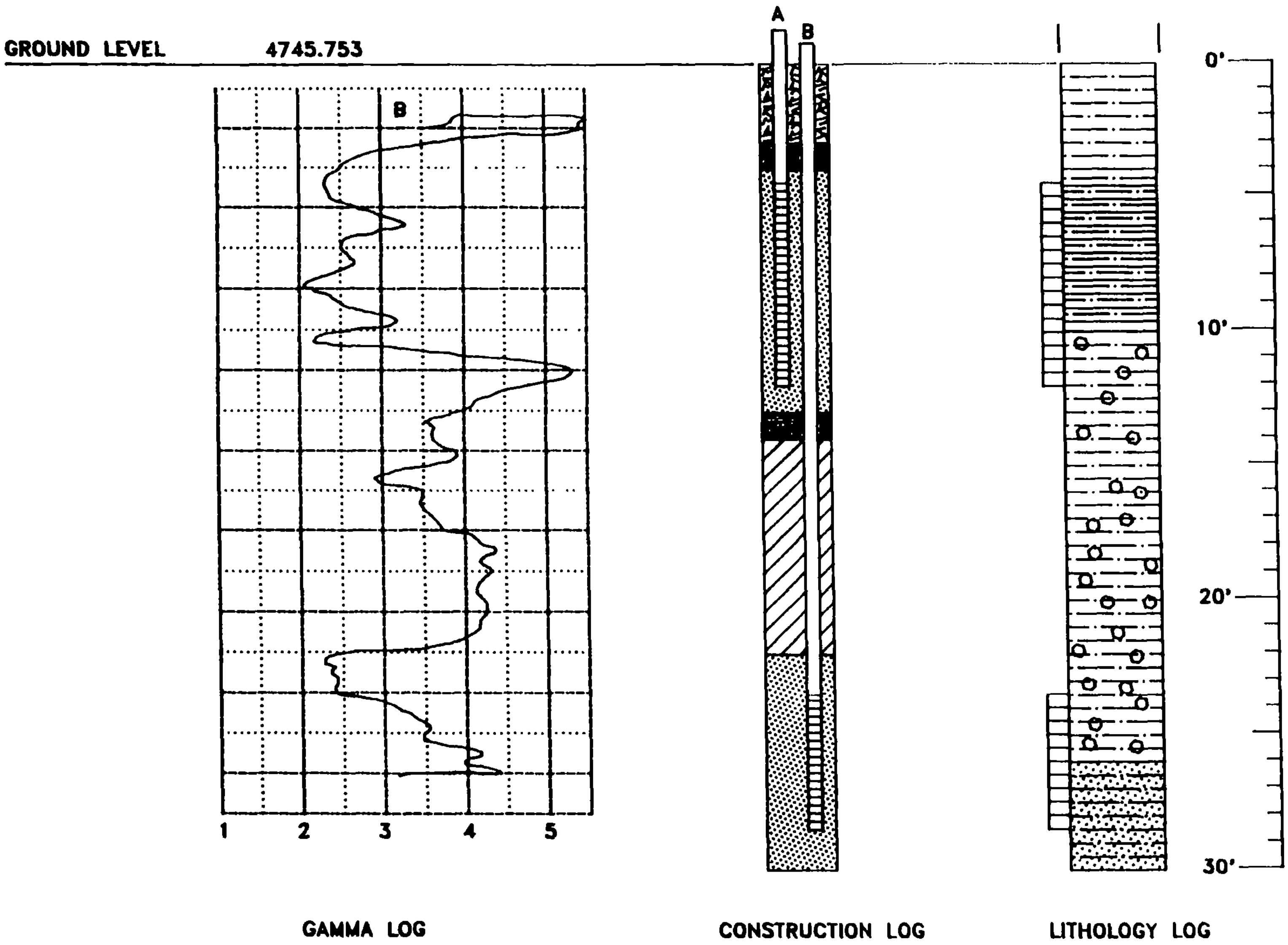
WELL NUMBER 2



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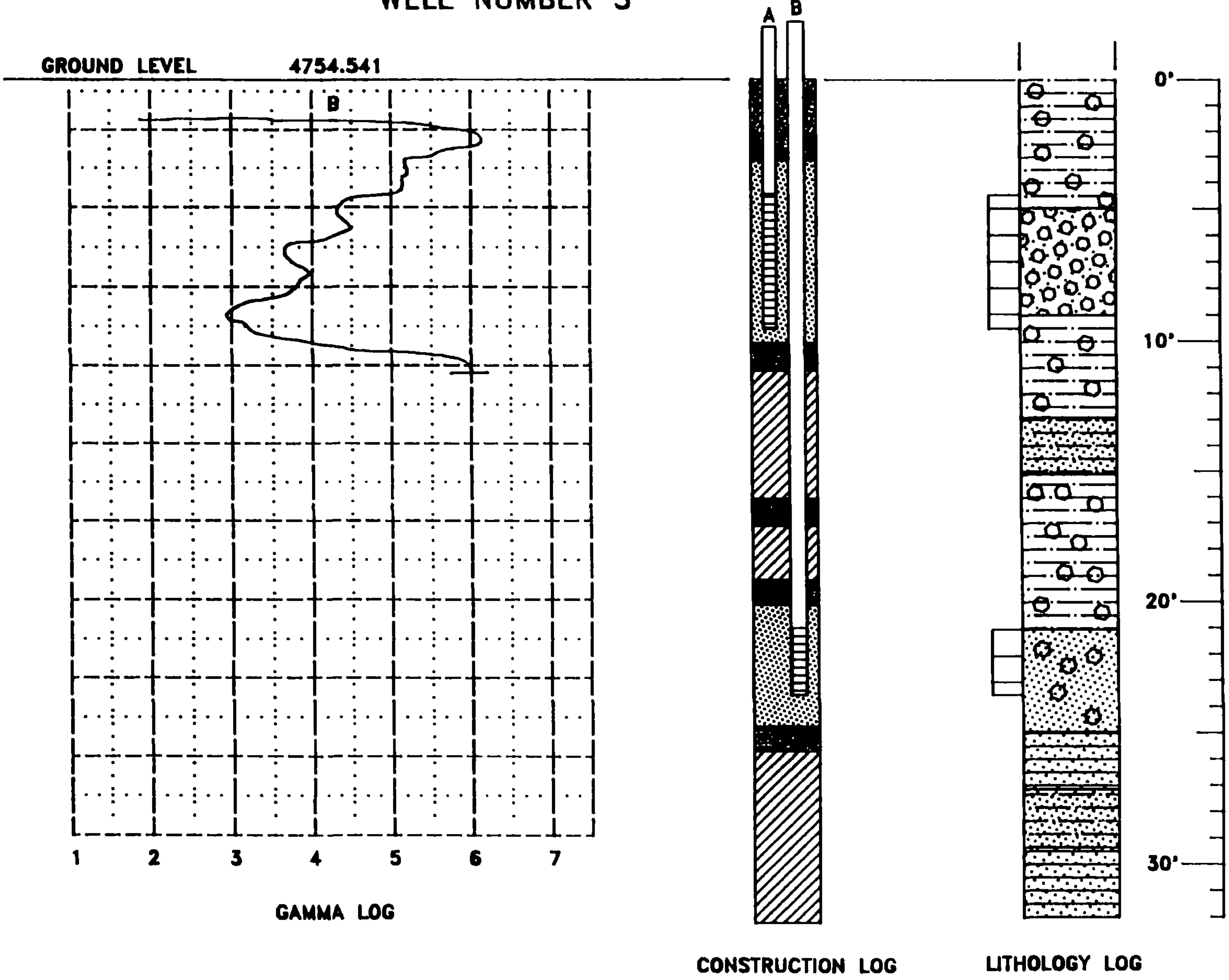

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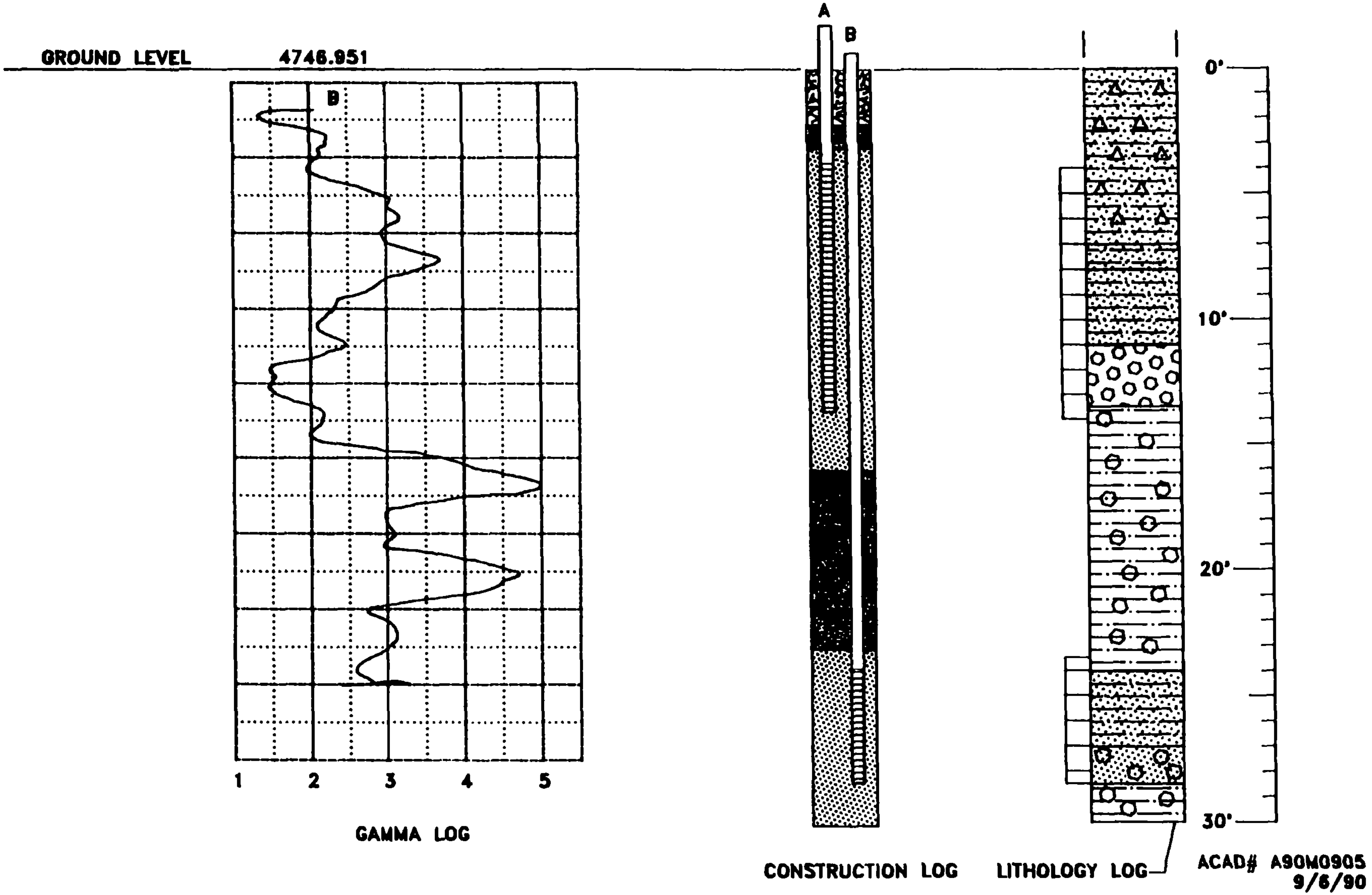

GAMMA LOG

CONSTRUCTION LOG

LITHOLOGY LOG

ACAD# A90M0905
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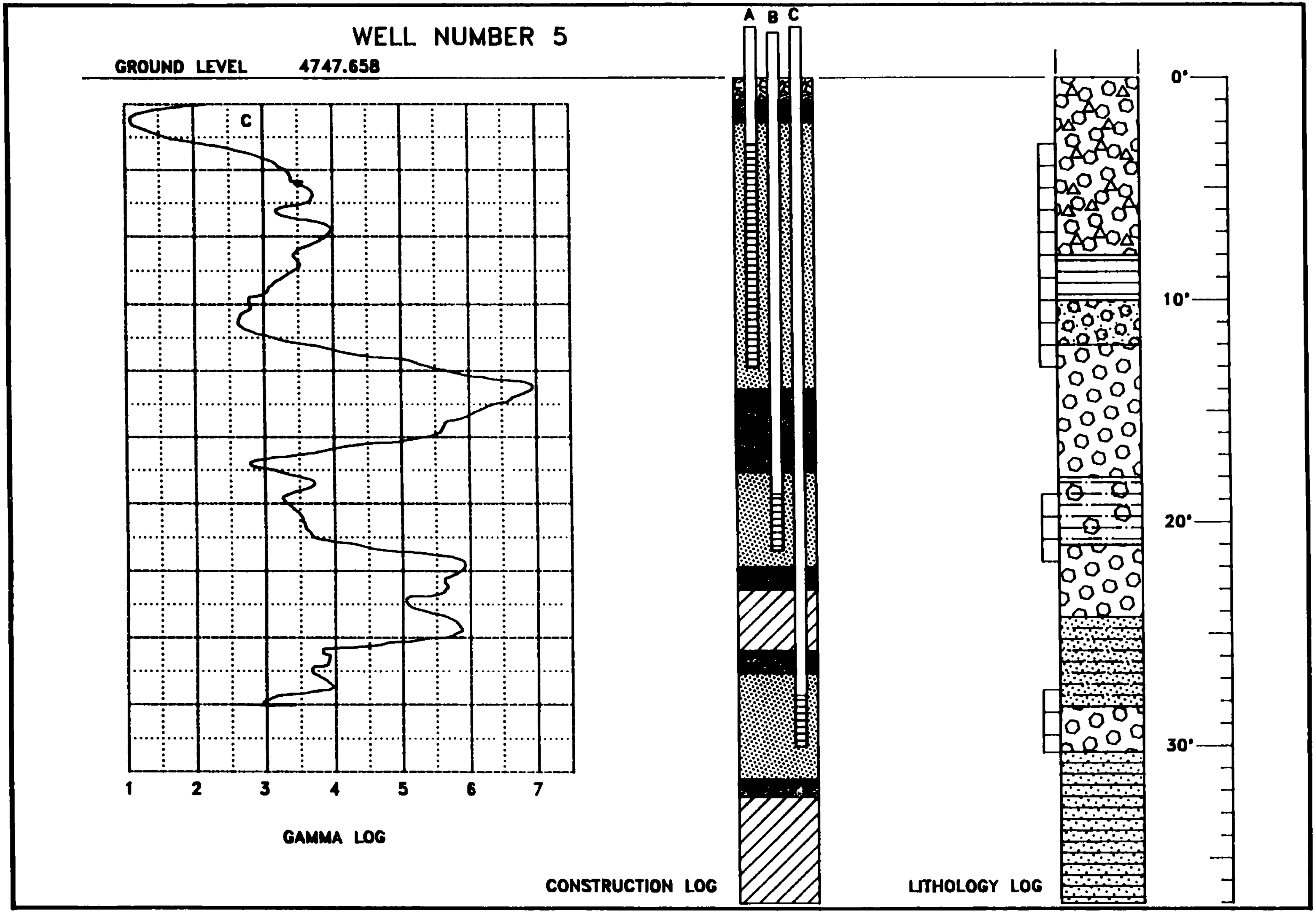

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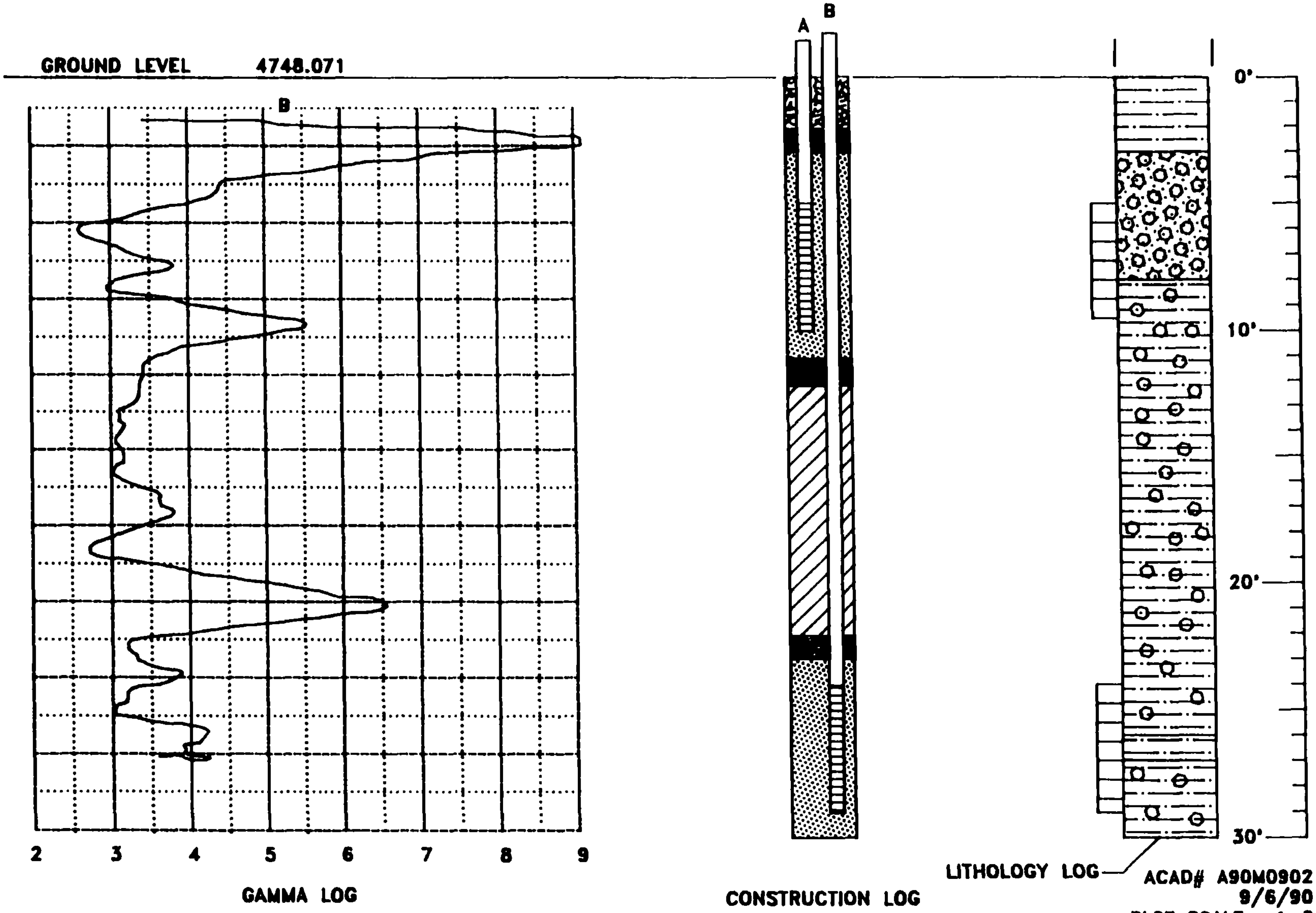

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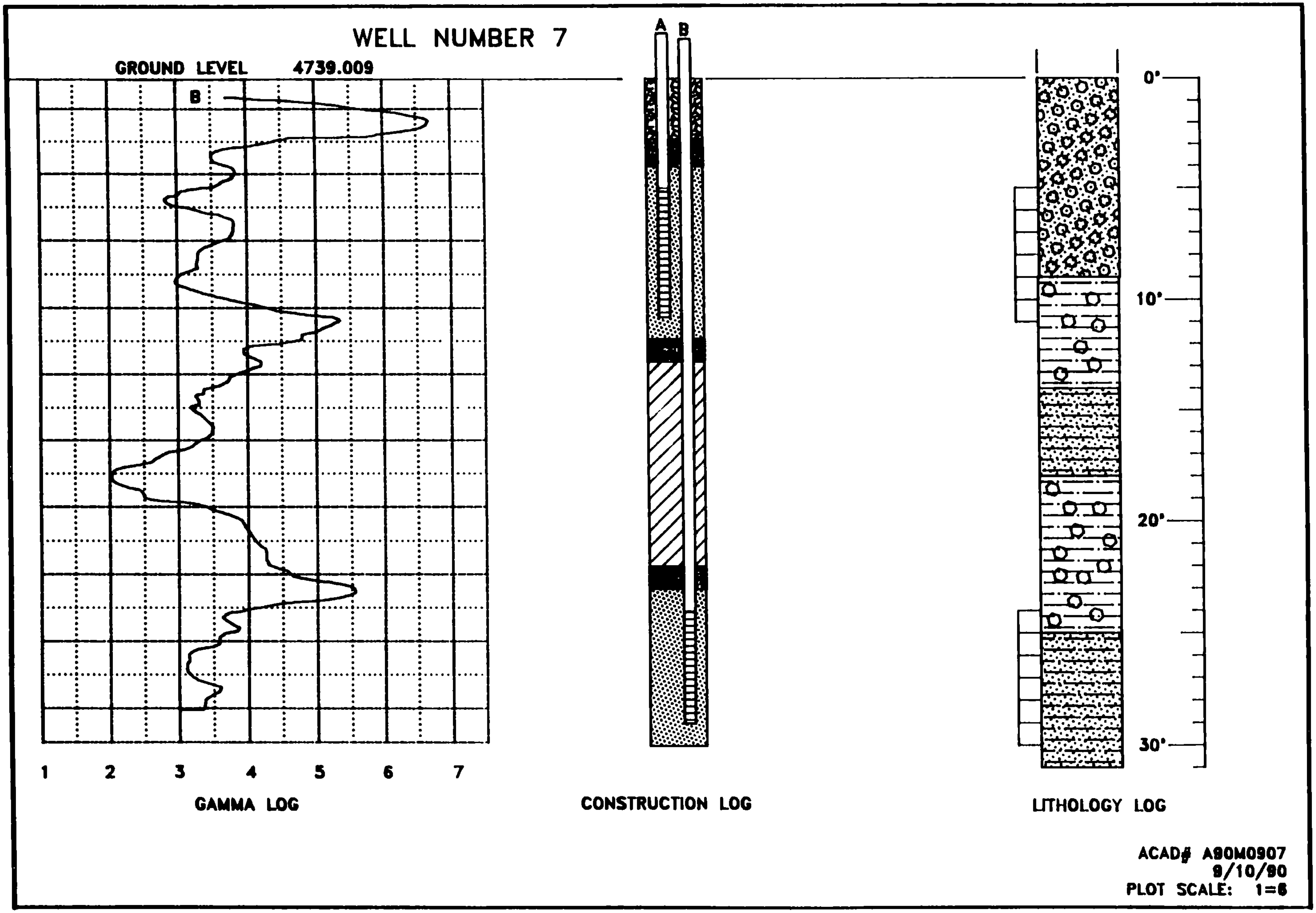
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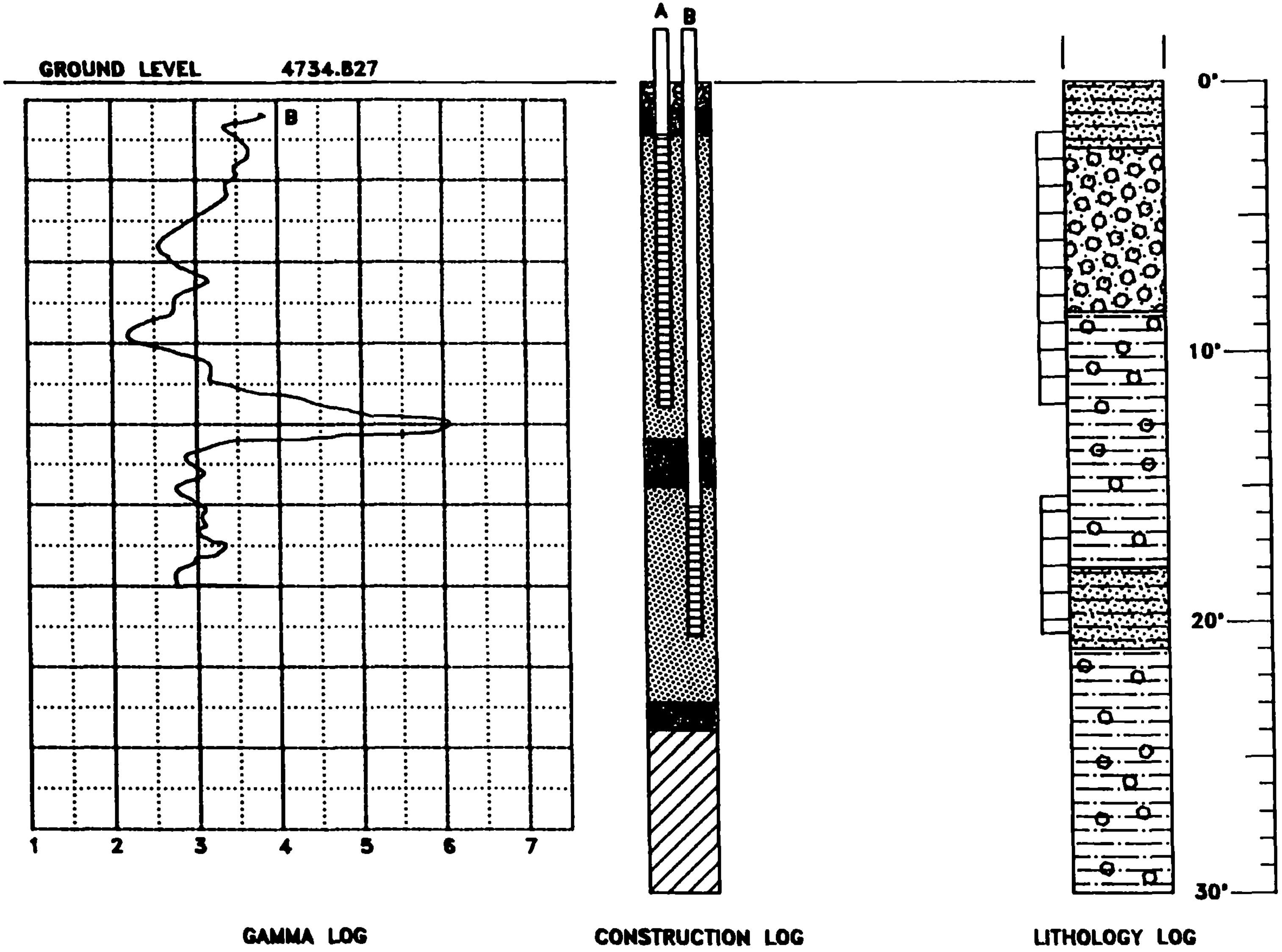
A
B
0'
10'
20'
30'
1
2
3
4
5
6
7
GAMMA LOG
CONSTRUCTION LOG
LITHOLOGY LOG
ACAD# A90M0907
9/10/90
PLOT SCALE: 1=6

WELL NUMBER 8



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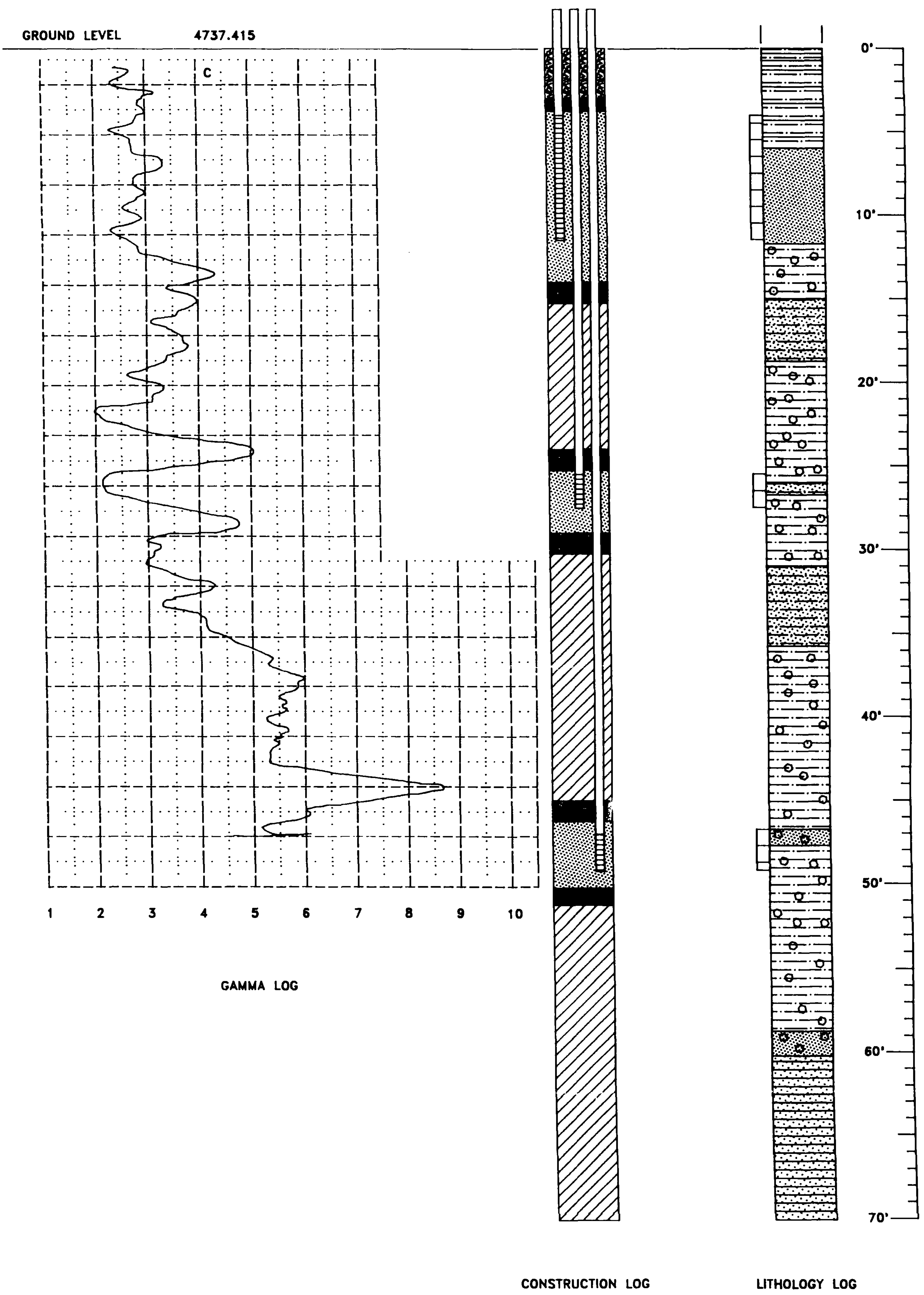

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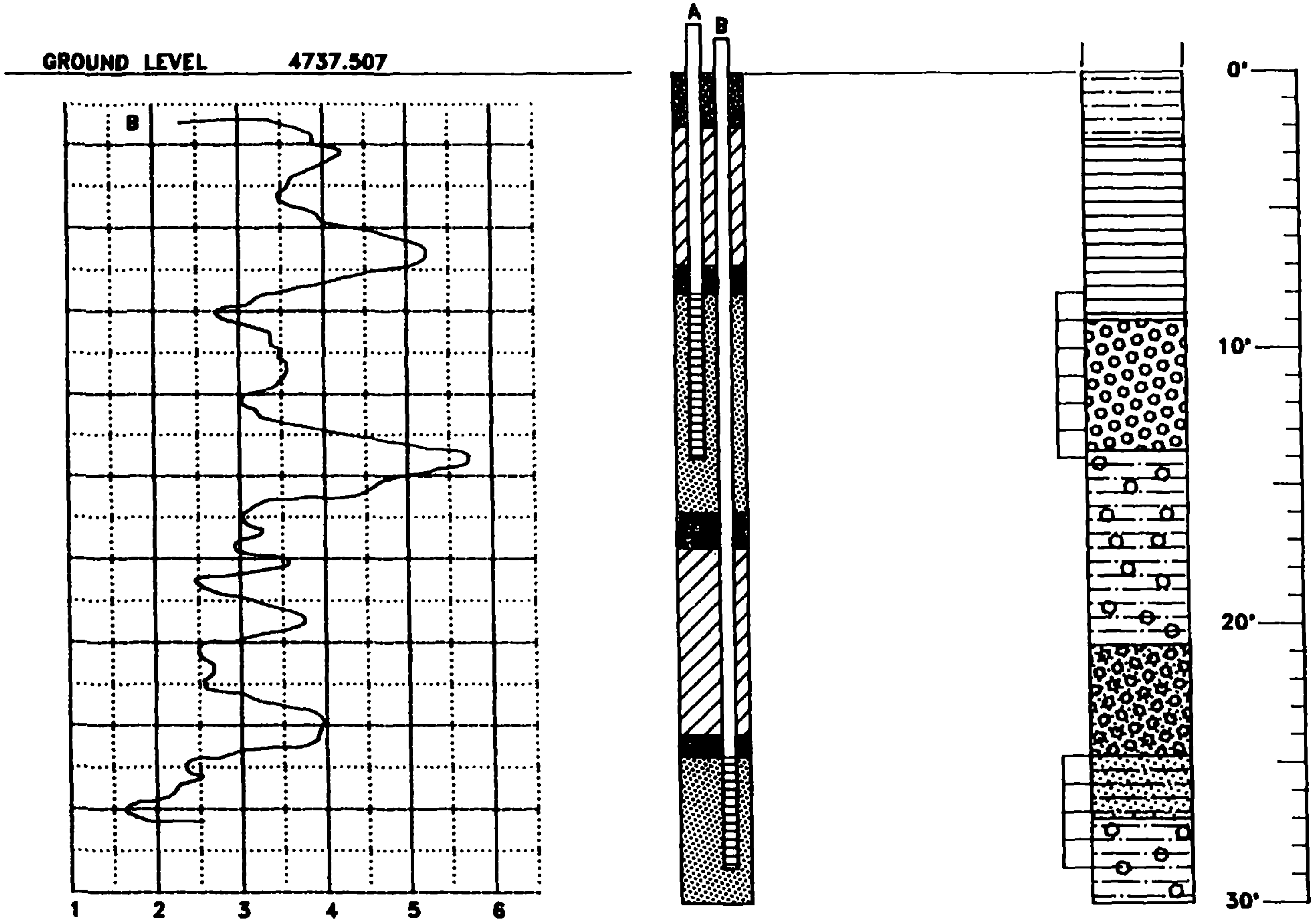

GAMMA LOG

CONSTRUCTION LOG

LITHOLOGY LOG

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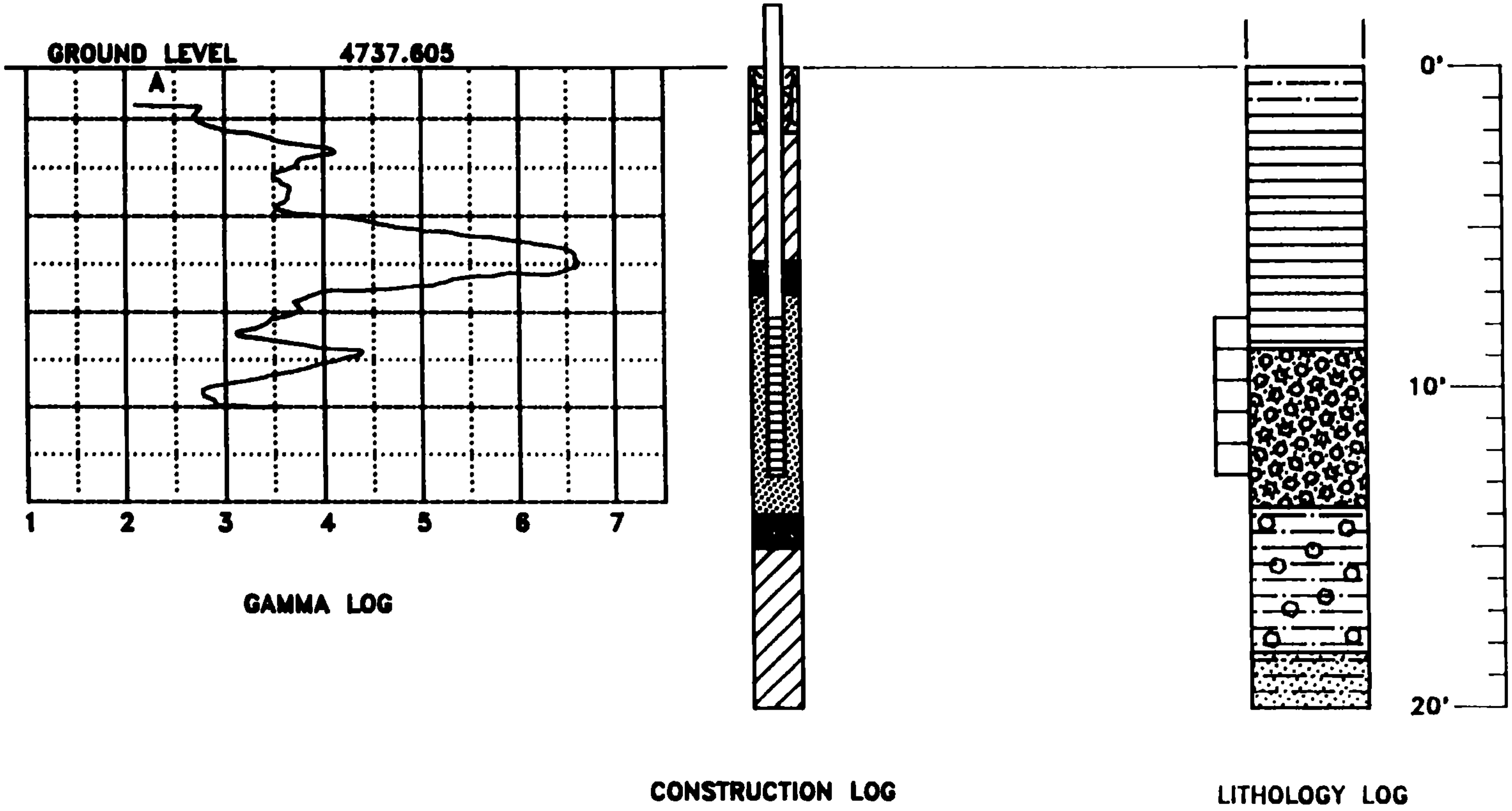

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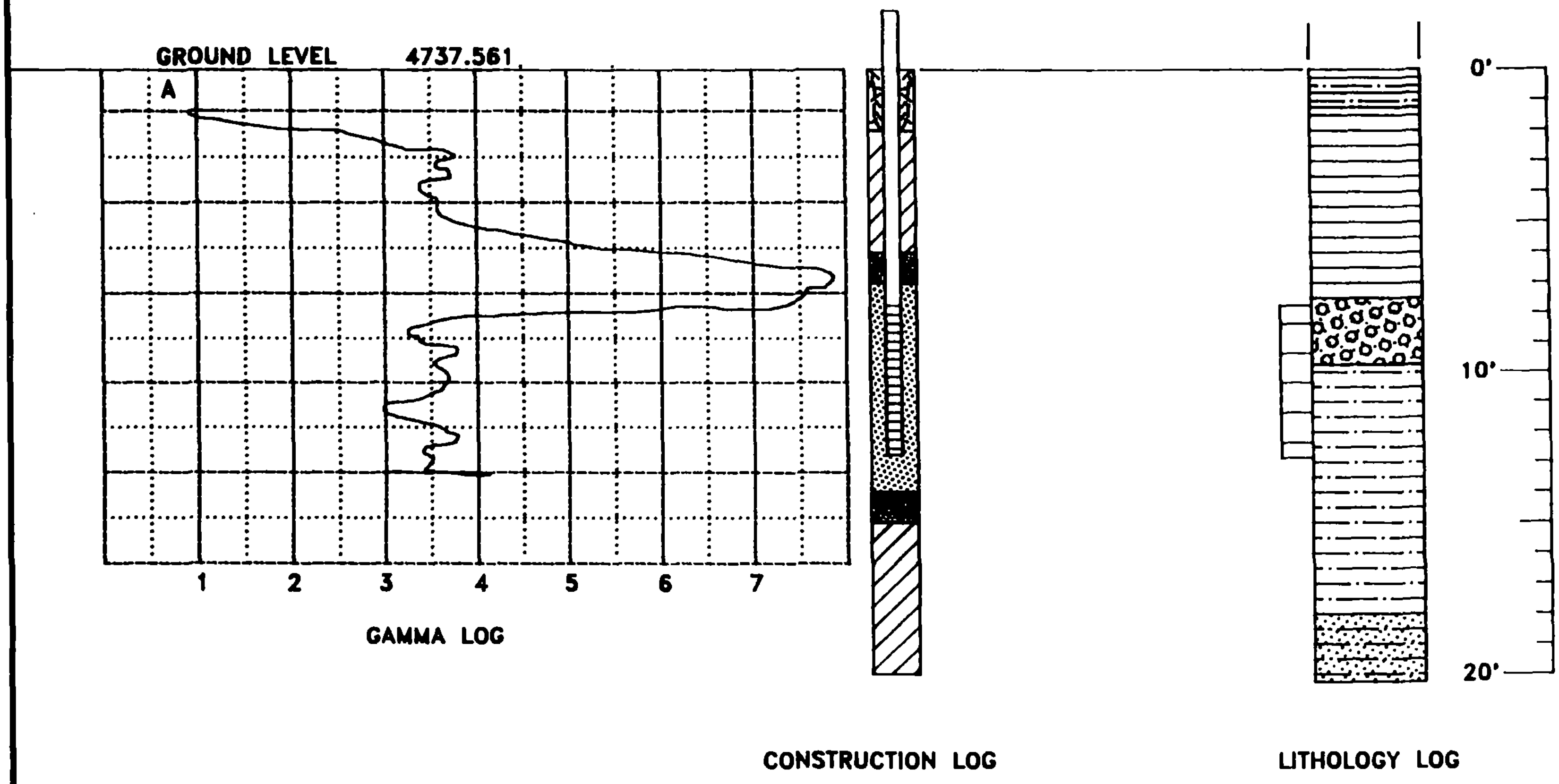

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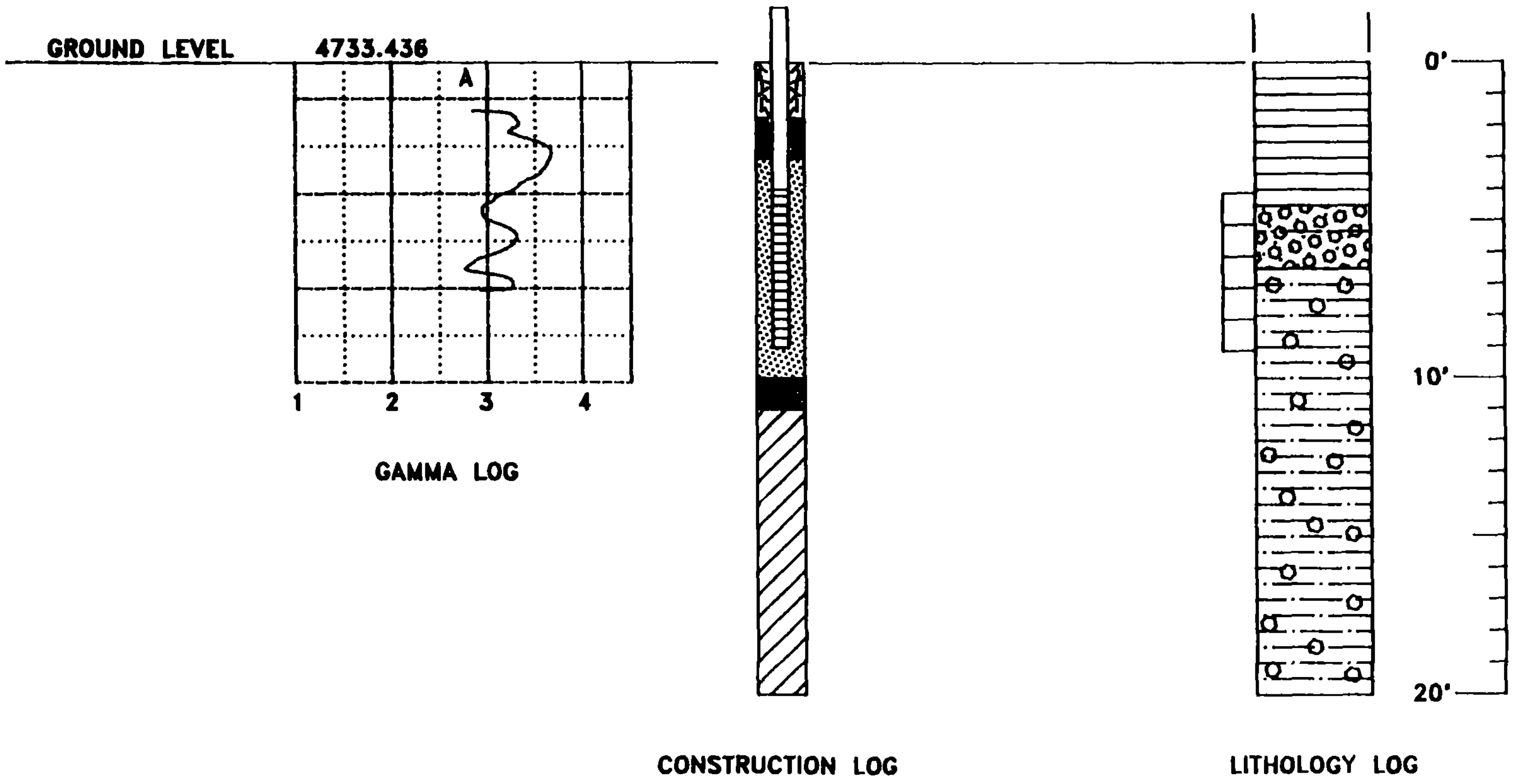

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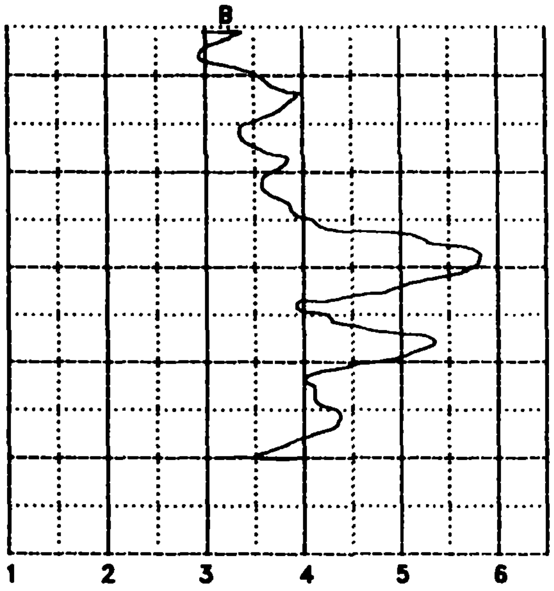

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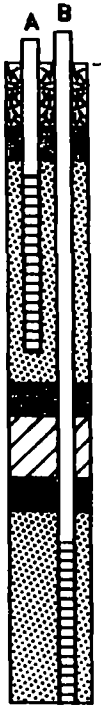

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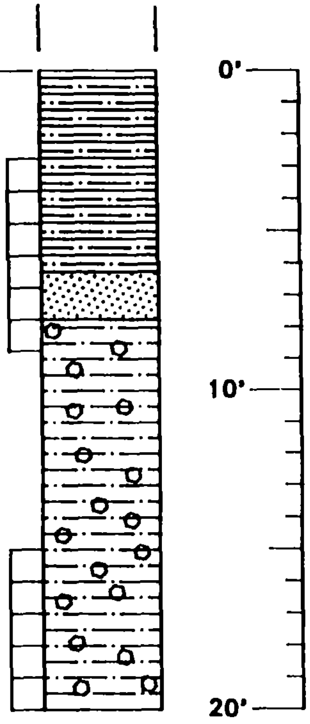

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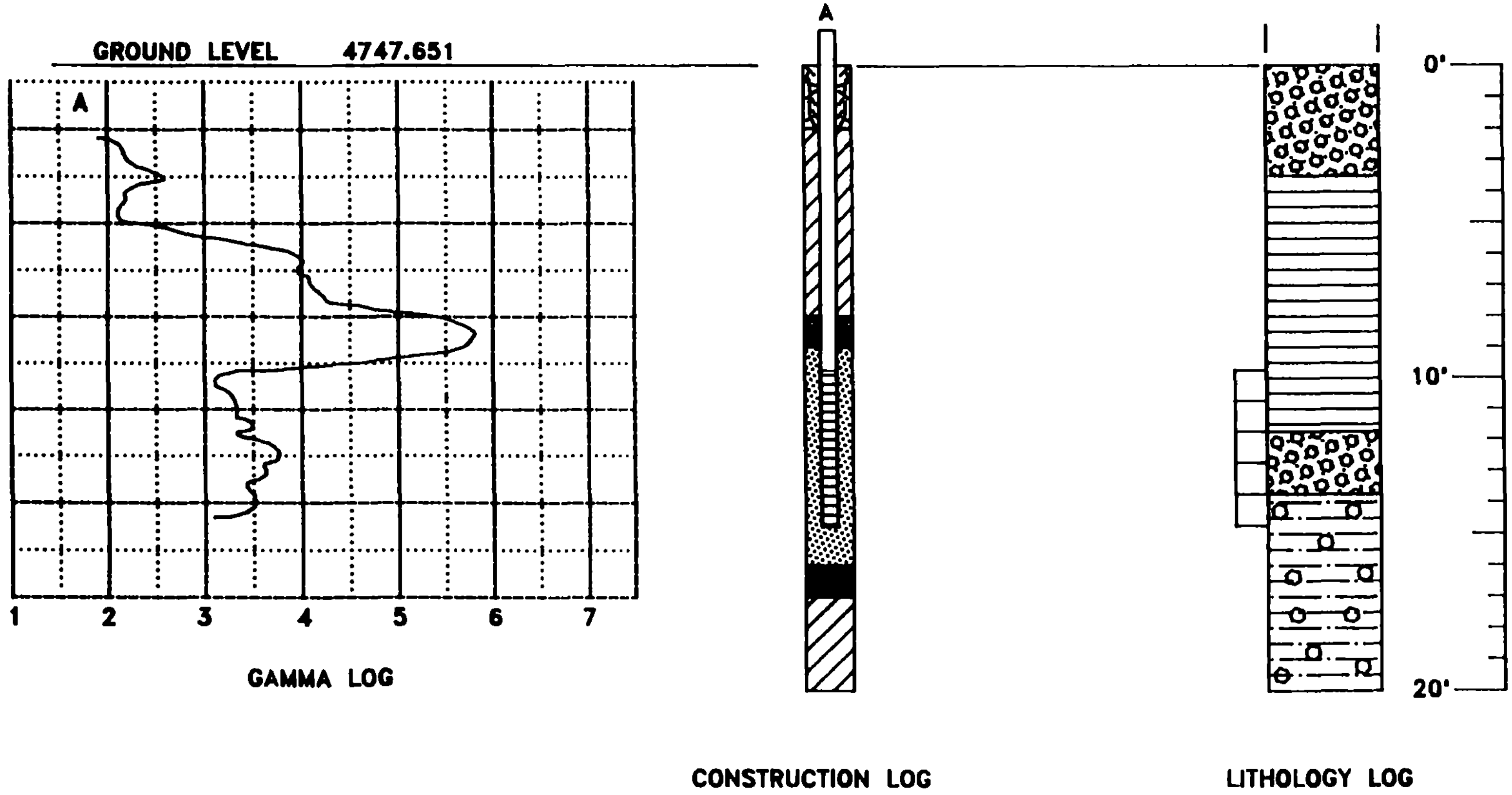

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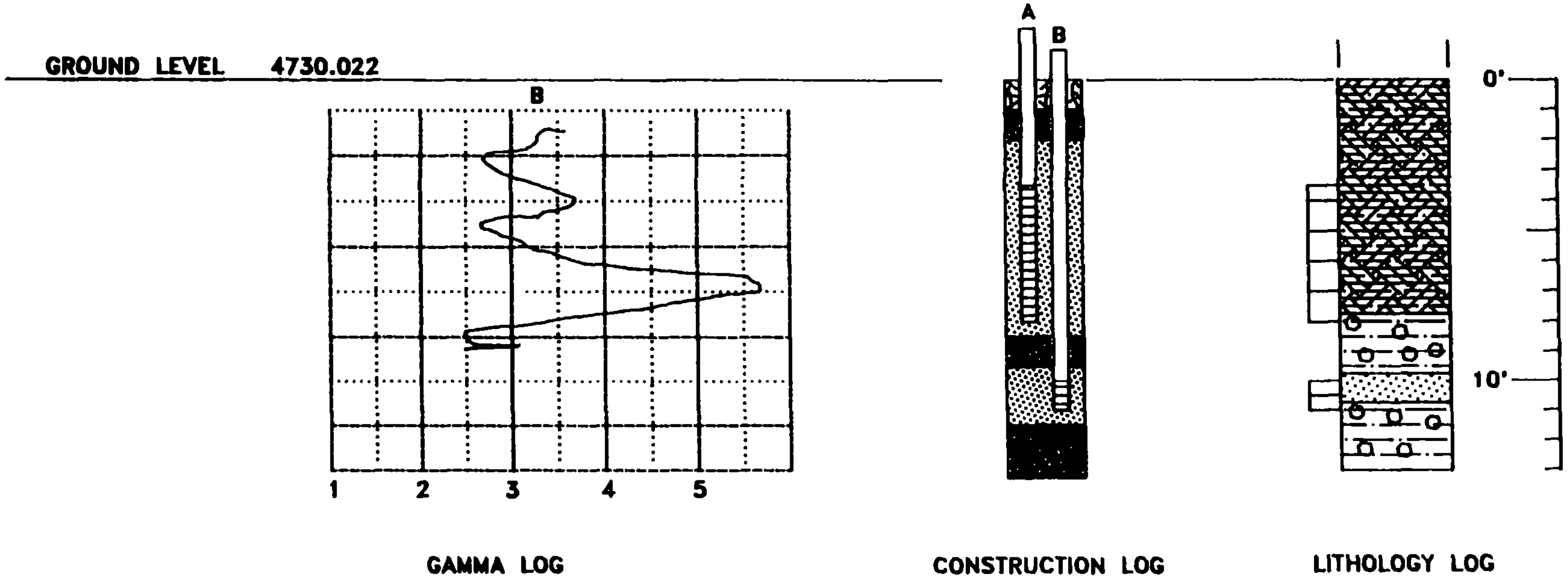

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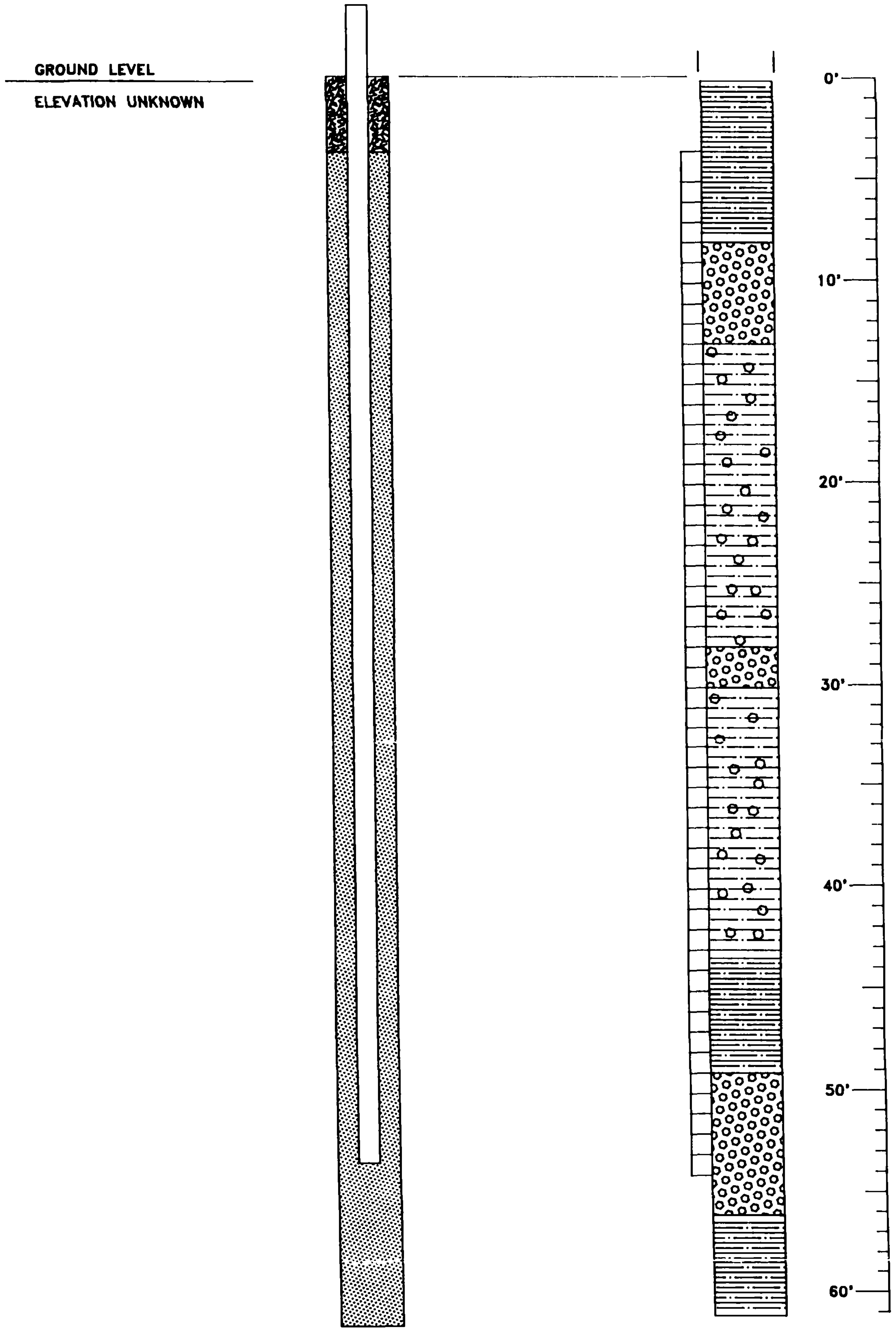

CONSTRUCTION LOG

LITHOLOGY LOG

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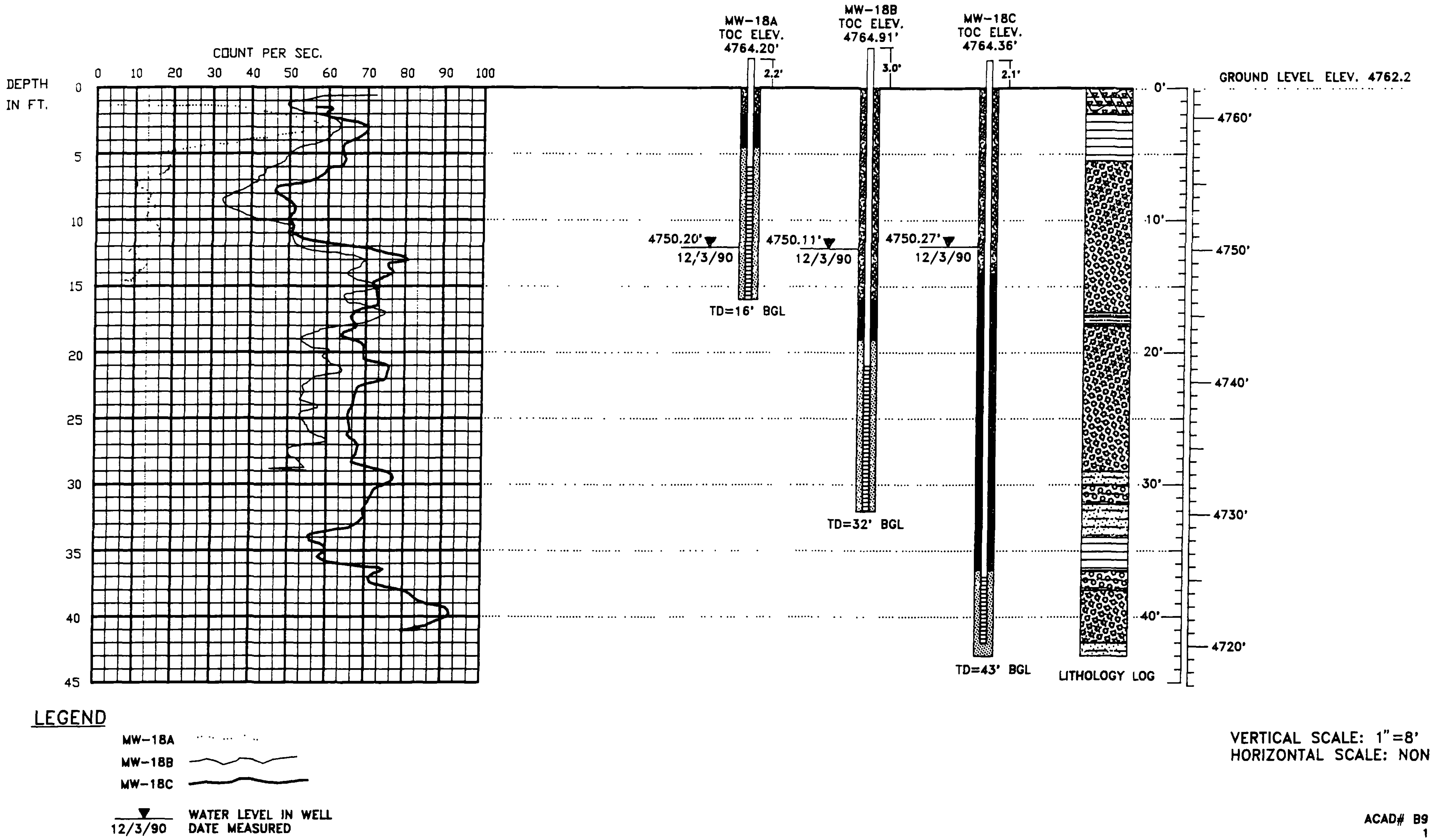
9/7/90
PLOT SCALE: 1=6

GAMMA LOG

WELL NEST 18



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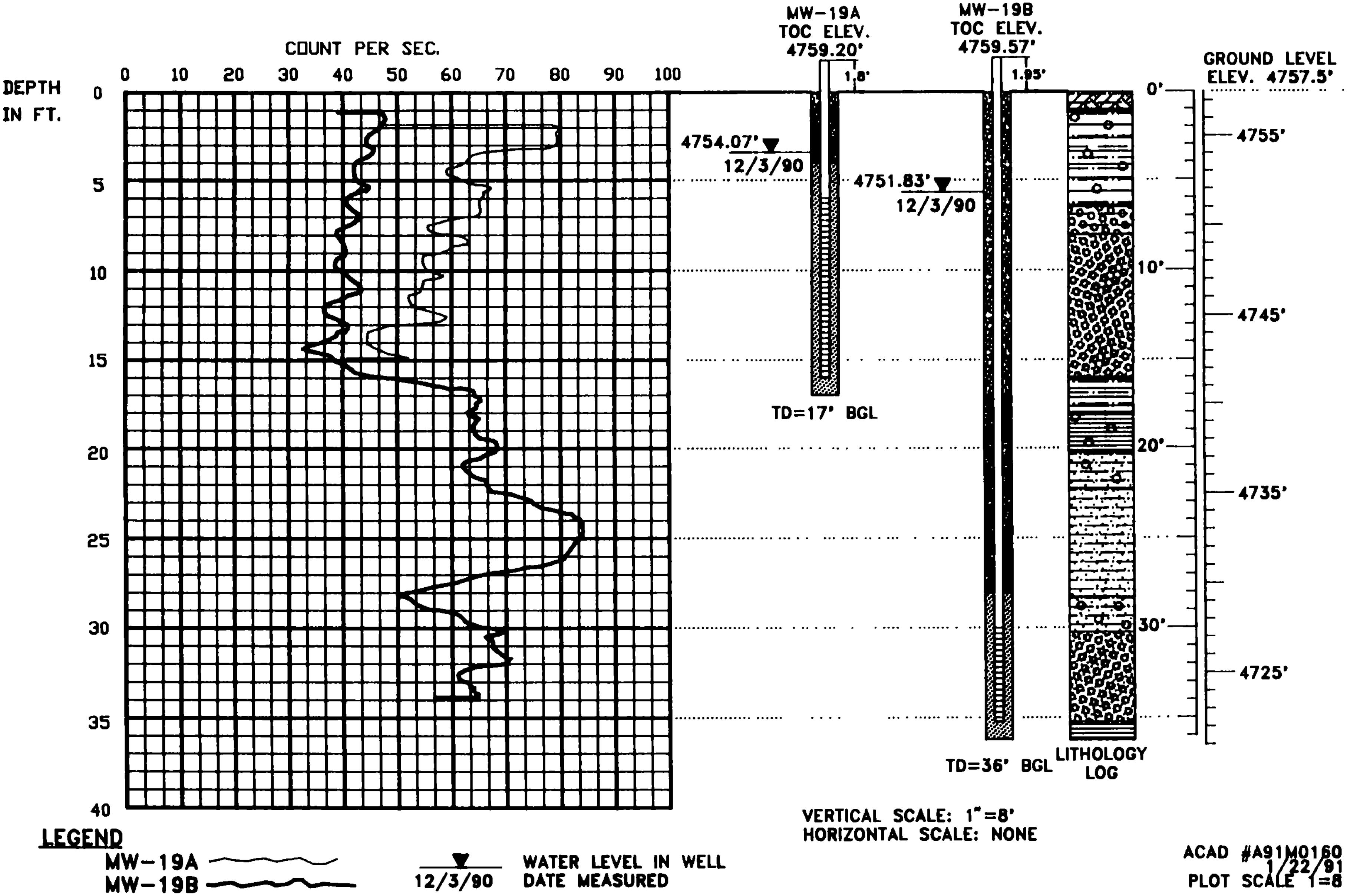
HORIZONTAL SCALE: NONE

ACAD# B91M0159
1/23/91
PLOT SCALE 1=8

GAMMA LOG WELL NEST 19



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HORIZONTAL SCALE: NONE

ACAD #A91M0160
1/22/91
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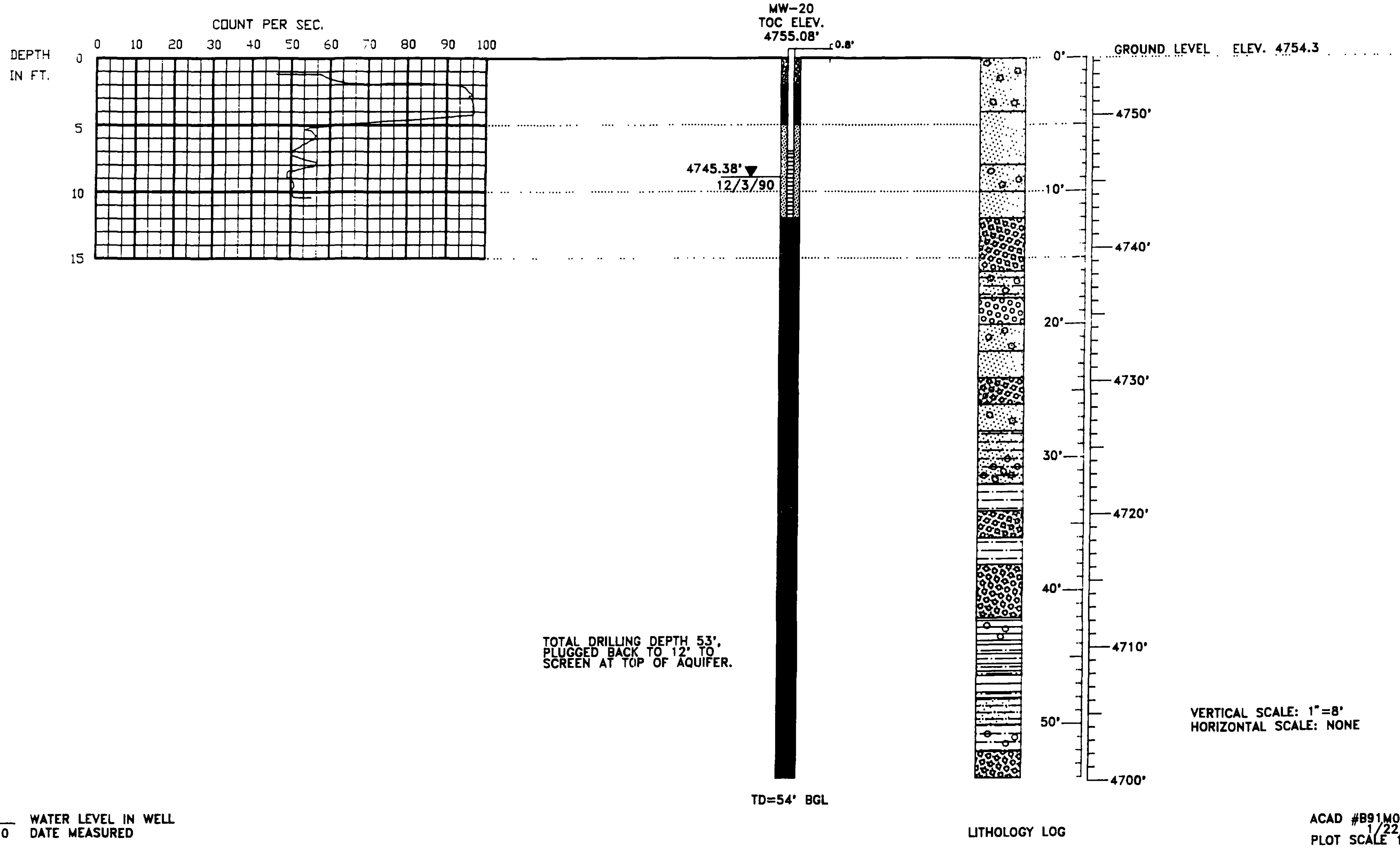

TOTAL DRILLING DEPTH 53', PLUGGED BACK TO 12' TO SCREEN AT TOP OF AQUIFER.

VERTICAL SCALE: 1"=8'
HORIZONTAL SCALE: NONE

LEGEND:

▼ 12/3/90 WATER LEVEL IN WELL DATE MEASURED

ACAD #B91M0161
1/22/91
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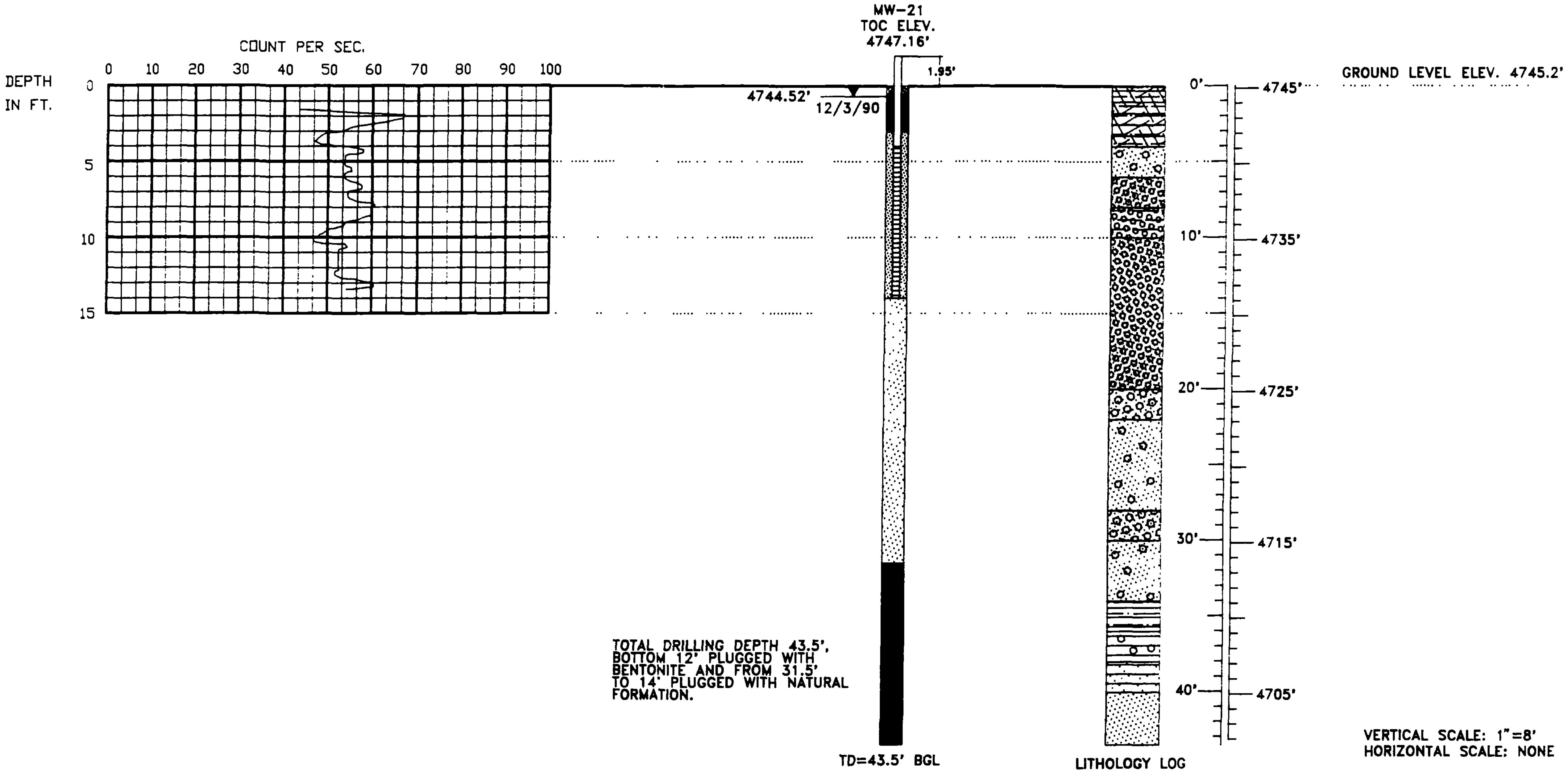

TOTAL DRILLING DEPTH 43.5', BOTTOM 12' PLUGGED WITH BENTONITE AND FROM 31.5' TO 14' PLUGGED WITH NATURAL FORMATION.

VERTICAL SCALE: 1"=8'
HORIZONTAL SCALE: NONE

LEDGEND:

▼ WATER LEVEL IN WELL
12/3/90 DATE MEASURED

ACAD# B91M0162
1/22/91
PLOT SCALE 1=8

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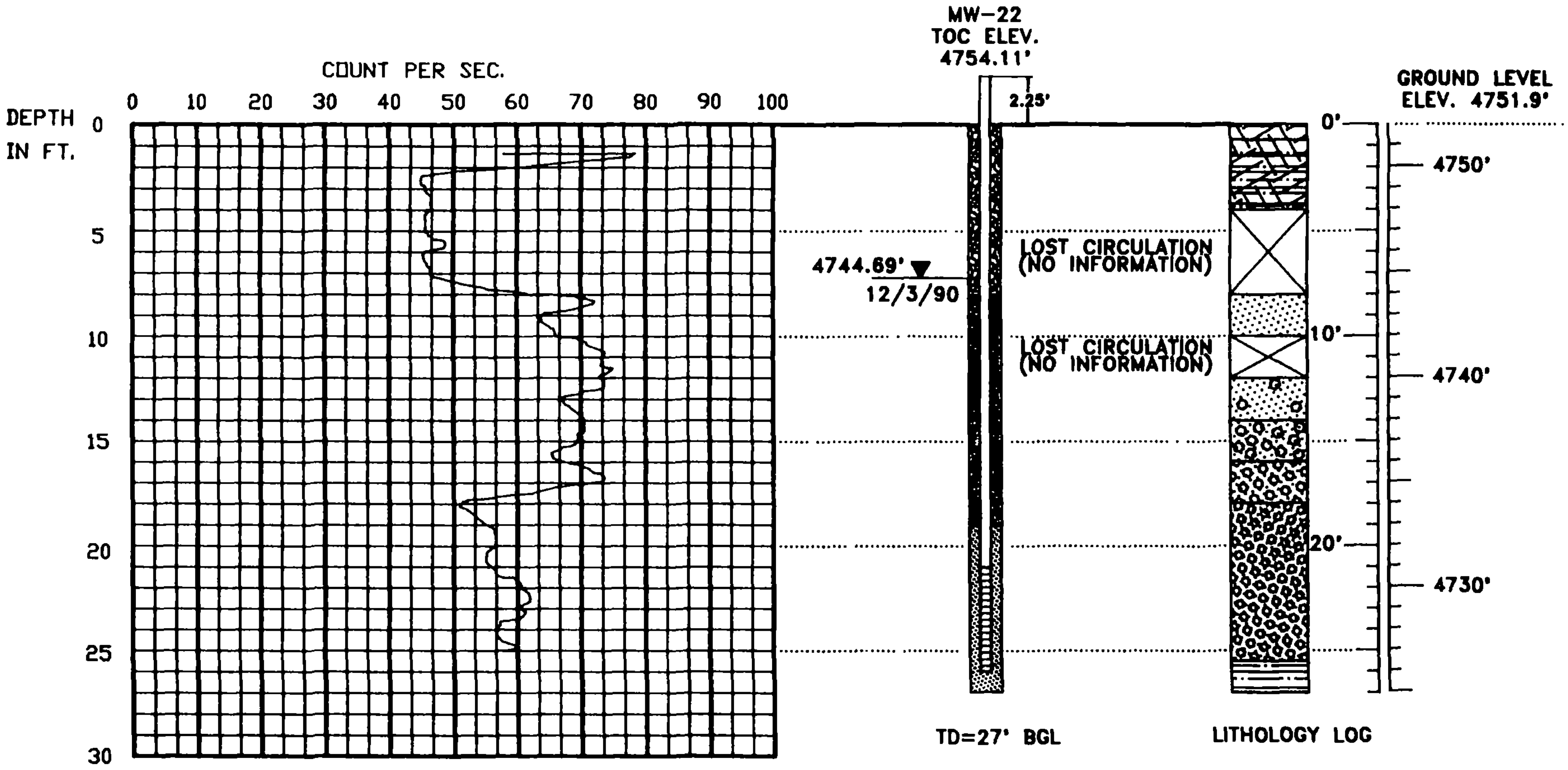

VERTICAL SCALE: 1"=8'
HORIZONTAL SCALE: NONE

LEGEND

▼ 12/3/90	WATER LEVEL IN WELL DATE MEASURED

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1/22/91
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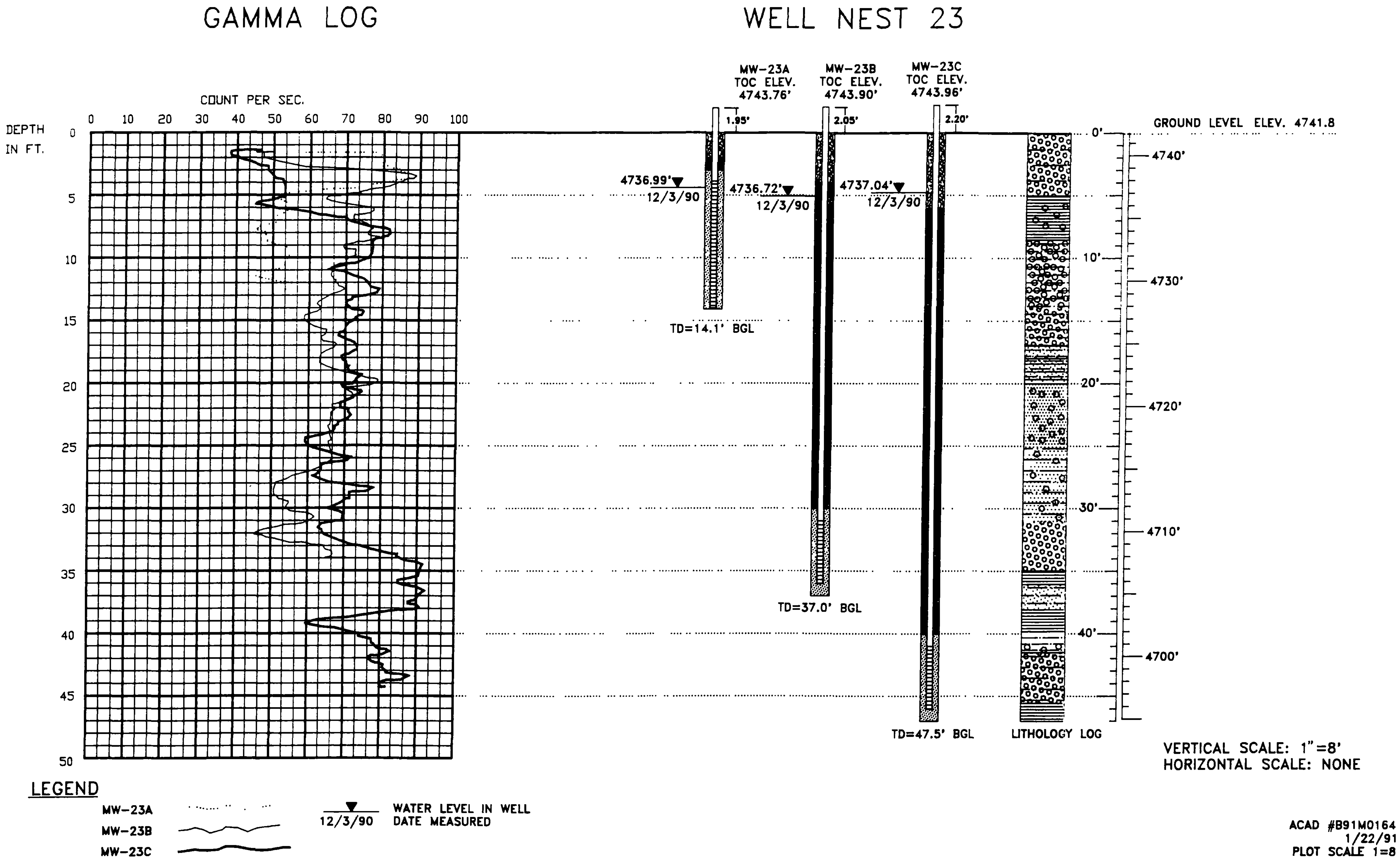
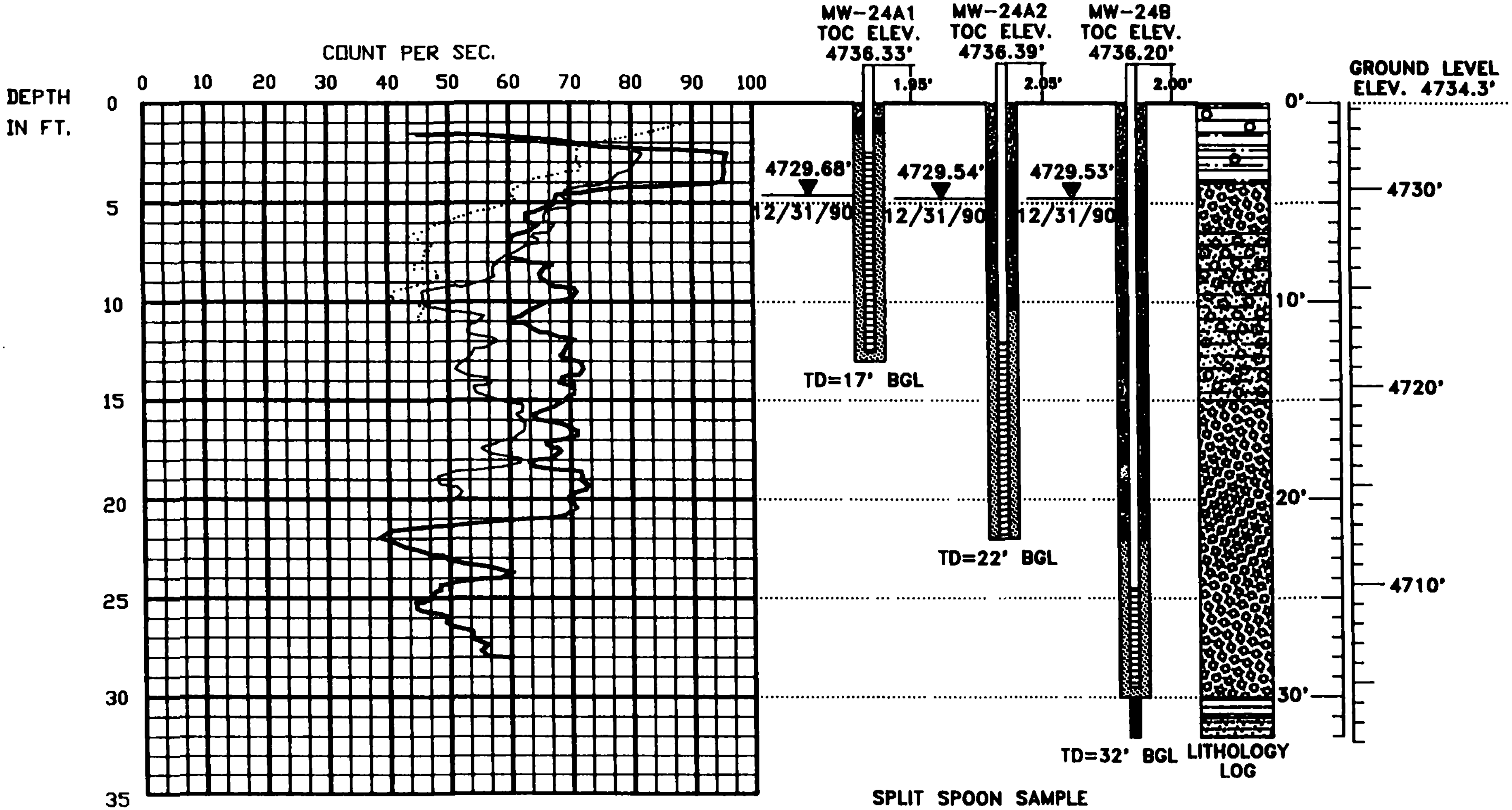

GAMMA LOG
WELL NEST 23
COUNT PER SEC.
0 10 20 30 40 50 60 70 80 90 100
DEPTH IN FT.
0
5
10
15
20
25
30
35
40
45
50
MW-23A TOC ELEV. 4743.76'
MW-23B TOC ELEV. 4743.90'
MW-23C TOC ELEV. 4743.96'
1.95'
2.05'
2.20'
4736.99'
12/3/90
4736.72'
12/3/90
4737.04'
12/3/90
TD=14.1' BGL
TD=37.0' BGL
TD=47.5' BGL
LITHOLOGY LOG
GROUND LEVEL ELEV. 4741.8
0'
10'
20'
30'
40'
4740'
4730'
4720'
4710'
4700'
VERTICAL SCALE: 1"=8'
HORIZONTAL SCALE: NONE
LEGEND
MW-23A
MW-23B
MW-23C
12/3/90
WATER LEVEL IN WELL
DATE MEASURED
ACAD #B91M0164
1/22/91
PLOT SCALE 1=8

GAMMA LOG WELL NEST 24



SPLIT SPOON SAMPLE
TAKEN FROM 30' TO 32'

VERTICAL SCALE: 1"=8'
HORIZONTAL SCALE: NONE

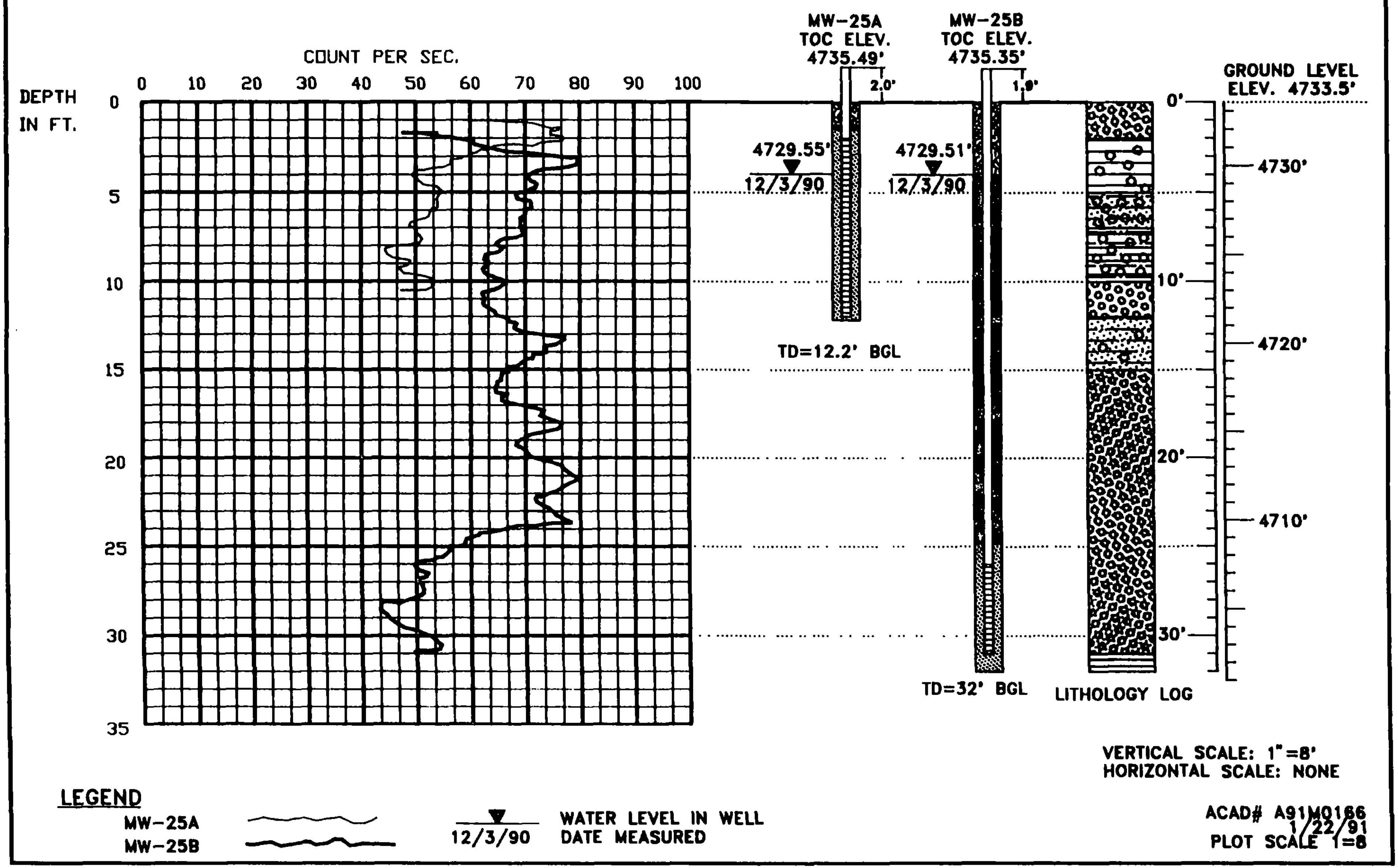
LEGEND

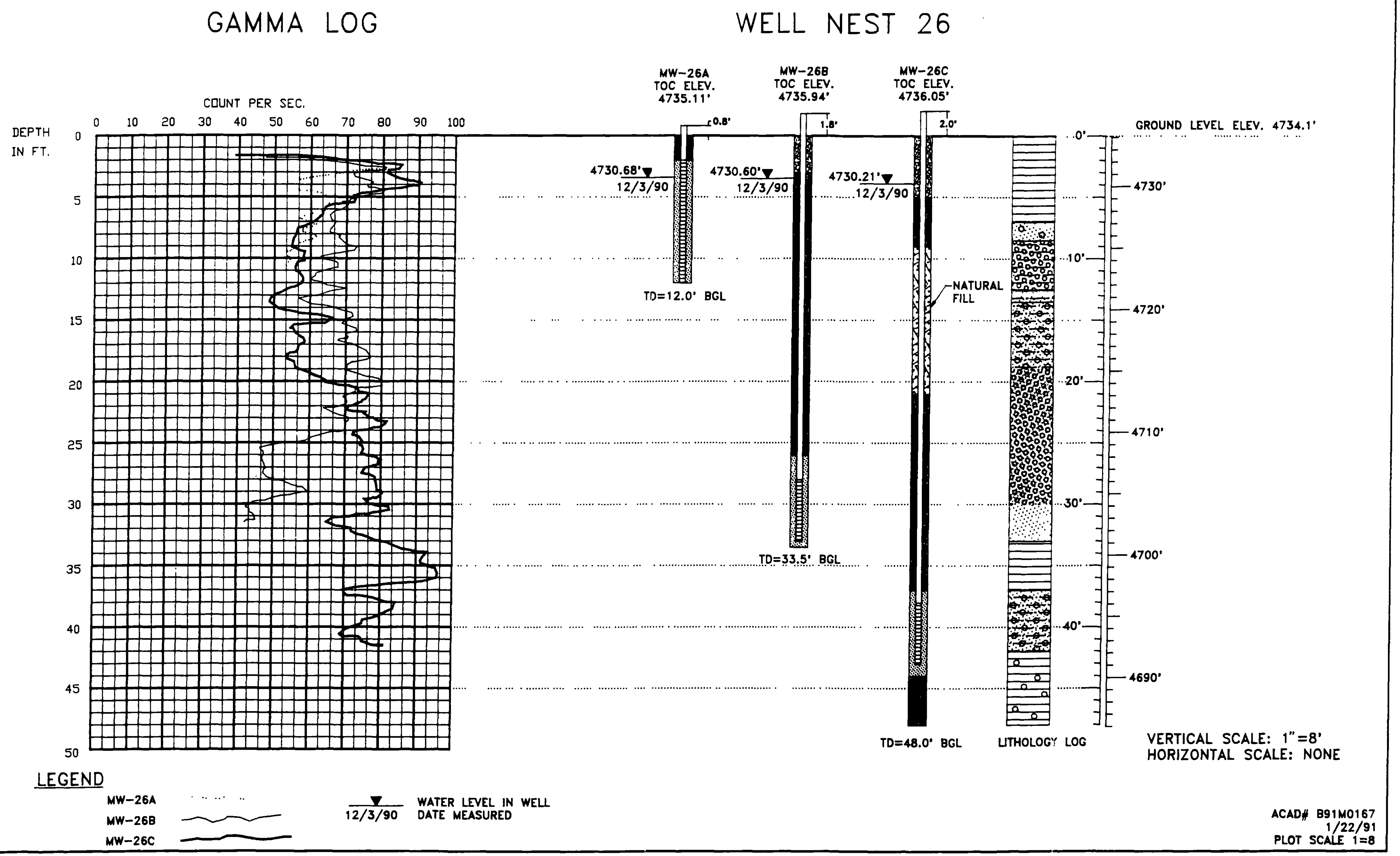
MW-24A1 ⋯⋯
MW-24A2 ～～
MW-24B ━━

▼ 12/31/90 WATER LEVEL IN WELL DATE MEASURED

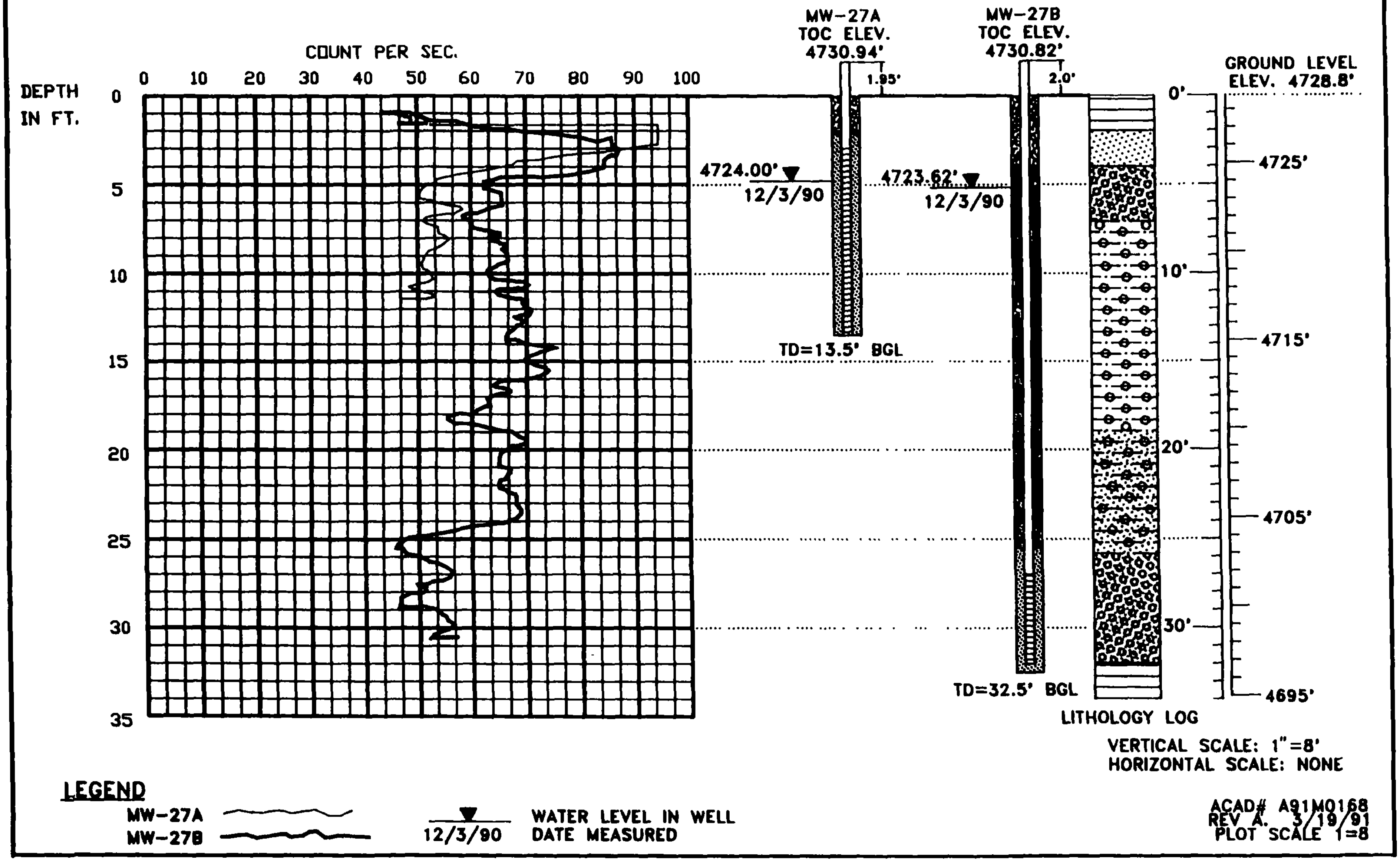
ACAD# A91M0165
1/23/91
PLOT SCALE 1=8

GAMMA LOG WELL NEST 25




GAMMA LOG
WELL NEST 26
COUNT PER SEC.
0 10 20 30 40 50 60 70 80 90 100
DEPTH IN FT.
0 5 10 15 20 25 30 35 40 45 50
MW-26A TOC ELEV. 4735.11'
MW-26B TOC ELEV. 4735.94'
MW-26C TOC ELEV. 4736.05'
0.8'
1.8'
2.0'
4730.68'
12/3/90
4730.60'
12/3/90
4730.21'
12/3/90
TD=12.0' BGL
TD=33.5' BGL
TD=48.0' BGL
NATURAL FILL
LITHOLOGY LOG
0' 10' 20' 30' 40'
GROUND LEVEL ELEV. 4734.1'
4730' 4720' 4710' 4700' 4690'
VERTICAL SCALE: 1"=8'
HORIZONTAL SCALE: NONE
LEGEND
MW-26A
MW-26B
MW-26C
WATER LEVEL IN WELL
12/3/90 DATE MEASURED
ACAD# B91M0167
1/22/91
PLOT SCALE 1=8

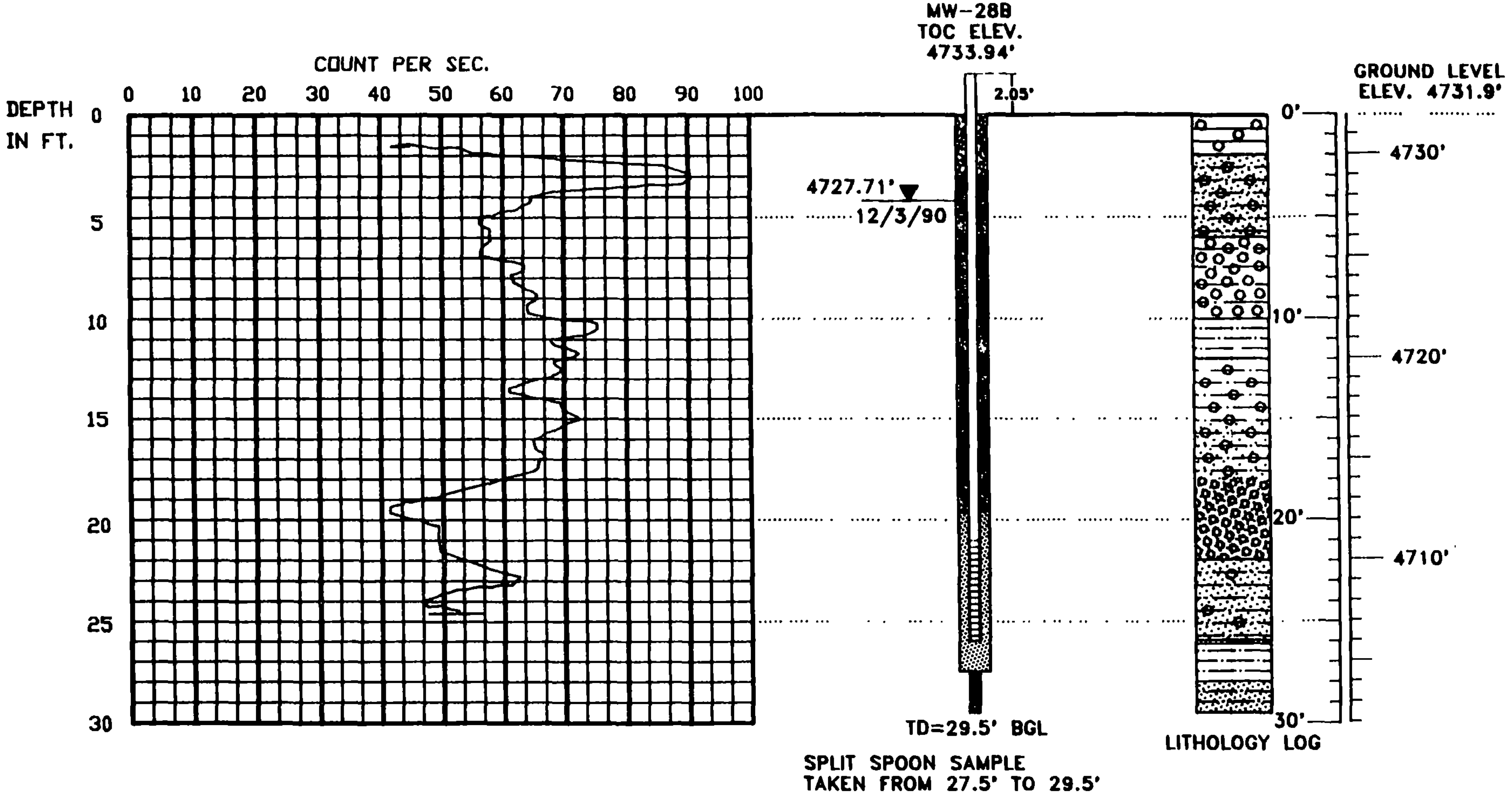
GAMMA LOG WELL NEST 27



VERTICAL SCALE: 1"=8'
HORIZONTAL SCALE: NONE

ACAD# A91M0168
REV A. 3/19/91
PLOT SCALE 1=8

GAMMA LOG WELL NUMBER 28B



LEGEND:

▼	WATER LEVEL IN WELL
12/3/90	DATE MEASURED

VERTICAL SCALE: 1"=8'
HORIZONTAL SCALE: NONE

ACAD# A91M0169
1/22/91
PLOT SCALE 1=8

BORING/WELL LOG DATA

Project: Idaho Pole RI/FS Page: Date: Well Boring No. MW-18A

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0-2.0′		Top Soil - w/cinders, sand
2.0′- 5.5′		Clay - brown, moist, plastic
5.5′- 12.5′		Gravel - fine to medium w/sand and silt, cobbles
12.5′- 16.0′		Gravel, fine to medium, same cobbles, w/fine to medium sand, saturation @ 13.0′
16.0′ TD		
		Logged By: K.P. Manchester

BORING/WELL LOG DATA

Project: Idaho Pole RI/FS Page: Date: Well Boring No. MW-18B

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0-2.0′		Top Soil - w/cinders, sand
2.0′- 5.5′		Clay - brown, moist, plastic
5.5′- 12.5′		Gravel - fine to medium w/sand and silt, boulder @ 8′, very tough drillings 8-12.5′ - cobbles and boulders
12.5′- 16.0′		Gravel, fine to medium, same cobbles, w/fine to medium sand, saturation @ 13′
16.0′- 19.0′		Gravely hardpan - hard drilling, gravel was dry - no moisture in reverse circulation returns
19.0′-20.0′		Gravel, fine to medium w/sand and silt
20.0- 24.5′		Gravel, fine to medium with increasing silt, some sand
24.5′- 31.0′		Gravel and cobbles
31.0′-32.0′		Clay, light brown w/silt, some sand, poor returns
32.0′ - TD		
		Logged By: K.P. Manchester

BORING/WELL LOG DATA

Project: Idaho Pole RI/FS Page: Date: Well Boring No.MW-18C

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0 - 2.0′		Black Cinder Fill
2.0′- 3.0′		Fine Sand and Silt
3.0′- 3.25′		Clay
3.25′- 10.0′		Coarse Sand and Gravel
10.0′- 17.0′		Coarse Sand and Gravel with Minor Silt; Water @ 12.5′
17.0′- 18.0′		Seam of Sand and Silty Clay
18.0′- 29.0′		Coarse Gravel with Sand and Some Silt, Wet
29.0′- 30.0′		Sand and Silt Seam - Wet
30.0′- 31.5′		Silty Gravel, Wet
31.5′- 35.0′		Fine, Sandy Silt DRY ZONE/NO WATER
35.0′- 36.5′		Silty Clay DRY ZONE/NO WATER
36.5′- 38.0′		Silty Gravel w/Clay - Wet
38.0′- 42.0′		Fine Gravel and Coarse Sand, Some Silt - Water bearing
42.0′- 43.0′		Silty Sand - Wet
43.0′		TD
		Recorded By: Dave Tuesday

BORING/WELL LOG DATA

Project: Idaho Pole RI/FS Page: Date: Well Boring No. MW-19A

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0-2.0'		Silt and clay loam, black, moist
2.0'- 4.0'		Sand, fine with gravel
4.0'- 6.0'		Gravel with sand and silt, tan
8.0'- 10.0'		Gravel, fine, angular, black, red, tan
10.0'- 12.0'		Sand, fine, with silt
12.0'- 14.0		Sand, fine to coarse w/small gravel, rounded
14.0'- 16.0'		Gravel moderately rounded, w/fine sand, and tan silt
16.0'-		Clay @ 16.0'
16.0' - TD		
		Logged By: John Ruth

BORING/WELL LOG DATA

Project: Idaho Pole RI/FS Page: Date: Well Boring No. MW-198

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0-1.0′		Top Soil
1.0′- 6.5′		Clay - w/silt, sand, gravel
6.5′- 8.0′		Gravel - w/silt
10.0′- 16.0′		Gravel, fine to medium, w/ silt and sand
16.0′- 18.0′		Silt and Clay - w/some sand, soft drilling
18.0′-20.0′		Clay - with gravel
20.0- 22.0′		Silt, brown w/gravel, sand and clay
22.0′- 28.0′		Silt, as above w/ little or no gravel
28.0′-30.0′		Siltstone - cemented, friable, with very fine sand
30.0′- 35.0′		Gravel - fine to medium, with sand, clay and silt
35.0′- 36.0′		Clay - light brown, plastic, poor returns
36.0′ - TD		
		Logged By K.P. Manchester

BORING/WELL LOG DATA

Project: Idaho Pole RI/FS Page: Date: Well Boring No. MW-20

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0-2.0′		Sand, fine to coarse, w/some fine gravel
2.0′- 6.0′		Sand, fine to coarse w/black silt, clay and fine gravel
6.0′- 8.0′		Sand, fine to medium, w/some fine angular gravel, moist
8.0′- 10.0′		Sand, medium to coarse, w/35% coarse to medium moderately rounded gravel, very moist
10.0′- 12.0′		Sand, very coarse, angular to moderately rounded, 10% moderately rounded pebbles
12.0′- 16.0′		Gravel, angular to moderately rounded, black and tan in color w/coarse sand, wet
16.0′- 18.0′		Sand, fine to medium, 10% gravel as above, 15% silt
18.0′- 20.0′		Gravel, black, red, tan, mostly black basalt, 10% coarse sand
20.0′- 22.0′		Sand, very coarse, multi-colored, angular w/35% small to medium gravel, multi-colored, and angular, slight oily odor
22.0′- 24.0′		Sand, fine, with some silt, some fine gravel, very oily smell, oily sheen or drilling fluid
24.0′- 26.0′		Gravel, black and tan, moderately rounded with coarse sand
26.0′- 28.0′		Sand, multi-colored, fine to coarse, angular with some fine gravel, angular
28.0′- 30.0′		Siltstone, brown, poorly to moderately cemented, w/ some fine sand and some gravel, black, angular
30.0′- 32.0′		Sand, light brown, weakly cemented, very fine to fine, with 40% gravel, fine, black, and some silt
32.0′- 34.0′		Silt, light brown w/some sand, very fine to fine and w/some medium to fine gravels
34.0′-36.0′		Gravel, black, multi-colored, angular medium to fine, w/coarse angular sand
36.0′- 38.0′		Silt, light brown, w/some fine sand, some angular gravel
38.0′- 42.0′		Gravel, angular to moderately rounded w/some very coarse sand
42.0′- 44.0′		Gravel, as above w/30% light brown sticky clay
44.0′- 46.0′		Clay, light brown, moist, w/silt, sticky
46.0′- 48.0′		Silt, light brown, w/some clay

BORING/WELL LOG DATA

Project: Idaho Pole RI/FS Page: 2 Date: Well Boring No. MW-20

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
48.0'- 50.0'		Silt, as above with 25% fine sand
50.0'- 52.0'		Silt, as above, 25% gravel, 15% fine sand, gravel has abundant siltstone fragements
52.0'- 54.0'		Gravel, moderately rounded, w/sand, coarse
54.0'- TD		
		Logged By: John Ruth

BORING/WELL LOG DATA

Project: Idaho Pole RI/FS Page: Date: Well Boring No. MW-21

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0 - 4.0′		Soil, brown silt - clay loam, with some fine sand and fine gravel, wet
4.0′- 6.0′		Sand, tan, red, black, very fine to coarse, with medium gravel
6.0′- 8.0′		Gravel, fine to medium, angular, with fine to coarse sand, no water w/returns
8.0′- 10.0′		Gravel, as above w/ some silt
10.0′- 12.0′		Gravel, multi-colored, medium, angular w/ coarse sand, making water
12.0′- 14.0′		Gravel, multi-colored, fine to medium, moderately rounded with 35-45% sand, black, fine to medium grained and w/some silt
14.0′- 22.0′		Gravel, multi-colored, fine to medium, with medium to coarse sand, gravel at 20-22% is chert, angilrite, basalt, sandstone, siltstone
22.0′- 24.0′		Sand, very fine to medium grained, wet, with some silt
24.0′- 28.0′		Sand, very fine to coarse, with silt and w/some gravel. No odor or visible sign of contamination
28.0′- 30.0′		Gravel, angular to moderately rounded, with some fine to coarse and and silt
30.0′- 32.0′		Sand, medium to coarse with some fine angular gravel
32.0′- 34.0′		Sand, fine to coarse, angular, moderately rounded, w/ some medium gravel
34.0′- 36.0′		Clay, tan, very silty, sticky w/some fine sand
36.0′- 38.0′		Clay, as above with fine to medium gravel
38.0′- 40.0′		Clay, as above, with sand, very coarse, angular and with some medium gravel, moist
40.0′- 42.0′		Sand, fine to coarse, with some clay, dry to slightly damp
42.0′- 43.5′		Sand, fine to medium, dry to slightly damp
43.5′- TD		
		Logged By: John Ruth

BORING/WELL LOG DATA

Project: Idaho Pole RI/FS Page: Date: Well Boring No. MW-22

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0 - 4.0′		Loamy soil, black, silty w/some coarse sand
4.0′- 8.0′		No returns, pulled bit out of hole - scrape black clay off drill string, oily sheen on clay
8,0′- 14.0′		Sand, coarse, angular to moderately rounded w/some gravel, no returns from 10-12′, dry
14.0′- 16.0′		Sand and gravel, sand, coarse grained, gravel, fine, moderately rounded, dry
16.0′- 25.5′		Gravel, multi-colored, angular to moderately rounded with very coarse to coarse sand. Oil coming up with water @ 25′
25.5′- 27.0′		Clay, brown, sticky, with gravel and some sand
27.0′- TD		
		Logged By: John Ruth

BORING/WELL LOG DATA

Project: Idaho Pole Page: Date: Well Boring No. MW-23A

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0′- 5′		Fill Material - Gravel and Clay
5′ - 8.5′		Black-Grey Silty Clay, Some Clay-Bound Gravel
8.5′ - 14′		Silty Gravel - Wet, But Not Very Clay Bound
14′		TD
		Reported By: Dave Tuesday

BORING/WELL LOG DATA

Project: Idaho Pole Page: Date: Well Boring No. MW-23B

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0′ - 5′		Fill: Gravel With Some Silt and Clay
5′ - 8.5′		Black-Gray Silty Clay, Some Gravel
8.5′		Wood Chips - Former Swamp?
8.5′ - 17′		Silty Gravel - Wet Large cobbles at 13.5 and at 16′- Wet
17′ - 18′		Brown Sand and Silt at 17′ Damp
18′ - 20′		Silty Sand and Clay, Very Wet With Gravel
20′ - 25′		Clean Sand and Gravel and Silty Water
25′		Mostly Sand (Medium to Coarse) and Gravel and Silt; Water
32′		Grading with depth to More Gravel, Less Sand
32′ - 35′		Clean Gravels - Much Water
35′ - 35.5′		Gravel Grading to Clay
35.5′ - 37′		Fine Sand/Silty Clay Confining Layer
37′TD		
		Reported By: Dave Tuesday

BORING/WELL LOG DATA

Project: Idaho Pole Page: Date: Well Boring No. MW-23C

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0′ - 5′		Fill: Gravel With Some Silt and Clay
5′ - 8.5′		Black-Gray Silty Clay, Some Gravel
8.5′		Wood Chips - Former Swamp
8.5′ - 17′		Silty Gravel - Wet Large Cobbles at 13.5 and at 16′ - Wet
17′ - 18′		Brown Sand and Silt at 17′-Damp
18′ - 20′		Silty Sand and Clay, Very Wet With Gravel
20′ - 25′		Clean Sand and Gravel and Silty Water
25′		Mostly Sand, Sand Medium to Coarse and Gravel and Silt; Water
32′		Grading With Depth to More Gravel, Less Sand
32′ - 35′		Clean Gravels - Much Water
35′- 36′		Silty Clay, No Water, Minor Fine Gravel
36 - 39.5′		Silty Sand and Clay Grading to Fine, Hard Sand, Some Pebbles
39.5′ - 40.5′		Silty Clay with Minor Gravel
40.5′ - 41′		Small Gravel and Silty Clay
41′ - 42.5′		Silty Gravel With Clay, Wet, Not Much Water
42.5′ - 45′		Gravel and Sand-Wet and Silty
45′ - 46′		Gravels With Silt and Clay
46′ - 47.5′		Clay Zone II, Grades to Hard Sand, No Water
47.5′		T.D. at 47.5
		Reported By: Dave Tuesday

BORING/WELL LOG DATA

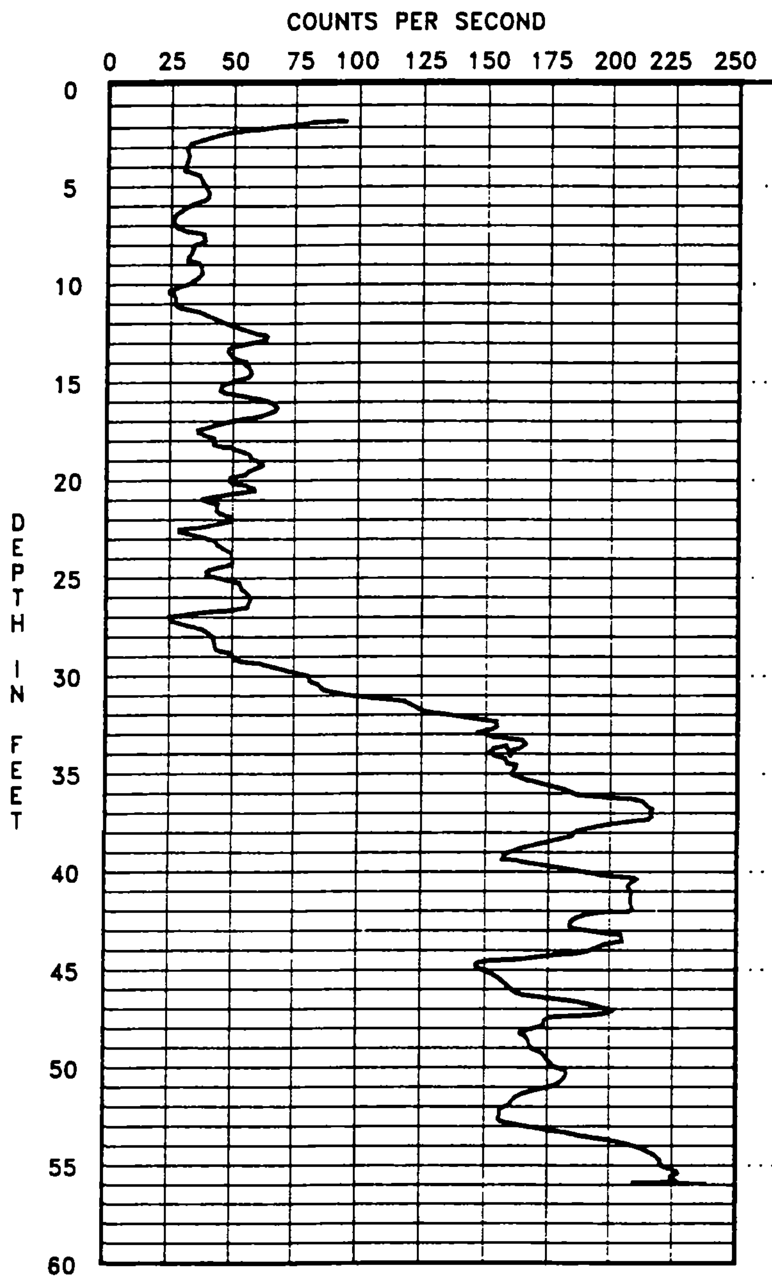
Project: Idaho Pole RI/FS Page: 1 Date:09/04/91 Well Boring No. 29D

DEPTH (FT)	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0 - 1.0		TOPSOIL, BLACK
1.0 - 2.0		GRAVEL WITH SILT AND SAND, DRY
2.0 - 4.0		SILTY SAND WITH FINE GRAVEL
4.0 - 11.0		SAND AND GRAVEL, MOIST, SATURATION @ 7 FT BGL
11.0 - 35.5		GRAVEL WITH SAND, MAKING LOTS OF WATER
35.5 - 46.0	35.5-37.5	CLAY, BROWN TO TAN, WITH SILT AND SOME SAND, SOME GRAVEL, MAKING NO WATER, HARD DRILLING AT 41 FT BGL
46.0 - 50.0		GRAVEL AND FINE SAND, WITH SILT AND SOME CLAY, MAKING SOME WATER, "DIRTY GRAVEL"
5.0 - 53.5	50.0-52.0	CLAY, BROWN WITH SILT, MOIST GRADING TO A CLAY WITH SILT AND FINE SAND
53.5 - 57.0		GRAVEL WITH SAND, MAKING ALOT OF WATER
57.0 - 58.5		CLAY, BROWN, WITH SILT AND SOME FINE SAND GRADING INTO A VERY FINE MOIST SAND
		LOGGED BY: K. MANCHESTER/ MSE

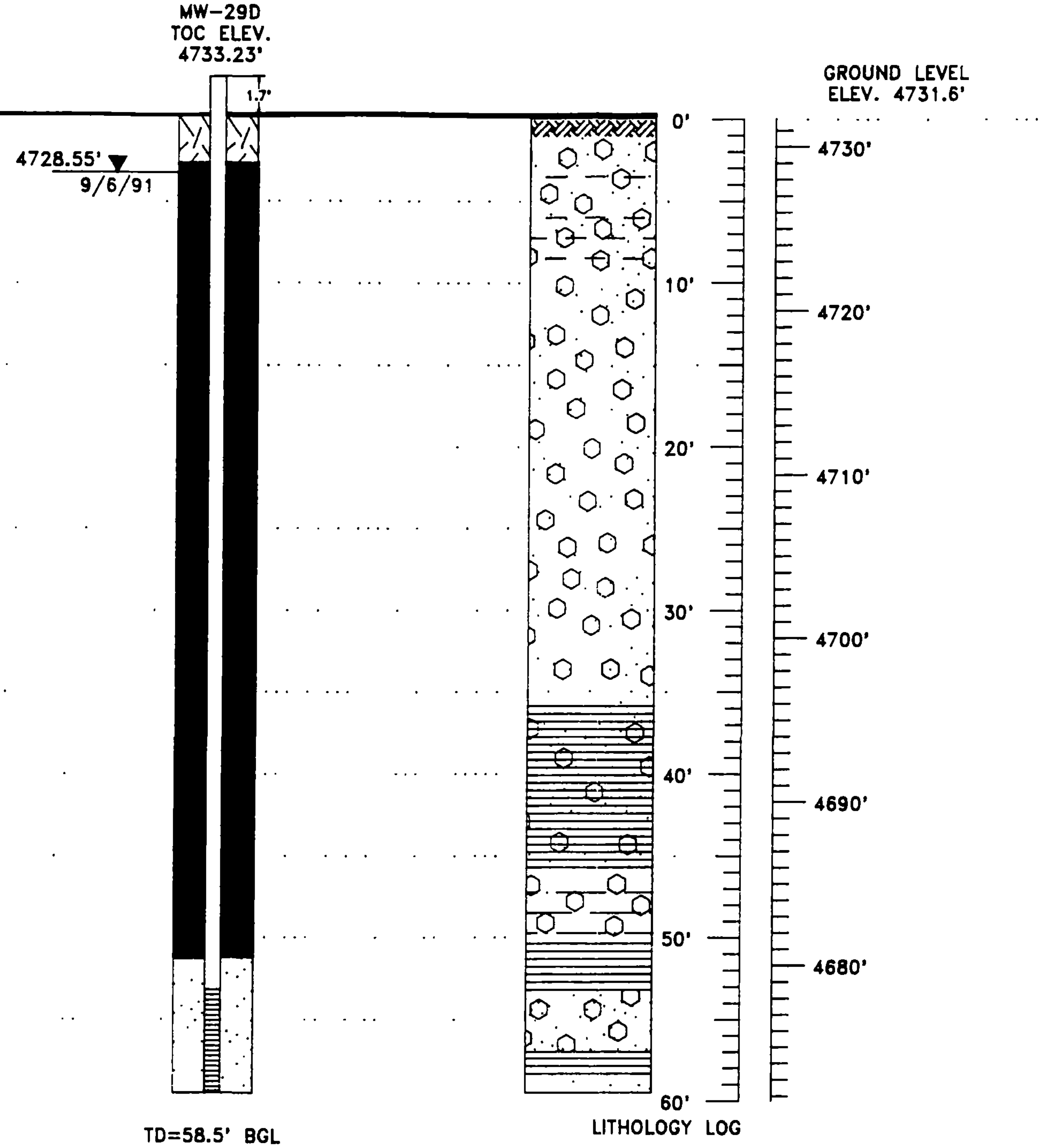
WELL CONSTRUCTION DETAILS FOR MONITORING WELL MW-29D

Well #	MW-29D
Date of Construction	06/09/91
Drilling Method	Air Rotary Casing Drive
Rig Type	Schram
Borehole Diameter	8"- 0' to 36' 6.5"- 36'to 58.5'
Well Casing	2"ID galvanized steel w/ couplings
Dielectric Casing to Screen Coupler	Yes
Screen Material	Stainless Steel Wire Wrap
Screen Length	5.0'
Screen Slot Size	.020"
Filter Pack Material	Colorado Silica Sand
Filter Pack Size	10-20 mesh
Filter Pack Volume	2 cubic ft.
Filter Pack Placement Method	Poured Down Annulus
Well Seal Material	3/8" bentonite chips
Seal Placement Method	Poured Down Annulus
Grout type	3/8" bentonite chips
Well Development	Pumped 10.0 gpm
Turbidity at End of Development	Clear
Protective Casing	Steel 6" ID
Top of Well Casing Elevation	4733.23'
Ground Elevation	4731.6'
Total Depth Drilled	58.5'
Stainless Steel Centralizer Above Screen	Yes

GAMMA LOG



WELL NUMBER 29D



TD=58.5' BGL

SPLIT SPOON SAMPLES
COLLECTED FROM
36'to 38' BGL
50'to 52' BGL

LEGEND

9/6/91 WATER LEVEL IN WELL
DATE MEASURED

MSE INC.
ACAD#: IP08-001
REV: - DATE: 10/7/91
DRAFTER: SL

BORING/WELL LOG DATA

Project: Idaho Pole Page: Date: Well Boring No. MW-24B

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0′ - 4′		Black Gray Clay/Silt, Some Gravel
4′ - 6′		Orangeish-Sand and Gravels
6′ - 13′		Silty Sand and Gravel, Gray, Damp,Not Much Water
13′ - 15′		Wet Silty Gravel and Sand
15′ - 18′		More Water at 15′; Cleaner Coarse Sand and Gravels
18′ - 20′		Very Little Silt - Coarse Sand and 1/2" Gravels, Lots of Water
20′ - 29.5′		Clean Sand and Gravel
29′ - 29 1/2′		Brown Water, Plugging Up Bit
29 1/2′ - TD		Clay Zone; Tan Silty Clay at 29.5, No Water
		Reported By: Dave Tuesday

BORING/WELL LOG DATA

Project: Idaho Pole Page: Date: Well Boring No. MW-25A

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0′ - 2′		Sand and Gravel - Dry
2′ - 5′		Brown-Black Silty Clay - Dry, Damp at 5′
5′ - 7′		Gravel and Sand - Minor Silt - Water
7′ - 10′		Silty Gravel and Sand - Wet
10′ - 12.2′		Clean Gravel and Sand - Lots of Water
12.2′ - TD		
		Recorded By: Dave Tuesday

BORING/WELL LOG DATA

Project: Idaho Pole Page: Date: Well Boring No. MW-25B

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0′ - 2′		Sand and Gravel-Dry
2′ - 4.25′		Brown-Black Clay and Gravel - Damp at 4′
4.25′ - 7′		Sand, Silt, and Gravel, Fine to Coarse Wet
7′ - 10.5′		Silty Gravel and Clay, Sand
10.5′ - 12′		Clean Gravel
12′ - 15′		Silty Sand, Wet, Fast Drilling Little Gravel - Wet
15′ - 17′		Gravel and Coarse Silty Sand, Much Water
17′ - 20′		Gravel and Coarse Silty Sand, Wet
20′ - 25′		Gravel and Sand, Some Silt
25′ - 30′		Clean Sand and Gravel, Lots of Water
30′ - 31′		Silty Clay and Sand
		Recorded By: Dave Tuesday

BORING/WELL LOG DATA

Project: Idaho Pole RI/FS Page: Date: Well Boring No. MW-26A

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0 - 5.0′		Black-gray, Silty Clay, Stiff, Few Gravel Pieces
5.0′- 8.0′		Coarse Gravels, Water bearing
8.0′- 11.0′		Gravel and Sand
11.0′- 12.0′		Silty Gravel and Sand
12.0′		TD
		Recorded By: Dave Tuesday

BORING/WELL LOG DATA

Project: Idaho Pole Page: Date: Well Boring No. MW-26B

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0 - 3.0′		Black-Gray Clay, Soft
3.0′- 7.0′		Tan-Grey Clay, Dry and Soft
7.0′- 8.5′		Dry Coarse Sand and Gravel (Wood Chips)
8.5′- 12.5′		Silty Gravel, Dark Gray Silt, Wet
12.5′- 13.5′		Silty Sand Lens Gray, Fine to Medium Sand, Some Gravel, Wet
13.5′- 17.0′		Silty Sand and Gravel, Wet
17.0′- 20.0′		Sand and Gravel, Minor Silt, Wet
20.0′- 25.0′		Clean Sand & Gravel, Wet
25.0′-30.0′		Sand and Gravel, 50% Sand (Coarse), Wet
30.0′- 33.0′		Clean Sand and Gravel, Grading to Mostly Sand, Coarse to Medium
33.0′- 33.5′		Silty Sand and Clay (Confining Unit), 2" layer of indurated Silty Sand "Siltstone"
33.5′ - TD		
		Recorded By: Dave Tuesday

BORING/WELL LOG DATA

Project: Idaho Pole   Page: Date: Well Boring No. MW-26C

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0 - 3.0′		Black-Gray Clay, Soft
3.0′- 7.0′		Tan-Grey Clay, Dry and Soft
7.0′- 8.5′		Dry Coarse Sand and Gravel (Wood Chips)
8.5′- 12.5′		Silty Gravel, Dark Gray Silt, Wet
12.5′- 13.5′		Silty Sand Lens Gray, Fine to Medium Sand, Some Gravel, Wet
13.5′- 17.0′		Silty Sand and Gravel, Wet
17.0′- 20.0′		Sand and Gravel, Minor Silt, Wet
20.0′- 25.0′		Clean Sand & Gravel, Wet
25.0′-30.0′		Sand and Gravel, 50% Sand (Coarse), Wet
30.0′- 33.0′		Clean Sand and Gravel, Grading to Mostly Sand, Coarse to Medium
33.0′- 33.5′		Silty Sand and Clay (Confining Unit), 2" layer of indurated Silty Sand "Siltstone"
33.5′ - 37′		Silty Clay and Fine Sand; Dry
37′ - 42′		Silt and Gravel and Sand - Good Water
42′ - 42.5′		Seam of Silty Clay
42.5′ - 48′		Silty Clay with Gravel - Dry, Tight/Dense
48′		TD
		Recorded By: Dave Tuesday

BORING/WELL LOG DATA

Project: Idaho Pole Page: Date: Well Boring No. MW-27A

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0′ - 1′		Black Clay
1′ - 2′		Grey Clay
2′ - 4′		Brown Fine to Medium Sand
4′ - 6′		Sand and Gravel, Wet at 5′
6′ - 13.5′		Silty Gravel - Wet
13.5′		T.D. at 13.5
		Reported By: Dave Tuesday

BORING/WELL LOG DATA

Project: Idaho Pole Page: Date: Well Boring No. MW-27B

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0′ - 1′		Black Clay
1′ - 2′		Gray Clay
2′ - 4′		Brown Fine Sand
4′ - 6′		Sand and gravel - Wet at 5′
6′ - 20′		Silty Gravel - Wet
20′ - 25′		Sand and Gravel, Minor Silt, Lots of Water
25′ - 28′		Silty Sand and Gravel
28′ - 31′		Cleaner Sand and Gravel; Lots of Water
31′ - 32′		Silty Clay Unit
32′ - 34′		Silty Clayey Sand
		Reported By: Dave Tuesday

BORING/WELL LOG DATA

Project: Idaho Pole Page: Date: Well Boring No. MW-28B

DEPTH	H_2O/SOIL SAMPLE	FORMATION DESCRIPTION
0′ - 2′		Silty Clay With Gravel - Topsoil
2′ - 6′		Sand and Gravel and Silt
6′ - 10′		Silty Gravel, Wet But Not a Lot of Water, Some Sand
10′ - 12′		More Water at 10′, Less Silty, Communicating With Rocky Creek (Silt in Creek)
12′ - 15′		Back into Silty Gravel; Less Water
15′ - 22′		Sandy (Coarse) and Gravel/Silt Lots of Water
22′ - 26′		Fine to Medium Sand, Gravel Silty Sand and Gravel (Muddy Water)
26′ - 27.5′		Clay, Silt Above Sandy Siltstone at 26.0 - No Water, Chips Very Hard-Indurated, Dry; take SS Sample at 1430
27.5′ - 29.5′		Fine Sand and Silt - Hard-Packed; Dry
		Reported By: Dave Tuesday

WELL CONSTRUCTION DETAILS FOR MONITORING WELLS MW-18 A, B, C MW-19 A, B MW-20, MW-21, AND MW-22

Well #	MW-18A	MW-18B	MW-18C	MW-19A	MW-19B	MW-20	MW-21	MW-22
Filter pack volume	4.5 cubic ft.	4 cubic ft.	2.0 cubic ft	4 cubic ft.	3 cubic ft.	17 cubic ft.	5 cubic ft.	2 cubic ft.
Filter pack placement method	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus
Well seal material	Bentonite chips	Bentonite chips	Bentonite chips	Bentonite chips	Bentonite chips	Bentonite chips	Bentonite chips	Bentonite chips
Seal placement method	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus
Grout Type	Neat cement	Neat cement	Neat cement	Neat cement	Neat cement	Neat cement	Neat cement	Neat cement
Well development	Pump and surge 10 gpm	Pump and surge 10 gpm	pumping 7.5gpm	pumping 10.0gpm	pump and surge 2.0gpm	Pump and surge 10.0gpm	pumping 10.0gpm	Pump and surge 6.7gpm
Turbidity at end of development	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Protective Casing	Steel 6" ID	Steel 6" ID	Steel 6" ID	Steel 6" ID	Steel 6" ID	Steel 6" ID	Steel 6" ID	Steel 6" ID
Top of well casing elevation	4764.20'	4764.91'	4764.36'	4759.20'	4759.57'	4755.08'	4754.11'	4754.11'
Ground Elevation	4762.0'	4761.9'	4762.3'	4757.4'	4757.6'	4754.3'	4751.9'	4751.9'
Total depth drilled	16.0'	32.0'	42.5'	17.0'	36.0'	54.0'	43.5'	26.0'

WELL CONSTRUCTION DETAILS FOR MONITORING WELLS MW-18 A, B, C MW-19 A, B MW-20, MW-21, AND MW-22

Well Construction Detail	MW-18A	MW-18B	MW-18C	MW-19A	MW-19B	MW-20	MW-21	MW-22
Date of Construction	5/7/90	5/7/90	11/1/90	5/9/90	5/12/90	5/12/90	5/18/90	5/14/90
Drilling Method	air-rotary casing drive	reverse circ air rotary	air rotary casing drive	air rotary casing drive	air rotary casing drive	air rotary casing drive	air rotary casing drive	air rotary casing drive
Rig type	Schram	Schram	Schram	Schram	Schram	Schram	Schram	Schram
Borehole diameter	6.5"	6.5"	6.5"	6.5"	6.5"	6.5"	6.5"	6.5"
Well casing	2" Id galv steel w/couplings	2" Id galv steel w/couplings	2" Id galv steel w/couplings	2" Id galv steel w/couplings	2" Id galv steel w/couplings	2" Id galv steel w/couplings	2" Id galv steel w/couplings	2" Id galv steel w/couplings
Dielectric casing screen coupler	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stainless steel centralican above screen	No	No	No	No	No	No	No	No
Screen material	Stainless steel wire wrap	Stainless steel wire wrap	Stainless steel wire wrap	Stainless steel wire wrap	Stainless steel wire wrap	Stainless steel wire wrap	Stainless steel wire wrap	Stainless steel wire wrap
Screen length	10.0′	10.0′	5.0′	10.0′	5.0′	5.0′	10.0′	5.0′
Screen slot size	.010"	.010"	.020"	.010"	.020"	.020"	.020"	.020"
Filter pack material	Colorado silica sand	Colorado silica sand	Colorado silica sand	Colorado silica sand	Colorado silica sand	Colorado silica sand	Colorado silica sand	Colorado silica sand
Filter pack size	10-20 mesh	10-20 mesh	10-20 mesh	10-20 mesh	10-20 mesh	10-20 mesh	10-20 mesh	10-20 mesh

WELL CONSTRUCTION DETAILS FOR MONITORING WELLS
MW-23ABC, MW-24A1,A2,B, AND 25 AB

Well #	MW-23A	M2-23B	MW-23C	MW-24A1	MW-24A2	MW-24B	MW-25A	M2-25B
Date of Construction	11/09/90	11/08/90	11/10/90	11/16/90	11/16/90	11/15/90	11/07/90	11/06/90
Drilling Method	air-rotary casing drive	air-rotary casing drive	air-rotary casing drive	air-rotary casing drive	air-rotary casing drive	air-rotary casing drive	air-rotary casing drive	air-rotary casing drive
Rig Type	Schram	Schram	Schram	Schram	Schram	Schram	Schram	Schram
Borehole diameter	6.5"	6.5"	8"-0 to 37.5' 6"-37.5' to 47.5'	6.5"	6.5"	6.5"	6.5"	6.5"
Well casing	2" ID galvanized steel w/ coupling	2" ID galvanized steel w/ coupling	2" ID galvanized steel w/ coupling	2" ID galvanized steel w/ coupling	2" ID galvanized steel w/ coupling	2" ID galvanized steel w/ coupling	2" ID galvanized steel w/ coupling	2" ID galvanized steel w/ coupling
Dielectric casing screen coupler	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stainless steel centralizer above screen	No	Yes	Yes	Yes	Yes	Yes	No	Yes
Screen material	Stainless steel wire wrap	Stainless steel wire wrap	Stainless steel wire wrap	Stainless steel wire wrap	Stainless steel wire wrap	Stainless steel wire wrap	Stainless steel wire wrap	Stainless steel wire wrap
Screen length	10.0'	5.0'	5.0'	10.0'	10.0'	5.0'	10.0'	5.0'
Screen slot size	.010"	.020"	.020"	.020"	.020"	.020"	.010"	.020"
Filter pack material	Colorado silica sand	Colorado silica sand	Colorado silica sand	Colorado silica sand	Colorado silica sand	Colorado silica sand	Colorado silica sand	Colorado silica sand
Filter pack size	10-20 mesh	10-20 mesh	10-20 mesh	10-20 mesh	10-20 mesh	10-20 mesh	10-20 mesh	10-20 mesh
Filter pack volume	3.5 cubic ft.	2.0 cubic ft.	2.5 cubic ft	3.5 cubic ft	3.0 cubic ft	1.5 cubic ft	2.5 cubic ft	1.5 cubic ft
Filter pack placement method	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus
Well seal material	1/8" bentonite chips	3/8" bentonite chips	bentonite chips	1/8" bentonite chips	3/8" bentonite chips	3/8" bentonite chips	bentonite chips-mashed	3/8" bentonite chips
Seal placement method	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus	Poured down annulus

WELL CONSTRUCTION DETAILS FOR MONITORING WELLS
MW-23ABC, MW-24A1,A2,B, AND 25 AB

Well #	MW-23A	M2-23B	MW-23C	MW-24A1	MW-24A2	MW-24B	MW-25A	M2-25B
Grout Type	Neat cement	Neat cement	Neat cement	Neat cement	Neat cement	Neat cement	Neat cement	Neat cement
Well development	Pumped 13.0 gpm	Pumped 4.0 gpm	Pumped 1.3 gpm	Pumped 12 gpm	Pumped 12.0 gpm	Pumped 12.0 gpm	Pumped 14 gpm	Pumped 8 gpm
Turbidity at end of development	Slightly cloudy	Clear	Slightly cloudy	Clear	Clear	Clear	Slightly cloudy	Clear
Protective Casing	Steel 6" ID	Steel 6" ID	Steel 6" ID	Steel 6" ID	Steel 6" ID	Steel 6" ID	Steel 6" ID	Steel 6" ID
Top of well casing elevation	4743.76'	4743.90'	4743.96'	4736.33'	4736.39'	4736.20'	4735.49'	4735.35'
Ground Elevation	4741.8'	4741.9'	4741.8'	4734.4'	4734.3'	4734.2'	4733.5'	4733.5'
Total depth drilled	14.0'	37.0'	47.5'	13.0'	22.0'	30.0'	12.2'	32.0'

WELL CONSTRUCTION DETAILS FOR MONITORING WELLS MW-26A,B,C, MW-27A,B, AND MW-28B (CONT'D)

Well #	MW-26-A	MW-26-B	MW-26-C	MW-27-A	MW-27-B	MW-28B
Date of Construction	11/01/90	11/02/90	11/05/90	11/12/90	11/13/90	11/14/90
Drilling Method	Air Rotary Casing Drive	Air Rotary Casing Drive	Air Rotary Casing Drive	Air Rotary Casing Drive	Air Rotary Casing Drive	Air Rotary Casing Drive
Rig Type	Schram	Schram	Schram	Schram	Schram	Schram
Borehole Diameter	6.5"	6.5"	8" - 0' to 36' 6.5" 36' to 44'	6.5"	6.5"	6.5"
Well Casing	2"ID galvanized steel w/ couplings	2"ID galvanized steel w/ couplings	2"ID galvanized steel w/ couplings	2"ID galvanized steel w/ couplings	2"ID galvanized steel w/ couplings	2"ID galvanized steel w/ couplings
Dielectric Casing to Screen Coupler	Yes	Yes	No	No	Yes	Yes
Screen Material	Stainless Steel Wire Wrap	Stainless Steel Wire Wrap	Stainless Steel Wire Wrap	Stainless Steel Wire Wrap	Stainless Steel Wire Wrap	Stainless Steel Wire Wrap
Screen Length	10.0'	5.0'	5.0'	10.0'	5.0'	5.0'
Screen Slot Size	.020"	.020"	.020"	.020"	.020"	.020"
Filter Pack Material	Colorado Silica Sand	Colorado Silica Sand	Colorado Silica Sand	Colorado Silica Sand	Colorado Silica Sand	Colorado Silica Sand
Filter Pack Size	10-20 mesh	10-20 mesh	10-20 mesh	10-20 mesh	10-20 mesh	10-20 mesh
Filter Pack Volume	2 cubic ft.	2 cubic ft.	1.5 cubic ft.	3.0 cubic ft.	2.0 cubic ft.	2.0 cubic ft.
Filter Pack Placement Method	Poured Down Annulus	Poured Down Annulus	Poured Down Annulus	Poured Down Annulus	Poured Down Annulus	Poured Down Annulus
Well Seal Material	Bentonite	3/8" bentonite chips	3/8 Bentonite chips	1/8" Bentonite chips	3/8" Bentonite chips	3/8" Bentonite chips
Seal Placement Method	Poured Down Annulus	Poured Down Annulus	Poured Down Annulus	Poured Down Annulus	Poured Down Annulus	Poured Down Annulus
Grout type	Regular Concrete	Neat Cement	Neat Cement	Neat Cement	Neat Cement	Neat Cement

WELL CONSTRUCTION DETAILS FOR MONITORING WELLS
MW-26A,B,C, MW-27A,B, AND MW-28B (CONT'D)

Well #	MW-26-A	MW-26-B	MW-26-C	MW-27-A	MW-27-B	MW-28B
Well Development	Pumped 12.0 gpm	Pumped 10.0 gpm	Pumped 5.0 gpm	Pumped 10.0 gpm	Pumped 12.0 gpm	Pumped 12.0 gpm
Turbidity at End of Development	Clear	Clear	Clear	Slightly Cloudy	Clear	Clear
Protective Casing	Steel 6" ID	Steel 6" ID	Steel 6" ID	Steel 6" ID	Steel 6" ID	Steel 6" ID
Top of Well Casing Elevation	4735.11'	4735.94'	4736.05'	4730.94	4730.82	4733.94
Ground Elevation	4734.3'	4734.1'	4734.1'	4729.0'	4728.8'	4731.9'
Total Depth Drilled	12.5'	33.5'	48.5'	13.5'	32.5'	27.5'
Stainless Steel Centralizer Above Screen	No	Yes	Yes	No	Yes	Yes

APPENDIX B

WELL INFORMATION WITHIN A TWO MILE RADIUS OF THE IPC SITE

T1S R5E

T1S R5E

LOCATION	MBMG FILE ID[a]	TOTAL DEPTH/ (PERF. INTERVAL) (FT)[b]	WELL USE[d]	YEAR COMPLETED
Sec. 36	044809	67	H	1977
Sec. 36A	044810	80	H	1946
Sec. 36AA	044836	--[c]	HS	1936
Sec. 36AC	044811	325 (174-180)	H	1976
Sec. 36AD	044838	60	HS	1955
Sec. 36C	044812	86	H	1954
Sec. 36D	044813	109 (63-95)	N	1961
Sec. 36D	044819	55	H	1979
Sec. 36D	044816	62	H	1962
Sec. 36D	044817	118	Q	1971
Sec. 36DB	044840	82	N	1950
Sec. 36DB	044815	87	HN	1962
Sec. 36DDD	044818	62 (55-62)	H	1974

[a] Indicates well log not found on Montana Bureau of Mines and Geology (MBMG) data file but shown on Montana Department of Natural Resources and Conservation (DNRC) data file. The number with a * indicates DNRC water right number.

[b] Perforated interval or well screen interval is in parenthesis.

[c] Dash (--) indicates information not available.

[d] Well Use Key.

H = Domestic - includes lawn and garden watering
S = Stockwater
N = Industrial (manufacturing, construction, oil field water, coal development etc.)
Q = Unknown

T2S R5E

T2S R5E

LOCATION	MBMG FILE ID[a]	TOTAL DEPTH/ (PERF. INTERVAL) (FT)[b]	WELL USE[d]	YEAR COMPLETED
Sec. 1	045734	90	H	1978
Sec. 1	045735	100	C	1978
Sec. 1	045732	32 (7-12)	H	1975
Sec. 1	045687	198	H	1956
Sec. 1	045733	110	Q	1960
Sec. 1	045643	12	I	1954
Sec. 1	045644	39	H	1952
Sec. 1	045645	42	H	1956
Sec. 1DBD	*P000280	200	H	1973
Sec. 1N2DB	*C058276	120	--[c]	1984
Sec. 1C	*T041809	--	--	--
Sec. 1C	*T041810	--	--	--
Sec. 1C	*W117266	--	--	1950
Sec. 1C	*W117267	--	--	1948
Sec. 1A	007265	60	I	1983
Sec. 1AA	045736	96	H	1971
Sec. 1AB	045737	91	I	1972
Sec. 1AC	045738	75	H	1966
Sec. 1C	045648	40	H	1955
Sec. 1C	045739	63	H	1973
Sec. 1C	045646	40	H	1953
Sec. 1C	045647	16	I	1956
Sec. 1C	045649	19	I	1970
Sec. 1C	045651	40	H	1954
Sec. 1C	045654	44	H	1948
Sec. 1C	045652	40	H	1949
Sec. 1C	045653	12	H	1949
Sec. 1C	045743	46	H	1965
Sec. 1C	045744	45	H	1962
Sec. 1CB	045740	30	H	1964
Sec. 1CC	045742	67 (40-63)	I	1967
Sec. 1CC	045650	42	H	1948
Sec. 1D	045655	32	H	1952

T2S R5E (cont'd)

LOCATION	MBMG FILE ID[a]	TOTAL DEPTH/ (PERF. INTERVAL) (FT)[b]	WELL USE[d]	YEAR COMPLETE
Sec. 1D	045656	--	H	1910
Sec. 1DC	045745	57	H	1960
Sec. 1DD	045657	33	NI	1949
Sec. 12	045965	40	H	--
Sec. 12	046058	60	H	1966
Sec. 12	046057	44	H	1974
Sec. 12A	007272	31	HI	1984
Sec. 12A	027657	49	I	1986
Sec. 12CA	*W163409	--	--	1930
Sec. 12A	027659	52	HI	1986
Sec. 12A	027658	52	I	1987
Sec. 12ABB	*C060703	52	--	1985
Sec. 12AAA	045823	47	H	1988
Sec. 12AAD	*W139918	--	--	1930
Sec. 12B	046059	93 (40-62) (81-91)	TI	1966
Sec. 12BA	045966	30	H	1936
Sec. 12ABC	C060788	--	--	1981
Sec. 12BB	046060	44	CI	1961
Sec. 12BD	045967	104	I	1957
Sec. 12BD	046061	41	C	1964
Sec. 12BD	045968	40	H	1885
Sec. 12C	007273	89 (42-45) (49-52)	Z	1983
Sec. 12S2CC	*W005194	--	--	1950
Sec. 12C	007274	55	Z	1983
Sec. 12N2C	*W163410	--	--	1930
Sec. 12C	045969	53	H	1949
Sec. 12CBB	*W039061	--	--	1954
Sec. 12CA	045973	60	H	1945
Sec. 12CAA	*C036208	29	--	1981
Sec. 12CA	046063	40	H	1945

T2S R5E (cont'd)

LOCATION	MBMG FILE ID[a]	TOTAL DEPTH/ (PERF. INTERVAL) (FT)[b]	WELL USE[d]	YEAR COMPLETE
Sec. 12CAA	*W115621	--	--	1966
Sec. 12CA	046062	36	H	1966
Sec. 12CAA	*W115622	--	--	1940
Sec. 12CAC	057616	52 (30-50)	H	1980
Sec. 12CAC	*W114961	--	--	1954
Sec. 12D	031359	40	Z	1987
Sec. 12DA	039253	80 (40-48) (61-68)	I	1988
Sec. 12DCA	046064	31	H	1977
Sec. 12DD	045974	42	H	1900
Sec. 13	046066	53	H	1973
Sec. 13	045976	45	H	1954
Sec. 13	045979	41	H	1958
Sec. 13	045975	40	H	1956
Sec. 13	046069	64 (55-64)	H	1975
Sec. 13	046065	53	H	1975
Sec. 13	046070	30	H	1973
Sec. 13	027660	60	H	1984
Sec. 13	046068	41	HI	1959
Sec. 13	045978	30	HS	1918
Sec. 13	045980	46	H	1960
Sec. 13	045991	30	H	1922
Sec 13AAD	031360	87 (72-87)	I	1987

[a] * - Indicates well log not found on Montana Bureau of Mines and Geology (MBMG) data file but shown on Montana Department of Natural Resources and Conservation (DNRC) data file. The number with a * indicates DNRC water right number.

[b] Perforated interval or well screen interval is in parenthesis.

[c] Dash (--) indicates information not available.

[d] Well Use Key

H = Domestic - includes lawn and garden watering
C = Dommercial or Business
Q = Unknown
I = Irrigation - for growing crops

N = Industrial (manufacturing, construction, oil field water, coal development etc.)
Z = Other
S = Stockwater

T1S R6E

LOCATION	MBMG FILE ID[a]	TOTAL DEPTH/ (PERF. INTERVAL) FT[b]	WELL USE[d]	YEAR COMPLETED
Sec. 30DDDD	047470	205	Q	1979
Sec. 31	007201	32	H	1977
Sec. 31	044913	49	HP	1966
Sec. 31A	044846	8	HS	1930
Sec. 31ADD	044900	75	H	1955
Sec. 31B	027594	40	H	1985
Sec. 31BCC	*C061531	40	--[c]	1986
Sec. 31C	044904	41	P	1975
Sec. 31C	044902	45	H	1979
Sec. 31C	044903	41	H	1979
Sec. 31C	044901	37	N	1979
Sec. 31C	007201	37	Q	1983
Sec. 31C	044905	29	H	1963
Sec. 31C	044847	--	SI	1957
Sec. 31C	044850	60	H	1951
Sec. 31C	044908	43	H	1970
Sec. 31CBB	*W136624	--	--	1957
Sec. 31CC	044906	58	N	1981
Sec. 31CC	044907	43	HS	1970
Sec. 31CDD	*W136572	--	--	1961
Sec. 31CD	044849	12	H	1946
Sec. 31CDD	*W136573	--	--	1961
Sec. 31CD	044909	90 (34-40) (45-48) (53-78) (76-80)	HS	1958
Sec. 31CD	044848	66	P	1960
Sec. 31CD	047464	12	H	1951
Sec. 31D	044910	30	H	1963
Sec. 31D	*C034051	--	--	1981
Sec. 31D	044854	18 (12-15)	I	1964
Sec. 31D	*W117285	--	--	1981

T1S R6E (cont'd)

LOCATION	MBMG FILE ID[a]	TOTAL DEPTH/ (PERF. INTERVAL) FT[b]	WELL USE[d]	YEAR COMPLETED
Sec. 31D	044915	71	H	1964
Sec. 31D	044851	15	H	1952
Sec. 31D	044911	42	H	1961
Sec. 31D	044912	42	H	1938
Sec. 31D	007203	42	H	1984
Sec. 31D	007204	77	--[c]	1983
Sec. 31D	044915	36	H	1968
Sec. 31D	044921	44	H	1971
Sec. 31D	044922	49	H	1971
Sec. 31D	044920	44	Q	1970
Sec. 31DA	062457	80	H	1989
Sec. 31DC	044852	--	H	1961
Sec. 31DCB	*C065383	36	--	1987
Sec. 31DC	044914	54	H	1972
Sec. 31DC	044853	12	H	1910
Sec. 31DD	044919	180 (143-147) (162-168) (171-178)	PH	1971
Sec. 31DD	044917	190 (114-130) (169-185)	PH	1972
Sec. 31DD	044918	185 (147-151) (155-185)	PH	1972
Sec. 32	044923	29	H	1960
Sec. 32	044937	30	H	1962
Sec. 32B	044924	63	Q	1979
Sec. 32BC	044855	54	H	1947
Sec. 32BC	047471	89	Q	1980
Sec. 32BC	047472	72	H	1979
Sec. 32BDC	*W019231	--	--	1946
Sec. 32BDD	027595	50 (40-50)	H	1986
Sec. 32DC	*C026963	--	--	1980
Sec. 32C	044925	30	H	1963
Sec. 32C	044928	60	H	1960

T1S R6E (cont'd)

LOCATION	MBMG FILE ID[a]	TOTAL DEPTH/ (PERF. INTERVAL) FT[b]	WELL USE[d]	YEAR COMPLETED
Sec. 32N2DC	*C028229	--[c]	--	1980
Sec. 32C	044929	56	H	1959
Sec. 32N2DC	*C044086	--	--	1982
Sec. 32C	044933	32	H	1959
Sec. 32N2DC	*C046730	35	--	1982
Sec. 32N2CD	*W115582	--	--	1958
Sec. 32C	044927	32	HI	1959
Sec. 32CDA	*W006170	--	--	1960
Sec 32C	044934	56	H	1962
Sec. 32CDB	*C043235	--	--	1982
Sec. 32C	044926	61	H	1962
Sec. 32CC	044930	28	H	1964
Sec. 32CC	W115620	--	--	1940
Sec. 32CCA	044858	20	S	1899
Sec. 32N2CC	*C043246	40	Uk	1982
Sec. 32CC	044856	22	H	1942
Sec. 32CCD	W136557	--	--	1959
Sec. 32CC	044931	34 (27-30)	H	1968
Sec. 32CC	044932	32	H	1965
Sec. 32CC	044857	25	H	1965
Sec. 32CD	044936	53	H	1865
Sec. 32CD	044938	40	HI	1958
Sec. 32CD	044935	50	H	1960
Sec. 32CDD	044860	20	S	1900
Sec. 32CDD	044859	30	H	1960
Sec. 32D	044959	80	U	1960
Sec. 32D	044945	39	H	1960
Sec. 32D	044962	62	H	1960
Sec. 32D	044948	46	H	1965
Sec. 32D	044961	20	H	1943
Sec. 32D	044958	20	S	1883
Sec. 32D	044963	70	H	1958
Sec. 32DC	044943	35	H	1959

T1S R6E (cont'd)

LOCATION	MBMG FILE ID[a]	TOTAL DEPTH/ (PERF. INTERVAL) FT[b]	WELL USE[d]	YEAR COMPLETED
Sec. 32DC	*C036788	--	--	1981
Sec. 32DC	044939	102 (65-70)	H	1958
Sec. 32DC	044940	70	H	1957
Sec. 32DC	044941	35	H	1957
Sec. 32DC	044942	34	H	1967
Sec. 32DC	044944	36	H	1966
Sec. 32DC	044960	30	H	1959
Sec. 32DC	044945	40	H	--
Sec. 32DC	044947	40	H	1947
Sec. 33A	044949	30	H	1968
Sec. 33AC	044950	80	H	1966
Sec. 33B	007205	72	H	1983
Sec. 33BC	007206	60	H	1984
Sec. 33CA	007207	96	Q	1980
Sec. 33D	044951	40	H	1967
Sec. 33D	044953	70	H	1959
Sec. 33D	044952	46 (24-37)	H	1962
Sec. 33D	044954	98 (38-43) (58-62) (78-83)	HS	1963

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[b] Perforated interval or well screen interval is in parenthesis.

[c] Dash (--) indicates information not available.

[d] Well Use Key

Q = Unknown
H = Domestic - includes lawn and garden watering
P = Public supplies (towns or other approved public water supplies)
S = Stockwater
N = Industrial (manufacturing, construction, oil field water, coal development etc.)
I = Irrigation - for growing crops
U = Unused - (if well is dry a 0 will appear in the yield field)

T2S R6E

T2S R6E

LOCATION	MBMG FILE ID[a]	TOTAL DEPTH/ (PERF. INTERVAL) (FT)[b]	WELL USE[d]	YEAR COMPLETED
Sec. 5	046256	60	S	1956
Sec. 5	046320	28	Q	1953
Sec. 5AC	*C034680	--c	--	1981
Sec. 5B	046319	28	IS	1921
Sec. 5BB	046257	38	H	1942
Sec. 5BDC	046258	179 (123-126) (133-136)	P	1978
Sec. 5C	046260	44	H	1967
Sec. 5CAB	046259	133 (30-62)	P	1978
Sec. 5CDC	*C041113	58	--	1982
Sec. 5DA	046261	199	H	1981
Sec. 5DA	027686	245 (225-245)	H	1986
Sec. 5DB	046321	--	S	--
Sec. 6	046324	12	H	1950
Sec. 6	046331	41	H	1950
Sec. 6	046332	18	H	1950
Sec. 6	046323	4	IS	1964
Sec. 6	046322	16	H	1960
Sec. 6	046325	73	HS	1947
Sec. 6	027687	50	HI	1985
Sec. 6	046327	20	H	1948
Sec. 6A	027333	--	H	--
Sec. 6A	046329	71	H	1961
Sec. 6A	046326	29	H	1960
Sec. 6AB	046262	20	H	1927
Sec. 6AC	046263	42	H	1966
Sec. 6AC	046328	--	H	1900
Sec. 6AAD	*W016084	--	--	1917
Sec. 6AAD	*T002109	--	--	--
Sec. 6ACB	046330	--	C	1955
Sec. 6ADD	*W136574	--	--	1959
Sec. 6B	*CD41871	--	--	1982

T2S R6E (cont'd)

LOCATION	MBMG FILE ID[a]	TOTAL DEPTH/ (PERF. INTERVAL) (FT)[b]	WELL USE[d]	YEAR COMPLETE
Sec. 6B	*CD41872	--[c]	--	1982
Sec. 6B	046334	--	H	1935
Sec. 6BA	046336	50	HS	--
Sec. 6BA	046335	54	H	1950
Sec. 6BAA	046264	190	H	1974
Sec. 6BAD	027688	228	C	1986
Sec. 6BBB	*C055045	60	--	1984
Sec. 6BBB	*W003279	--	--	1954
Sec. 6BB	046265	144	N	1976
Sec. 6BC	046266	299 (220-282)	H	1971
Sec. 6C	007324	48	H	1982
Sec. 6CA	046337	60	SH	1932
Sec. 6CD	027689	43	I	1987
Sec. 6CCA	*C069605	112	--	1988
Sec. 6CDB	027690	55	HI	1985
Sec. 6CDC	046267	37	H	1981
Sec. 6CDC	027691	80 (30-39) (50-65)	I	1987
Sec. 6DAB	*C048366	--	--	1982
Sec. 6DD	046281	90	H	1973
Sec. 6DD	046388	--	HI	1950
Sec. 6DDA	*W139759	--	--	1895
Sec. 6DDA	*W139760	--	--	1895
Sec. 6DDA	*W139761	--	--	1895
Sec. 6DDD	*C068943	24	--	1988
Sec. 7	046270	56	I	1980
Sec. 7	046269	56	H	1971
Sec. 7	046341	25	A	1961
Sec. 7	046339	28	H	1938
Sec. 7	046340	304	P	1936
Sec. 7	046268	97	H	1978
Sec. 7	046342	30	A	1961

T2S R6E (cont'd)

LOCATION	MBMG FILE ID[a]	TOTAL DEPTH/ (PERF. INTERVAL) (FT)[b]	WELL USE[d]	YEAR COMPLETED
Sec. 7ABB	045826	63	I	1988
Sec. 7ABC	046271	26	Q	1981
Sec. 7ABD	045827	48	I	1988
Sec. 7ACC	*C061642	303	--[c]	1986
Sec. 7ACC	*P061643	--	--	1986
Sec. 7ACC	*T056462	350	--	--
Sec. 7B	046272	157	M	1978
Sec. 7BAA	027692	69	I	1987
Sec. 7BAC	*C030645	56	--	1980
Sec. 7BB	027693	70	HI	1986
Sec. 7BDA	056539	55	I	1989
Sec. 7BDC	*C061526	81	--	1986
Sec. 7CAD	065984	150 (40-50) (100-110) (130-150)	I	1987
Sec. 7CAD	*P057075	--	--	1984
Sec. 7CAD	*P057084	--	--	1984
Sec. 7CCD	027694	79	HI	1987
Sec. 7DC	046343	22	Q	1885
Sec. 8	046274	96	H	1949
Sec. 8	046273	104	I	1949
Sec. 8	057624	120	H	1985
Sec. 8AA	027695	87	H	1985
Sec. 8AAB	*C059798	152	--	1985
Sec. 8AAB	*W139018	--	--	1972
Sec. 8AAB	*W139019	--	--	1972
Sec. 8ACA	046276	205	H	1979
Sec. 8ACD	046277	100	H	1977
Sec. 8AD	046279	420 (294-334) (380-400)	H	1972
Sec. 8AD	057625	136	H	1979
Sec. 8ADD	046278	130	Q	1980
Sec. 8BA	046282	68	PH	1973

T2S R6E (cont'd)

LOCATION	MBMG FILE ID[a]	TOTAL DEPTH/ (PERF. INTERVAL) (FT)[b]	WELL USE[d]	YEAR COMPLETED
Sec. 8BA	046283	52	H	1967
Sec. 8BA	046280	56	H	1972
Sec. 8BAB	*P049596	--[c]	--	1982
Sec. 8BAB	*W136800	--	--	1983
Sec. 8BAB	*W153956	--	--	1983
Sec. 8BBB	027696	77 (57-77)	I	1986
Sec. 8BD	*C016495	73	--	1977
Sec. 8CDA	046344	--	HS	1880
Sec. 8D	046285	83 (61-83)	H	1977
Sec. 8D	046284	60	H	1978
Sec. 8D	007325	51 (30-33)	H	1983
Sec. 8DA	046289	110 (7-106)	I	1972
Sec. 8DAA	046286	214	H	1976
Sec. 8DAA	*C033399	52	--	1981
Sec. 8DAA	*C039217	75	--	1981
Sec. 8DAD	*C045269	--	--	1982
Sec. 8DB	046287	213 (132-135) (160-170)	I	1972
Sec. 8DB	046288	30	H	1973
Sec. 8DB	046290	32	H	1978
Sec. 8DBBD	046634	16	H	1936
Sec. 8DD	043423	27	P	1970
Sec. 8DD	046291	34	P	1972
Sec. 8DDB	046292	75 (64-75)	H	1977
Sec. 9C	046346	22	H	1935
Sec. 9C	046348	12	H	1893
Sec. 9CB	027697	550 (530-550)	H	1985
Sec. 9CCAA	046347	64	HS	1945
Sec. 9DDA	*W140889	--	--	1957
Sec. 9D	046349	--	H	--
Sec. 9D	046350	66	H	1957
Sec. 9DAB	046293	68 (63-68)	Q	1981

T2S R6E (cont'd)

LOCATION	MBMG FILE ID[a]	TOTAL DEPTH/ (PERF. INTERVAL) (FT)[b]	WELL USE[d]	YEAR COMPLETED
Sec. 9DDD	046294	40 (30-40)	H	1978
Sec. 16BB	046473	80	H	1979
Sec. 16BB	046472	109	H	1964
Sec. 16BB	*C000479	95	--[c]	1973
Sec. 16BB	*C006950	114	--	1975
Sec. 16BB	*C016159	64	--	1977
Sec. 16BB	*023002	85	--	1979
Sec. 16BB	*C031857	--	--	1981
Sec. 16BBC	057561	78 (58-71)	H	1984
Sec. 17	046491	30	H	1976
Sec. 17	046490	33	H	1976
Sec. 17	046489	33	H	1976
Sec. 17	046492	151	H	1975
Sec. 17	007341	45	H	1978
Sec. 17	007342	52	H	1978
Sec. 17	007343	36	H	1977
Sec. 17	007344	64	H	1978
Sec. 17	027710	133 (117-124)	H	1985
Sec. 17A	046493	120	H	1979
Sec. 17A	046494	117	H	1978
Sec. 17A	*C045581	--	--	1982
Sec. 17AA	*C007902	67	--	1976
Sec. 17AAB	*C031110	74	--	1980
Sec. 17ABA	*C024065	80	--	1979
Sec. 17E2AA	*C020065	83	--	1978
Sec. 17E2AA	*C059750	--	--	1985
Sec. 17N2AA	*C059803	87	--	1985
Sec. 17N2AA	*C060756	65	--	1985
Sec. 17BA	046275	80 (47-80)	H	1979
Sec. 17BB	*C061587	127	--	1986

T2S R6E (cont'd)

LOCATION	MBMG FILE ID[a]	TOTAL DEPTH/ (PERF. INTERVAL) (FT)[b]	WELL USE[d]	YEAR COMPLETED
Sec. 18	046497	92	H	1960
Sec. 18	046374	32	H	1958
Sec. 18	046495	69	H	1958
Sec. 18A	046376	25	H	1956
Sec. 18A	046377	20	H	1938
Sec. 18A	046500	62	H	1963
Sec. 18A	046383	--[c]	H	1930
Sec. 18A	046498	37	H	1960
Sec. 18AB	046375	15	H	1895
Sec. 18AB	C026483	--	--	1980
Sec. 18AB	046378	--	H	1948
Sec. 18AB	057562	48	H	1982
Sec. 18ABB	*C045029	--	--	1982
Sec. 18ABB	*C071492	--	--	1989
Sec. 18ABD	*C008075	--	--	1976
Sec. 18AC	*E003786	--	--	1974
Sec. 18AC	*6003786	--	--	1957
Sec. 18AC	046499	127	H	1974
Sec. 18AC	046379	65	H	1939
Sec. 18AC	046380	45	H	1945
Sec. 18AC	046381	--	H	1933
Sec. 18AC	046384	156	H	1938
Sec. 18AC	047505	--	H	1933
Sec. 18ACA	027711	25	I	1987
Sec. 18ACA	046382	99	H	1956
Sec. 18ACB	*W113246	--	--	1963
Sec. 18W2A	*C047058	49	--	1982
Sec. 18B	*C034870	120	--	1981
Sec. 18BAA	*T012188	--	--	--
Sec. 18BBB	*C061576	77	--	1986
Sec. 18BDB	*C063902	24	--	1987
Sec. 18BCA	*C061537	--	--	1986
Sec. 18B	046496	120	Q	1981

T2S R6E (cont'd)

LOCATION	MBMG FILE ID[a]	TOTAL DEPTH/ (PERF. INTERVAL) (FT)[b]	WELL USE[d]	YEAR COMPLETED
Sec. 18BA	058083	56 (15-28)	N	1989
Sec. 18BA	058084	30 (13-14) (17-25)	N	1989
Sec. 18BBB	031366	80	H	1987

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[a] * - Indicates well log not found on Montana Bureau of Mines and Geology (MBMG) data file but shown on Montana Department of Natural Resources and Conservation (DNRC) data file. The number with a * indicates DNRC water right number.

[b] Perforated interval or well screen interval is in parenthesis.

[c] Dash (--) indicates information not available.

[d] Well Use Key.

S = Stockwater
Q = Unknown
I = Irrigation - for growing crops
H = Domestic - includes lawn and garden watering
P = Public Supplies (towns or other approved public water supplies)
C = Commercial or Business
N = Industrial (manufacturing, construction, oil field water, coal development etc.)
I = Irrigation - for growing crops
A = Air conditioning
P = Public Supplies (towns or other approved public water supplies)
M = Medical

APPENDIX C

WATER LEVEL MEASUREMENTS

IPC WATER LEVEL DATA

					DATE: 10/16/84			DATE: 01/19/85	
WELL #	NORTHIN	EASTING	ELEV/TOC	WELL #	WTR DEPTH	WT ELEVATION	WELL #	WTR DEPTH	WT ELEVATION
1A	3964.92	6049.97	4761.19	1A	11.65	4749.54	1A	11.92	4749.27
1B	3964.92	6049.97	4762.28	1B	12.77	4749.51	1B	13.00	4749.28
2A	3580.20	7210.58	4750.10	2A	3.12	4746.98	2A	3.00	4747.10
2B	3580.20	7210.58	4749.36	2B	3.96	4745.40	2B	2.50	4746.86
3A	4275.00	6412.03	4756.56	3A	10.00	4746.56	3A	10.33	4746.23
3B	4275.00	6412.03	4756.70	3B	10.27	4746.43	3B	10.54	4746.16
4A	4395.43	6893.64	4748.69	4A	5.70	4742.99	4A	5.92	4742.77
4B	4395.43	6893.64	4747.59	4B	4.76	4742.83	4B	5.00	4742.59
5A	4659.73	6498.16	4749.71	5A	6.81	4742.90	5A	7.08	4742.63
5B	4659.73	6498.16	4749.51	5B	6.61	4742.90	5B	6.83	4742.68
5C	4659.73	6498.16	4749.79	5C	7.30	4742.49	5C	7.50	4742.29
6A	4919.89	6166.50	4749.28	6A	7.83	4741.45	6A	8.00	4741.28
6B	4919.89	6166.50	4749.60	6B	8.20	4741.40	6B	8.38	4741.22
7A	4865.00	7279.67	4741.33	7A	6.50	4734.83	7A	6.50	4734.83
7B	4865.00	7279.67	4740.99	7B	5.83	4735.16	7B	5.83	4735.16
8A	5205.53	7303.00	4737.07	8A	4.81	4732.26	8A	4.92	4732.15
8B	5205.53	7303.00	4737.04	8B	4.47	4732.57	8B	4.50	4732.54
9A	5216.61	6849.56	4739.60	9A	4.09	4735.51	9A	4.00	4735.60
9B	5216.61	6849.56	4739.67	9B	4.25	4735.42	9B	4.17	4735.50
9C	5216.61	6849.56	4739.64	9C	4.96	4734.68	9C	4.92	4734.72
10A	5395.51	6513.02	4739.26	10A	3.85	4735.41	10A	3.75	4735.51
10B	5395.51	6513.02	4738.97	10B	4.00	4734.97	10B	3.92	4735.05
11A	5290.28	6725.53	4739.91	11A	4.25	4735.66	11A	4.17	4735.74
12A	5344.44	6622.69	4739.70	12A	4.19	4735.51	12A	4.08	4735.62
13A	5304.58	7112.90	4735.37	13A	2.64	4732.73	13A	2.38	4732.99
14A	5081.56	6627.59	4740.16	14A	1.80	4738.36	14A	1.75	4738.40
14B	5081.56	6627.59	4739.81	14B	2.13	4737.68	14B	2.08	4737.73
15A	4571.74	6703.49	4748.89	15A	6.90	4741.99	15A	7.08	4741.81
16A	5983.55	7200.46	4731.70	16A	5.80	4725.90	16A	5.75	4725.95
16B	5983.56	7200.48	4730.96	16B	5.04	4725.92	16B	5.08	4725.88
18A	3939.04	5788.54	4764.20	18A			18A		
18B	3946.95	5782.37	4764.91	18B			18B		
18C	3931.68	5794.74	4764.36	18C			18C		
19A	3151.68	6752.11	4759.20	19A			19A		
19B	3143.37	6755.33	4759.57	19B			19B		
20	4407.62	6088.49	4756.08	20			20		
21	3917.65	7178.63	4747.16	21			21		
22	4391.75	6478.93	4754.11	22			22		
23A	4815.66	6998.02	4743.78	23A			23A		
23B	4820.21	7001.66	4743.90	23B			23B		
23C	4810.77	7009.24	4743.96	23C			23C		
24A1	5489.01	7332.49	4736.33	24A1			24A1		
24A2	5483.99	7335.69	4736.39	24A2			24A2		
24B	5480.88	7330.06	4736.20	24B			24B		
25A	5647.52	7206.71	4735.49	25A			25A		
25B	5649.05	7200.83	4735.36	25B			25B		
26A	5748.99	6869.62	4735.11	26A			26A		
26B	5744.53	6874.31	4735.94	26B			26B		
26C	5739.83	6879.88	4736.05	26C			26C		
27A	6268.15	7196.30	4730.94	27A			27A		
27B	6272.98	7191.81	4730.82	27B			27B		
28B	5697.54	7533.17	4733.94	28B			28B		

IPC WATER LEVEL DATA

DATE: 04/05/85			DATE: 07/08/85			DATE: 04/18/90		
WELL #	WTR DEPTH	WT ELEVATION	WELL	WTR DEPTH	WT ELEVATION	WELL	WTR DEPTH	WT ELEVATION
1A	10 63	4750 56	1A	13.17	4748 02	1A	11 38	4749 81
1B	11 73	4750 56	1B	11 50	4750 78	1B	12.49	4749 79
2A	2.19	4747 91	2A	3 91	4746 19	2A	2.81	4747 29
2B	2.35	4747 01	2B	2 38	4746 98	2B	2 20	4747 16
3A	9 04	4747 52	3A	10 65	4745 71	3A	9 79	4746 77
3B	9 25	4747 46	3B	10 71	4745 99	3B	9 90	4746 60
4A	5 00	4743 69	4A	6 38	4742.31	4A	5 14	4743 55
4B	4 06	4743 53	4B	5 44	4742.15	4B	4 34	4743 25
5A	6 00	4743 71	5A	7 54	4742.17	5A	n/a	
5B	5 83	4743 68	5B	7 27	4742 24	5B	6 24	4743 27
5C	6 48	4743.31	5C	7 92	4741 87	5C	6 90	4742.89
6A	6 90	4742.38	6A	8 52	4740 76	6A	7 51	4741 77
6B	7 25	4742.35	6B	8 65	4740 75	6B	7 65	4741 75
7A	6 04	4736 29	7A	6 92	4734 41	7A	5 98	4736 35
7B	5 25	4736 74	7B	6 29	4734 70	7B	5 22	4736 77
8A	3 44	4733 63	8A	5 20	4731 87	8A	3 76	4733 31
8B	4 06	4732 98	8B	5 50	4731 54	8B	4 32	4732.72
9A	3 13	4736 47	9A	4 92	4734 68	9A	3 51	4736 09
9B	3 29	4736 38	9B	5 00	4734 67	9B	3 65	4736 02
9C	4 00	4735 64	9C	5 69	4733 95	9C	4 29	4735 35
10A	2 94	4736 32	10A	4 67	4734 59	10A	3 47	4736 79
10B	3.06	4736 91	10B	4 96	4734 01	10B	3 64	4736 33
11A	3 23	4736 68	11A	5 08	4734 63	11A	3 65	4736 06
12A	3 17	4736 53	12A	5 00	4734 70	12A	3 69	4736 01
13A	1 48	4733 89	13A	3 50	4731 87	13A	1 66	4733 49
14A	1 06	4739 09	14A	2 67	4737 48	14A	broken	4740 15
14B	1 29	4736 52	14B	2 83	4736 98	14B	1 80	4738 21
15A	6 17	4742 72	15A	7 54	4741 35	15A	6 33	4742 56
16A	4 94	4726 76	16A	6 10	4725 60	16A	4 76	4726 94
16B	4 35	4726 61	16B	5 48	4725 48	16B	3 97	4726 99
18A			18A			18A		
18B			18B			18B		
18C			18C			18C		
19A			19A			19A		
19B			19B			19B		
20			20			20		
21			21			21		
22			22			22		
23A			23A			23A		
23B			23B			23B		
23C			23C			23C		
24A1			24A1			24A1		
24A2			24A2			24A2		
24B			24B			24B		
25A			25A			25A		
25B			25B			25B		
26A			26A			26A		
26B			26B			26B		
26C			26C			26C		
27A			27A			27A		
27B			27B			27B		
28B			28B			28B		

IPC WATER LEVEL DATA

DATE: 05/21/90			DATE: 06/18/90			DATE: 7/16/90		
WELL #	WTR DEPTH	WT ELEVATION	WELL #	WTR DEPTH	WT ELEVATION	WELL #	WTR DEPTH	WT ELEVATION
1A	10 27	4750 92	1A	11 15	4750 04	1A	11 95	4749 24
1B	11 42	4750 86	1B	12 25	4750 03	1B	13 06	4749 22
2A	2 37	4747 73	2A	2 98	4747 12	2A	3 76	4746 34
2B	1 79	4747 57	2B	2 32	4747 04	2B	3.10	4746.26
3A	8 89	4747 67	3A	9 53	4747 03	3A		
3B	8 99	4747 71	3B	9 74	4746 96	3B	10 56	4746 14
4A	4 62	4744 07	4A	5 27	4743 42	4A	6 17	4742.52
4B	3 93	4743 66	4B	4 41	4743 18	4B	5 26	4742.33
5A	6 01	4743 70	5A	6 34	4743 37	5A	7 36	4742.35
5B	5 48	4744 03	5B	6 17	4743 34	5B	7 08	4742 43
5C	6 19	4743 60	5C	6 87	4742.92	5C	7 75	4742.04
6A	6 68	4742.60	6A	7 51	4741 77	6A	8 52	4740 76
6B	7 04	4742 56	6B	7 86	4741 74	6B	8 85	4740 75
7A	5 86	4735 47	7A	6 23	4735 10	7A	6 92	4734 41
7B	5 07	4735 92	7B	5 52	4735 47	7B	6 25	4734 74
8A	3 64	4733 43	8A	4 30	4732 77	8A	5 38	4731 69
8B	4 20	4732.84	8B	4 79	4732 25	8B	5 65	4731 39
9A	3 31	4736 29	9A	3 89	4735 71	9A	4 75	4734 85
9B	3 42	4736 25	9B	3 97	4735 70	9B	4 90	4734 77
9C	4 06	4735 58	9C	4 63	4735 01	9C	5 56	4734 08
10A	3 22	4736 04	10A	3 66	4735 60	10A	4 69	4734 57
10B	3 42	4735 55	10B	3 91	4735 06	10B	4 92	4734 05
11A	3 62	4736 29	11A	4 16	4735 75	11A	5 08	4734 83
12A	3 46	4736 24	12A	3.96	4735 74	12A	4 92	4734 78
13A	1 69	4733 68	13A	2 36	4733 01	13A	3 34	4732 03
14A	broken	4740 15	14A	2 06	4738 09	14A	1 67	4738 48
14B	1 28	4738 53	14B	1 81	4738 00	14B	2.77	4737 04
15A	5 87	4743 02	15A	6 34	4742 55	15A	7 20	4741 69
16A	4 69	4727 02	16A	5 15	4726 55	16A	6 02	4725 69
16B	3 92	4727 04	16B	n/a		16B	5 09	4725 87
18A	12 16	4752 04	18A	12 98	4751 22	18A	13 73	4750 47
18B	12 96	4751 95	18B	13 81	4751 10	18B	14 56	4750 35
18C			18C			18C		
19A	3 24	4755 96	19A	4 50	4754 70	19A	5 17	4754 03
19B	5 97	4753 60	19B	7 09	4752.48	19B	7 79	4751 78
20	7 81	4747 27	20	8 64	4746 44	20	9 39	4745 69
21	2 37	4744 79	21	2 50	4744 66	21	3 00	4744 16
22	7 81	4746 30	22	8 43	4745 68	22	9 25	4744 86
23A			23A			23A		
23B			23B			23B		
23C			23C			23C		
24A1			24A1			24A1		
24A2			24A2			24A2		
24B			24B			24B		
25A			25A			25A		
25B			25B			25B		
26A			26A			26A		
26B			26B			26B		
26C			26C			26C		
27A			27A			27A		
27B			27B			27B		
28B			28B			28B		

IPC WATER LEVEL DATA

DATE: 8/14/90			DATE: 9/11/90			DATE: 10/8/90		
WELL #	WTR DEPTH	WT ELEVATION	WELL #	WTR DEPTH	WT ELEVATION	WELL #	WTR DEPTH	WT ELEVATION
1A	12.38	4748.81	1A	12.50	4748.69	1A	12.53	4748.66
1B	13.42	4748.86	1B	13.50	4748.78	1B	13.64	4748.64
2A	3.88	4746.22	2A	3.73	4746.37	2A	3.51	4746.59
2B	3.23	4746.13	2B	3.00	4746.36	2B	2.84	4746.52
3A			3A	10.94	4745.62	3A	10.98	4745.58
3B	10.94	4745.76	3B	11.06	4745.64	3B	11.12	4745.58
4A	6.39	4742.30	4A	6.49	4742.20	4A	6.40	4742.29
4B	5.54	4742.05	4B	5.53	4742.06	4B	5.43	4742.16
5A	7.50	4742.21	5A	7.60	4742.11	5A	7.59	4742.12
5B	7.42	4742.09	5B	7.50	4742.01	5B	7.46	4742.05
5C	8.09	4741.70	5C	8.15	4741.64	5C	8.07	4741.72
6A	8.79	4740.49	6A	8.79	4740.49	6A	8.72	4740.56
6B	9.15	4740.45	6B	9.17	4740.43	6B	9.06	4740.54
7A	7.00	4734.33	7A	6.96	4734.37	7A	6.82	4734.51
7B	6.46	4734.53	7B	6.35	4734.64	7B	6.22	4734.77
8A	5.54	4731.53	8A	5.48	4731.59	8A	5.31	4731.76
8B	5.79	4731.25	8B	5.75	4731.29	8B	5.63	4731.41
9A	4.98	4734.62	9A	4.86	4734.74	9A	4.62	4734.98
9B	5.16	4734.51	9B	5.00	4734.67	9B	4.79	4734.88
9C	5.75	4733.89	9C	5.66	4733.98	9C	5.45	4734.19
10A	4.93	4734.33	10A	4.81	4734.45	10A	4.56	4734.70
10B	4.96	4733.99	10B	4.86	4734.09	10B	4.63	4734.34
11A	5.32	4734.59	11A	5.23	4734.68	11A	4.99	4734.92
12A	5.15	4734.55	12A	5.06	4734.64	12A	4.80	4734.90
13A	3.50	4731.67	13A	3.42	4731.95	13A	3.18	4732.19
14A	2.00	4738.15	14A	1.87	4738.28	14A	1.66	4738.49
14B	3.04	4736.77	14B	3.00	4736.81	14B	2.79	4737.02
15A	7.54	4741.35	15A	7.54	4741.35	15A	7.46	4741.43
16A	6.15	4725.55	16A	6.15	4725.55	16A	5.98	4725.72
16B	5.27	4725.69	16B	5.21	4725.75	16B	5.10	4725.86
18A	14.06	4750.14	18A	14.15	4750.05	18A	14.24	4749.96
18B	14.88	4750.03	18B	14.80	4750.11	18B	15.06	4749.85
18C			18C			18C		
19A	5.42	4753.78	19A	5.35	4753.85	19A	5.40	4753.80
19B	8.33	4751.24	19B	8.19	4751.38	19B	8.08	4751.49
20	9.88	4745.20	20	9.81	4745.27	20	10.00	4745.08
21	3.02	4744.14	21	2.84	4744.32	21	2.67	4744.49
22	9.65	4744.46	22	9.67	4744.44	22	9.73	4744.38
23A			23A			23A		
23B			23B			23B		
23C			23C			23C		
24A1			24A1			24A1		
24A2			24A2			24A2		
24B			24B			24B		
25A			25A			25A		
25B			25B			25B		
26A			26A			26A		
26B			26B			26B		
26C			26C			26C		
27A			27A			27A		
27B			27B			27B		
28B			28B			28B		

IPC WATER LEVEL DATA

DATE: 11/5/90			DATE: 12/3/90			DATE: 12/31/90		
WELL #	WTR DEPTH	WT ELEVATION	WELL #	WTR DEPTH	WT ELEVATION	WELL #	WTR DEPTH	WT ELEVATION
1A	12.25	4748 94	1A	12.20	4748 99	1A	12 23	4748.96
1B	13 36	4748 93	1B	13.28	4749 00	1B	13 31	4748 97
2A	3 21	4746 89	2A	3.24	4746 86	2A	3 21	4746 89
2B	2 56	4746 80	2B	2 62	4746 74	2B	2 57	4746 79
3A	10 73	4745 83	3A	10 64	4745 92	3A	10 69	4745 87
3B	10 89	4745 81	3B	10 82	4745 88	3B	10 84	4745 86
4A	6 13	4742 56	4A	6 15	4742.54	4A	6 14	4742.55
4B	5 17	4742 42	4B	5 13	4742.46	4B	5 16	4742 43
5A	OIL		5A	7 81	4741 90	5A	7 59	4742.12
5B	7 12	4742 39	5B	7 15	4742.36	5B	7 05	4742 46
5C	7 79	4742 00	5C	7 75	4742.04	5C	7 73	4742 06
6A	8.43	4740 85	6A	8 37	4740 91	6A	8.30	4740 98
6B	8.76	4740 84	6B	8 73	4740 87	6B	8 66	4740 94
7A	6 67	4734 86	7A	6 67	4734 86	7A	6 59	4734 74
7B	6 04	4734 95	7B	6 05	4734 94	7B	5 98	4735 01
8A	5 08	4731 99	8A	5 17	4731 90	8A	5 00	4732.07
8B	5 44	4731 60	8B	5 52	4731 52	8B	5 42	4731 62
9A	4 31	4735 29	9A	4 25	4735 35	9A	4 21	4735 39
9B	4 46	4735 21	9B	4 39	4735 28	9B	4 34	4735 33
9C	5 17	4734 47	9C	5 16	4734 48	9C	5 06	4734 58
10A	4 22	4735 04	10A	4 20	4735 06	10A	4 16	4735 10
10B	4 29	4734 68	10B	4 22	4734 75	10B	4 17	4734 80
11A	4 66	4735 25	11A	4 60	4735 31	11A	4 55	4735 36
12A	4 46	4735 24	12A	4 42	4735 28	12A	4 34	4735 36
13A	2 81	4732 56	13A	2 79	4732 58	13A	2 79	4732.58
14A	OIL	4740 15	14A	1 29	4738 86	14A	1 22	4738 93
14B	2.43	4737 38	14B	2 39	4737 42	14B	2 29	4737 52
15A	7 19	4741 70	15A	7 16	4741 73	15A	7 13	4741 76
16A	5 83	4725 87	16A	5 87	4725 83	16A	5 78	4725 92
16B	4 92	4726 04	16B	5 06	4725 90	16B	4 94	4726 02
18A	14 06	4750 14	18A	14 00	4750 20	18A	13 95	4750 25
18B	14 83	4750 08	18B	14 80	4750 11	18B	14 74	4750 17
18C			18C	14 09	4750 27	18C	14 04	4750 32
19A	4 97	4754 23	19A	5 13	4754 07	19A	5 48	4753 72
19B	7 67	4751 90	19B	7 74	4751 83	19B	8 11	4751 46
20	9 80	4745 28	20	9 70	4745 38	20	9 61	4745 47
21	2 52	4744 64	21	2 64	4744 52	21	2 60	4744 56
22	9 43	4744 68	22	9 42	4744 69	22	9 44	4744 67
23A			23A	6 77	4736 99	23A	6 85	4736 91
23B			23B	7 18	4736 72	23B	7 12	4736 78
23C			23C	6 92	4737 04	23C	6 84	4737 12
24A1			24A1	6 73	4729 60	24A1	6 65	4729 68
24A2			24A2	6 05	4730 34	24A2	6 85	4729 54
24B			24B	6 64	4729 36	24B	6 67	4729 53
25A			25A	5 94	4729 55	25A	5 79	4729 70
25B			25B	5 84	4729 51	25B	5 79	4729 56
26A			26A	4 43	4730 68	26A	4 21	4730 90
26B			26B	5 34	4730 60	26B	5 27	4730.67
26C			26C	5 84	4730 21	26C	5 80	4730 25
27A			27A	6 94	4724 00	27A	6 82	4724 12
27B			27B	7 20	4723 62	27B	7 14	4723.68
28B			28B	6 23	4727 71	28B	5 98	4727 96

IPC WATER LEVEL DATA

DATE: 1/31/91			DATE: 2/26/91			DATE: 3/26/91		
WELL #	WTR DEPTH	WT ELEVATION	WELL #	WTR DEPTH	WT ELEVATION	WELL #	WTR DEPTH	WT ELEVATION
1A	12.58	4748.61	1A	12.13	4749.06	1A	11.74	4749.45
1B	13.66	4748.62	1B	13.22	4749.06	1B	12.84	4749.44
2A	3.26	4746.84	2A	2.96	4747.14	2A	2.76	4747.34
2B	2.64	4746.72	2B	2.34	4747.02	2B	2.12	4747.24
3A	10.79	4745.77	3A	10.41	4746.15	3A	10.09	4746.47
3B	11.09	4745.61	3B	10.59	4746.11	3B	10.24	4746.46
4A	6.23	4742.46	4A	5.62	4743.07	4A	5.38	4743.31
4B	5.22	4742.37	4B	4.75	4742.84	4B	4.49	4743.10
5A	7.99	4741.72	5A	7.04	4742.67	5A	7.10	4742.61
5B	7.26	4742.25	5B	6.80	4742.71	5B	6.47	4743.04
5C	7.93	4741.86	5C	7.46	4742.33	5C	7.16	4742.63
6A	8.49	4740.79	6A	8.09	4741.19	6A	7.74	4741.54
6B	8.84	4740.76	6B	8.46	4741.14	6B	8.10	4741.50
7A	6.30	4735.03	7A	6.38	4734.95	7A	6.26	4735.07
7B	5.70	4735.29	7B	5.69	4735.30	7B	5.55	4735.44
8A	4.70	4732.37	8A	4.42	4732.65	8A	4.11	4732.96
8B	5.19	4731.85	8B	5.15	4731.89	8B	4.90	4732.14
9A	4.15	4735.45	9A	3.77	4735.83	9A	3.46	4736.14
9B	4.27	4735.40	9B	3.91	4735.76	9B	3.60	4736.07
9C	5.00	4734.64	9C	4.68	4734.96	9C	4.41	4735.23
10A	4.18	4735.08	10A	3.70	4735.56	10A	3.38	4735.88
10B	4.20	4734.77	10B	3.75	4735.22	10B	3.39	4735.58
11A	4.54	4735.37	11A	4.09	4735.82	11A	3.73	4736.18
12A	4.34	4735.36	12A	3.91	4735.79	12A	3.55	4736.15
13A	frozen	4735.37	13A	2.21	4733.16	13A	1.96	4733.41
14A	1.22	4736.93	14A	0.62	4739.33	14A	0.53	4739.62
14B	2.31	4737.50	14B	1.88	4737.93	14B	1.60	4738.21
15A	7.25	4741.64	15A	6.83	4742.06	15A	6.57	4742.32
16A	5.70	4726.00	16A	5.34	4726.36	16A	5.16	4726.54
16B	4.88	4726.08	16B	4.79	4726.17	16B	4.64	4726.32
18A	14.37	4749.83	18A	14.00	4750.20	18A	13.61	4750.59
18B	15.11	4749.80	18B	14.79	4750.12	18B	14.40	4750.51
18C	14.30	4750.08	18C	14.03	4750.33	18C	13.70	4750.68
19A	5.95	4753.25	19A	5.37	4753.83	19A	4.91	4754.29
19B	8.34	4751.23	19B	7.74	4751.83	19B	7.36	4752.21
20	9.99	4745.09	20	9.45	4745.63	20	9.06	4746.02
21	2.64	4744.52	21	2.44	4744.72	21	2.28	4744.88
22	9.65	4744.46	22	9.18	4744.93	22	8.85	4745.26
23A	6.75	4737.01	23A	6.39	4737.37	23A	6.12	4737.64
23B	7.03	4736.87	23B	6.71	4737.19	23B	6.42	4737.48
23C	6.74	4737.22	23C	6.43	4737.53	23C	6.15	4737.81
24A1	6.51	4729.82	24A1	6.56	4729.77	24A1	6.38	4729.95
24A2	6.71	4729.68	24A2	6.79	4729.60	24A2	6.61	4729.78
24B	6.49	4729.71	24B	6.56	4729.64	24B	6.41	4729.79
25A	5.67	4729.82	25A	5.57	4729.92	25A	5.31	4730.18
25B	5.56	4729.79	25B	5.59	4729.76	25B	5.41	4729.94
26A	4.13	4730.98	26A	3.90	4731.21	26A	3.69	4731.42
26B	5.24	4730.70	26B	4.86	4731.08	26B	4.64	4731.30
26C	5.73	4730.32	26C	5.33	4730.72	26C	5.19	4730.86
27A	6.88	4724.06	27A	6.62	4724.32	27A	6.33	4724.61
27B	7.08	4723.74	27B	6.96	4723.86	27B	6.76	4724.06
28B	5.94	4728.00	28B	6.11	4727.83	28B	6.02	4727.92

IPC WATER LEVEL DATA

DATE: 4/23/91			DATE: 7/17/91		
WELL #	WTR DEPTH	WT ELEVATION	WELL #	WTR DEPTH	WT ELEVATION
1A	10.75	4750.44	1A	11.72	4749.47
1B	11.85	4750.43	1B	12.82	4749.46
2A	2.44	4747.66	2A	3.53	4746.57
2B	1.80	4747.56	2B	2.85	4746.51
3A	9.30	4747.26	3A	10.38	4746.18
3B	9.40	4747.30	3B	10.08	4746.62
4A	4.99	4743.70	4A	6.05	4742.64
4B	4.13	4743.46	4B	5.14	4742.45
5A	6.10	4743.61	5A	7.31	4742.40
5B	5.81	4743.70	5B	6.89	4742.62
5C	6.49	4743.30	5C	7.64	4742.15
6A	NOT MEASRD		6A	NOT MEASRD	4749.28
6B	NOT MEASRD		6B	NOT MEASRD	4749.60
7A	5.99	4735.34	7A	6.89	4734.44
7B	5.23	4735.76	7B	6.24	4734.75
8A	3.73	4733.34	8A	5.29	4731.78
8B	4.44	4732.60	8B	5.59	4731.45
9A	3.30	4736.30	9A	4.66	4734.94
9B	3.44	4736.23	9B	4.75	4734.92
9C	4.16	4735.48	9C	5.43	4734.21
10A	3.31	4735.95	10A	4.60	4734.66
10B	3.31	4735.66	10B	4.63	4734.34
11A	3.82	4736.29	11A	4.98	4734.93
12A	3.46	4736.24	12A	4.82	4734.88
13A	1.74	4733.63	13A	3.23	4732.14
14A	0.35	4739.60	14A	1.36	4738.59
14B	1.37	4738.44	14B	2.63	4737.18
15A	6.09	4742.80	15A	7.12	4741.77
16A	4.82	4726.88	16A	5.91	4725.79
16B			16B		4730.96
18A	12.65	4751.55	18A	13.50	4750.70
18B	13.43	4751.48	18B	14.30	4750.61
18C	12.70	4751.66	18C	13.51	4750.85
19A	3.60	4755.60	19A	4.81	4754.39
19B	6.31	4753.26	19B	7.64	4751.93
20	8.23	4746.85	20	9.29	4745.79
21	2.34	4744.82	21	2.80	4744.36
22	8.13	4745.98	22	9.08	4745.03
23A	5.86	4737.90	23A	6.96	4736.80
23B	6.18	4737.72	23B	7.40	4736.50
23C	5.89	4738.07	23C	7.11	4736.85
24A1	5.78	4730.55	24A1	6.72	4729.61
24A2	6.09	4730.30	24A2	6.96	4729.43
24B	5.90	4730.30	24B	6.71	4729.49
25A	4.88	4730.61	25A	5.99	4729.50
25B	4.84	4730.51	25B	5.95	4729.40
26A	3.51	4731.60	26A	4.97	4730.14
26B	4.50	4731.44	26B	5.88	4730.06
26C	4.99	4731.06	26C	6.29	4729.76
27A	5.90	4725.04	27A	7.02	4723.92
27B	6.32	4724.50	27B	7.22	4723.60
28B	5.36	4728.58	28B	5.96	4727.98

APPENDIX D

SLUG TEST DATA AND TYPE CURVE PLOTS

IDAHO POLE SLUG TEST DATA

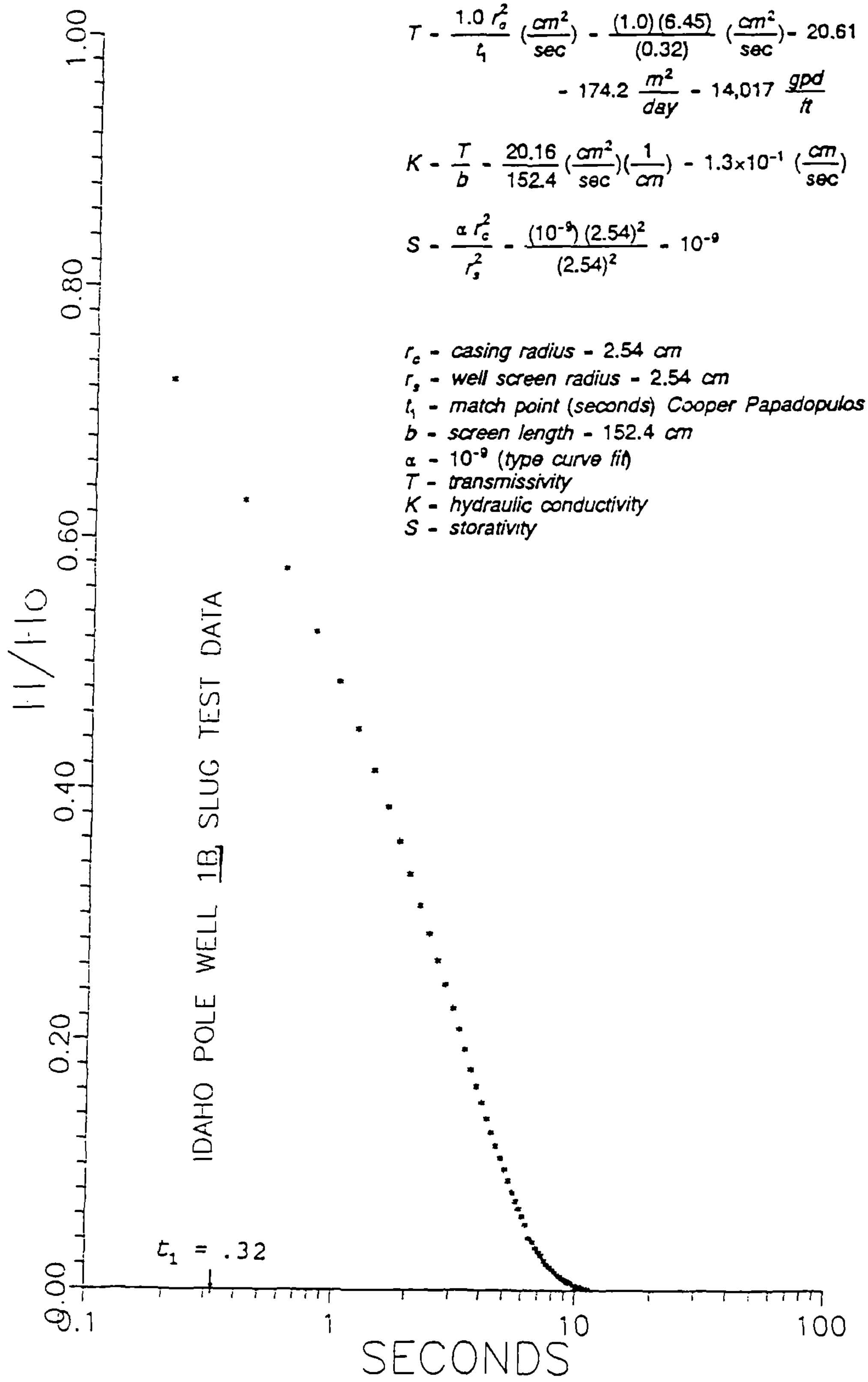
MONITOR WELL 1B
INITIAL X-DUCER READING = 10.116′
8.12 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	HEAD	H/Ho
0.2	4.23	5.886	0.725
0.4	5.01	5.106	0.629
0.6	5.45	4.666	0.575
0.8	5.85	4.266	0.525
1.0	6.18	3.936	0.485
1.2	6.48	3.636	0.448
1.4	6.75	3.366	0.415
1.6	6.98	3.136	0.386
1.8	7.21	2.906	0.358
2.0	7.42	2.696	0.332
2.2	7.62	2.496	0.307
2.4	7.80	2.316	0.285
2.6	7.97	2.146	0.264
2.8	8.13	1.986	0.245
3.0	8.28	1.836	0.226
3.2	8.42	1.696	0.209
3.4	8.55	1.566	0.193
3.6	8.68	1.436	0.177
3.8	8.79	1.326	0.163
4.0	8.90	1.216	0.150
4.2	9.00	1.116	0.137
4.4	9.09	1.026	0.126
4.6	9.18	0.936	0.115
4.8	9.26	0.856	0.105
5.0	9.34	0.776	0.096
5.2	9.41	0.706	0.087
5.4	9.48	0.636	0.078
5.6	9.54	0.576	0.071
5.8	9.59	0.526	0.065
6.0	9.64	0.476	0.059
6.2	9.69	0.426	0.052
6.4	9.78	0.336	0.041
6.6	9.81	0.306	0.038
6.8	9.85	0.266	0.033
7.0	9.87	0.246	0.030
7.2	9.90	0.216	0.027
7.4	9.93	0.186	0.023
7.6	9.95	0.166	0.020
7.8	9.97	0.146	0.018
8.0	9.99	0.126	0.016
8.2	10.00	0.116	0.014
8.4	10.02	0.096	0.012
8.6	10.03	0.086	0.011
8.8	10.04	0.076	0.009
9.0	10.05	0.066	0.008

IDAHO POLE SLUG TEST DATA (CONTD'T.)

MONITOR WELL 1B
INITIAL X-DUCER READING = 10.116'
8.12 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	HEAD	H/Ho
9.2	10.06	0.056	0.007
9.4	10.07	0.046	0.006
9.8	10.08	0.036	0.004
10.2	10.09	0.026	0.003
10.6	10.10	0.016	0.002
11.2	10.11	0.006	0.001



$$T = \frac{1.0\, r_c^2}{t_1}\left(\frac{cm^2}{sec}\right) = \frac{(1.0)(6.45)}{(0.32)}\left(\frac{cm^2}{sec}\right) = 20.61\left(\frac{cm^2}{sec}\right)$$

$$= 174.2\ \frac{m^2}{day} = 14{,}017\ \frac{gpd}{ft}$$

$$K = \frac{T}{b} = \frac{20.16}{152.4}\left(\frac{cm^2}{sec}\right)\left(\frac{1}{cm}\right) = 1.3\times10^{-1}\left(\frac{cm}{sec}\right)$$

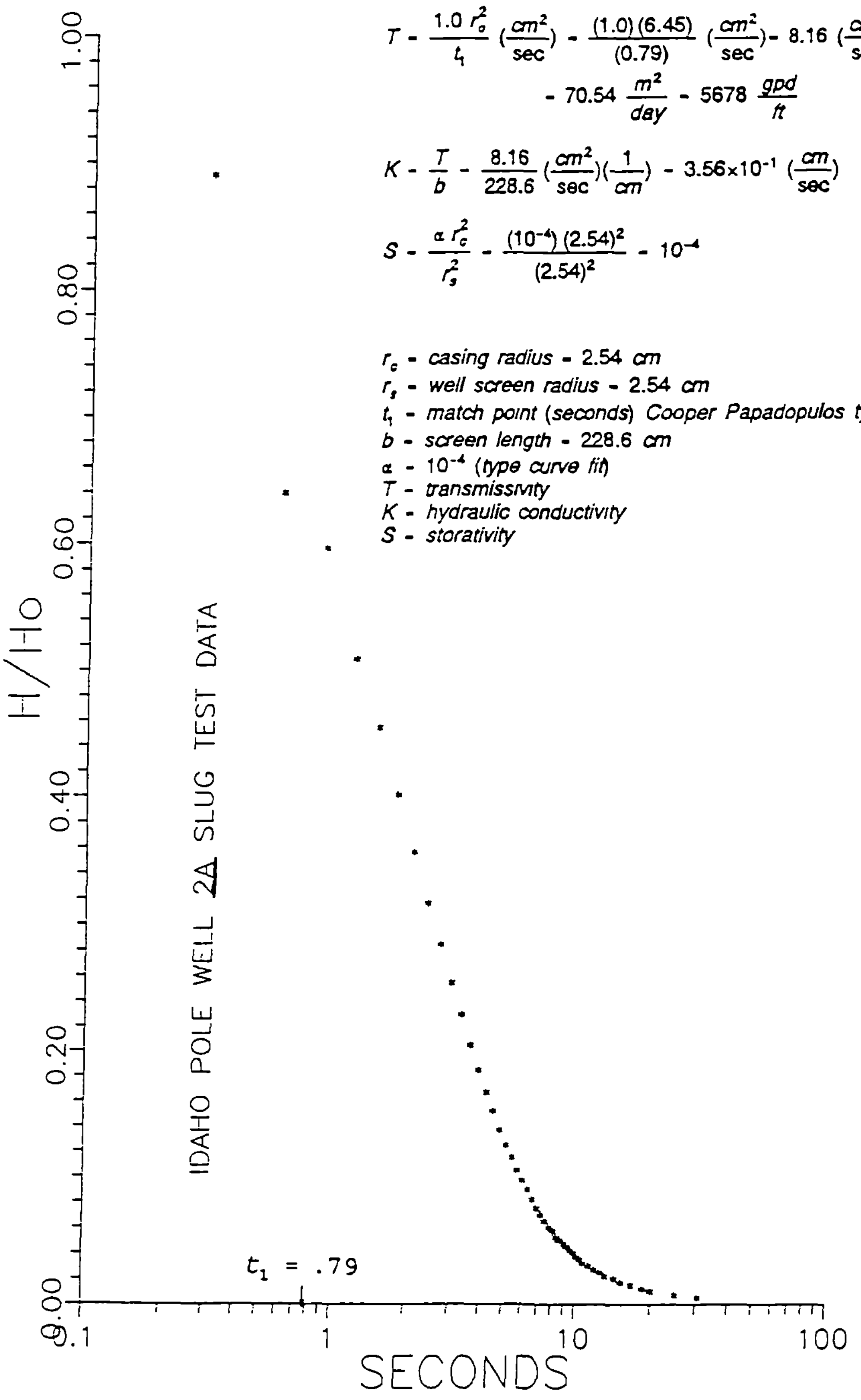
$$S = \frac{\alpha\, r_c^2}{r_s^2} = \frac{(10^{-9})(2.54)^2}{(2.54)^2} = 10^{-9}$$

r_c = *casing radius* = 2.54 *cm*
r_s = *well screen radius* = 2.54 *cm*
t_1 = *match point (seconds) Cooper Papadopulos type curve*
b = *screen length* = 152.4 *cm*
α = 10^{-9} *(type curve fit)*
T = *transmissivity*
K = *hydraulic conductivity*
S = *storativity*

IDAHO POLE SLUG TEST DATA

MONITOR WELL 2A
INITIAL X-DUCER READING = 9.540'
4.00 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
0.3	5.98	3.56	0.89
0.6	6.98	2.56	0.64
0.9	7.15	2.39	0.60
1.2	7.50	2.04	0.51
1.5	7.72	1.82	0.45
1.8	7.93	1.61	0.40
2.1	8.11	1.43	0.36
2.4	8.27	1.27	0.32
2.7	8.40	1.14	0.28
3.0	8.52	1.02	0.25
3.3	8.62	0.92	0.23
3.6	8.72	0.82	0.20
3.9	8.80	0.74	0.18
4.2	8.87	0.67	0.17
4.5	8.93	0.61	0.15
4.8	8.99	0.55	0.14
5.1	9.04	0.50	0.13
5.4	9.08	0.46	0.11
5.7	9.12	0.42	0.10
6.0	9.15	0.39	0.10
6.3	9.18	0.36	0.09
6.6	9.21	0.33	0.08
6.9	9.24	0.30	0.07
7.2	9.26	0.28	0.07
7.5	9.28	0.26	0.06
7.8	9.30	0.24	0.06
8.1	9.31	0.23	0.06
8.4	9.33	0.21	0.05
8.7	9.34	0.20	0.05
9.0	9.35	0.19	0.05
9.3	9.36	0.18	0.04
9.6	9.37	0.17	0.04
9.9	9.38	0.16	0.04
10.2	9.39	0.15	0.04
10.5	9.40	0.14	0.03
10.8	9.41	0.13	0.03
11.4	9.42	0.12	0.03
12.0	9.43	0.11	0.03
12.6	9.44	0.10	0.02
13.2	9.45	0.09	0.02
14.4	9.46	0.08	0.02
15.3	9.47	0.07	0.02
16.8	9.48	0.06	0.01
18.6	9.49	0.05	0.01
20.0	9.50	0.04	0.01
24.9	9.51	0.03	0.01
30.6	9.52	0.02	0.00



$$T - \frac{1.0\ r_c^2}{t_1}\ (\frac{cm^2}{sec}) - \frac{(1.0)\,(6.45)}{(0.79)}\ (\frac{cm^2}{sec}) - 8.16\ (\frac{cm^2}{sec})$$

$$- 70.54\ \frac{m^2}{day} - 5678\ \frac{gpd}{ft}$$

$$K - \frac{T}{b} - \frac{8.16}{228.6}(\frac{cm^2}{sec})(\frac{1}{cm}) - 3.56\times10^{-1}\ (\frac{cm}{sec})$$

$$S - \frac{\alpha\ r_c^2}{r_s^2} - \frac{(10^{-4})\,(2.54)^2}{(2.54)^2} - 10^{-4}$$

r_c - *casing radius* - 2.54 *cm*
r_s - *well screen radius* - 2.54 *cm*
t_1 - *match point (seconds) Cooper Papadopulos type curve*
b - *screen length* - 228.6 *cm*
α - 10^{-4} *(type curve fit)*
T - *transmissivity*
K - *hydraulic conductivity*
S - *storativity*

IDAHO POLE SLUG TEST DATA

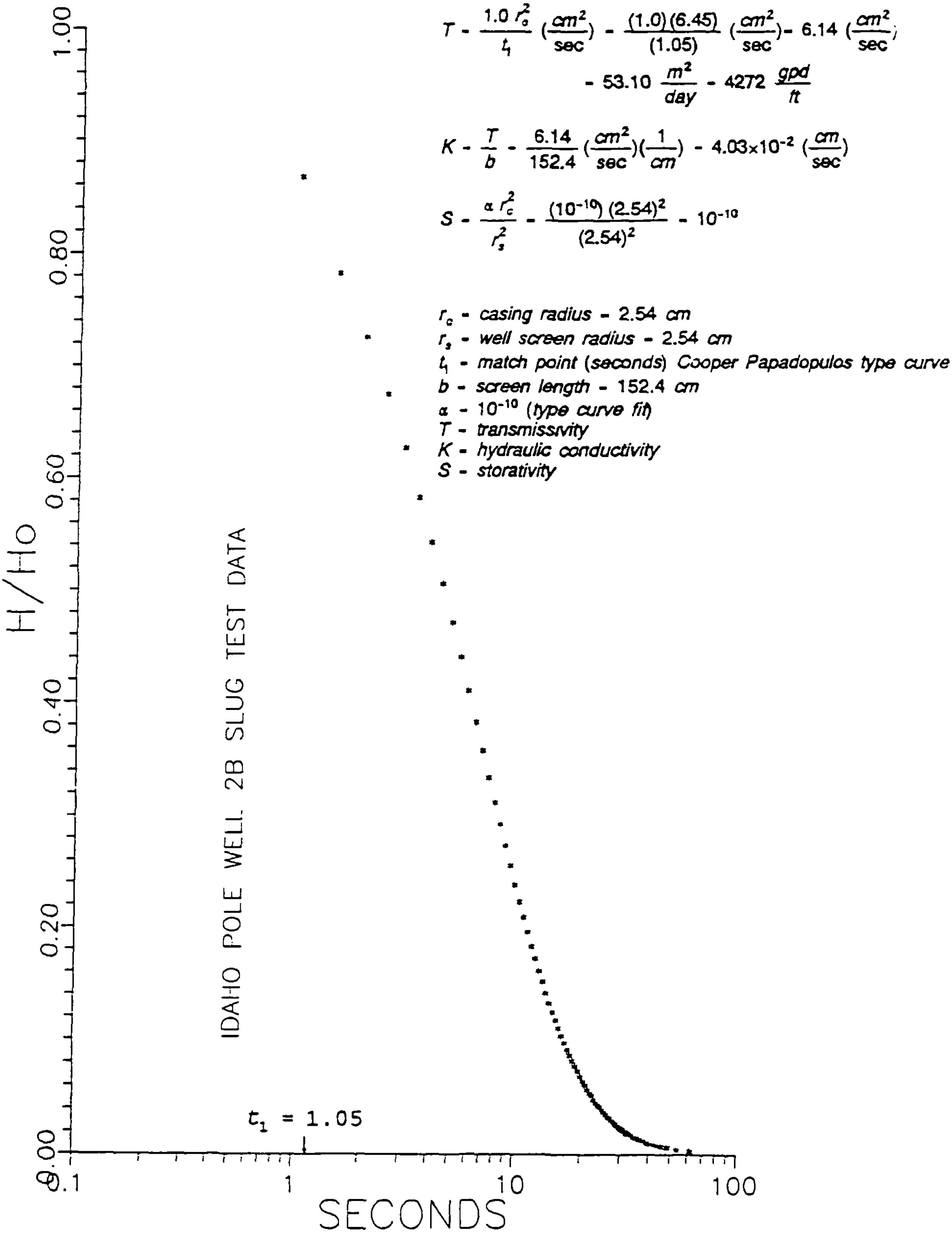
MONITOR WELL 2B
INITIAL X-DUCER READING = 10.584'
8.00 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
1.0	3.64	6.95	0.87
1.5	4.31	6.27	0.78
2.0	4.77	5.81	0.73
2.5	5.18	5.40	0.68
3.0	5.56	5.02	0.63
3.5	5.91	4.67	0.58
4.0	6.23	4.35	0.54
4.5	6.53	4.05	0.51
5.0	6.80	3.78	0.47
5.5	7.05	3.53	0.44
6.0	7.29	3.29	0.41
6.5	7.51	3.07	0.38
7.0	7.71	2.87	0.36
7.5	7.90	2.68	0.34
8.0	8.08	2.50	0.31
8.5	8.24	2.34	0.29
9.0	8.39	2.19	0.27
9.5	8.54	2.04	0.26
10.0	8.67	1.91	0.24
10.5	8.79	1.79	0.22
11.0	8.90	1.68	0.21
11.5	9.01	1.57	0.20
12.0	9.11	1.47	0.18
12.5	9.20	1.38	0.17
13.0	9.29	1.29	0.16
13.5	9.37	1.21	0.15
14.0	9.45	1.13	0.14
14.5	9.52	1.06	0.13
15.0	9.58	1.00	0.13
15.5	9.64	0.94	0.12
16.0	9.70	0.88	0.11
16.5	9.75	0.83	0.10
17.0	9.80	0.78	0.10
17.5	9.85	0.73	0.09
18.0	9.89	0.69	0.09
18.5	9.93	0.65	0.08
19.0	9.97	0.61	0.08
19.5	10.00	0.58	0.07
20.0	10.04	0.54	0.07
20.5	10.07	0.51	0.06
21.0	10.10	0.48	0.06
21.5	10.13	0.45	0.06
22.0	10.15	0.43	0.05
22.5	10.17	0.41	0.05
23.0	10.20	0.38	0.05

IDAHO POLE SLUG TEST DATA (CONT'D.)

MONITOR WELL 2B
INITIAL X-DUCER READING = 10.584'
8.00 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
23.5	10.22	0.36	0.05
24.0	10.24	0.34	0.04
24.5	10.25	0.33	0.04
25.0	10.27	0.31	0.04
25.5	10.29	0.29	0.04
26.0	10.30	0.28	0.04
26.5	10.32	0.26	0.03
27.0	10.33	0.25	0.03
27.5	10.34	0.24	0.03
28.0	10.36	0.22	0.03
28.5	10.37	0.21	0.03
29.0	10.38	0.20	0.03
29.5	10.39	0.19	0.02
30.0	10.40	0.18	0.02
30.5	10.41	0.17	0.02
31.5	10.42	0.16	0.02
32.0	10.43	0.15	0.02
32.5	10.44	0.14	0.02
33.5	10.45	0.13	0.02
34.5	10.46	0.12	0.02
35.5	10.47	0.11	0.01
36.5	10.48	0.10	0.01
37.5	10.49	0.09	0.01
39.0	10.50	0.08	0.01
40.5	10.51	0.07	0.01
43.0	10.52	0.06	0.01
45.5	10.53	0.05	0.01
48.5	10.54	0.04	0.01
53.5	10.55	0.03	0.00
61.5	10.56	0.02	0.00



$$T - \frac{1.0\,r_c^2}{t_1}\left(\frac{cm^2}{sec}\right) - \frac{(1.0)(6.45)}{(1.05)}\left(\frac{cm^2}{sec}\right) - 6.14\left(\frac{cm^2}{sec}\right)$$

$$- 53.10\,\frac{m^2}{day} - 4272\,\frac{gpd}{ft}$$

$$K - \frac{T}{b} - \frac{6.14}{152.4}\left(\frac{cm^2}{sec}\right)\left(\frac{1}{cm}\right) - 4.03\times10^{-2}\left(\frac{cm}{sec}\right)$$

$$S - \frac{\alpha\,r_c^2}{r_s^2} - \frac{(10^{-10})\,(2.54)^2}{(2.54)^2} - 10^{-10}$$

r_c - *casing radius* - 2.54 *cm*
r_s - *well screen radius* - 2.54 *cm*
t_1 - *match point* (*seconds*) *Cooper Papadopulos type curve*
b - *screen length* - 152.4 *cm*
α - 10^{-10} (*type curve fit*)
T - *transmissivity*
K - *hydraulic conductivity*
S - *storativity*

IDAHO POLE SLUG TEST DATA

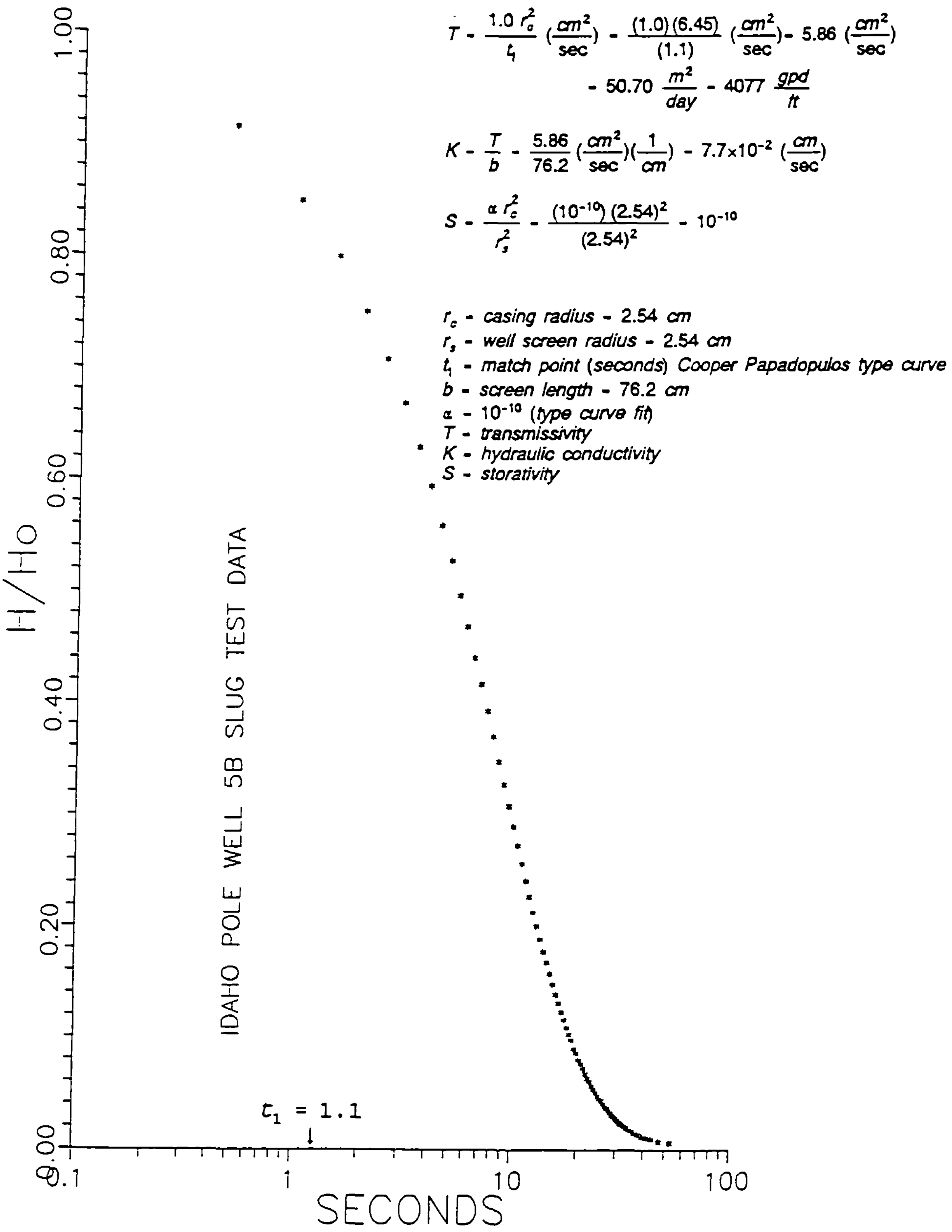
MONITOR WELL 5B
INITIAL X-DUCER READING = 10.440'
6.97 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
0.5	4.07	6.37	0.91
1.0	4.53	5.91	0.85
1.5	4.88	5.56	0.80
2.0	5.21	5.23	0.75
2.5	5.51	4.93	0.71
3.0	5.79	4.65	0.67
3.5	6.06	4.38	0.63
4.0	6.31	4.13	0.59
4.5	6.55	3.89	0.56
5.0	6.77	3.67	0.53
5.5	6.98	3.46	0.50
6.0	7.18	3.26	0.47
6.5	7.37	3.07	0.44
7.0	7.54	2.90	0.42
7.5	7.71	2.73	0.39
8.0	7.87	2.57	0.37
8.5	8.02	2.42	0.35
9.0	8.16	2.28	0.33
9.5	8.29	2.15	0.31
10.0	8.42	2.02	0.29
10.5	8.54	1.90	0.27
11.0	8.65	1.79	0.26
11.5	8.75	1.69	0.24
12.0	8.85	1.59	0.23
12.5	8.95	1.49	0.21
13.0	9.04	1.40	0.20
13.5	9.12	1.32	0.19
14.0	9.20	1.24	0.18
14.5	9.27	1.17	0.17
15.0	9.34	1.10	0.16
15.5	9.41	1.03	0.15
16.0	9.47	0.97	0.14
16.5	9.53	0.91	0.13
17.0	9.58	0.86	0.12
17.5	9.63	0.81	0.12
18.0	9.68	0.76	0.11
18.5	9.72	0.72	0.10
19.0	9.76	0.68	0.10
19.5	9.81	0.63	0.09
20.0	9.84	0.60	0.09
20.5	9.88	0.56	0.08
21.0	9.91	0.53	0.08
21.5	9.94	0.50	0.07
22.0	9.97	0.47	0.07
22.5	10.00	0.44	0.06

IDAHO POLE SLUG TEST DATA (CONT'D.)

MONITOR WELL 5B
INITIAL X-DUCER READING = 10.440'
6.97 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
23.0	10.02	0.42	0.06
23.5	10.05	0.39	0.06
24.0	10.07	0.37	0.05
24.5	10.09	0.35	0.05
25.0	10.11	0.33	0.05
25.5	10.13	0.31	0.04
26.0	10.14	0.30	0.04
26.5	10.16	0.28	0.04
27.0	10.18	0.26	0.04
27.5	10.19	0.25	0.04
28.0	10.20	0.24	0.03
28.5	10.22	0.22	0.03
29.0	10.23	0.21	0.03
29.5	10.24	0.20	0.03
30.0	10.25	0.19	0.03
30.5	10.26	0.18	0.03
31.0	10.27	0.17	0.02
31.5	10.28	0.16	0.02
32.0	10.29	0.15	0.02
33.0	10.30	0.14	0.02
33.5	10.31	0.13	0.02
34.5	10.32	0.12	0.02
35.5	10.33	0.11	0.02
36.5	10.34	0.10	0.01
38.0	10.35	0.09	0.01
39.5	10.36	0.08	0.01
41.5	10.37	0.07	0.01
43.5	10.38	0.06	0.01
47.0	10.39	0.05	0.01
53.0	10.40	0.04	0.01



$$T = \frac{1.0\, r_c^2}{t_1} \left(\frac{cm^2}{sec}\right) = \frac{(1.0)(6.45)}{(1.1)} \left(\frac{cm^2}{sec}\right) = 5.86 \left(\frac{cm^2}{sec}\right)$$

$$= 50.70 \frac{m^2}{day} = 4077 \frac{gpd}{ft}$$

$$K = \frac{T}{b} = \frac{5.86}{76.2} \left(\frac{cm^2}{sec}\right)\left(\frac{1}{cm}\right) = 7.7 \times 10^{-2} \left(\frac{cm}{sec}\right)$$

$$S = \frac{\alpha\, r_c^2}{r_s^2} = \frac{(10^{-10})(2.54)^2}{(2.54)^2} = 10^{-10}$$

r_c = casing radius = 2.54 cm
r_s = well screen radius = 2.54 cm
t_1 = match point (seconds) Cooper Papadopulos type curve
b = screen length = 76.2 cm
α = 10^{-10} (type curve fit)
T = transmissivity
K = hydraulic conductivity
S = storativity

IDAHO POLE SLUG TEST DATA

MONITOR WELL 5C
INITIAL X-DUCER READING = 10.264'
7.60 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
5	3.15	7.11	0.94
10	3.38	6.88	0.91
15	3.59	6.67	0.88
20	3.78	6.48	0.85
25	3.96	6.30	0.83
30	4.13	6.13	0.81
35	4.29	5.97	0.79
40	4.44	5.82	0.77
45	4.59	5.67	0.75
50	4.73	5.53	0.73
55	4.86	5.40	0.71
60	4.99	5.27	0.69
65	5.12	5.14	0.68
70	5.24	5.02	0.66
75	5.35	4.91	0.65
80	5.46	4.80	0.63
85	5.57	4.69	0.62
90	5.68	4.58	0.60
95	5.78	4.48	0.59
100	5.87	4.39	0.58
105	5.97	4.29	0.57
110	6.06	4.20	0.55
115	6.15	4.11	0.54
120	6.24	4.02	0.53
125	6.32	3.94	0.52
130	6.40	3.86	0.51
135	6.48	3.78	0.50
140	6.56	3.70	0.49
145	6.63	3.63	0.48
150	6.70	3.56	0.47
155	6.78	3.48	0.46
160	6.84	3.42	0.45
165	6.91	3.35	0.44
170	6.97	3.29	0.43
175	7.04	3.22	0.42
180	7.10	3.16	0.42
185	7.16	3.10	0.41
190	7.21	3.05	0.40
195	7.27	2.99	0.39
200	7.33	2.93	0.39
205	7.38	2.88	0.38
210	7.43	2.83	0.37
215	7.48	2.78	0.37
220	7.53	2.73	0.36
225	7.58	2.68	0.35
230	7.63	2.63	0.35
235	7.68	2.58	0.34
240	7.72	2.54	0.33
245	7.76	2.50	0.33
250	7.81	2.45	0.32
255	7.85	2.41	0.32

IDAHO POLE SLUG TEST DATA (CONT'D.)

MONITOR WELL 5C
INITIAL X-DUCER READING = 10.264'
7.60 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
260	7.89	2.37	0.31
265	7.93	2.33	0.31
270	7.97	2.29	0.30
275	8.01	2.25	0.30
280	8.05	2.21	0.29
285	8.08	2.18	0.29
290	8.12	2.14	0.28
295	8.15	2.11	0.28
300	8.19	2.07	0.27
305	8.22	2.04	0.27
310	8.25	2.01	0.26
315	8.29	1.97	0.26
320	8.32	1.94	0.26
325	8.35	1.91	0.25
330	8.38	1.88	0.25
335	8.41	1.85	0.24
340	8.43	1.83	0.24
345	8.46	1.80	0.24
350	8.49	1.77	0.23
355	8.52	1.74	0.23
360	8.54	1.72	0.23
365	8.57	1.69	0.22
370	8.59	1.67	0.22
375	8.62	1.64	0.22
380	8.64	1.62	0.21
385	8.67	1.59	0.21
390	8.69	1.57	0.21
395	8.71	1.55	0.20
400	8.73	1.53	0.20
405	8.76	1.50	0.20
410	8.78	1.48	0.20
415	8.80	1.46	0.19
420	8.82	1.44	0.19
425	8.84	1.42	0.19
430	8.86	1.40	0.18
435	8.88	1.38	0.18
440	8.90	1.36	0.18
445	8.92	1.34	0.18
450	8.93	1.33	0.18
455	8.95	1.31	0.17
460	8.97	1.29	0.17
465	8.99	1.27	0.17
470	9.00	1.26	0.17
475	9.02	1.24	0.16
480	9.04	1.22	0.16
485	9.05	1.21	0.16
490	9.07	1.19	0.16
495	9.09	1.17	0.15
500	9.10	1.16	0.15
505	9.11	1.15	0.15
510	9.13	1.13	0.15
520	9.16	1.10	0.15

MONITOR WELL 5C
INITIAL X-DUCER READING = 10.264'
7.60 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
535	9.20	1.06	0.14
550	9.24	1.02	0.13
565	9.28	0.98	0.13
580	9.31	0.95	0.13
595	9.34	0.92	0.12
610	9.38	0.88	0.12
625	9.40	0.86	0.11
640	9.43	0.83	0.11
655	9.46	0.80	0.11
670	9.48	0.78	0.10
685	9.51	0.75	0.10
700	9.53	0.73	0.10
715	9.55	0.71	0.09
730	9.58	0.68	0.09
745	9.60	0.66	0.09
760	9.62	0.64	0.08
775	9.63	0.63	0.08
795	9.65	0.61	0.08
810	9.67	0.59	0.08
825	9.69	0.57	0.08
840	9.70	0.56	0.07
855	9.72	0.54	0.07
870	9.73	0.53	0.07
885	9.74	0.52	0.07
900	9.76	0.50	0.07
915	9.77	0.49	0.06
930	9.78	0.48	0.06
960	9.81	0.45	0.06
1020	9.85	0.41	0.05
1080	9.88	0.38	0.05
1140	9.91	0.35	0.05
1200	9.94	0.32	0.04
1260	9.97	0.29	0.04
1320	9.99	0.27	0.04
1380	10.00	0.26	0.03

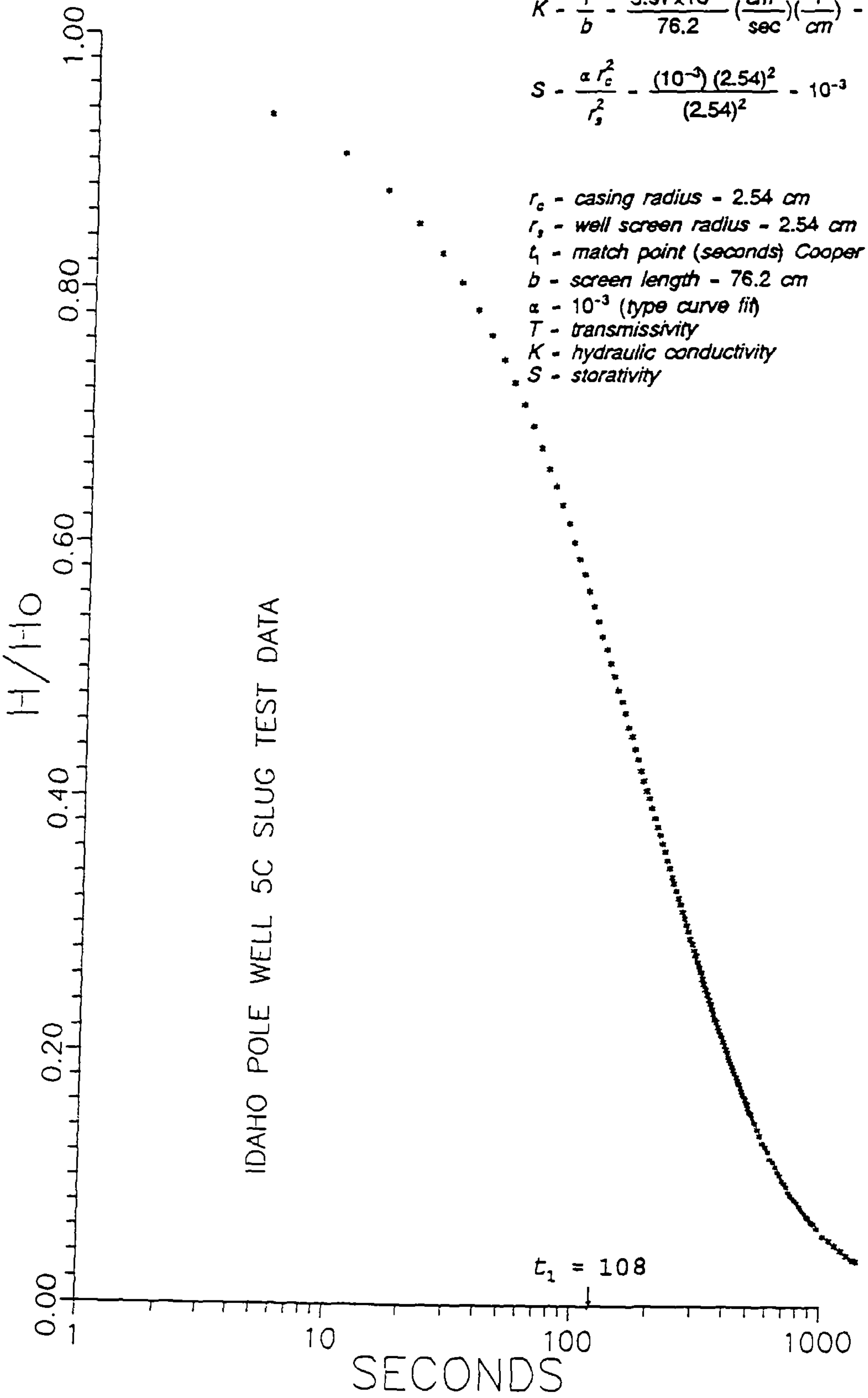
$$T = \frac{1.0\, r_c^2}{t_1}\left(\frac{cm^2}{sec}\right) = \frac{(1.0)(6.45)}{(108)}\left(\frac{cm^2}{sec}\right) = 5.97\times10^{-2}\ (\frac{cm}{sec}$$

$$= .516\ \frac{m^2}{day} = 41.52\ \frac{gpd}{ft}$$

$$K = \frac{T}{b} = \frac{5.97\times10^{-2}}{76.2}\left(\frac{cm^2}{sec}\right)\left(\frac{1}{cm}\right) = 7.8\times10^{-4}\left(\frac{cm}{sec}\right)$$

$$S = \frac{\alpha\, r_c^2}{r_s^2} = \frac{(10^{-3})\,(2.54)^2}{(2.54)^2} = 10^{-3}$$

r_c = *casing radius* = 2.54 *cm*
r_s = *well screen radius* = 2.54 *cm*
t_1 = *match point (seconds) Cooper Papadopulos type cur*
b = *screen length* = 76.2 *cm*
α = 10^{-3} *(type curve fit)*
T = *transmissivity*
K = *hydraulic conductivity*
S = *storativity*



IDAHO POLE SLUG TEST DATA

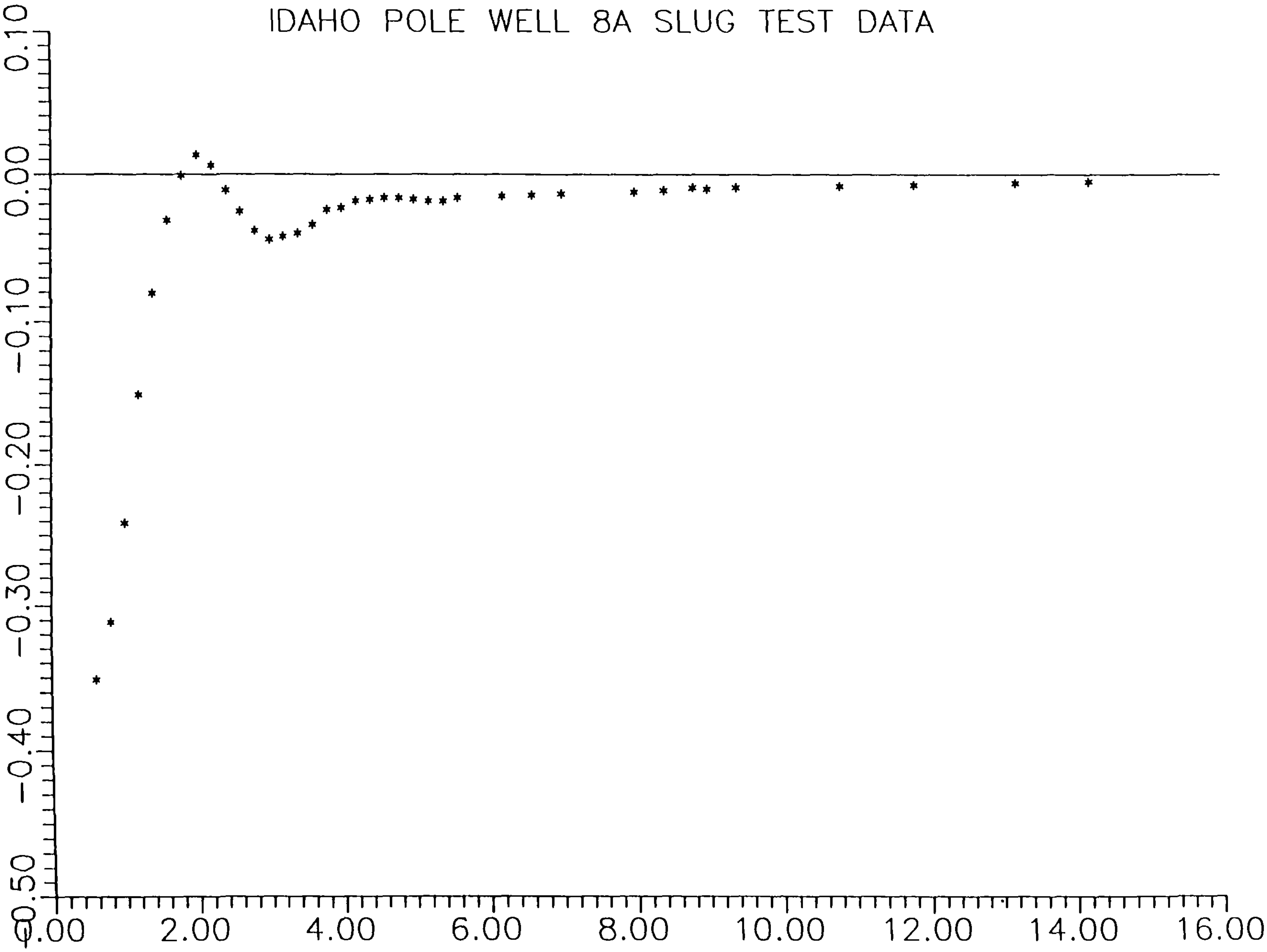
INITIAL X-DUCER READING = 6.851'

MONITOR WELL 8A

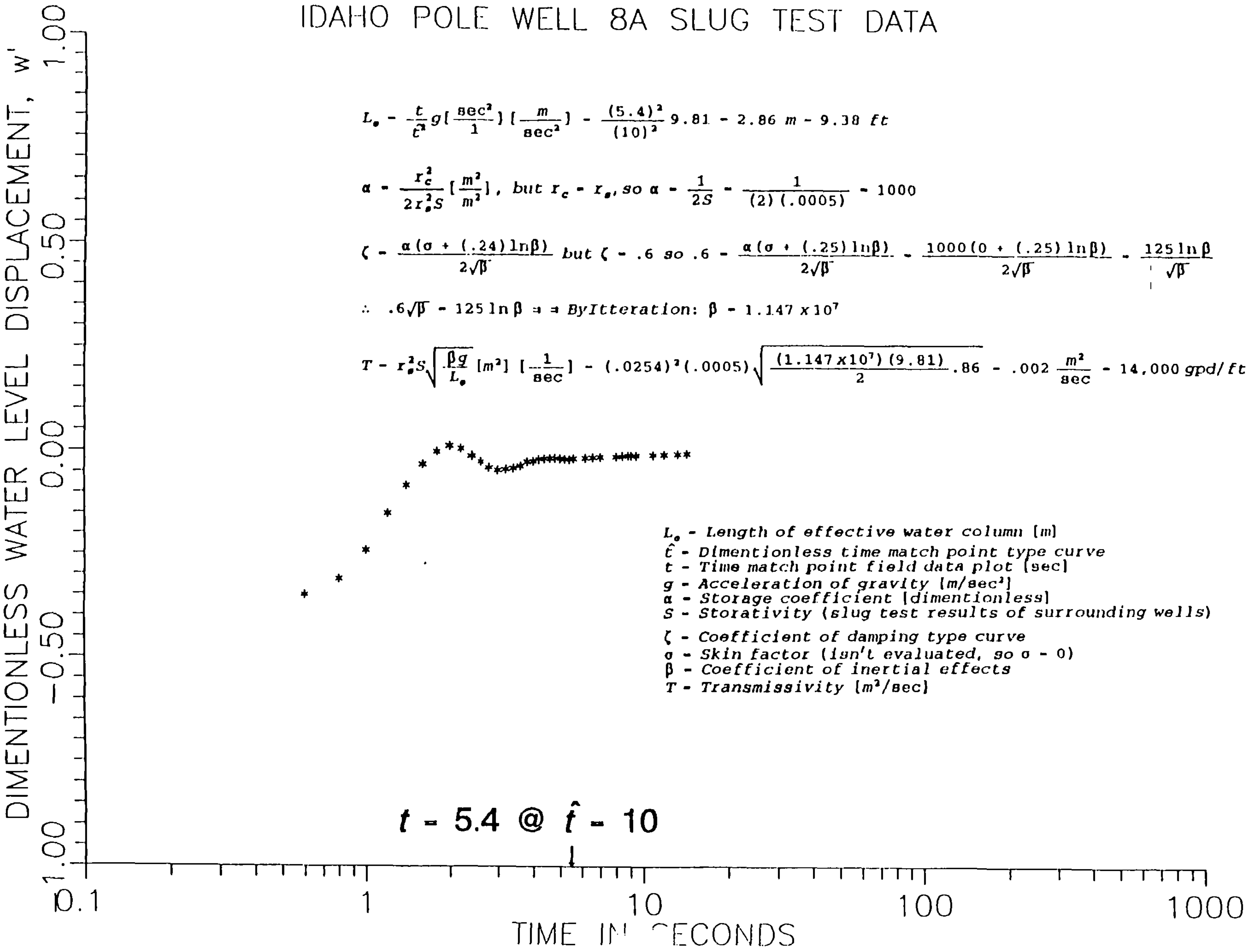
1.00 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
0.60	6.50	-0.351	NA
0.80	6.54	-0.311	NA
1.00	6.61	-0.241	NA
1.20	6.70	-0.151	NA
1.40	6.77	-0.081	NA
1.60	6.82	-0.031	NA
1.80	6.85	-0.001	NA
2.00	86	0.013	NA
2.20	[illegible]	0.006	NA
2.40	[illegible]	-0.011	NA
2.60	[illegible]	-0.025	NA
2.80	6.81	-0.038	NA
3.00	6.81	-0.044	NA
3.20	6.81	-0.042	NA
3.40	6.81	-0.040	NA
3.60	6.82	-0.034	NA
3.80	6.83	-0.024	NA
4.00	6.83	-0.023	NA
4.20	6.83	-0.018	NA
4.40	6.83	-0.017	NA
4.60	6.84	-0.016	NA
4.80	6.84	-0.016	NA
5.00	6.83	-0.017	NA
5.20	6.83	-0.018	NA
5.40	6.83	-0.018	NA
5.60	6.84	-0.016	NA
6.20	6.84	-0.015	NA
6.60	6.84	-0.014	NA
7.00	6.84	-0.013	NA
8.00	6.84	-0.012	NA
8.40	6.84	-0.011	NA
8.80	6.84	-0.009	NA
9.00	6.84	-0.010	NA
9.40	6.84	-0.009	NA
10.80	6.843	-0.008	NA
11.80	6.844	-0.007	NA
13.20	6.845	-0.006	NA
14.20	6.846	-0.005	NA

IDAHO POLE WELL 8A SLUG TEST DATA



IDAHO POLE WELL 8A SLUG TEST DATA



$$L_e = \frac{t}{\hat{t}^2} g \left[\frac{sec^2}{1}\right]\left[\frac{m}{sec^2}\right] = \frac{(5.4)^2}{(10)^2} 9.81 = 2.86\ m = 9.38\ ft$$

$$\alpha = \frac{r_c^2}{2 r_e^2 S}\left[\frac{m^2}{m^2}\right],\ but\ r_c = r_e,\ so\ \alpha = \frac{1}{2S} = \frac{1}{(2)(.0005)} = 1000$$

$$\zeta = \frac{\alpha(\sigma + (.24)\ln\beta)}{2\sqrt{\beta}}\ but\ \zeta = .6\ so\ .6 = \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}} = \frac{1000(0 + (.25)\ln\beta)}{2\sqrt{\beta}} = \frac{125\ln\beta}{\sqrt{\beta}}$$

$$\therefore\ .6\sqrt{\beta} = 125\ln\beta \Rightarrow \Rightarrow ByItteration:\ \beta = 1.147 \times 10^7$$

$$T = r_e^2 S\sqrt{\frac{\beta g}{L_e}}\,[m^2]\left[\frac{1}{sec}\right] = (.0254)^2(.0005)\sqrt{\frac{(1.147 \times 10^7)(9.81)}{2}.86} = .002\ \frac{m^2}{sec} = 14,000\ gpd/ft$$

L_e = Length of effective water column [m]
$\hat{t}$ = Dimentionless time match point type curve
t = Time match point field data plot [sec]
g = Acceleration of gravity [m/sec²]
α = Storage coefficient [dimentionless]
S = Storativity (slug test results of surrounding wells)
ζ = Coefficient of damping type curve
σ = Skin factor (isn't evaluated, so $\sigma = 0$)
β = Coefficient of inertial effects
T = Transmissivity [m²/sec]

IDAHO POLE SLUG TEST DATA

MONITOR WELL 8B
INITIAL X-DUCER READING = 9.280'
8.00 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
0.6	2.13	7.15	0.89
0.9	2.42	6.86	0.86
1.2	2.67	6.61	0.83
1.5	2.82	6.46	0.81
1.8	2.92	6.36	0.79
2.1	3.01	6.27	0.78
2.4	3.10	6.18	0.77
2.7	3.19	6.09	0.76
3.0	3.26	6.02	0.75
3.3	3.34	5.94	0.74
3.6	3.42	5.86	0.73
3.9	3.49	5.79	0.72
4.2	3.56	5.72	0.72
4.5	3.63	5.65	0.71
4.8	3.69	5.59	0.70
5.1	3.77	5.51	0.69
5.4	3.85	5.43	0.68
5.7	3.92	5.36	0.67
6.0	3.98	5.30	0.66
6.3	4.05	5.23	0.65
6.6	4.11	5.17	0.65
6.9	4.19	5.09	0.64
7.2	4.25	5.03	0.63
7.5	4.32	4.96	0.62
7.8	4.39	4.89	0.61
8.1	4.45	4.83	0.60
8.4	4.51	4.77	0.60
8.7	4.58	4.70	0.59
9.0	4.64	4.64	0.58
9.3	4.70	4.58	0.57
9.6	4.76	4.52	0.57
9.9	4.84	4.44	0.55
10.2	4.89	4.39	0.55
10.5	4.94	4.34	0.54
10.8	5.01	4.27	0.53
11.1	5.06	4.22	0.53
11.4	5.12	4.16	0.52
11.7	5.18	4.10	0.51
12.0	5.24	4.04	0.50
12.3	5.29	3.99	0.50
12.6	5.35	3.93	0.49
12.9	5.40	3.88	0.48
13.2	5.46	3.82	0.48
13.5	5.51	3.77	0.47
13.8	5.57	3.71	0.46
14.1	5.62	3.66	0.46
14.4	5.67	3.61	0.45
14.7	5.72	3.56	0.44
15.0	5.77	3.51	0.44
15.3	5.83	3.45	0.43
15.6	5.87	3.41	0.43

IDAHO POLE SLUG TEST DATA (CONT'D.)

MONITOR WELL 8B
INITIAL X-DUCER READING = 9.280'
8.00 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
15.9	5.93	3.35	0.42
16.2	5.97	3.31	0.41
16.5	6.02	3.26	0.41
16.8	6.07	3.21	0.40
17.1	6.12	3.16	0.39
17.4	6.17	3.11	0.39
17.7	6.22	3.06	0.38
18.0	6.26	3.02	0.38
18.3	6.31	2.97	0.37
18.6	6.35	2.93	0.37
18.9	6.40	2.88	0.36
19.2	6.44	2.84	0.35
19.5	6.49	2.79	0.35
19.8	6.53	2.75	0.34
20.1	6.57	2.71	0.34
20.4	6.62	2.66	0.33
20.7	6.66	2.62	0.33
21.0	6.70	2.58	0.32
21.3	6.74	2.54	0.32
21.6	6.78	2.50	0.31
21.9	6.82	2.46	0.31
22.2	6.86	2.42	0.30
22.5	6.90	2.38	0.30
22.8	6.94	2.34	0.29
23.1	6.98	2.30	0.29
23.4	7.12	2.16	0.27
23.7	7.06	2.22	0.28
24.0	7.09	2.19	0.27
24.3	7.13	2.15	0.27
24.6	7.17	2.11	0.26
24.9	7.20	2.08	0.26
25.2	7.24	2.04	0.25
25.5	7.28	2.00	0.25
25.8	7.31	1.97	0.25
26.1	7.34	1.94	0.24
26.4	7.38	1.90	0.24
26.7	7.41	1.87	0.23
27.0	7.45	1.83	0.23
27.3	7.48	1.80	0.22
27.6	7.51	1.77	0.22
27.9	7.54	1.74	0.22
28.2	7.58	1.70	0.21
28.5	7.61	1.67	0.21
28.8	7.64	1.64	0.20
29.1	7.67	1.61	0.20
29.4	7.70	1.58	0.20
29.7	7.73	1.55	0.19
30.0	7.76	1.52	0.19
30.3	7.79	1.49	0.19
30.6	7.82	1.46	0.18
30.9	7.84	1.44	0.18
31.2	7.87	1.41	0.18
31.5	7.90	1.38	0.17

IDAHO POLE SLUG TEST DATA (CONT'D.)

MONITOR WELL 8B
INITIAL X-DUCER READING = 9.280'
8.00 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
31.8	7.93	1.35	0.17
32.1	7.95	1.33	0.17
32.4	7.98	1.30	0.16
32.7	8.01	1.27	0.16
33.0	8.03	1.25	0.16
33.3	8.06	1.22	0.15
33.6	8.08	1.20	0.15
33.9	8.11	1.17	0.15
34.2	8.13	1.15	0.14
34.5	8.16	1.12	0.14
34.8	8.18	1.10	0.14
35.1	8.20	1.08	0.14
35.4	8.22	1.06	0.13
35.7	8.25	1.03	0.13
36.0	8.27	1.01	0.13
36.3	8.29	0.99	0.12
36.6	8.31	0.97	0.12
36.9	8.33	0.95	0.12
37.2	8.35	0.93	0.12
37.5	8.38	0.90	0.11
37.8	8.40	0.88	0.11
38.1	8.42	0.86	0.11
38.4	8.43	0.85	0.11
38.7	8.45	0.83	0.10
39.0	8.47	0.81	0.10
39.3	8.49	0.79	0.10
39.6	8.51	0.77	0.10
39.9	8.53	0.75	0.09
40.2	8.55	0.73	0.09
40.5	8.56	0.72	0.09
40.8	8.58	0.70	0.09
41.1	8.60	0.68	0.08
41.4	8.61	0.67	0.08
41.7	8.63	0.65	0.08
42.0	8.65	0.63	0.08
42.3	8.66	0.62	0.08
42.6	8.68	0.60	0.07
42.9	8.69	0.59	0.07
43.2	8.71	0.57	0.07
43.5	8.72	0.56	0.07
43.8	8.73	0.55	0.07
44.1	8.75	0.53	0.07
44.4	8.76	0.52	0.06
44.7	8.77	0.51	0.06
45.0	8.79	0.49	0.06
45.3	8.80	0.48	0.06
45.6	8.81	0.47	0.06
45.9	8.82	0.46	0.06
46.2	8.84	0.44	0.05
46.5	8.85	0.43	0.05

IDAHO POLE SLUG TEST DATA (CONT'D.)

MONITOR WELL 8B
INITIAL X-DUCER READING = 9.280'
8.00 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
46.8	8.86	0.42	0.05
47.1	8.87	0.41	0.05
47.4	8.88	0.40	0.05
47.7	8.89	0.39	0.05
48.0	8.90	0.38	0.05
48.3	8.91	0.37	0.05
48.6	8.92	0.36	0.04
48.9	8.93	0.35	0.04
49.2	8.94	0.34	0.04
49.5	8.95	0.33	0.04
49.8	8.96	0.32	0.04
50.1	8.97	0.31	0.04
50.4	8.98	0.30	0.04
50.7	8.99	0.29	0.04
51.0	9.00	0.28	0.03
51.6	9.01	0.27	0.03
51.9	9.02	0.26	0.03
52.5	9.03	0.25	0.03
53.1	9.04	0.24	0.03
53.7	9.05	0.23	0.03
54.0	9.06	0.22	0.03
54.6	9.07	0.21	0.03
55.2	9.08	0.20	0.02
55.8	9.09	0.19	0.02
56.4	9.10	0.18	0.02
57.3	9.11	0.17	0.02
57.9	9.12	0.16	0.02
58.8	9.13	0.15	0.02
59.7	9.14	0.14	0.02
60.9	9.15	0.13	0.02
63.0	9.16	0.12	0.01
67.5	9.17	0.11	0.01

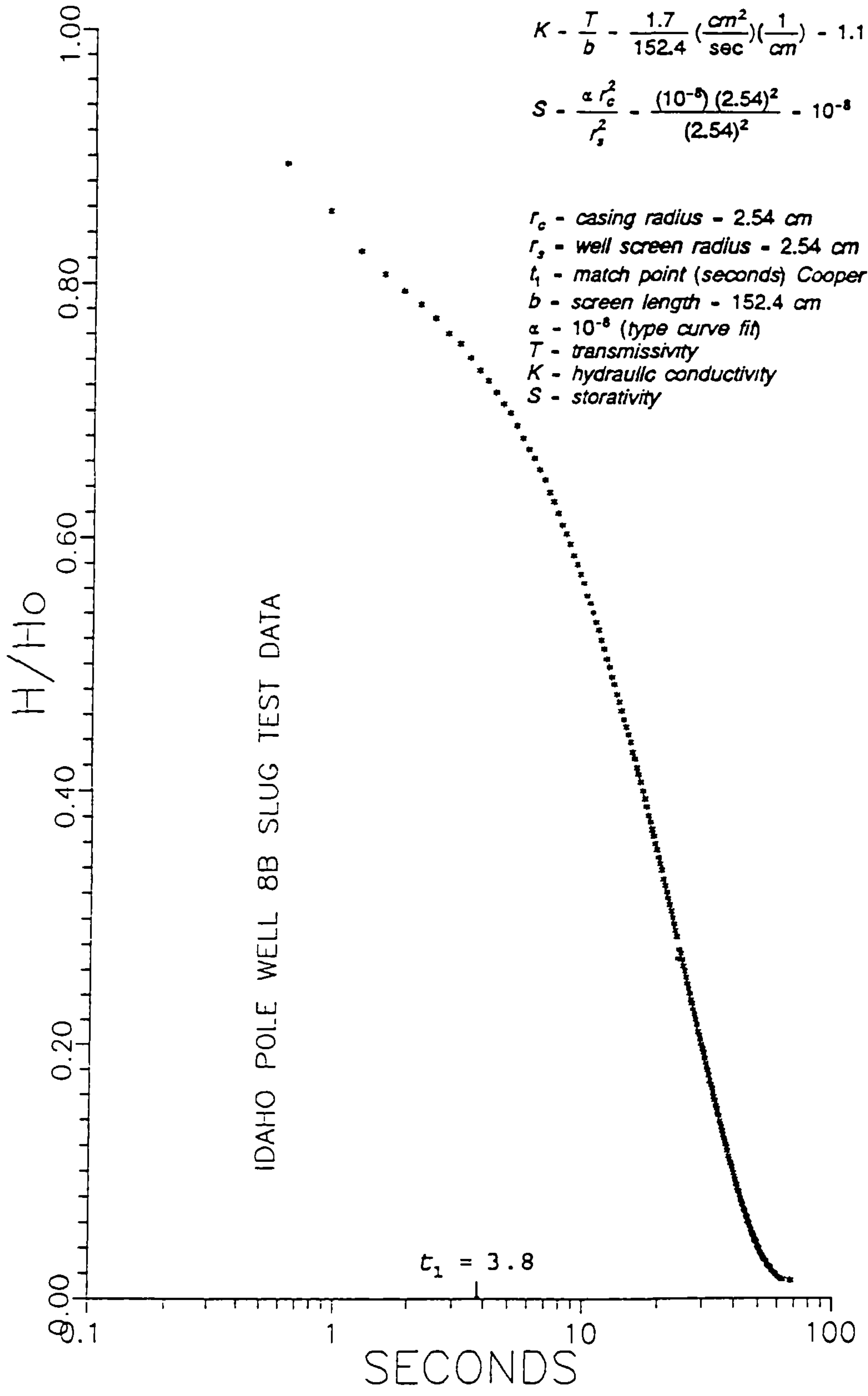
$$T = \frac{1.0\, r_o^2}{t_1} \left(\frac{cm^2}{sec}\right) = \frac{(1.0)(6.45)}{(3.8)} \left(\frac{cm^2}{sec}\right) = 1.7 \left(\frac{cm^2}{sec}\right)$$

$$= 14.67 \frac{m^2}{day} = 1180 \frac{gpd}{ft}$$

$$K = \frac{T}{b} = \frac{1.7}{152.4} \left(\frac{cm^2}{sec}\right)\left(\frac{1}{cm}\right) = 1.1 \times 10^{-2} \left(\frac{cm}{sec}\right)$$

$$S = \frac{\alpha\, r_c^2}{r_s^2} = \frac{(10^{-8})\,(2.54)^2}{(2.54)^2} = 10^{-8}$$

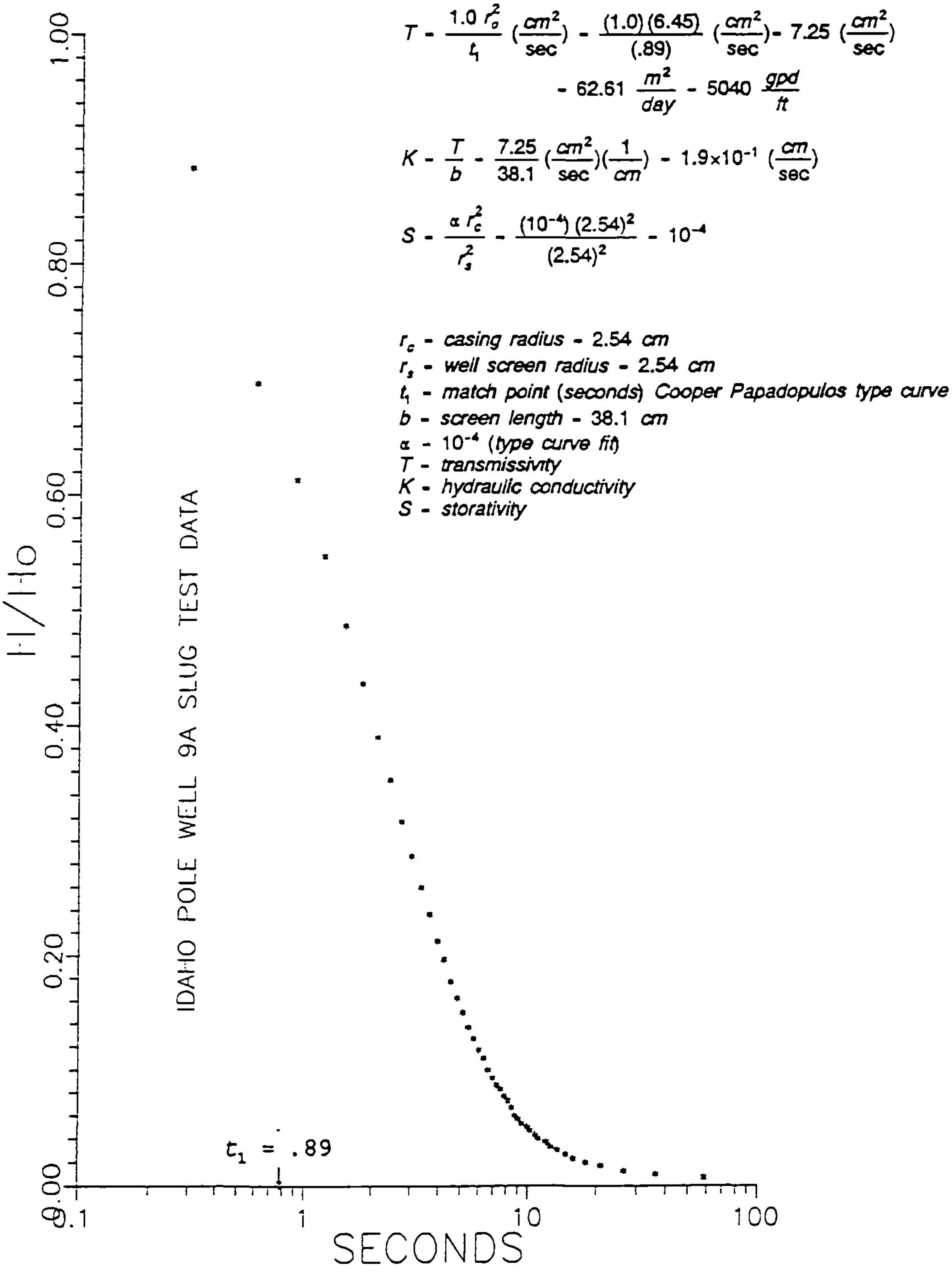
r_c - *casing radius* - 2.54 *cm*
r_s - *well screen radius* - 2.54 *cm*
t_1 - *match point* (*seconds*) *Cooper Papadopulos type cur*
b - *screen length* - 152.4 *cm*
α - 10^{-8} (*type curve fit*)
T - *transmissivity*
K - *hydraulic conductivity*
S - *storativity*



IDAHO POLE SLUG TEST DATA

MONITOR WELL 9A
INITIAL X-DUCER READING = 6.99'
3.00 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
0.3	4.34	2.65	0.883
0.6	4.90	2.09	0.697
0.9	5.15	1.84	0.613
1.2	5.35	1.64	0.547
1.5	5.53	1.46	0.487
1.8	5.68	1.31	0.437
2.1	5.82	1.17	0.390
2.4	5.93	1.06	0.353
2.7	6.04	0.95	0.317
3.0	6.13	0.86	0.287
3.3	6.21	0.78	0.260
3.6	6.28	0.71	0.237
3.9	6.35	0.64	0.213
4.2	6.40	0.59	0.197
4.5	6.46	0.53	0.177
4.8	6.50	0.49	0.163
5.1	6.54	0.45	0.150
5.4	6.58	0.41	0.137
5.7	6.61	0.38	0.127
6.0	6.64	0.35	0.117
6.3	6.66	0.33	0.110
6.6	6.69	0.30	0.100
6.9	6.71	0.28	0.093
7.2	6.73	0.26	0.087
7.5	6.74	0.25	0.083
7.8	6.76	0.23	0.077
8.1	6.77	0.22	0.073
8.4	6.79	0.20	0.067
8.7	6.81	0.18	0.060
9.0	6.82	0.17	0.057
9.3	6.83	0.16	0.053
9.9	6.84	0.15	0.050
10.2	6.85	0.14	0.047
10.8	6.86	0.13	0.043
11.1	6.87	0.12	0.040
12.0	6.88	0.11	0.037
12.6	6.89	0.10	0.033
13.5	6.90	0.09	0.030
14.7	6.91	0.08	0.027
15.9	6.92	0.07	0.023
18.0	6.93	0.06	0.020
21.0	6.94	0.05	0.017
26.4	6.95	0.04	0.013
36.3	6.96	0.03	0.010
58.5	6.97	0.02	0.007



$$T = \frac{1.0\, r_c^2}{t_1} \left(\frac{cm^2}{sec}\right) = \frac{(1.0)(6.45)}{(.89)} \left(\frac{cm^2}{sec}\right) = 7.25 \left(\frac{cm^2}{sec}\right) = 62.61\ \frac{m^2}{day} = 5040\ \frac{gpd}{ft}$$

$$K = \frac{T}{b} = \frac{7.25}{38.1} \left(\frac{cm^2}{sec}\right)\left(\frac{1}{cm}\right) = 1.9\times10^{-1} \left(\frac{cm}{sec}\right)$$

$$S = \frac{\alpha\, r_c^2}{r_s^2} = \frac{(10^{-4})(2.54)^2}{(2.54)^2} = 10^{-4}$$

r_c - *casing radius* - 2.54 *cm*
r_s - *well screen radius* - 2.54 *cm*
t_1 - *match point (seconds) Cooper Papadopulos type curve*
b - *screen length* - 38.1 *cm*
α - 10^{-4} (*type curve fit*)
T - *transmissivity*
K - *hydraulic conductivity*
S - *storativity*

IDAHO POLE SLUG TEST DATA

MONITOR WELL 9B
INITIAL X-DUCER READING = 10.135′
7.80 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
0.3	3.53	6.605	0.847
0.6	3.64	6.495	0.833
0.9	3.79	6.345	0.813
1.2	3.94	6.195	0.794
1.5	4.08	6.055	0.776
1.8	4.20	5.935	0.761
2.1	4.33	5.805	0.744
2.4	4.44	5.695	0.730
2.7	4.55	5.585	0.716
3.0	4.66	5.475	0.702
3.3	4.77	5.365	0.688
3.6	4.87	5.265	0.675
3.9	4.97	5.165	0.662
4.2	5.07	5.065	0.649
4.5	5.17	4.965	0.637
4.8	5.26	4.875	0.625
5.1	5.35	4.785	0.613
5.4	5.44	4.695	0.602
5.7	5.53	4.605	0.590
6.0	5.62	4.515	0.579
6.3	5.70	4.435	0.569
6.6	5.79	4.345	0.557
6.9	5.87	4.265	0.547
7.2	5.95	4.185	0.537
7.5	6.03	4.105	0.526
7.8	6.11	4.025	0.516
8.1	6.19	3.945	0.506
8.4	6.26	3.875	0.497
8.7	6.34	3.795	0.487
9.0	6.41	3.725	0.478
9.3	6.48	3.655	0.469
9.6	6.55	3.585	0.460
9.9	6.62	3.515	0.451
10.2	6.69	3.445	0.442
10.5	6.75	3.385	0.434
10.8	6.82	3.315	0.425
11.1	6.88	3.255	0.417
11.4	6.95	3.185	0.408
11.7	7.01	3.125	0.401
12.0	7.07	3.065	0.393
12.3	7.13	3.005	0.385
12.6	7.19	2.945	0.378
12.9	7.25	2.885	0.370
13.2	7.30	2.835	0.363
13.5	7.36	2.775	0.356
13.8	7.41	2.725	0.349
14.1	7.47	2.665	0.342
14.4	7.52	2.615	0.335
14.7	7.57	2.565	0.329
15.0	7.63	2.505	0.321
15.3	7.68	2.455	0.315

IDAHO POLE SLUG TEST DATA (CONT'D.)

MONITOR WELL 9B
INITIAL X-DUCER READING = 10.135'
7.80 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
15.6	7.73	2.405	0.308
15.9	7.77	2.365	0.303
16.2	7.82	2.315	0.297
16.5	7.87	2.265	0.290
16.8	7.92	2.215	0.284
17.1	7.96	2.175	0.279
17.4	8.01	2.125	0.272
17.7	8.05	2.085	0.267
18.0	8.09	2.045	0.262
18.3	8.13	2.005	0.257
18.6	8.18	1.955	0.251
18.9	8.22	1.915	0.246
19.2	8.26	1.875	0.240
19.5	8.30	1.835	0.235
19.8	8.34	1.795	0.230
20.1	8.37	1.765	0.226
20.4	8.41	1.725	0.221
20.7	8.45	1.685	0.216
21.0	8.48	1.655	0.212
21.3	8.52	1.615	0.207
21.6	8.55	1.585	0.203
21.9	8.59	1.545	0.198
22.2	8.62	1.515	0.194
22.5	8.65	1.485	0.190
22.8	8.68	1.455	0.187
23.1	8.71	1.425	0.183
23.4	8.75	1.385	0.178
23.7	8.78	1.355	0.174
24.0	8.81	1.325	0.170
24.3	8.83	1.305	0.167
24.6	8.86	1.275	0.163
24.9	8.89	1.245	0.160
25.2	8.92	1.215	0.156
25.5	8.95	1.185	0.152
25.8	8.97	1.165	0.149
26.1	9.00	1.135	0.146
26.4	9.02	1.115	0.143
26.7	9.05	1.085	0.139
27.0	9.07	1.065	0.137
27.3	9.10	1.035	0.133
27.6	9.12	1.015	0.130
27.9	9.14	0.995	0.128
28.2	9.16	0.975	0.125
28.5	9.19	0.945	0.121
28.8	9.21	0.925	0.119
29.1	9.23	0.905	0.116
29.4	9.25	0.885	0.113
29.7	9.27	0.865	0.111
30.0	9.29	0.845	0.108
30.3	9.31	0.825	0.106
30.6	9.33	0.805	0.103
30.9	9.35	0.785	0.101

IDAHO POLE SLUG TEST DATA (CONT'D.)

MONITOR WELL 9B
INITIAL X-DUCER READING = 10.135'
7.80 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
31.2	9.36	0.775	0.099
31.5	9.38	0.755	0.097
31.8	9.40	0.735	0.094
32.1	9.42	0.715	0.092
32.4	9.43	0.705	0.090
32.7	9.45	0.685	0.088
33.0	9.46	0.675	0.087
33.3	9.48	0.655	0.084
33.6	9.50	0.635	0.081
33.9	9.51	0.625	0.080
34.2	9.52	0.615	0.079
34.5	9.54	0.595	0.076
34.8	9.55	0.585	0.075
35.1	9.57	0.565	0.072
35.4	9.58	0.555	0.071
35.7	9.59	0.545	0.070
36.0	9.60	0.535	0.069
36.3	9.62	0.515	0.066
36.6	9.63	0.505	0.065
36.9	9.64	0.495	0.063
37.2	9.65	0.485	0.062
37.5	9.66	0.475	0.061
37.8	9.67	0.465	0.060
38.1	9.69	0.445	0.057
38.4	9.70	0.435	0.056
38.7	9.71	0.425	0.054
39.0	9.72	0.415	0.053
39.3	9.73	0.405	0.052
39.6	9.74	0.395	0.051
40.2	9.75	0.385	0.049
40.5	9.76	0.375	0.048
40.8	9.77	0.365	0.047
41.1	9.78	0.355	0.046
41.4	9.79	0.345	0.044
42.0	9.80	0.335	0.043
42.3	9.81	0.325	0.042
42.6	9.82	0.315	0.040
43.2	9.83	0.305	0.039
43.5	9.84	0.295	0.038
44.1	9.85	0.285	0.037
44.4	9.86	0.275	0.035
45.0	9.87	0.265	0.034
45.3	9.88	0.255	0.033
45.9	9.89	0.245	0.031
46.5	9.90	0.235	0.030
47.1	9.91	0.225	0.029
47.7	9.92	0.215	0.028
48.6	9.93	0.205	0.026
49.2	9.94	0.195	0.025
50.1	9.95	0.185	0.024

IDAHO POLE SLUG TEST DATA (CONT'D.)

MONITOR WELL 9B
INITIAL X-DUCER READING = 10.135'
7.80 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
50.7	9.96	0.175	0.022
51.6	9.97	0.165	0.021
52.5	9.98	0.155	0.020
53.7	9.99	0.145	0.019
54.9	10.00	0.135	0.017

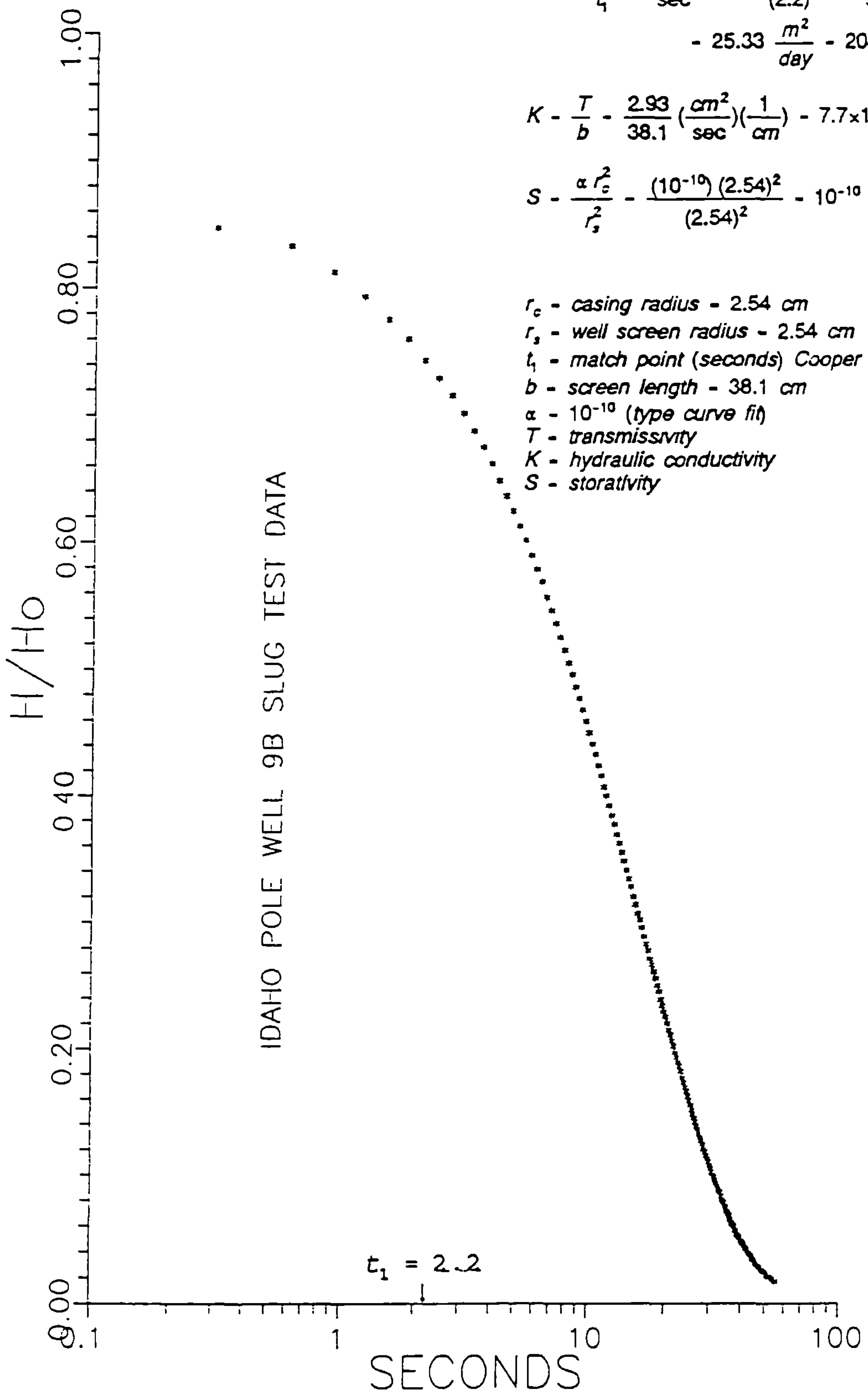
$$T = \frac{1.0\, r_c^2}{t_1} \left(\frac{cm^2}{sec}\right) = \frac{(1.0)(6.45)}{(2.2)} \left(\frac{cm^2}{sec}\right) = 2.93 \left(\frac{cm^2}{sec}\right)$$

$$= 25.33\ \frac{m^2}{day} = 2039\ \frac{gpd}{ft}$$

$$K = \frac{T}{b} = \frac{2.93}{38.1} \left(\frac{cm^2}{sec}\right)\left(\frac{1}{cm}\right) = 7.7\times10^{-2} \left(\frac{cm}{sec}\right)$$

$$S = \frac{\alpha\, r_c^2}{r_s^2} = \frac{(10^{-10})\,(2.54)^2}{(2.54)^2} = 10^{-10}$$

r_c - *casing radius* - 2.54 *cm*
r_s - *well screen radius* - 2.54 *cm*
t_1 - *match point* (*seconds*) *Cooper Papadopulos type cur*
b - *screen length* - 38.1 *cm*
α - 10^{-10} (*type curve fit*)
T - *transmissivity*
K - *hydraulic conductivity*
S - *storativity*



IDAHO POLE SLUG TEST DATA

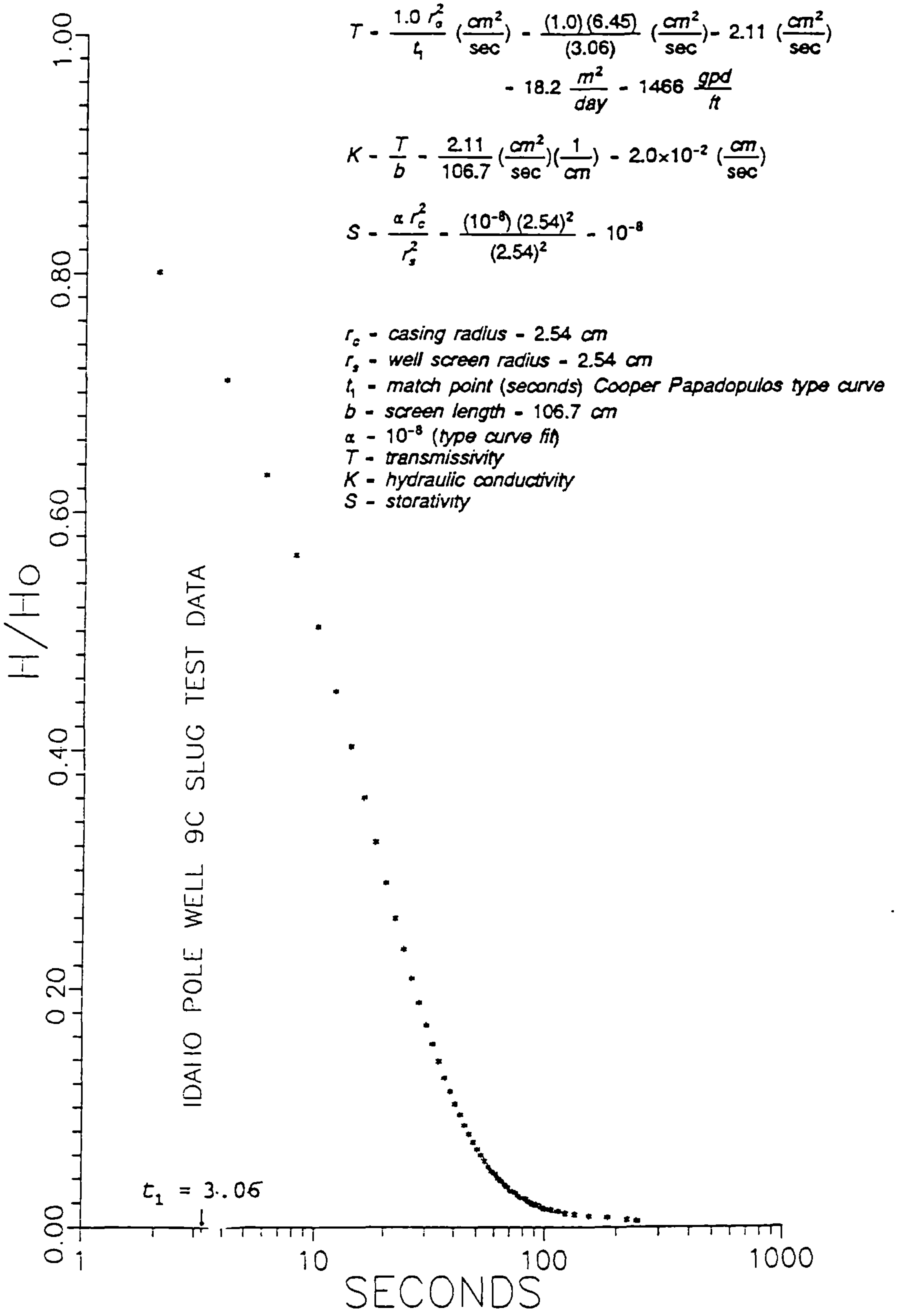
MONITOR WELL 9C
INITIAL X-DUCER READING = 11.71'
8.00 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
2	5.30	6.410	0.801
4	6.03	5.680	0.710
6	6.66	5.050	0.631
8	7.20	4.510	0.564
10	7.68	4.030	0.504
12	8.11	3.600	0.450
14	8.48	3.230	0.404
16	8.82	2.890	0.361
18	9.12	2.590	0.324
20	9.39	2.320	0.290
22	9.63	2.080	0.260
24	9.84	1.870	0.234
26	10.03	1.680	0.210
28	10.20	1.510	0.189
30	10.35	1.360	0.170
32	10.48	1.230	0.154
34	10.60	1.110	0.139
36	10.71	1.000	0.125
38	10.80	0.910	0.114
40	10.89	0.820	0.103
42	10.96	0.750	0.094
44	11.03	0.680	0.085
46	11.09	0.620	0.078
48	11.14	0.570	0.071
50	11.19	0.520	0.065
52	11.23	0.480	0.060
54	11.27	0.440	0.055
56	11.31	0.400	0.050
58	11.34	0.370	0.046
60	11.36	0.350	0.044
62	11.39	0.320	0.040
64	11.41	0.300	0.038
66	11.43	0.280	0.035
68	11.45	0.260	0.033
70	11.47	0.240	0.030
72	11.48	0.230	0.029
74	11.49	0.220	0.028
76	11.50	0.210	0.026
78	11.52	0.190	0.024
82	11.53	0.180	0.023
84	11.54	0.170	0.021
86	11.55	0.160	0.020
88	11.56	0.150	0.019
92	11.57	0.140	0.018
96	11.58	0.130	0.016
100	11.59	0.120	0.015
106	11.60	0.110	0.014
114	11.61	0.100	0.013
122	11.62	0.090	0.011
134	11.63	0.080	0.010
154	11.64	0.070	0.009

IDAHO POLE SLUG TEST DATA (CONT'D.)

MONITOR WELL 9C
INITIAL X-DUCER READING = 11.71'
8.00 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
184	11.65	0.060	0.008
222	11.66	0.050	0.006
244	11.67	0.040	0.005



$$T = \frac{1.0\, r_c^2}{t_1} \left(\frac{cm^2}{sec}\right) = \frac{(1.0)(6.45)}{(3.06)} \left(\frac{cm^2}{sec}\right) = 2.11 \left(\frac{cm^2}{sec}\right)$$

$$= 18.2 \frac{m^2}{day} = 1466 \frac{gpd}{ft}$$

$$K = \frac{T}{b} = \frac{2.11}{106.7} \left(\frac{cm^2}{sec}\right)\left(\frac{1}{cm}\right) = 2.0\times10^{-2} \left(\frac{cm}{sec}\right)$$

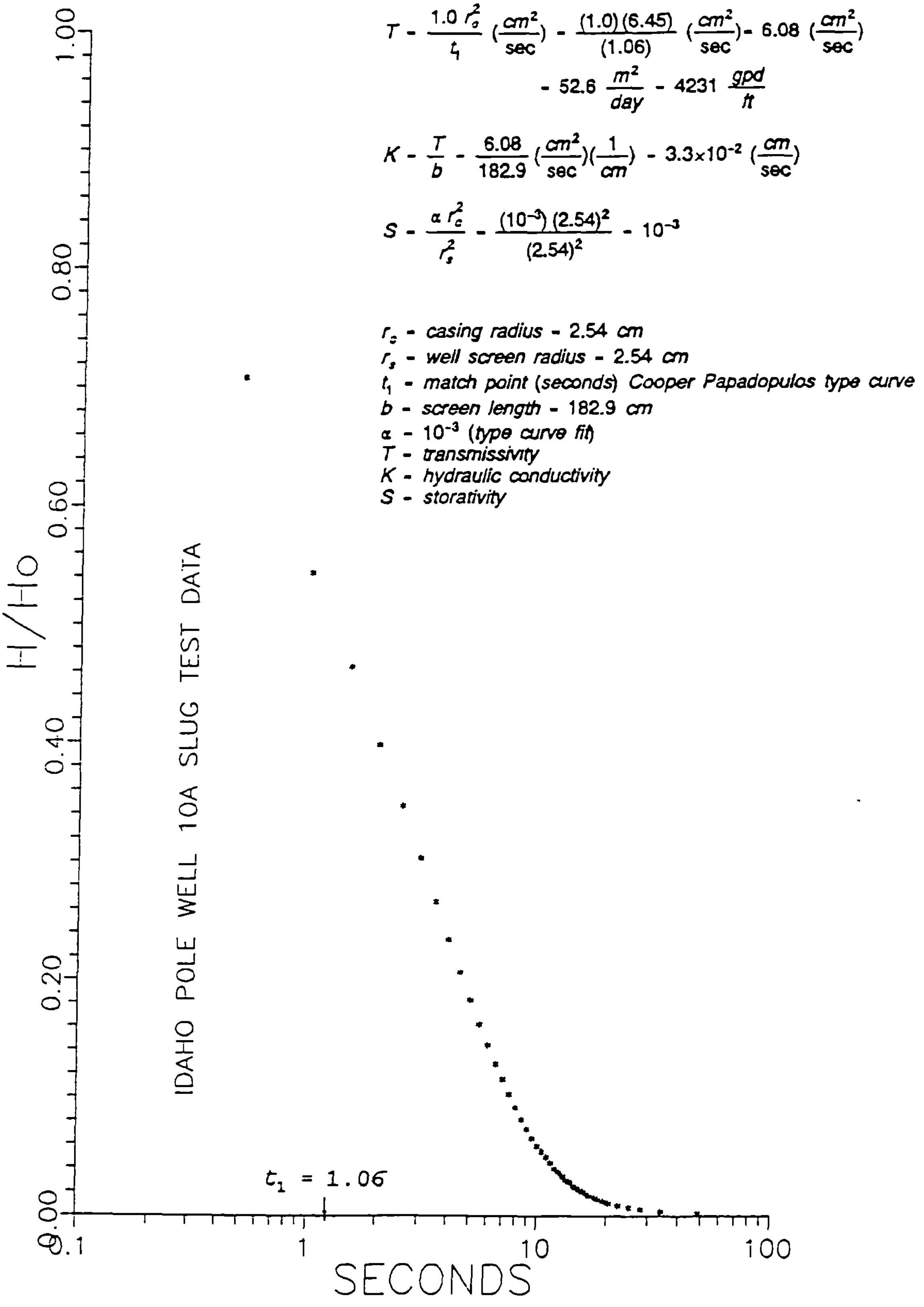
$$S = \frac{\alpha\, r_c^2}{r_s^2} = \frac{(10^{-8})(2.54)^2}{(2.54)^2} = 10^{-8}$$

r_c - *casing radius* - 2.54 *cm*
r_s - *well screen radius* - 2.54 *cm*
t_1 - *match point (seconds) Cooper Papadopulos type curve*
b - *screen length* - 106.7 *cm*
α - 10^{-8} (*type curve fit*)
T - *transmissivity*
K - *hydraulic conductivity*
S - *storativity*

IDAHO POLE SLUG TEST DATA

MONITOR WELL 10A
INITIAL X-DUCER READING = 8.813
6.20 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
0.0	2.61	6.203	1.0005
0.5	4.42	4.393	0.7085
1.0	5.44	3.373	0.5440
1.5	5.93	2.883	0.4650
2.0	6.34	2.473	0.3989
2.5	6.66	2.153	0.3473
3.0	6.93	1.883	0.3037
3.5	7.16	1.653	0.2666
4.0	7.36	1.453	0.2344
4.5	7.53	1.283	0.2069
5.0	7.68	1.133	0.1827
5.5	7.81	1.003	0.1618
6.0	7.92	0.893	0.1440
6.5	8.02	0.793	0.1279
7.0	8.10	0.713	0.1150
7.5	8.18	0.633	0.1021
8.0	8.25	0.563	0.0908
8.5	8.31	0.503	0.0811
9.0	8.36	0.453	0.0731
9.5	8.41	0.403	0.0650
10.0	8.45	0.363	0.0585
10.5	8.48	0.333	0.0537
11.0	8.51	0.303	0.0489
11.5	8.54	0.273	0.0440
12.0	8.57	0.243	0.0392
12.5	8.59	0.223	0.0360
13.0	8.61	0.203	0.0327
13.5	8.63	0.183	0.0295
14.0	8.64	0.173	0.0279
14.5	8.66	0.153	0.0247
15.0	8.67	0.143	0.0231
15.5	8.68	0.133	0.0215
16.0	8.69	0.123	0.0198
16.5	8.70	0.113	0.0182
17.0	8.71	0.103	0.0166
18.0	8.72	0.093	0.0150
18.5	8.73	0.083	0.0134
19.5	8.74	0.073	0.0118
20.5	8.75	0.063	0.0102
22.5	8.76	0.053	0.0085
25.0	8.77	0.043	0.0069
28.0	8.78	0.033	0.0053
34.0	8.79	0.023	0.0037
48.5	8.80	0.013	0.0021



$$T = \frac{1.0\, r_c^2}{t_1}\left(\frac{cm^2}{sec}\right) = \frac{(1.0)(6.45)}{(1.06)}\left(\frac{cm^2}{sec}\right) = 6.08\left(\frac{cm^2}{sec}\right)$$

$$= 52.6\,\frac{m^2}{day} = 4231\,\frac{gpd}{ft}$$

$$K = \frac{T}{b} = \frac{6.08}{182.9}\left(\frac{cm^2}{sec}\right)\left(\frac{1}{cm}\right) = 3.3\times10^{-2}\left(\frac{cm}{sec}\right)$$

$$S = \frac{\alpha\, r_c^2}{r_s^2} = \frac{(10^{-3})(2.54)^2}{(2.54)^2} = 10^{-3}$$

r_c = *casing radius* = 2.54 *cm*
r_s = *well screen radius* = 2.54 *cm*
t_1 = *match point (seconds) Cooper Papadopulos type curve*
b = *screen length* = 182.9 *cm*
α = 10^{-3} (*type curve fit*)
T = *transmissivity*
K = *hydraulic conductivity*
S = *storativity*

IDAHO POLE SLUG TEST DATA

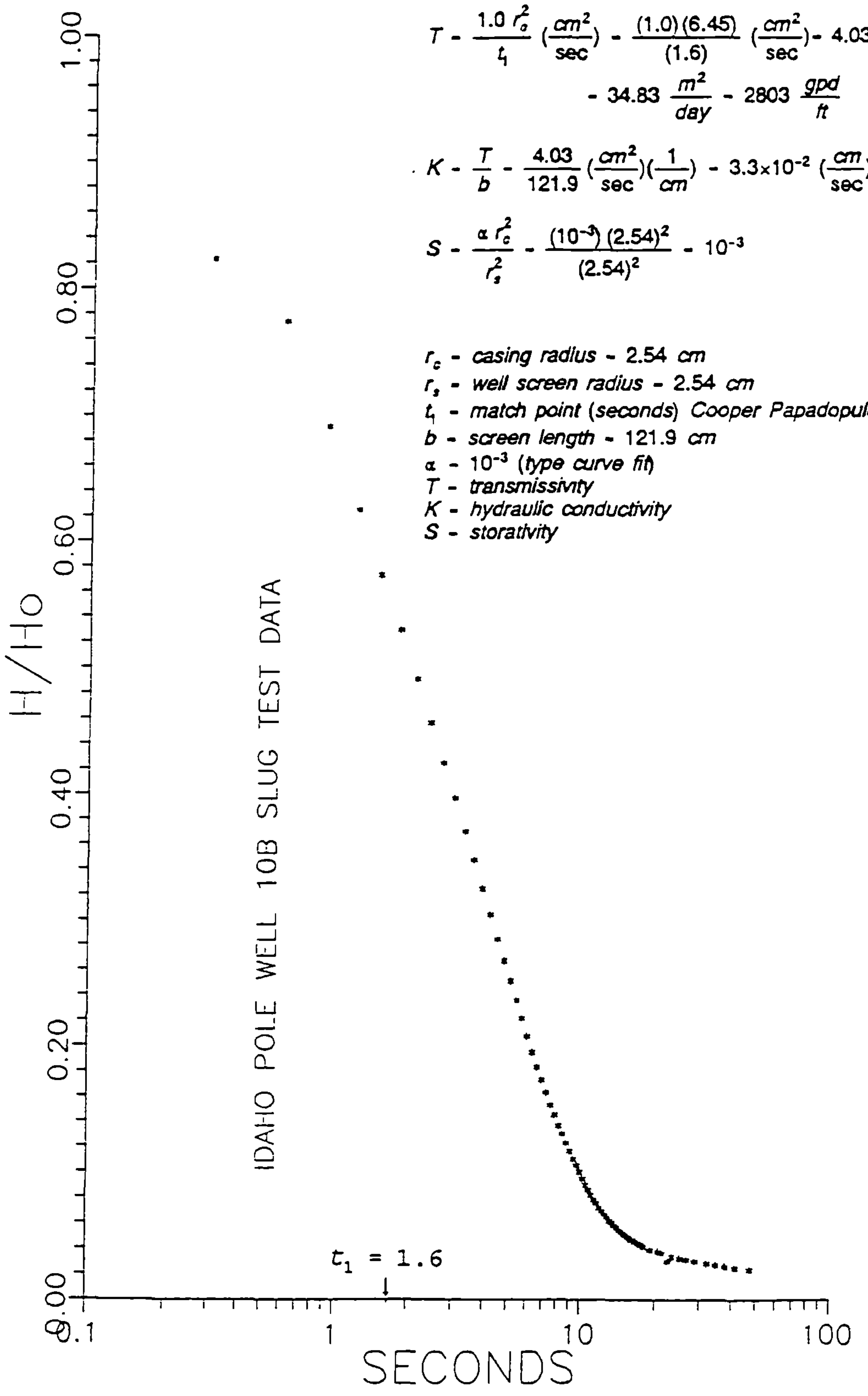
MONITOR WELL 10B
INITIAL X-DUCER READING = 10.164
7.85 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
0.3	3.70	6.46	0.82
0.6	4.08	6.08	0.78
0.9	4.73	5.43	0.69
1.2	5.25	4.91	0.63
1.5	5.66	4.50	0.57
1.8	6.00	4.16	0.53
2.1	6.30	3.86	0.49
2.4	6.57	3.59	0.46
2.7	6.82	3.34	0.43
3.0	7.04	3.12	0.40
3.3	7.25	2.91	0.37
3.6	7.43	2.73	0.35
3.9	7.61	2.55	0.33
4.2	7.77	2.39	0.30
4.5	7.92	2.24	0.29
4.8	8.06	2.10	0.27
5.1	8.19	1.97	0.25
5.4	8.31	1.85	0.24
5.7	8.42	1.74	0.22
6.0	8.53	1.63	0.21
6.3	8.63	1.53	0.20
6.6	8.72	1.44	0.18
6.9	8.80	1.36	0.17
7.2	8.88	1.28	0.16
7.5	8.96	1.20	0.15
7.8	9.02	1.14	0.15
8.1	9.09	1.07	0.14
8.4	9.14	1.02	0.13
8.7	9.20	0.96	0.12
9.0	9.25	0.91	0.12
9.3	9.30	0.86	0.11
9.6	9.34	0.82	0.10
9.9	9.38	0.78	0.10
10.2	9.42	0.74	0.09
10.5	9.46	0.70	0.09
10.8	9.49	0.67	0.09
11.1	9.52	0.64	0.08
11.4	9.55	0.61	0.08
11.7	9.57	0.59	0.08
12.0	9.60	0.56	0.07
12.3	9.62	0.54	0.07
12.6	9.64	0.52	0.07
12.9	9.66	0.50	0.06
13.2	9.68	0.48	0.06
13.5	9.69	0.47	0.06
13.8	9.71	0.45	0.06
14.1	9.72	0.44	0.06
14.4	9.74	0.42	0.05
14.7	9.75	0.41	0.05
15.0	9.76	0.40	0.05
15.3	9.77	0.39	0.05

IDAHO POLE SLUG TEST DATA (CONT'D.)

MONITOR WELL 10B
INITIAL X-DUCER READING = 10.164
7.85 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
15.6	9.78	0.38	0.05
15.9	9.79	0.37	0.05
16.2	9.80	0.36	0.05
16.8	9.81	0.35	0.05
17.1	9.82	0.34	0.04
17.7	9.83	0.33	0.04
18.0	9.84	0.32	0.04
19.2	9.86	0.30	0.04
20.7	9.87	0.29	0.04
21.3	9.88	0.28	0.04
22.5	9.98	0.18	0.02
23.4	9.90	0.26	0.03
25.2	9.91	0.25	0.03
26.7	9.92	0.24	0.03
28.8	9.93	0.23	0.03
32.1	9.94	0.22	0.03
34.8	9.95	0.21	0.03
37.8	9.96	0.20	0.03
41.4	9.97	0.19	0.02
47.4	9.98	0.18	0.02



$$T = \frac{1.0\, r_c^2}{t_1} \left(\frac{cm^2}{sec}\right) = \frac{(1.0)(6.45)}{(1.6)} \left(\frac{cm^2}{sec}\right) = 4.03 \left(\frac{cm^2}{sec}\right)$$

$$= 34.83 \frac{m^2}{day} = 2803 \frac{gpd}{ft}$$

$$K = \frac{T}{b} = \frac{4.03}{121.9} \left(\frac{cm^2}{sec}\right)\left(\frac{1}{cm}\right) = 3.3\times10^{-2} \left(\frac{cm}{sec}\right)$$

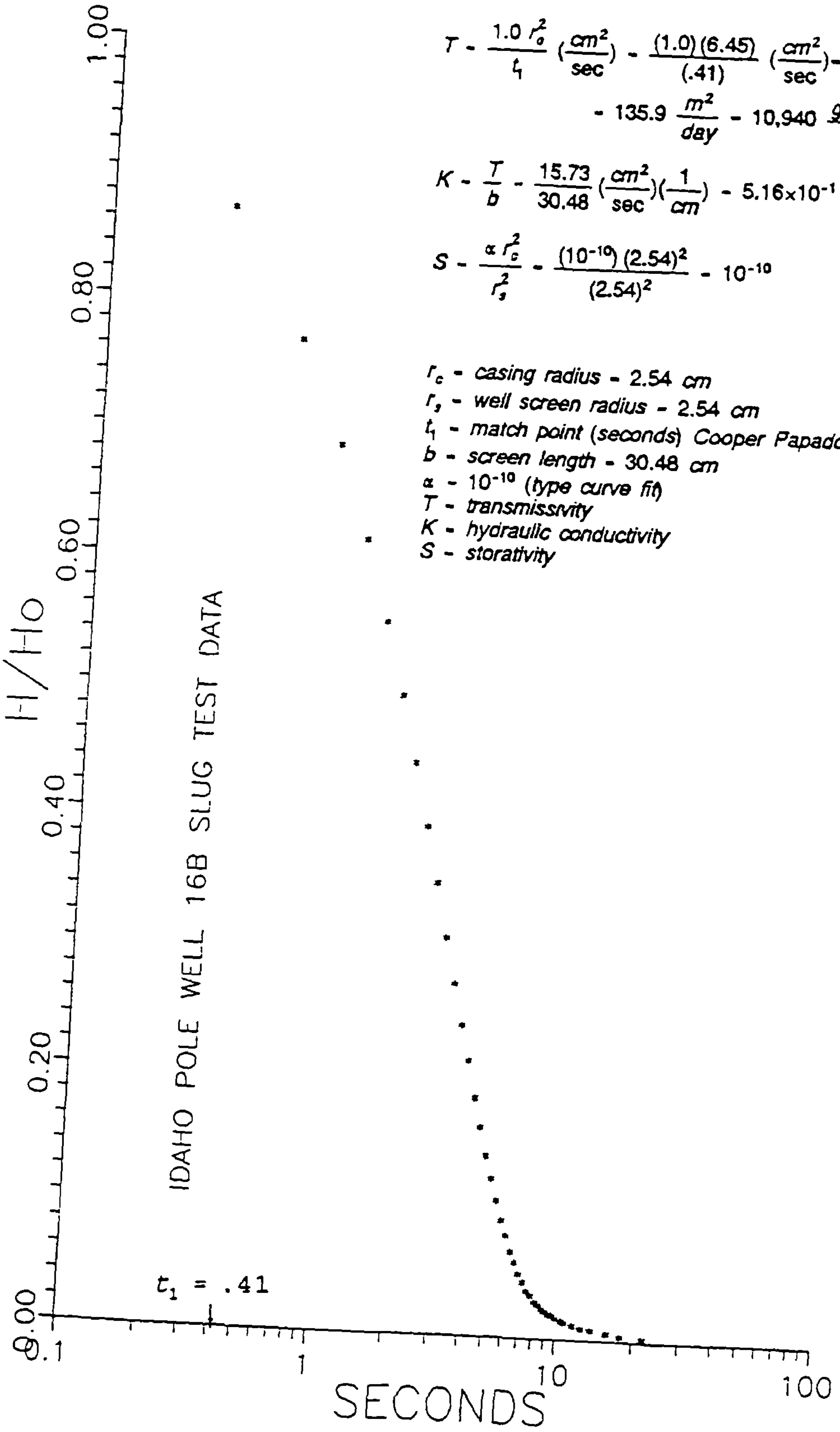
$$S = \frac{\alpha\, r_c^2}{r_s^2} = \frac{(10^{-3})(2.54)^2}{(2.54)^2} = 10^{-3}$$

r_c = *casing radius* = 2.54 *cm*
r_s = *well screen radius* = 2.54 *cm*
t_1 = *match point (seconds) Cooper Papadopulos type curve*
b = *screen length* = 121.9 *cm*
α = 10^{-3} *(type curve fit)*
T = *transmissivity*
K = *hydraulic conductivity*
S = *storativity*

IDAHO POLE SLUG TEST DATA

MONITOR WELL 16B
INITIAL X-DUCER READING = 8.396'
6.00 FT OF WATER DISPLACED

TIME IN SECONDS	TRANSDUCER WATER LEVEL READING	H	H/Ho
0.3	3.18	5.22	0.869
0.6	3.79	4.61	0.768
0.9	4.27	4.13	0.688
1.2	4.70	3.70	0.616
1.5	5.08	3.32	0.553
1.8	5.42	2.98	0.496
2.1	5.74	2.66	0.443
2.4	6.03	2.37	0.394
2.7	6.29	2.11	0.351
3.0	6.54	1.86	0.309
3.3	6.75	1.65	0.274
3.6	6.95	1.45	0.241
3.9	7.12	1.28	0.213
4.2	7.29	1.11	0.184
4.5	7.43	0.97	0.161
4.8	7.56	0.84	0.139
5.1	7.67	0.73	0.121
5.4	7.77	0.63	0.104
5.7	7.86	0.54	0.089
6.0	7.93	0.47	0.078
6.3	8.00	0.40	0.066
6.6	8.05	0.35	0.058
6.9	8.10	0.30	0.049
7.2	8.14	0.26	0.043
7.5	8.18	0.22	0.036
7.8	8.20	0.20	0.033
8.1	8.23	0.17	0.028
8.4	8.24	0.16	0.026
8.7	8.26	0.14	0.023
9.0	8.27	0.13	0.021
9.3	8.28	0.12	0.019
9.6	8.29	0.11	0.018
9.9	8.30	0.10	0.016
10.5	8.31	0.09	0.014
10.8	8.32	0.08	0.013
11.7	8.33	0.07	0.011
12.6	8.34	0.06	0.009
13.8	8.35	0.05	0.008
15.9	8.36	0.04	0.006
18.0	8.37	0.03	0.004
21.9	8.38	0.02	0.003



$$T = \frac{1.0\, r_c^2}{t_1}\left(\frac{cm^2}{sec}\right) = \frac{(1.0)(6.45)}{(.41)}\left(\frac{cm^2}{sec}\right) = 15.73\left(\frac{cm^2}{sec}\right)$$

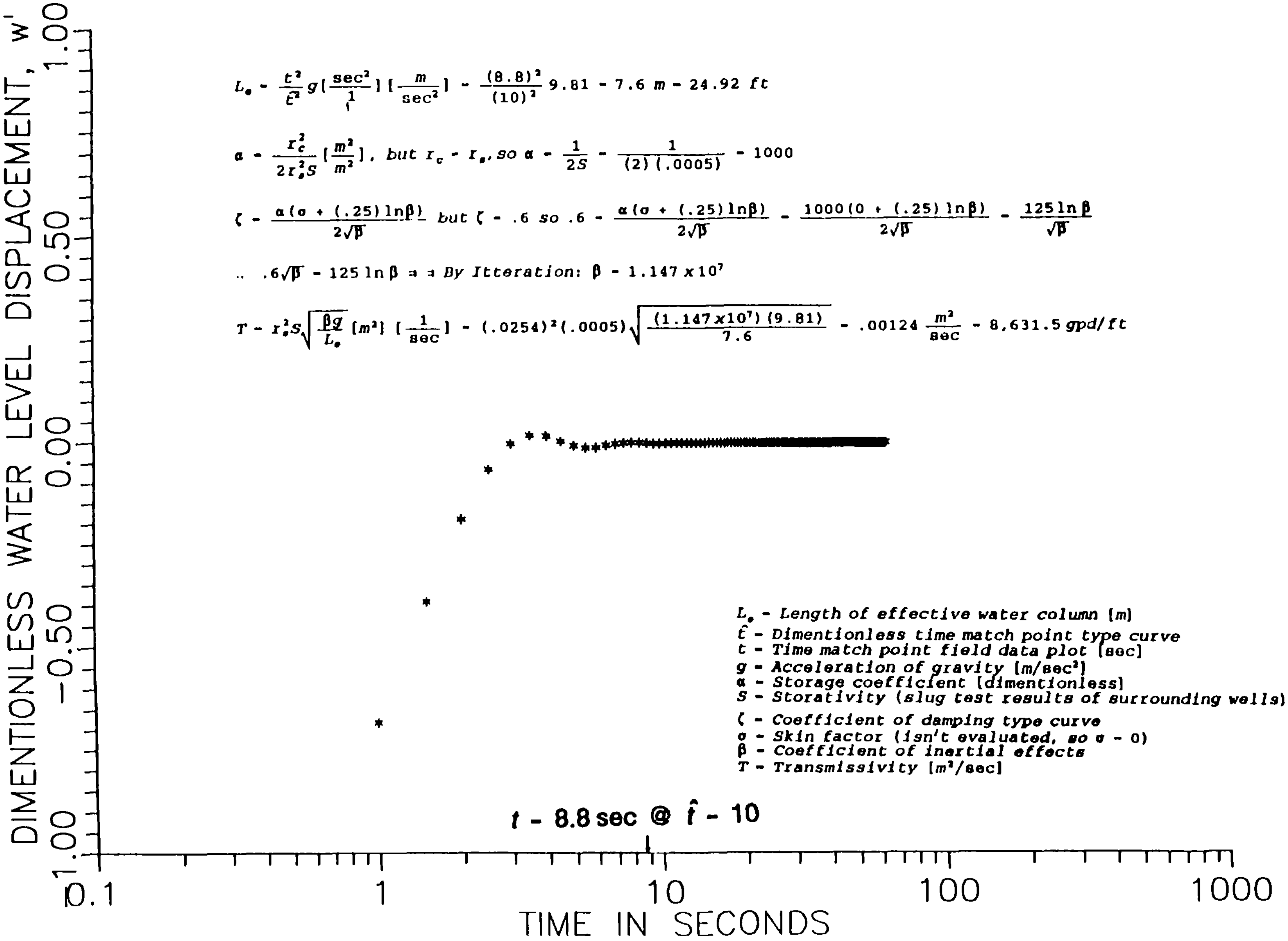
$$= 135.9\ \frac{m^2}{day} = 10{,}940\ \frac{gpd}{ft}$$

$$K = \frac{T}{b} = \frac{15.73}{30.48}\left(\frac{cm^2}{sec}\right)\left(\frac{1}{cm}\right) = 5.16\times10^{-1}\left(\frac{cm}{sec}\right)$$

$$S = \frac{\alpha\, r_c^2}{r_s^2} = \frac{(10^{-10})(2.54)^2}{(2.54)^2} = 10^{-10}$$

r_c - *casing radius* = 2.54 *cm*
r_s - *well screen radius* = 2.54 *cm*
t_1 - *match point (seconds) Cooper Papadopulos type curve*
b - *screen length* = 30.48 *cm*
α - 10^{-10} *(type curve fit)*
T - *transmissivity*
K - *hydraulic conductivity*
S - *storativity*

IDAHO POLE WELL MW-18B SLUG TEST DATA



$$L_e - \frac{t^2}{\hat{t}^2} g [\frac{sec^2}{1}] [\frac{m}{sec^2}] - \frac{(8.8)^2}{(10)^2} 9.81 - 7.6\ m - 24.92\ ft$$

$$\alpha - \frac{r_c^2}{2 r_e^2 S} [\frac{m^2}{m^2}],\ but\ r_c - r_e, so\ \alpha - \frac{1}{2S} - \frac{1}{(2)(.0005)} - 1000$$

$$\zeta - \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}}\ but\ \zeta - .6\ so\ .6 - \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}} - \frac{1000(0 + (.25)\ln\beta)}{2\sqrt{\beta}} - \frac{125\ln\beta}{\sqrt{\beta}}$$

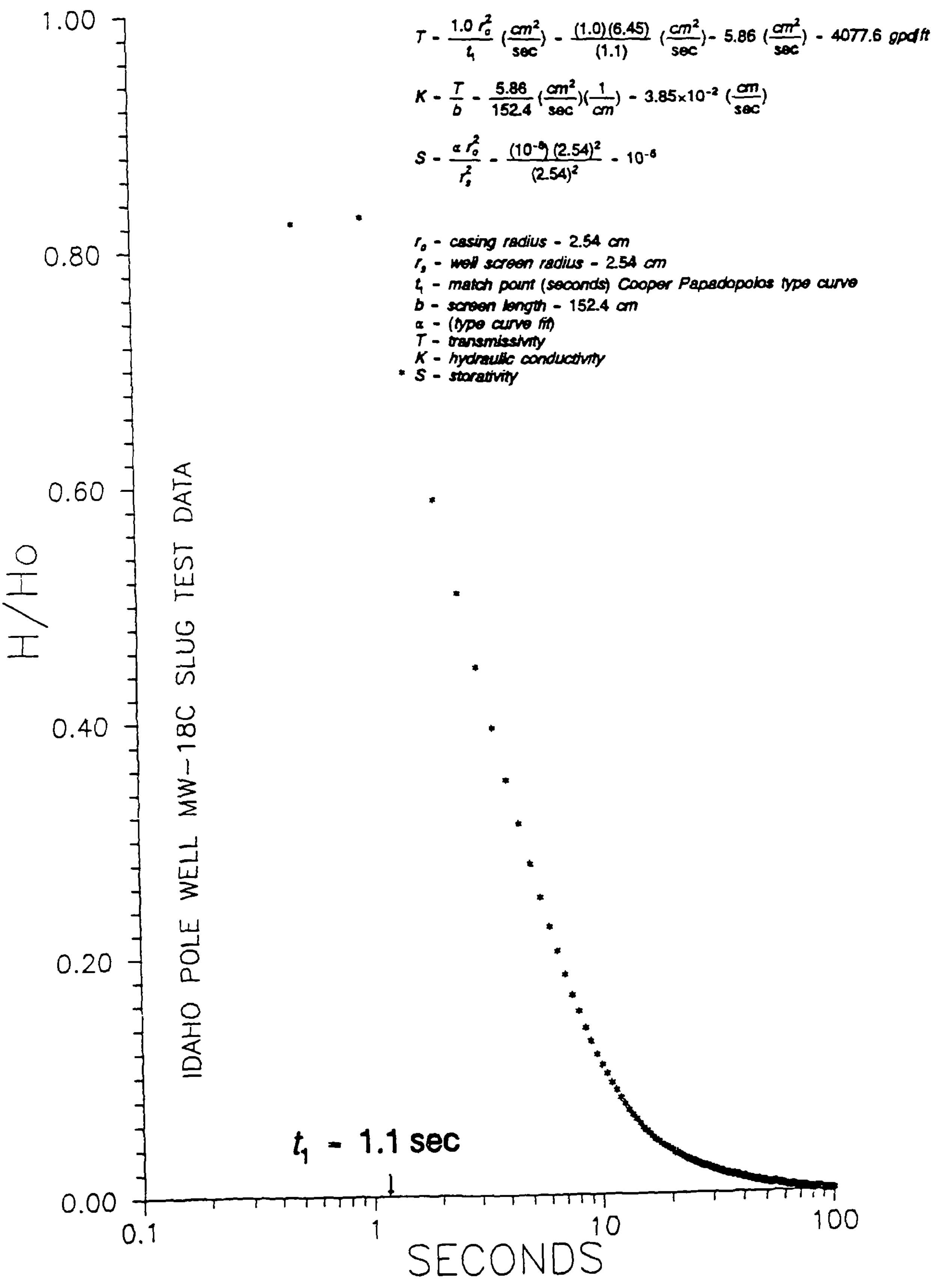
$$\therefore\ .6\sqrt{\beta} - 125\ln\beta \Rightarrow \Rightarrow By\ Itteration:\ \beta - 1.147 x 10^7$$

$$T - r_e^2 S \sqrt{\frac{\beta g}{L_e}} [m^2] [\frac{1}{sec}] - (.0254)^2 (.0005) \sqrt{\frac{(1.147 x 10^7)(9.81)}{7.6}} - .00124 \frac{m^2}{sec} - 8,631.5\ gpd/ft$$

L_e - Length of effective water column [m]
$\hat{t}$ - Dimentionless time match point type curve
t - Time match point field data plot [sec]
g - Acceleration of gravity [m/sec^2]
α - Storage coefficient [dimentionless]
S - Storativity (slug test results of surrounding wells)

ζ - Coefficient of damping type curve
σ - Skin factor (isn't evaluated, so σ - 0)
β - Coefficient of inertial effects
T - Transmissivity [m^2/sec]

t - 8.8 sec @ $\hat{t}$ - 10

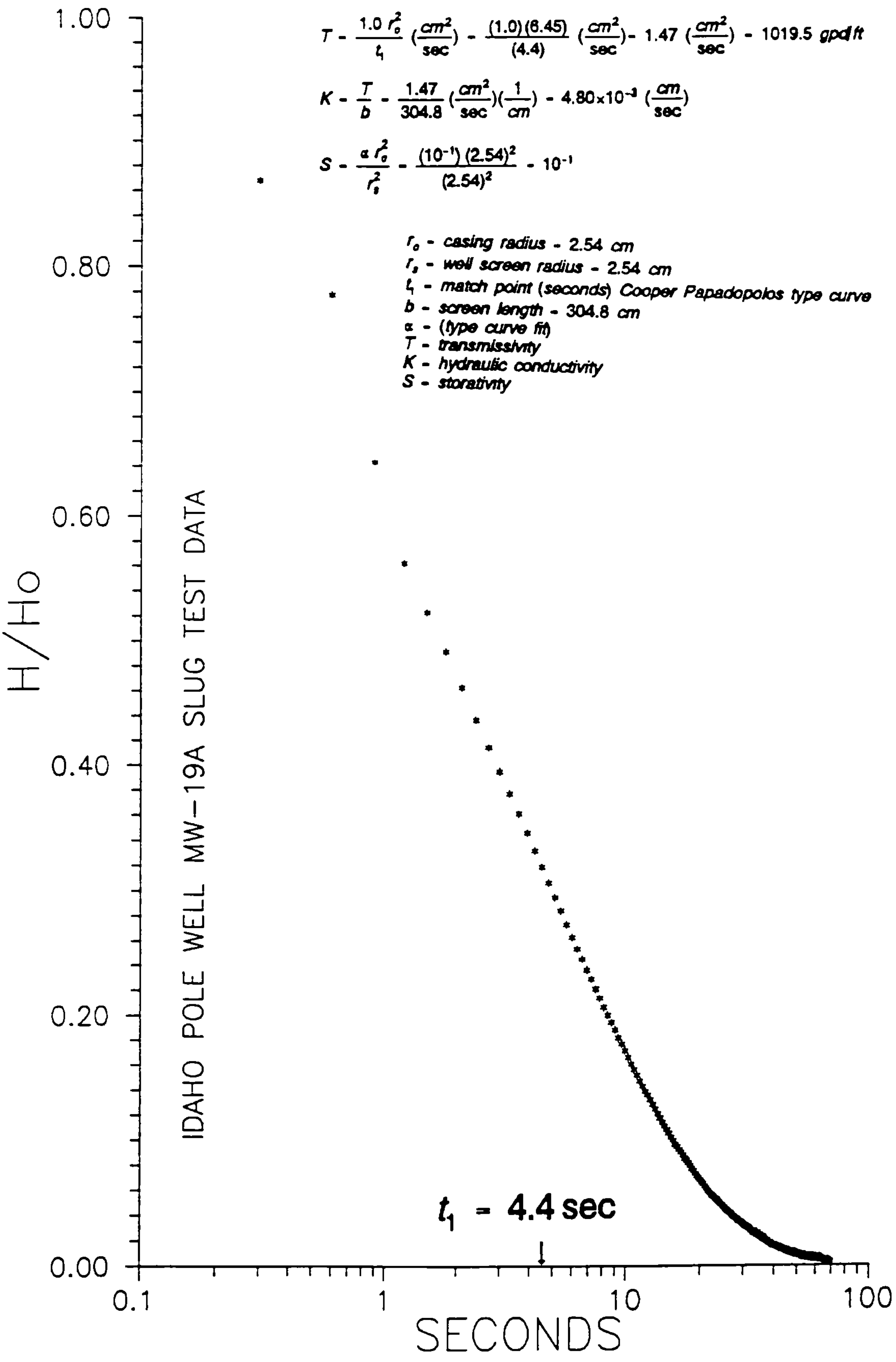


$$T = \frac{1.0\,r_c^2}{t_1}\left(\frac{cm^2}{sec}\right) = \frac{(1.0)(6.45)}{(1.1)}\left(\frac{cm^2}{sec}\right) = 5.86\left(\frac{cm^2}{sec}\right) = 4077.6\ gpd/ft$$

$$K = \frac{T}{b} = \frac{5.86}{152.4}\left(\frac{cm^2}{sec}\right)\left(\frac{1}{cm}\right) = 3.85\times10^{-2}\left(\frac{cm}{sec}\right)$$

$$S = \frac{\alpha\,r_c^2}{r_s^2} = \frac{(10^{-6})(2.54)^2}{(2.54)^2} = 10^{-6}$$

r_c = casing radius = 2.54 cm
r_s = well screen radius = 2.54 cm
t_1 = match point (seconds) Cooper Papadopolos type curve
b = screen length = 152.4 cm
α = (type curve fit)
T = transmissivity
K = hydraulic conductivity
* S = storativity


IDAHO POLE WELL MW-19A SLUG TEST DATA

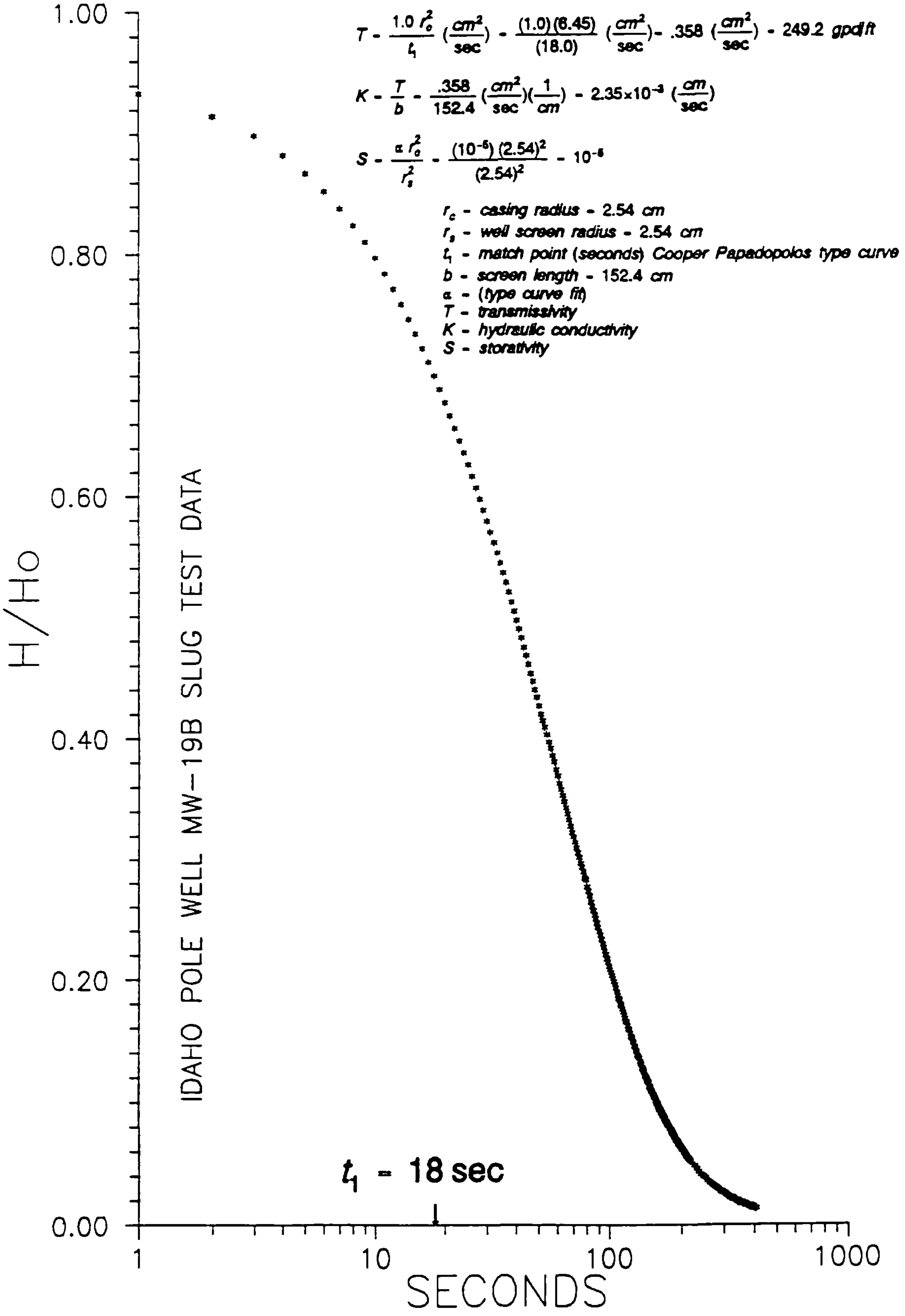
$$T = \frac{1.0\, r_o^2}{t_1} \left(\frac{cm^2}{sec}\right) = \frac{(1.0)(6.45)}{(4.4)} \left(\frac{cm^2}{sec}\right) = 1.47 \left(\frac{cm^2}{sec}\right) = 1019.5\ gpd/ft$$

$$K = \frac{T}{b} = \frac{1.47}{304.8} \left(\frac{cm^2}{sec}\right)\left(\frac{1}{cm}\right) = 4.80\times10^{-3} \left(\frac{cm}{sec}\right)$$

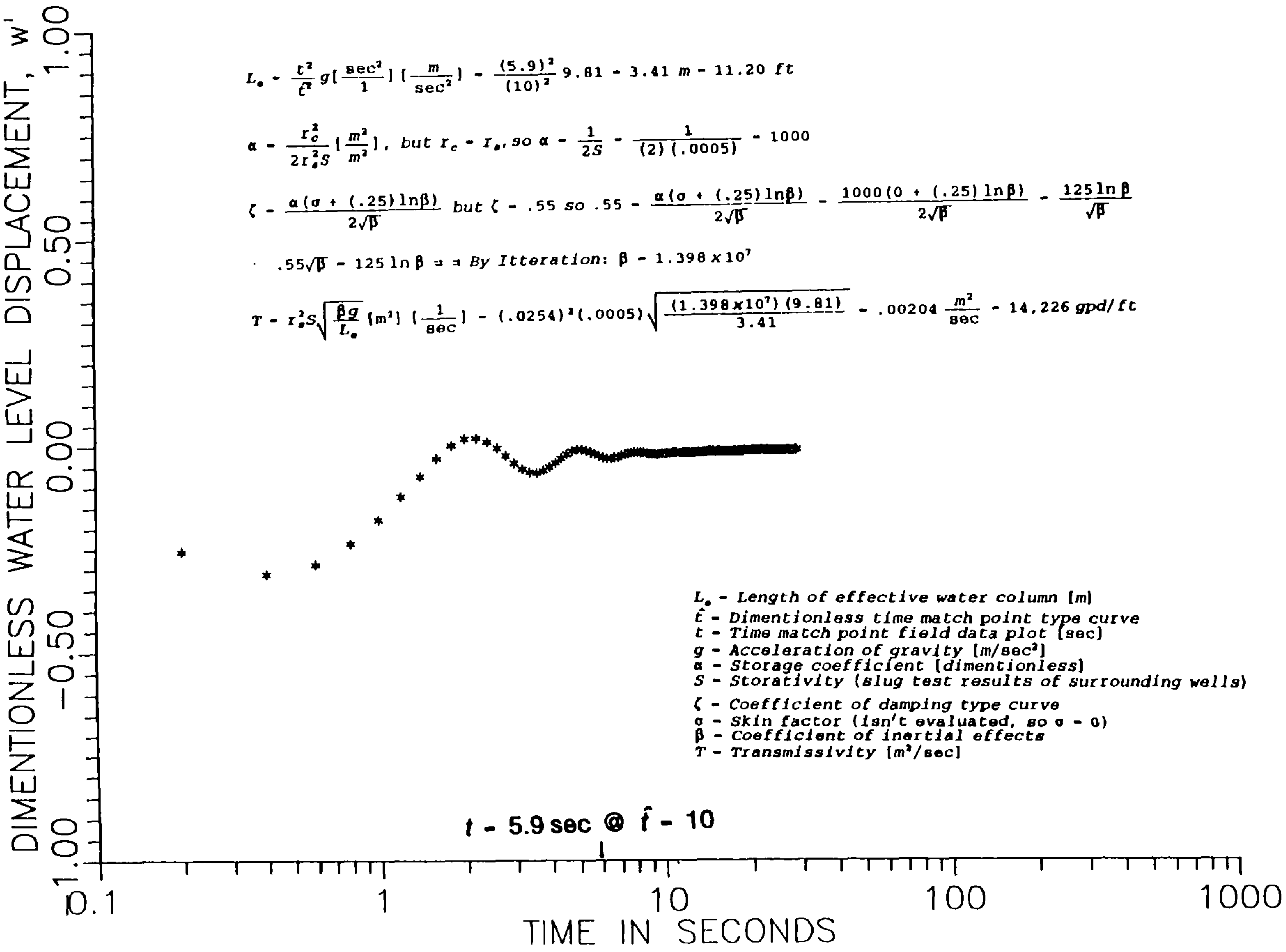
$$S = \frac{\alpha\, r_o^2}{r_s^2} = \frac{(10^{-1})(2.54)^2}{(2.54)^2} = 10^{-1}$$

r_o - *casing radius* - 2.54 *cm*
r_s - *well screen radius* - 2.54 *cm*
t_1 - *match point (seconds) Cooper Papadopolos type curve*
b - *screen length* - 304.8 *cm*
α - *(type curve fit)*
T - *transmissivity*
K - *hydraulic conductivity*
S - *storativity*

t_1 = 4.4 sec


IDAHO POLE WELL MW-19B SLUG TEST DATA
H/Ho
SECONDS
1.00
0.80
0.60
0.40
0.20
0.00
1
10
100
1000
t_1 = 18 sec
$T = \frac{1.0\, r_c^2}{t_1} \left(\frac{cm^2}{sec}\right) = \frac{(1.0)(6.45)}{(18.0)} \left(\frac{cm^2}{sec}\right) = .358 \left(\frac{cm^2}{sec}\right) = 249.2\ gpd/ft$
$K = \frac{T}{b} = \frac{.358}{152.4} \left(\frac{cm^2}{sec}\right)\left(\frac{1}{cm}\right) = 2.35\times10^{-3} \left(\frac{cm}{sec}\right)$
$S = \frac{\alpha\, r_c^2}{r_s^2} = \frac{(10^{-5})(2.54)^2}{(2.54)^2} = 10^{-5}$
r_c - casing radius - 2.54 cm
r_s - well screen radius - 2.54 cm
t_1 - match point (seconds) Cooper Papadopolos type curve
b - screen length - 152.4 cm
α - (type curve fit)
T - transmissivity
K - hydraulic conductivity
S - storativity

IDAHO POLE WELL MW-21 SLUG TEST DATA



$$L_e = \frac{t^2}{\hat{t}^2} g\left[\frac{\sec^2}{1}\right]\left[\frac{m}{\sec^2}\right] = \frac{(5.9)^2}{(10)^2} 9.81 = 3.41\ m = 11.20\ ft$$

$$\alpha = \frac{r_c^2}{2r_s^2 S}\left[\frac{m^2}{m^2}\right],\ \text{but } r_c = r_s, \text{so } \alpha = \frac{1}{2S} = \frac{1}{(2)(.0005)} = 1000$$

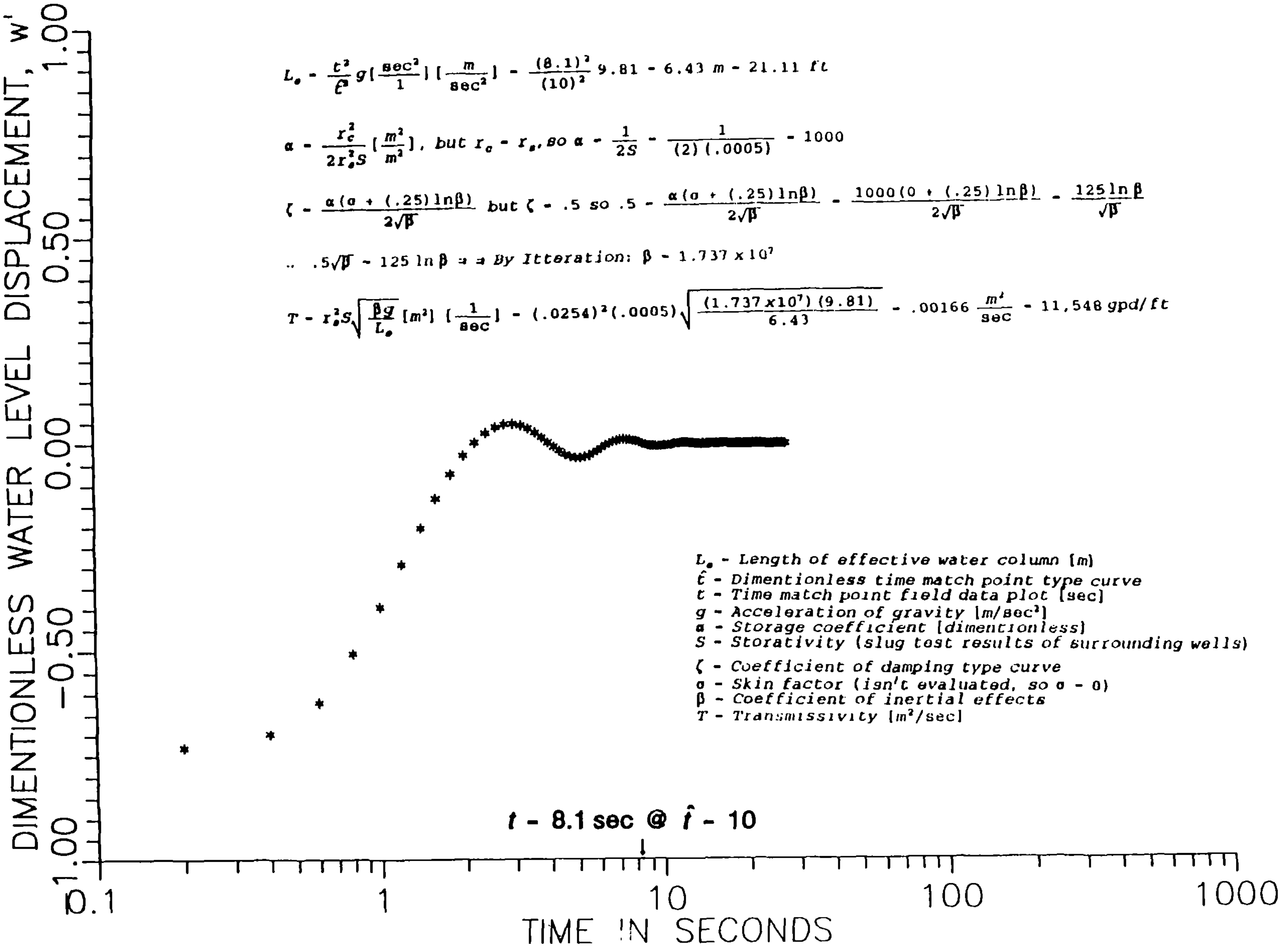
$$\zeta = \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}}\ \text{but } \zeta = .55\ \text{so } .55 = \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}} = \frac{1000(0 + (.25)\ln\beta)}{2\sqrt{\beta}} = \frac{125\ln\beta}{\sqrt{\beta}}$$

$$\therefore\ .55\sqrt{\beta} = 125\ln\beta \Rightarrow \Rightarrow \text{By Itteration: } \beta = 1.398\times10^7$$

$$T = r_s^2 S\sqrt{\frac{\beta g}{L_e}}\,[m^2]\left[\frac{1}{sec}\right] = (.0254)^2(.0005)\sqrt{\frac{(1.398\times10^7)(9.81)}{3.41}} = .00204\ \frac{m^2}{sec} = 14,226\ gpd/ft$$

L_e - Length of effective water column [m]
$\hat{t}$ - Dimentionless time match point type curve
t - Time match point field data plot [sec]
g - Acceleration of gravity [m/sec^2]
α - Storage coefficient [dimentionless]
S - Storativity (slug test results of surrounding wells)
ζ - Coefficient of damping type curve
σ - Skin factor (isn't evaluated, so $\sigma = 0$)
β - Coefficient of inertial effects
T - Transmissivity [m^2/sec]

IDAHO POLE WELL MW-22 SLUG TEST DATA



$$L_e = \frac{t^2}{\hat{t}^2} g \left[\frac{sec^2}{1}\right]\left[\frac{m}{sec^2}\right] = \frac{(8.1)^2}{(10)^2} 9.81 = 6.43\ m = 21.11\ ft$$

$$\alpha = \frac{r_c^2}{2r_e^2 S}\left[\frac{m^2}{m^2}\right],\ but\ r_c = r_e,\ so\ \alpha = \frac{1}{2S} = \frac{1}{(2)(.0005)} = 1000$$

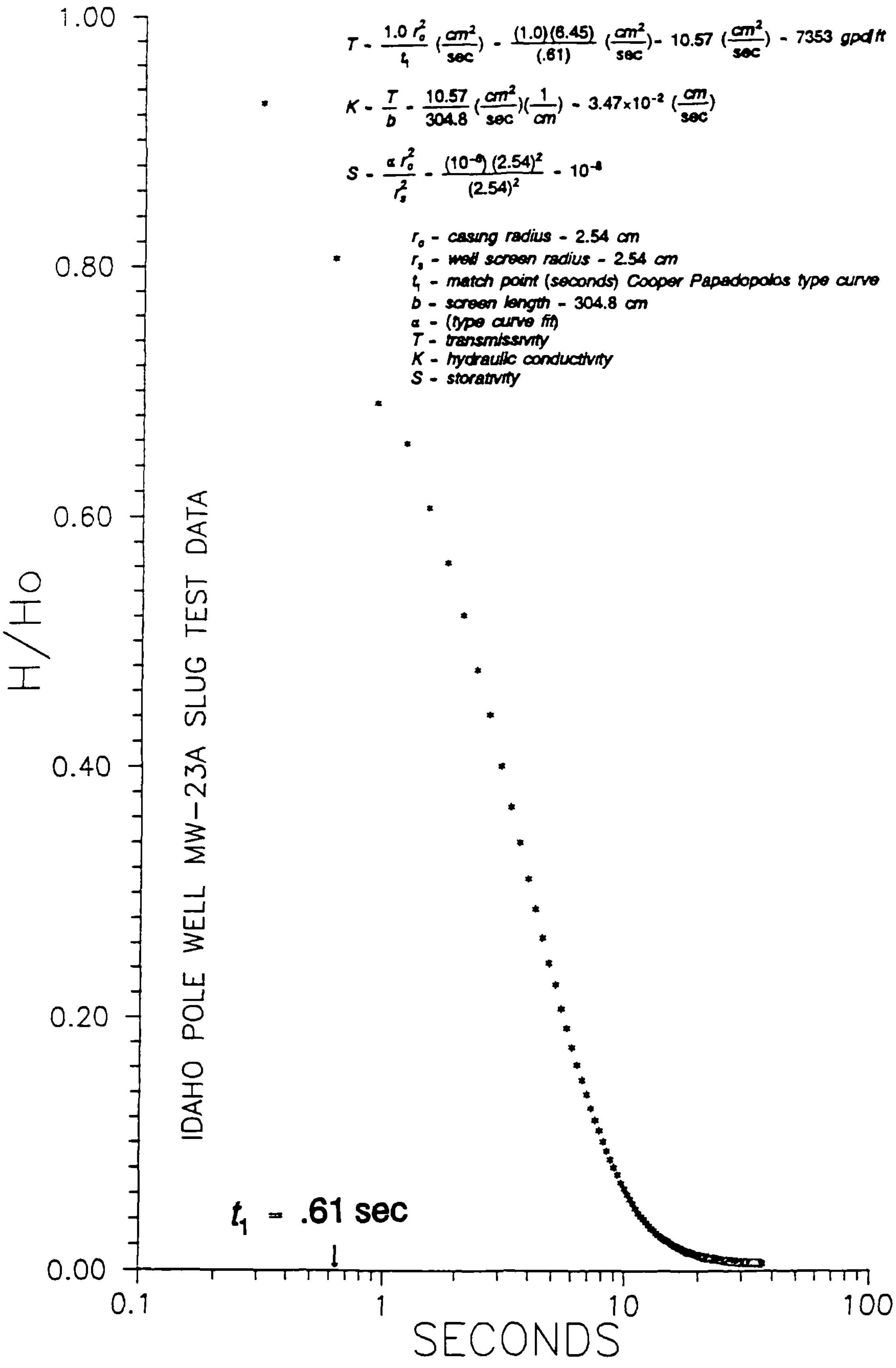
$$\zeta = \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}}\ but\ \zeta = .5\ so\ .5 = \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}} = \frac{1000(0 + (.25)\ln\beta)}{2\sqrt{\beta}} = \frac{125\ln\beta}{\sqrt{\beta}}$$

$$\therefore\ .5\sqrt{\beta} = 125\ln\beta \Rightarrow By\ Itteration:\ \beta = 1.737 \times 10^7$$

$$T = r_e^2 S\sqrt{\frac{\beta g}{L_e}}[m^2]\left[\frac{1}{sec}\right] = (.0254)^2(.0005)\sqrt{\frac{(1.737 \times 10^7)(9.81)}{6.43}} = .00166\ \frac{m^2}{sec} = 11{,}548\ gpd/ft$$

L_e - Length of effective water column [m]
$\hat{t}$ - Dimentionless time match point type curve
t - Time match point field data plot [sec]
g - Acceleration of gravity [m/sec²]
α - Storage coefficient [dimentionless]
S - Storativity (slug test results of surrounding wells)

ζ - Coefficient of damping type curve
σ - Skin factor (isn't evaluated, so $\sigma = 0$)
β - Coefficient of inertial effects
T - Transmissivity [m²/sec]



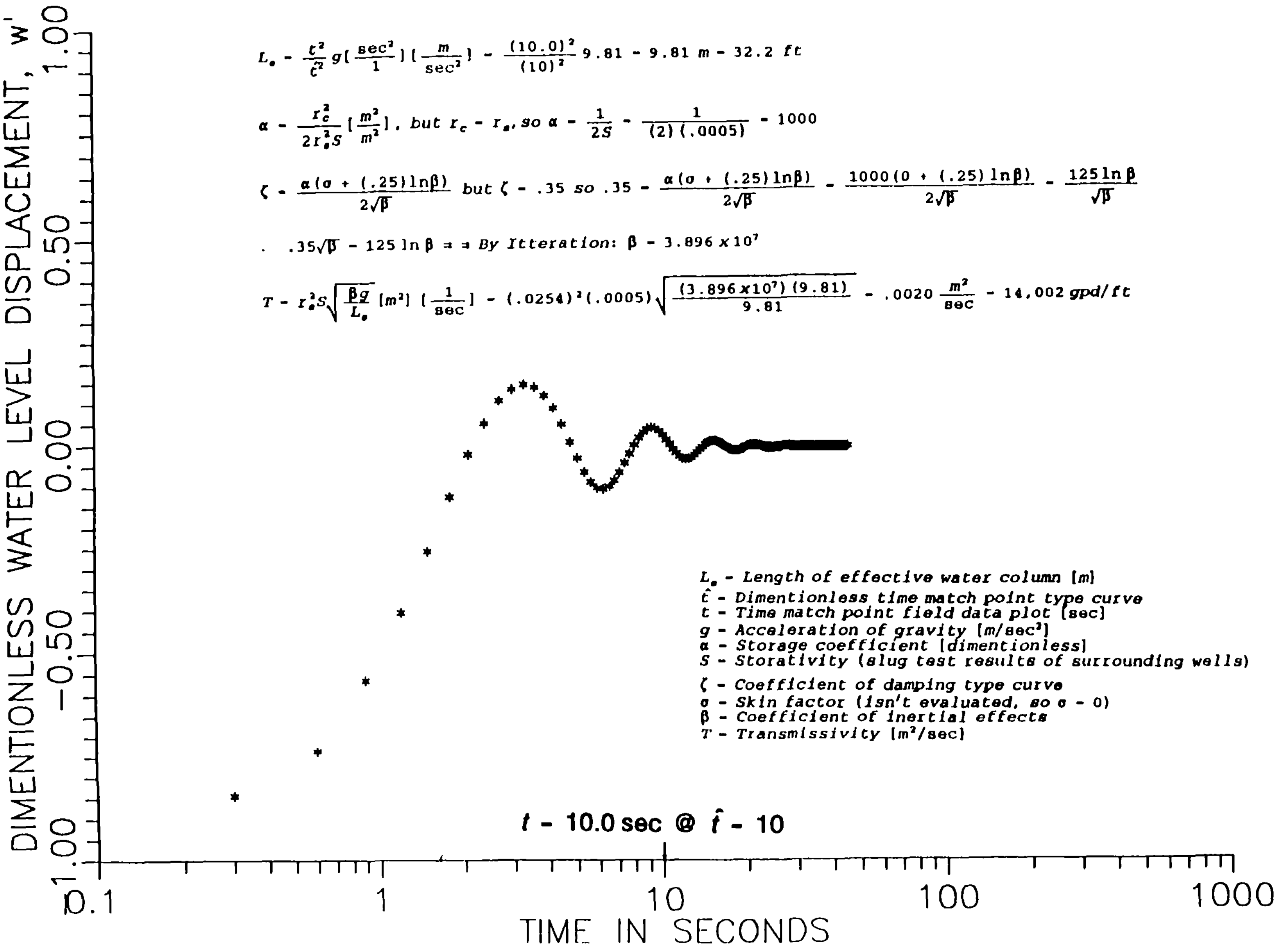
$$T = \frac{1.0\, r_o^2}{t_1} \left(\frac{cm^2}{sec}\right) = \frac{(1.0)(6.45)}{(.61)} \left(\frac{cm^2}{sec}\right) = 10.57 \left(\frac{cm^2}{sec}\right) = 7353 \text{ gpd/ft}$$

$$K = \frac{T}{b} = \frac{10.57}{304.8} \left(\frac{cm^2}{sec}\right)\left(\frac{1}{cm}\right) = 3.47 \times 10^{-2} \left(\frac{cm}{sec}\right)$$

$$S = \frac{\alpha\, r_o^2}{r_s^2} = \frac{(10^{-8})(2.54)^2}{(2.54)^2} = 10^{-8}$$

r_o - *casing radius* - 2.54 *cm*
r_s - *well screen radius* - 2.54 *cm*
t_1 - *match point (seconds) Cooper Papadopolos type curve*
b - *screen length* - 304.8 *cm*
α - *(type curve fit)*
T - *transmissivity*
K - *hydraulic conductivity*
S - *storativity*

IDAHO POLE WELL MW-23B SLUG TEST DATA



$$L_e - \frac{t^2}{\hat{t}^2} g [\frac{sec^2}{1}] [\frac{m}{sec^2}] - \frac{(10.0)^2}{(10)^2} 9.81 - 9.81\ m - 32.2\ ft$$

$$\alpha - \frac{r_c^2}{2 r_e^2 S} [\frac{m^2}{m^2}], \text{ but } r_c - r_e, \text{ so } \alpha - \frac{1}{2S} - \frac{1}{(2)(.0005)} - 1000$$

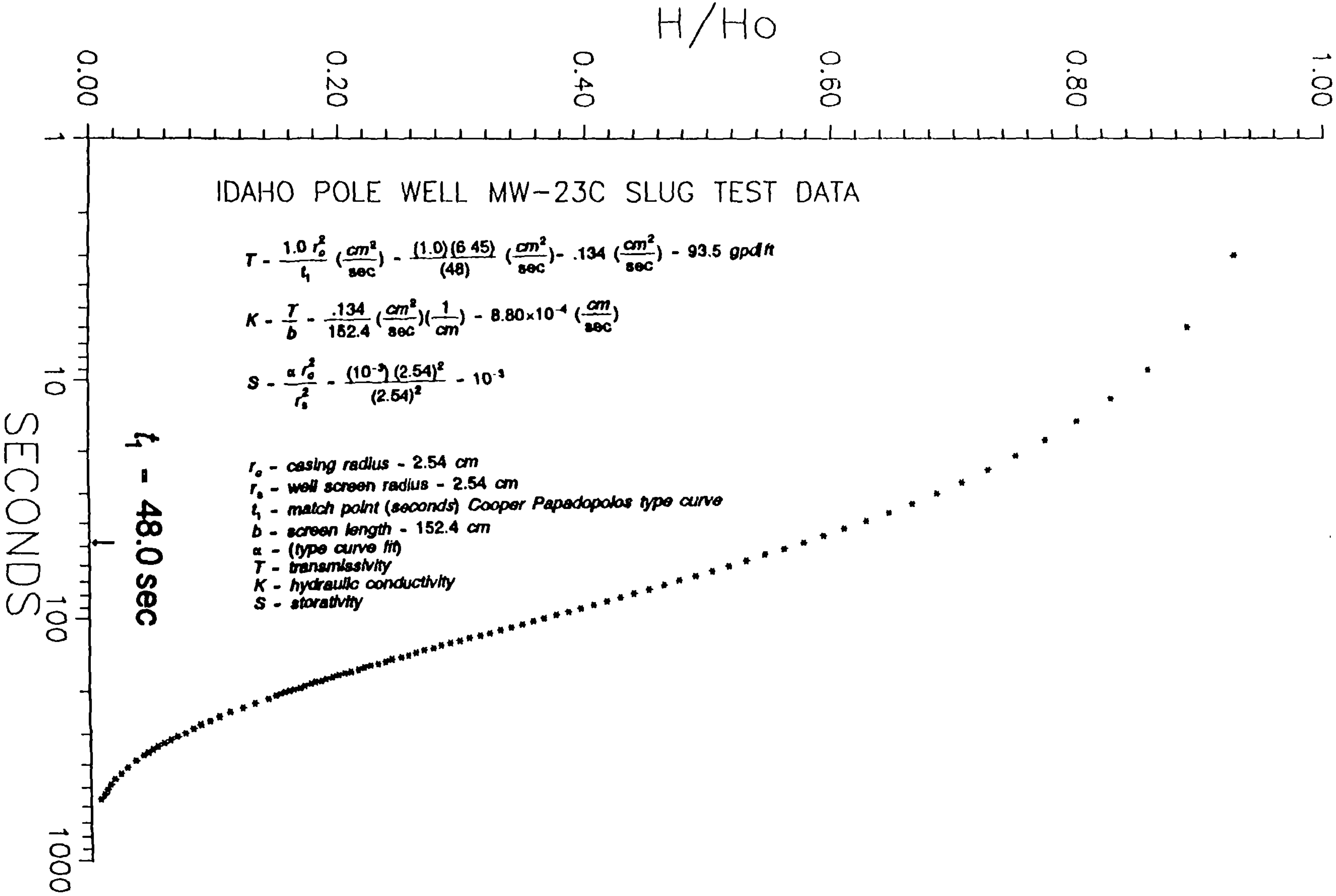
$$\zeta - \frac{\alpha(\sigma + (.25) \ln\beta)}{2\sqrt{\beta}} \text{ but } \zeta - .35 \text{ so } .35 - \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}} - \frac{1000(0 + (.25)\ln\beta)}{2\sqrt{\beta}} - \frac{125 \ln\beta}{\sqrt{\beta}}$$

$$.35\sqrt{\beta} - 125 \ln\beta \Rightarrow \text{By Itteration: } \beta - 3.896 \times 10^7$$

$$T - r_e^2 S \sqrt{\frac{\beta g}{L_e}} [m^2] [\frac{1}{sec}] - (.0254)^2 (.0005) \sqrt{\frac{(3.896 \times 10^7)(9.81)}{9.81}} - .0020 \frac{m^2}{sec} - 14,002\ gpd/ft$$

L_e - Length of effective water column [m]
$\hat{t}$ - Dimentionless time match point type curve
t - Time match point field data plot [sec]
g - Acceleration of gravity [m/sec^2]
α - Storage coefficient [dimentionless]
S - Storativity (slug test results of surrounding wells)
ζ - Coefficient of damping type curve
σ - Skin factor (isn't evaluated, so σ - 0)
β - Coefficient of inertial effects
T - Transmissivity [m^2/sec]

t - 10.0 sec @ $\hat{t}$ - 10



IDAHO POLE WELL MW-23C SLUG TEST DATA

$$T = \frac{1.0\ r_o^2}{t_1} \left(\frac{cm^2}{sec}\right) = \frac{(1.0)(6.45)}{(48)} \left(\frac{cm^2}{sec}\right) = .134 \left(\frac{cm^2}{sec}\right) = 93.5\ gpd/ft$$

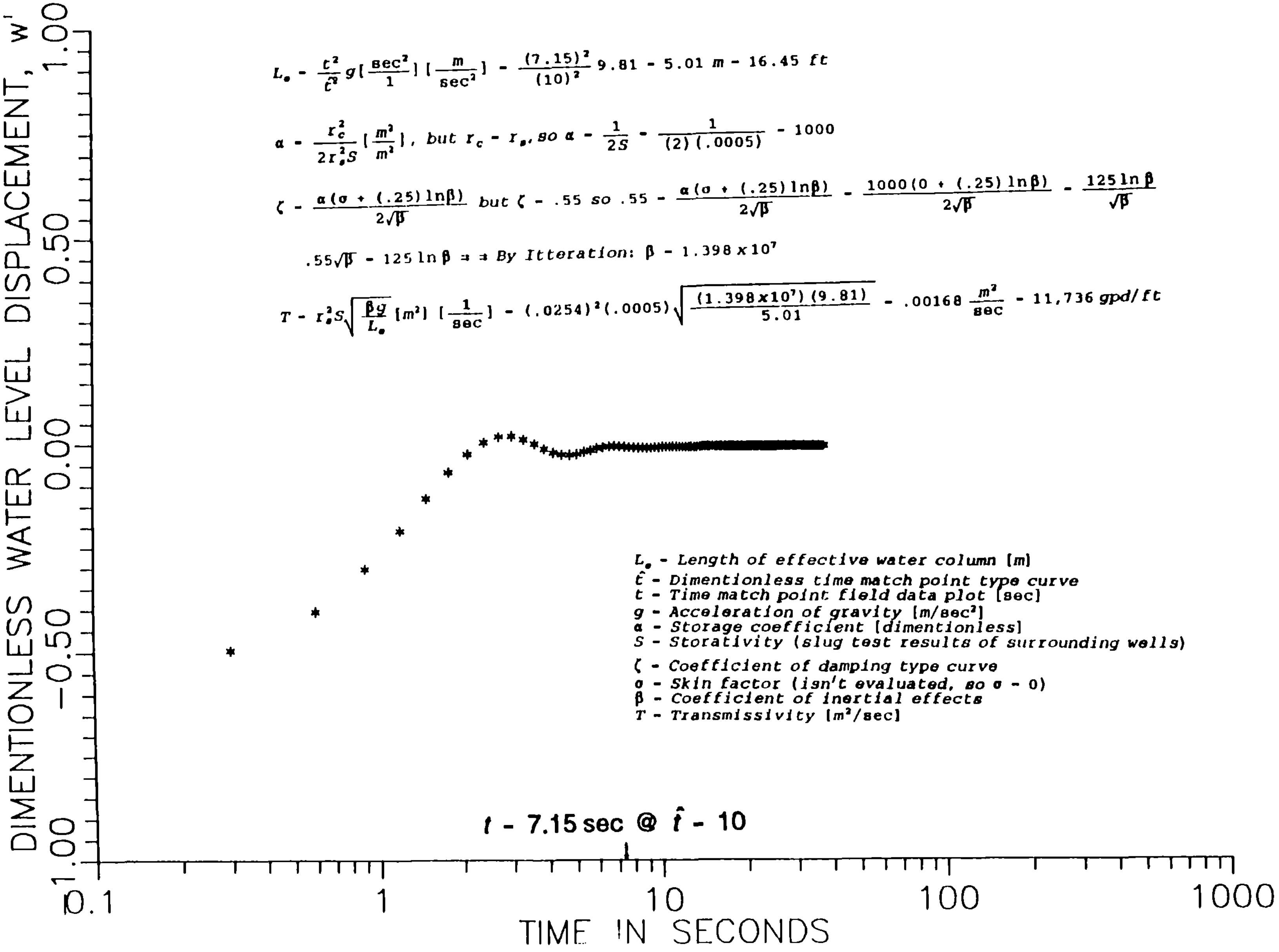
$$K = \frac{T}{b} = \frac{.134}{152.4} \left(\frac{cm^2}{sec}\right)\left(\frac{1}{cm}\right) = 8.80 \times 10^{-4} \left(\frac{cm}{sec}\right)$$

$$S = \frac{\alpha\ r_o^2}{r_s^2} = \frac{(10^{-3})(2.54)^2}{(2.54)^2} = 10^{-3}$$

r_o - *casing radius* - 2.54 *cm*
r_s - *well screen radius* - 2.54 *cm*
t_1 - *match point (seconds) Cooper Papadopolos type curve*
b - *screen length* - 152.4 *cm*
α - *(type curve fit)*
T - *transmissivity*
K - *hydraulic conductivity*
S - *storativity*

t_1 = 48.0 sec

IDAHO POLE WELL MW-24A2 SLUG TEST DATA



$$L_e - \frac{t^2}{\hat{t}^2} g [\frac{sec^2}{1}] [\frac{m}{sec^2}] - \frac{(7.15)^2}{(10)^2} 9.81 - 5.01\ m - 16.45\ ft$$

$$\alpha - \frac{r_c^2}{2 r_s^2 S} [\frac{m^2}{m^2}],\ but\ r_c - r_s,\ so\ \alpha - \frac{1}{2S} - \frac{1}{(2)(.0005)} - 1000$$

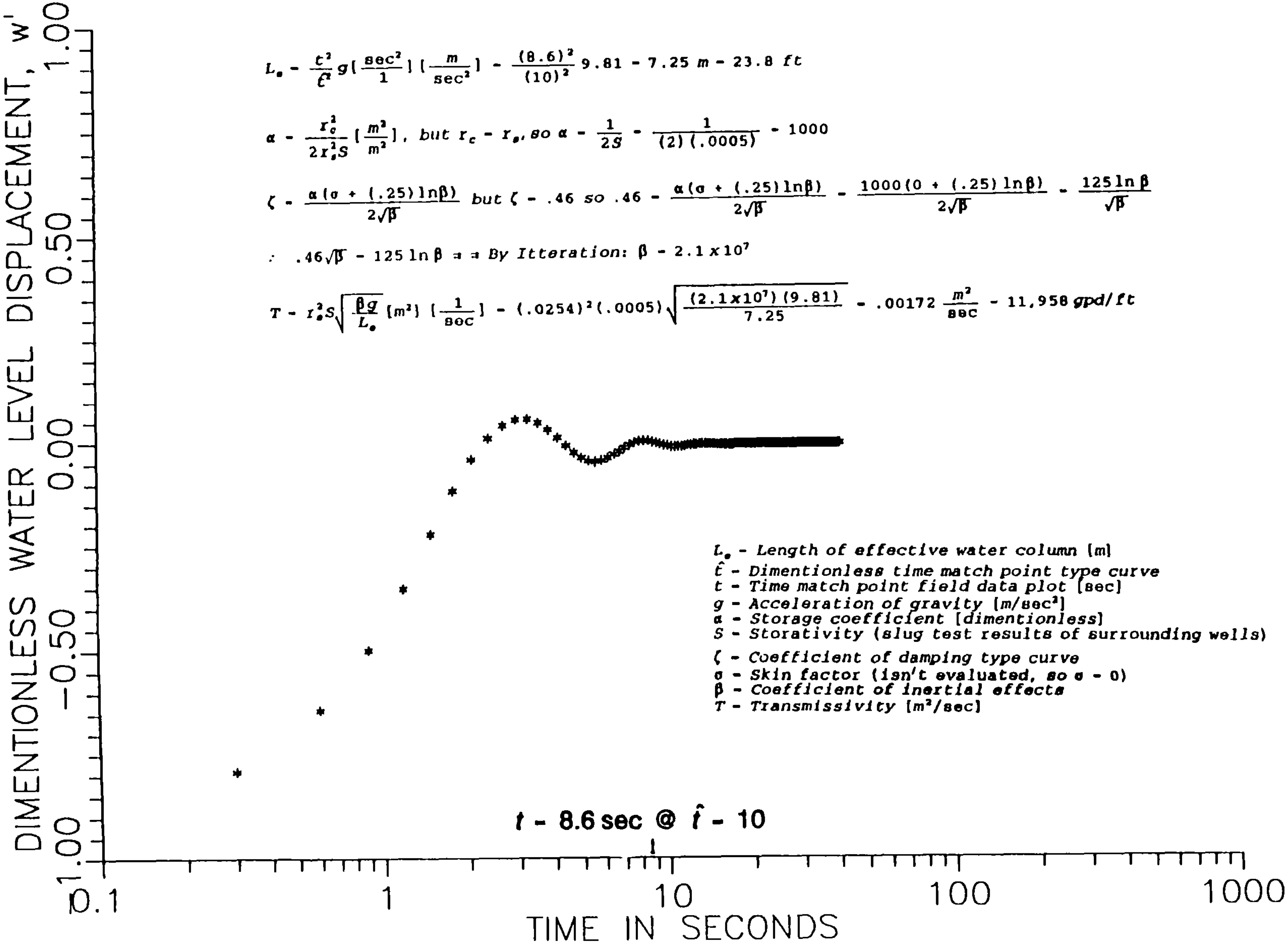
$$\zeta - \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}}\ but\ \zeta - .55\ so\ .55 - \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}} - \frac{1000(0 + (.25)\ln\beta)}{2\sqrt{\beta}} - \frac{125\ln\beta}{\sqrt{\beta}}$$

$$.55\sqrt{\beta} - 125\ln\beta \Rightarrow By\ Itteration:\ \beta - 1.398 \times 10^7$$

$$T - r_s^2 S \sqrt{\frac{\beta g}{L_e}} [m^2] [\frac{1}{sec}] - (.0254)^2 (.0005) \sqrt{\frac{(1.398 \times 10^7)(9.81)}{5.01}} - .00168 \frac{m^2}{sec} - 11{,}736\ gpd/ft$$

L_e - Length of effective water column [m]
$\hat{t}$ - Dimentionless time match point type curve
t - Time match point field data plot [sec]
g - Acceleration of gravity [m/sec^2]
α - Storage coefficient [dimentionless]
S - Storativity (slug test results of surrounding wells)
ζ - Coefficient of damping type curve
σ - Skin factor (isn't evaluated, so σ - 0)
β - Coefficient of inertial effects
T - Transmissivity [m^2/sec]

IDAHO POLE WELL MW-24B SLUG TEST DATA



$L_e - \frac{t^2}{\hat{t}^2} g [\frac{sec^2}{1}] [\frac{m}{sec^2}] - \frac{(8.6)^2}{(10)^2} 9.81 - 7.25\ m - 23.8\ ft$

$\alpha - \frac{r_c^2}{2 r_s^2 S} [\frac{m^2}{m^2}]$, but $r_c - r_s$, so $\alpha - \frac{1}{2S} - \frac{1}{(2)(.0005)} - 1000$

$\zeta - \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}}$ but $\zeta - .46$ so $.46 - \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}} - \frac{1000(0 + (.25)\ln\beta)}{2\sqrt{\beta}} - \frac{125\ln\beta}{\sqrt{\beta}}$

$\therefore\ .46\sqrt{\beta} - 125\ln\beta \Rightarrow$ By Itteration: $\beta - 2.1 x 10^7$

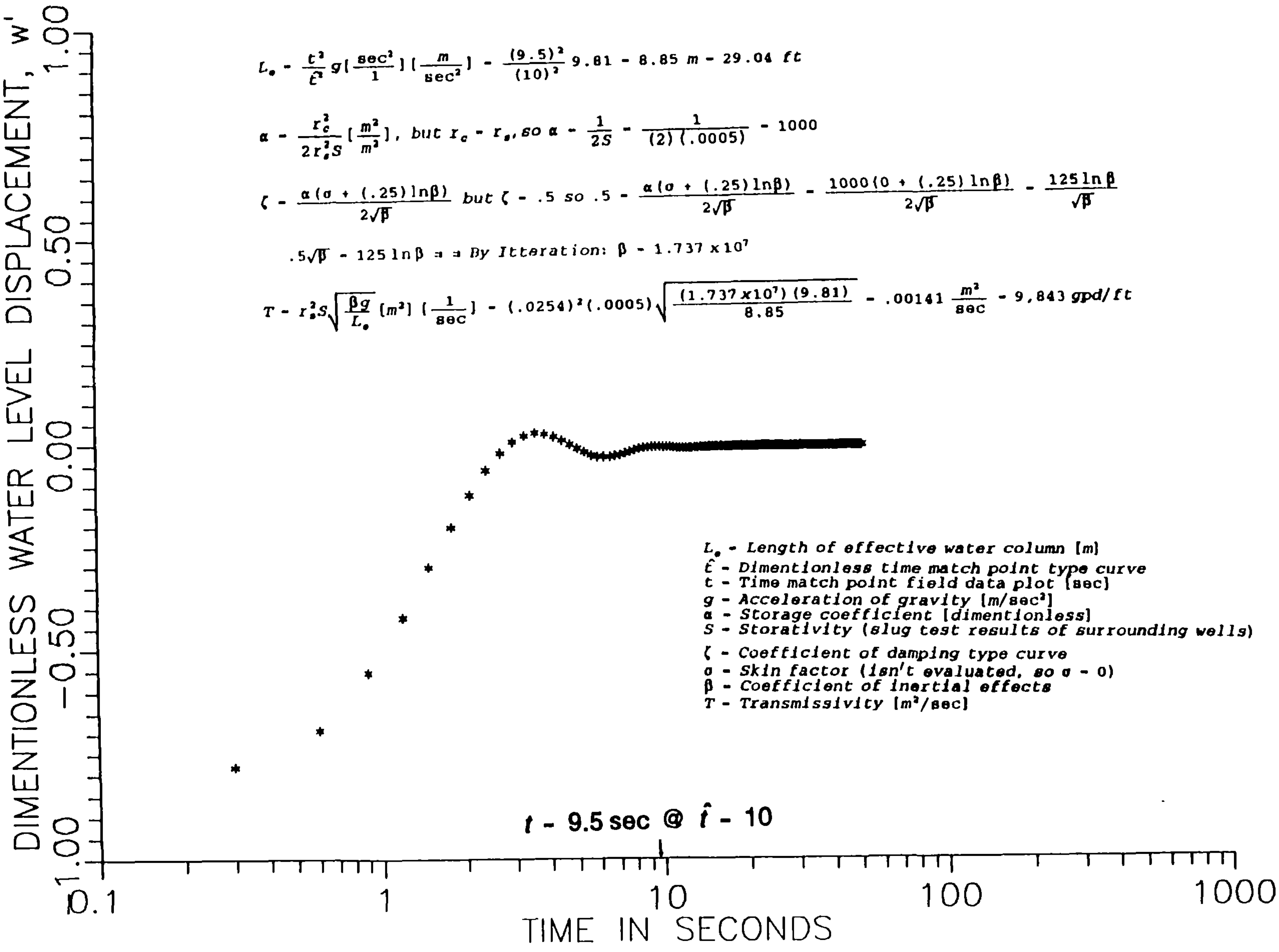
$T - r_s^2 S \sqrt{\frac{\beta g}{L_e}} [m^2] [\frac{1}{sec}] - (.0254)^2(.0005)\sqrt{\frac{(2.1 x 10^7)(9.81)}{7.25}} - .00172 \frac{m^2}{sec} - 11,958\ gpd/ft$

L_e - Length of effective water column [m]
$\hat{t}$ - Dimentionless time match point type curve
t - Time match point field data plot [sec]
g - Acceleration of gravity [m/sec^2]
α - Storage coefficient [dimentionless]
S - Storativity (slug test results of surrounding wells)

ζ - Coefficient of damping type curve
σ - Skin factor (isn't evaluated, so σ - 0)
β - Coefficient of inertial effects
T - Transmissivity [m^2/sec]

t - 8.6 sec @ $\hat{t}$ - 10

IDAHO POLE WELL MW-25B SLUG TEST DATA



$$L_e - \frac{t^2}{\hat{t}^2} g [\frac{sec^2}{1}] [\frac{m}{sec^2}] - \frac{(9.5)^2}{(10)^2} 9.81 - 8.85\ m - 29.04\ ft$$

$$\alpha - \frac{r_c^2}{2 r_s^2 S} [\frac{m^2}{m^2}],\ but\ r_c - r_s, so\ \alpha - \frac{1}{2S} - \frac{1}{(2)(.0005)} - 1000$$

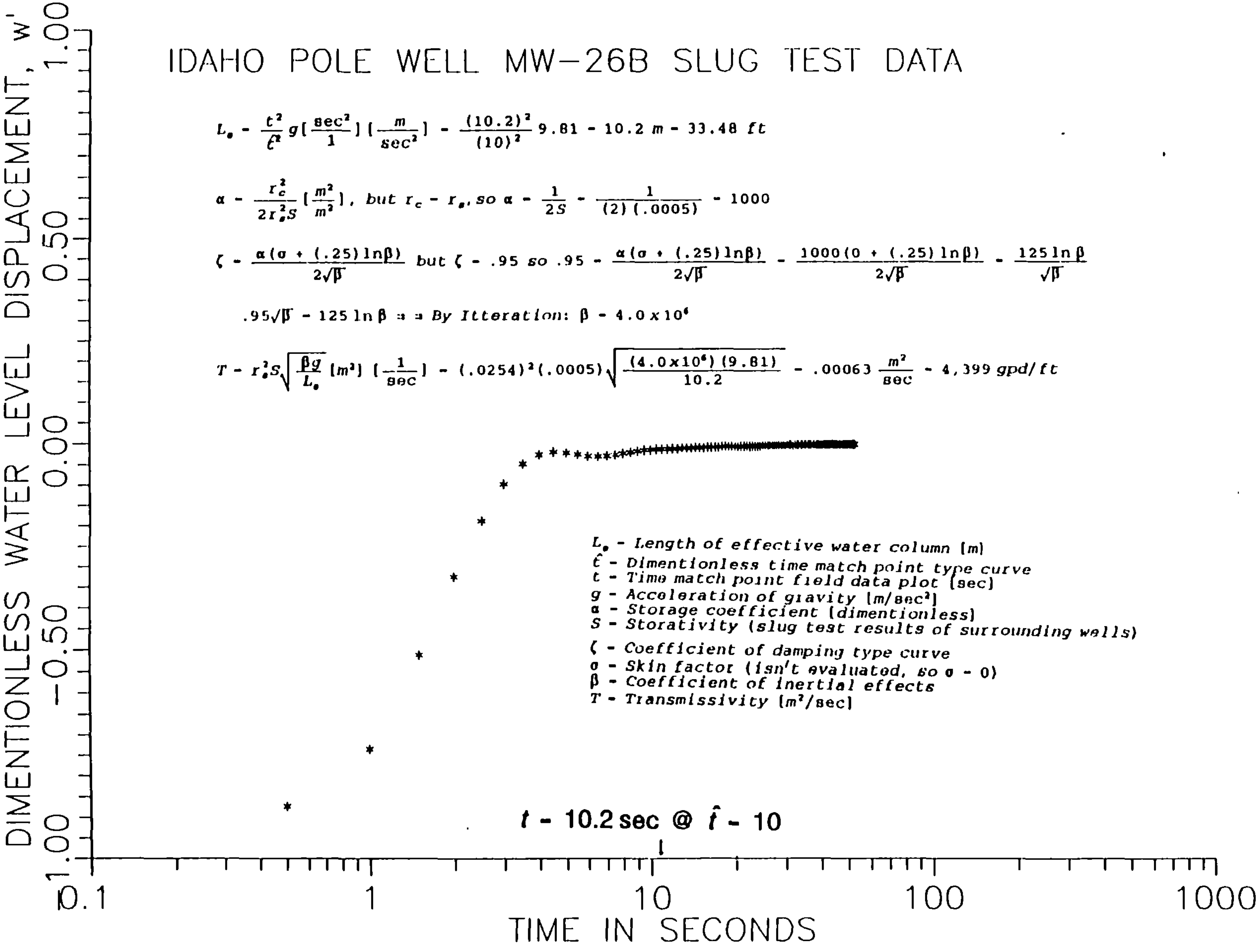
$$\zeta - \frac{\alpha(\sigma + (.25) \ln\beta)}{2\sqrt{\beta}}\ but\ \zeta - .5\ so\ .5 - \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}} - \frac{1000(0 + (.25)\ln\beta)}{2\sqrt{\beta}} - \frac{125 \ln\beta}{\sqrt{\beta}}$$

$$.5\sqrt{\beta} - 125 \ln\beta \Rightarrow \Rightarrow By\ Itteration:\ \beta - 1.737 \times 10^7$$

$$T - r_s^2 S \sqrt{\frac{\beta g}{L_e}} [m^2] [\frac{1}{sec}] - (.0254)^2 (.0005) \sqrt{\frac{(1.737 \times 10^7)(9.81)}{8.85}} - .00141 \frac{m^2}{sec} - 9,843\ gpd/ft$$

L_e - *Length of effective water column [m]*
$\hat{t}$ - *Dimentionless time match point type curve*
t - *Time match point field data plot [sec]*
g - *Acceleration of gravity* $[m/sec^2]$
α - *Storage coefficient [dimentionless]*
S - *Storativity (slug test results of surrounding wells)*
ζ - *Coefficient of damping type curve*
σ - *Skin factor (isn't evaluated, so* $\sigma - 0$*)*
β - *Coefficient of inertial effects*
T - *Transmissivity* $[m^2/sec]$

t - 9.5 sec @ $\hat{t}$ - 10



IDAHO POLE WELL MW−26B SLUG TEST DATA

$$L_e - \frac{t^2}{\hat{t}^2} g \left[\frac{sec^2}{1}\right]\left[\frac{m}{sec^2}\right] - \frac{(10.2)^2}{(10)^2} 9.81 - 10.2\ m - 33.48\ ft$$

$$\alpha - \frac{r_c^2}{2 r_s^2 S}\left[\frac{m^2}{m^2}\right],\ but\ r_c - r_s,\ so\ \alpha - \frac{1}{2S} - \frac{1}{(2)(.0005)} - 1000$$

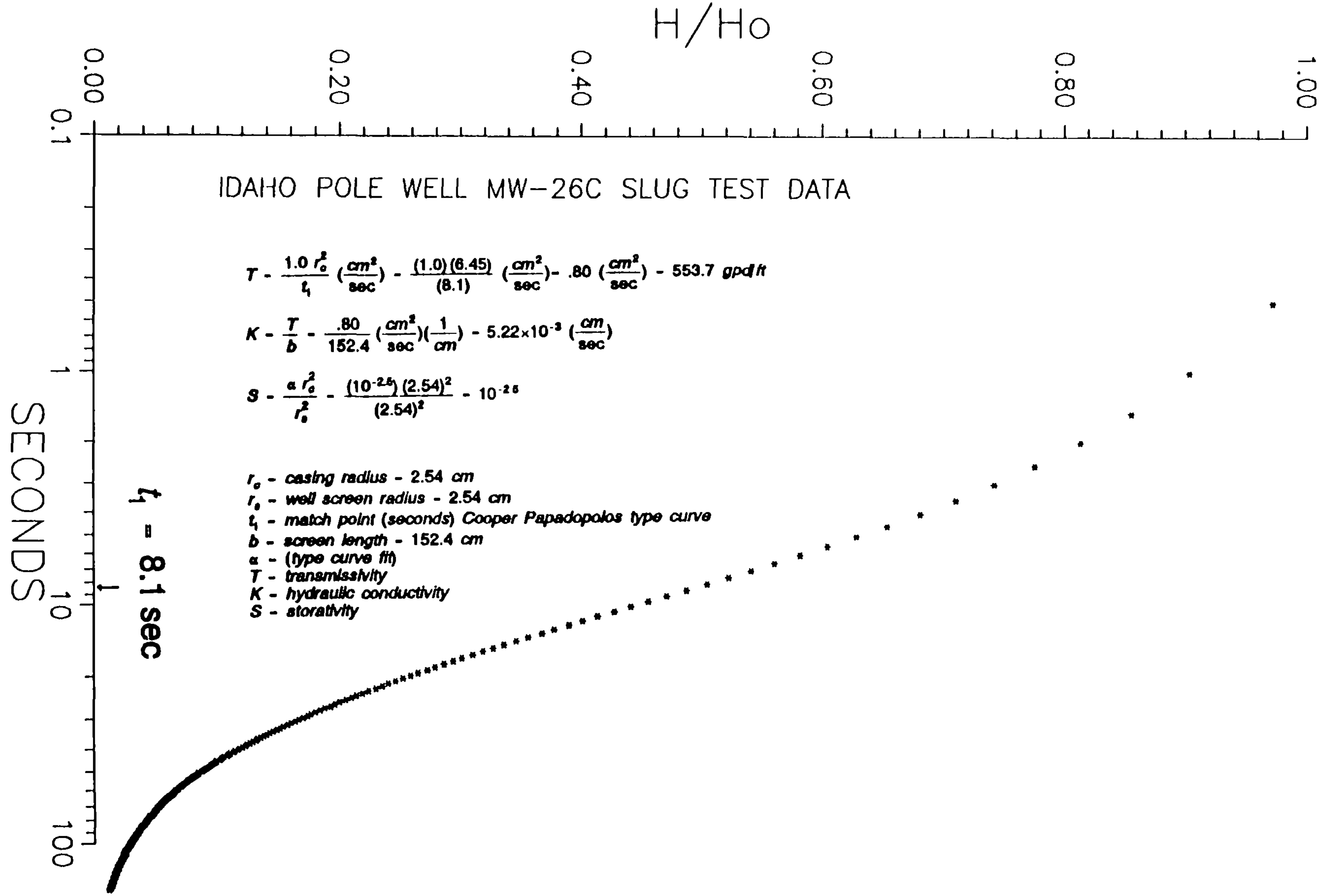
$$\zeta - \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}}\ but\ \zeta - .95\ so\ .95 - \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}} - \frac{1000(0 + (.25)\ln\beta)}{2\sqrt{\beta}} - \frac{125\ln\beta}{\sqrt{\beta}}$$

$$.95\sqrt{\beta} - 125\ln\beta \Rightarrow \text{By Itteration: } \beta - 4.0 \times 10^6$$

$$T - r_s^2 S\sqrt{\frac{\beta g}{L_e}}\,[m^2]\left[\frac{1}{sec}\right] - (.0254)^2(.0005)\sqrt{\frac{(4.0\times10^6)(9.81)}{10.2}} - .00063\ \frac{m^2}{sec} - 4,399\ gpd/ft$$

L_e - Length of effective water column [m]
$\hat{t}$ - Dimentionless time match point type curve
t - Time match point field data plot [sec]
g - Acceleration of gravity [m/sec^2]
α - Storage coefficient [dimentionless]
S - Storativity (slug test results of surrounding wells)
ζ - Coefficient of damping type curve
σ - Skin factor (isn't evaluated, so σ - 0)
β - Coefficient of inertial effects
T - Transmissivity [m^2/sec]

t - 10.2 sec @ $\hat{t}$ - 10



IDAHO POLE WELL MW-26C SLUG TEST DATA

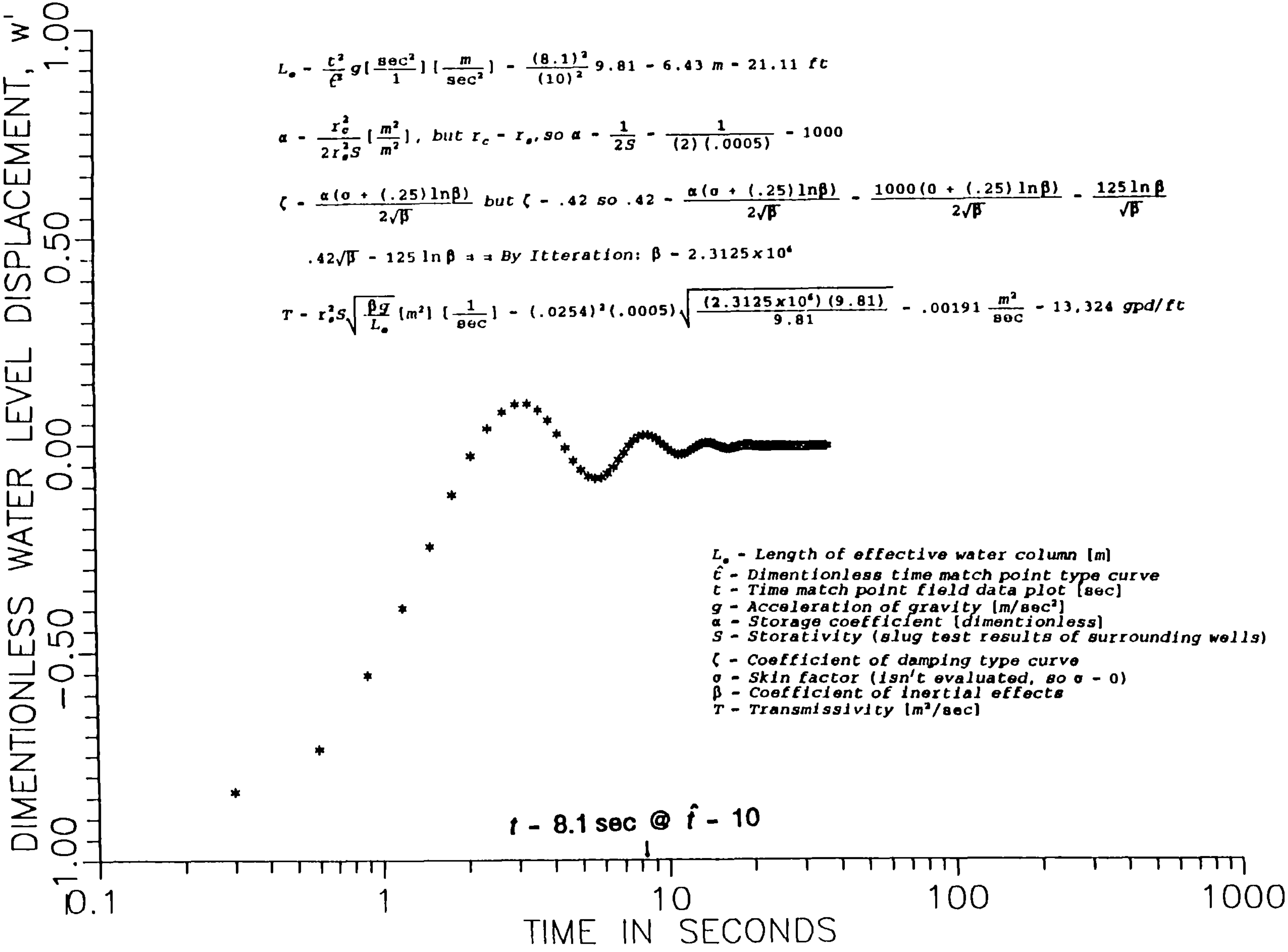
$$T = \frac{1.0\,r_c^2}{t_1}\left(\frac{cm^2}{sec}\right) = \frac{(1.0)(6.45)}{(8.1)}\left(\frac{cm^2}{sec}\right) = .80\left(\frac{cm^2}{sec}\right) = 553.7\ gpd/ft$$

$$K = \frac{T}{b} = \frac{.80}{152.4}\left(\frac{cm^2}{sec}\right)\left(\frac{1}{cm}\right) = 5.22\times10^{-3}\left(\frac{cm}{sec}\right)$$

$$S = \frac{\alpha\,r_c^2}{r_s^2} = \frac{(10^{-2.5})(2.54)^2}{(2.54)^2} = 10^{-2.5}$$

r_c - casing radius - 2.54 cm
r_s - well screen radius - 2.54 cm
t_1 - match point (seconds) Cooper Papadopolos type curve
b - screen length - 152.4 cm
α - (type curve fit)
T - transmissivity
K - hydraulic conductivity
S - storativity

IDAHO POLE WELL MW-27B SLUG TEST DATA



$L_e - \frac{t^2}{\hat{t}^2} g [\frac{sec^2}{1}] [\frac{m}{sec^2}] - \frac{(8.1)^2}{(10)^2} 9.81 - 6.43\ m - 21.11\ ft$

$\alpha - \frac{r_c^2}{2 r_e^2 S} [\frac{m^2}{m^2}]$, but $r_c - r_e$, so $\alpha - \frac{1}{2S} - \frac{1}{(2)(.0005)} - 1000$

$\zeta - \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}}$ but $\zeta - .42$ so $.42 - \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}} - \frac{1000(0 + (.25)\ln\beta)}{2\sqrt{\beta}} - \frac{125\ln\beta}{\sqrt{\beta}}$

$.42\sqrt{\beta} - 125 \ln\beta \Rightarrow$ By Itteration: $\beta - 2.3125 x 10^4$

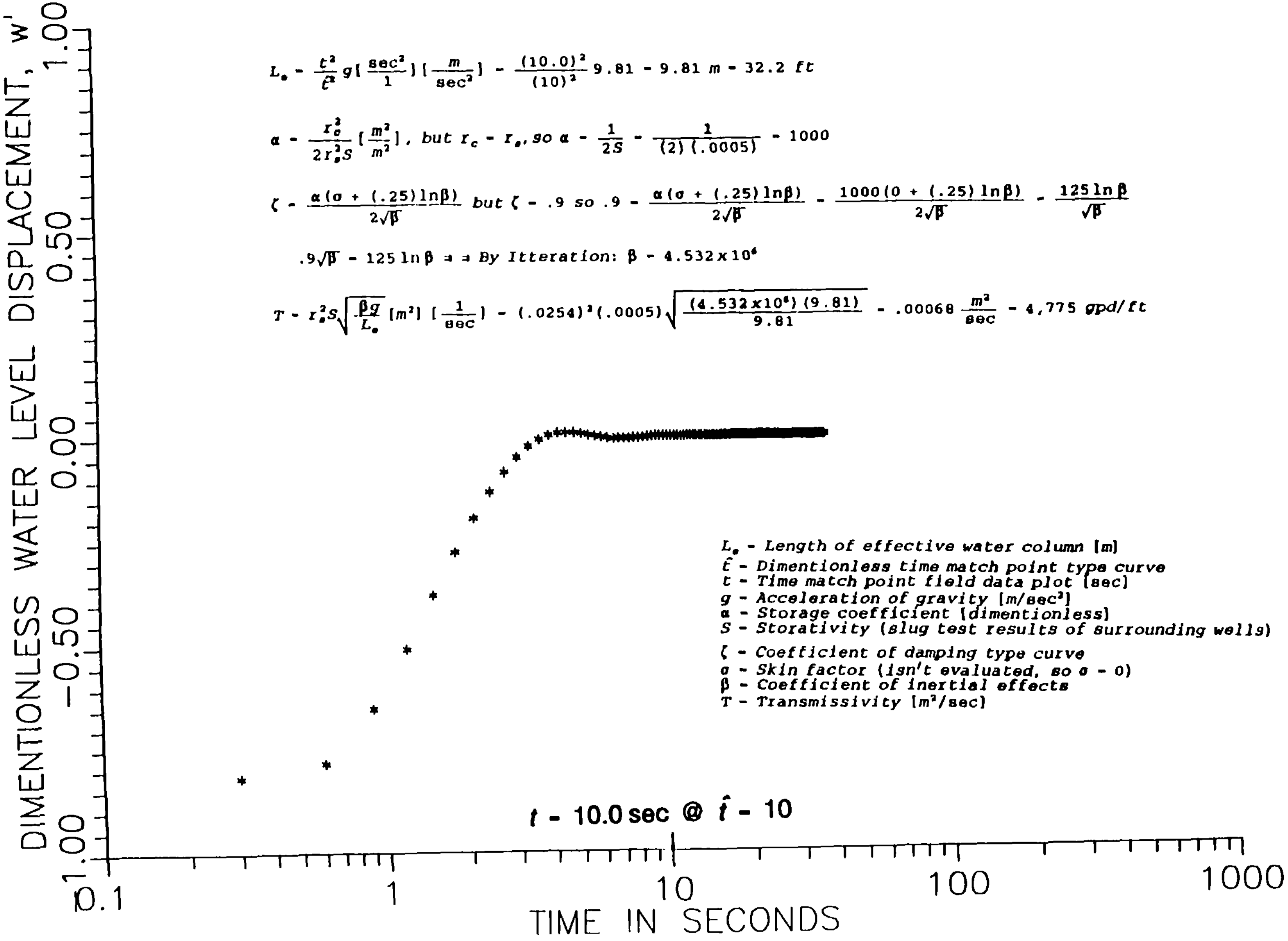
$T - r_e^2 S \sqrt{\frac{\beta g}{L_e}} [m^2] [\frac{1}{sec}] - (.0254)^2 (.0005) \sqrt{\frac{(2.3125 x 10^4)(9.81)}{9.81}} - .00191 \frac{m^2}{sec} - 13,324\ gpd/ft$

L_e - Length of effective water column [m]
$\hat{t}$ - Dimentionless time match point type curve
t - Time match point field data plot [sec]
g - Acceleration of gravity [m/sec²]
α - Storage coefficient [dimentionless]
S - Storativity (slug test results of surrounding wells)

ζ - Coefficient of damping type curve
σ - Skin factor (isn't evaluated, so σ - 0)
β - Coefficient of inertial effects
T - Transmissivity [m²/sec]

t - 8.1 sec @ $\hat{t}$ - 10

IDAHO POLE WELL MW-28B SLUG TEST DATA



$$L_e = \frac{t^2}{\hat{t}^2} g\left[\frac{sec^2}{1}\right]\left[\frac{m}{sec^2}\right] = \frac{(10.0)^2}{(10)^2} 9.81 = 9.81\ m = 32.2\ ft$$

$$\alpha = \frac{r_c^2}{2r_e^2 S}\left[\frac{m^2}{m^2}\right],\ \text{but } r_c = r_e, \text{so } \alpha = \frac{1}{2S} = \frac{1}{(2)(.0005)} = 1000$$

$$\zeta = \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}}\ \text{but } \zeta = .9 \text{ so } .9 = \frac{\alpha(\sigma + (.25)\ln\beta)}{2\sqrt{\beta}} = \frac{1000(0 + (.25)\ln\beta)}{2\sqrt{\beta}} = \frac{125\ln\beta}{\sqrt{\beta}}$$

$$.9\sqrt{\beta} = 125\ln\beta \Rightarrow \Rightarrow \text{By Itteration: } \beta = 4.532\times10^6$$

$$T = r_e^2 S\sqrt{\frac{\beta g}{L_e}}\,[m^2]\left[\frac{1}{sec}\right] = (.0254)^2(.0005)\sqrt{\frac{(4.532\times10^6)(9.81)}{9.81}} = .00068\ \frac{m^2}{sec} = 4{,}775\ gpd/ft$$

L_e - *Length of effective water column [m]*
$\hat{t}$ - *Dimentionless time match point type curve*
t - *Time match point field data plot [sec]*
g - *Acceleration of gravity [m/sec²]*
α - *Storage coefficient [dimentionless]*
S - *Storativity (slug test results of surrounding wells)*

ζ - *Coefficient of damping type curve*
σ - *Skin factor (isn't evaluated, so $\sigma = 0$)*
β - *Coefficient of inertial effects*
T - *Transmissivity [m²/sec]*

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APPENDIX E

ANALYTICAL DATA

TABLE OF CONTENTS FOR RI
APPENDIX E ANALYTICAL DATA

GROUNDWATER ANALYTICAL DATA

SURFACE WATER ANALYTICAL DATA

SOIL ANALYTICAL DATA

ORGANICS QUALIFIERS

DATA REPORTING QUALIFIERS[1]

U - Indicates compound was analyzed for but not detected.

J - Indicates an estimated value.

B - This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. This flag must be used for a TIC as well as for a positively identified TCL compound.

E - This flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis. This flag will <u>not</u> apply to pesticides/PCBs analyzed by GC/EC methods.

C - This flag applies to pesticide results where the identification has been confirmed by GC/MS.

D - This flag identifies all compounds identified in an analysis at a secondary dilution factor. If a sample or extract is re-analyzed at a higher dilution factor, as in the "E" flag above, the "DL" suffix is appended to the sample number. <u>All</u> concentration values reported are flagged with the "D" flag.

A - This flag indicates that a TIC is a suspected aldol-condensation product.

X - Other specific flags may be required to properly define the results. If used, they must be fully described and such description attached to the Sample Data Summary Package and the Case Narrative. Begin by using "X". If more than one flag is required, use "Y" and "Z", as needed. If more than five qualifiers are required for a sample result, use the "X" flag to combine several flags, as needed. For instance, the "X" flag might combine the "A", "B", and "D" for some sample.

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[1] From USEPA CLP SOW for Organics Analysis (EPA 1988).

ORGANICS QUALIFIERS

DATA QUALIFIERS[2]

U - The material was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.

J - The associated numerical value is an estimated quantity.

R - The data are unusable (compound may or may not be present). Resampling and reanalysis is necessary for verification.

N - Presumptive evidence of presence of material.

NJ - Presumptive evidence of the presence of the material at an estimated quantity.

UJ - The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.

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[2] From Laboratory Data Validation Function Guidelines for Validating Organics Analyses (EPA 1988).

INORGANICS QUALIFIERS

RESULT QUALIFIERS[1]

1) C (Concentration) qualifier -- Enter "B" if, the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL). If the analyte was analyzed for but not detected, a "U" must be entered.

2) Q qualifier

   E - The reported value is estimated because of the presence of interference.

M - Duplicate injection precision not met.

   N - Spike sample recovery not within control limits.

   S - The reported value was determined by the Method of Standard Additions (MSA).

   W - Post-digestion spike for Furnace AA analysis is out of control limits (85-115%), while sample absorbance is less than 50% of spike absorbance.

   * - Duplicate analysis not within control limits.

   + - Correlation coefficient for the MSA is less than 0.995.

   Entering "S", "W", or "+" is mutually exclusive.. No combination of these qualifiers can appear in the same field for an analyte.

3) M (Method) qualifier -- Enter:

   - "P" for ICP
   - "A" for Flame AA
   - "F" for Furnace AA
   - "CV" for Manual Cold Vapor AA
   - "AV" for Automated Cold Vapor AA
   - "AS" for Semi-Automated Spectrophotometric
   - "C" for Manual Spectrophotometric
   - "T" for Titrimetric
   - "NR" if the analyte is not required to be analyzed

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[1] USEPA CLP SOW for Inorganics Analysis (EPA 1988).

INORGANICS QUALIFIERS

DATA QUALIFIERS[2]

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

J - The associated value is an estimated quantity.

R - The data are unusable. (Note: Analyte may or may not be present.)

UJ - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

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[2] From Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA 1988).

GROUNDWATER ANALYTICAL DATA

GW01AD01 - Sample number

GW - Groundwater medium

01 - Monitor well number (01 through 28); Resident Well number (RES01 through RES10); QA/QC Number (50 through 55, 58 and TB; blanks, rinsates, standard reference material, and trip blank); C3-water sample from clay subsurface drainage pipe

A - Well Completion Depth
    A - Upper (Water Table)
    B - Middle (Above Silty Clay Zone)
    C - Lower (Below Silty Clay Zone)
    D - Deep well (29 only)

D - Field Duplicate Indicator

01 - Sample Round
    01 - May 1990
    02 - August 1990
    03 - November 1990
    04 - March 1991
    05 - June 1991
    06 - September 1991

SS - Subsample designation
    DIL - Lab Dilution
    DUP - Lab Duplicate

PHENOLS ANALYSIS (ug/L; Method 8040)

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPGW01A02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW01B02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW02A02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW02B02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW03A02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW03A02	DIL	580 U	680 U	630 U	11800 U	25000 U	770 U	700 U	3079	2200 U	580 U		
IPGW03B02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW04A02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW04B02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW05A02	DIL	5800 U	6800 U	6300 U	118000 U	250000 U	7700 U	7000 U	63454	22000 U	5800 U		
IPGW05A02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 UJ	34.5		
IPGW05B02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	35	22 U	5.8 U		
IPGW05C02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	241	22 U	5.8 U		
IPGW06A02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW06B02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW07A02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 UJ	5.8 U		
IPGW07B02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	32.9	22 UJ	5.8 U		
IPGW08A02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	158	22 UJ	5.8 U		
IPGW08B02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	1331	22 UJ	5.8 U		
IPGW09A02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW09A02	DIL	5800 U	6800 U	6300 U	118000 U	250000 U	7700 U	7000 U	5920	22000 U	5800 U		
IPGW09B02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW09B02	DIL	5800 U	6800 U	6300 U	118000 U	250000 U	7700 U	7000 U	5900 U	22000 U	5800 U		
IPGW09C02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW09C02	DIL	5800 U	6800 U	6300 U	118000 U	250000 U	7700 U	7000 U	5900 U	22000 U	5800 U		
IPGW10A02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW10B02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 UJ	5.8 U		
IPGW11A02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 UJ	5.8 U		
IPGW12A02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 UJ	5.8 U		
IPGW13A02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	744	22 UJ	5.8 U		
IPGW14A02	DIL	5800 U	6800 U	6300 U	118000 U	250000 U	7700 U	7000 U	5900 U	22000 U	5800 U		
IPGW14A02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW14B02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	65.8	22 U	5.8 U		
IPGW15A02	DIL	580 U	680 U	630 U	11800 U	25000 U	770 U	700 U	1299	2200 U	580 U		
IPGW15A02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 UJ	5.8 U		
IPGW16A02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	337	22 UJ	5.8 U		
IPGW16B02	DIL	5800 U	6800 U	6300 U	118000 U	250000 U	7700 U	7000 U	5900 U	22000 U	5800 U		

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPGW01A02		18 U						
IPGW01B02		18 U						
IPGW02A02		18 U						
IPGW02B02		18 U						
IPGW03A02		18 U						
IPGW03A02	DIL	1800 U						
IPGW03B02		18 U						
IPGW04A02		18 U						
IPGW04B02		18 U						
IPGW05A02	DIL	18000 U						
IPGW05A02		18 U						
IPGW05B02		18 U						
IPGW05C02		18 U						
IPGW06A02		18 U						
IPGW06B02		18 U						
IPGW07A02		18 U						
IPGW07B02		18 U						
IPGW08A02		18 U						
IPGW08B02		18 U						
IPGW09A02		18 U						
IPGW09A02	DIL	18000 U						
IPGW09B02		18 U						
IPGW09B02	DIL	18000 U						
IPGW09C02		18 U						
IPGW09C02	DIL	18000 U						
IPGW10A02		18 U						
IPGW10B02		18 U						
IPGW11A02		18 U						
IPGW12A02		18 U						
IPGW13A02		18 U						
IPGW14A02	DIL	18000 U						
IPGW14A02		18 U						
IPGW14B02		18 U						
IPGW15A02	DIL	1800 U						
IPGW15A02		18 U						
IPGW16A02		18 U						
IPGW16B02	DIL	18000 U						

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPGW16B02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 UJ	5.8 U		
IPGW18B02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW19A02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW19B02		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW2002		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW2102		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW2202	DIL	580 U	680 U	630 U	11800 U	25000 U	770 U	700 U	1641	2200 U	580 U		
IPGW2202		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 UJ	5.8 U		
IPGW5002		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW5102		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGW5302		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 UJ	5.8 U		
IPGW5402		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 UJ	5.8 U		
IPGWRES012		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGWRES022		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGWRES032		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGWRES042		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGWRES052		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGWRES062		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGWRES072		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGWRES082		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGWRES082	DIL	580 U	680 U	630 U	11800 U	25000 U	770 U	700 U	590 U	2200 U	580 U		
IPGWRES092		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	5.9 U	22 U	5.8 U		
IPGWRES102		5.8 U	6.8 U	6.3 U	118 U	250 U	7.7 U	7.0 U	321	22 U	31.8		

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPGW16B02		18 U						
IPGW18B02		18 U						
IPGW19A02		18 U						
IPGW19B02		18 U						
IPGW2002		18 U						
IPGW2102		18 U						
IPGW2202	DIL	1800 U						
IPGW2202		18 U						
IPGW5002		18 U						
IPGW5102		18 U						
IPGW5302		18 U						
IPGW5402		18 U						
IPGWRES012		18 U						
IPGWRES022		18 U						
IPGWRES032		18 U						
IPGWRES042		18 U						
IPGWRES052		18 U						
IPGWRES062		18 U						
IPGWRES072		18 U						
IPGWRES082		18 U						
IPGWRES082	DIL	1800 U						
IPGWRES092		18 U						
IPGWRES102		18 U						

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPGW01A03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW01B03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW02A03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW02B03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.72 X	0.64 U		
IPGW03A03		15.5 U	19.5 U	16.0 U	410	525.0	22.5 U	140.0 U	575	7.0 U	84.5		
IPGW03B03		15.5 U	19.5 U	16.0 U	800.0 U	108.0	22.5 U	119.0	877	7.0 U	32.0 U		
IPGW04A03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW04B03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW05A03		15.5 U	19.5 U	16.0 U	200.0	733.0	22.5 U	643.0	964.0	7.0 U	131.0		
IPGW05C03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW06A03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW06B03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW07A03		0.31 U	47.9	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	22.3	0.14 U	0.64 U		
IPGW07B03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW07BD03	DUP	0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.47	0.64 U		
IPGW08A03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW08B03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW08BD03	DUP	0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW09A03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	44.0	0.14 U	0.64 U		
IPGW09B03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	16.3 X	0.14 U	0.64 U		
IPGW09C03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	26.0 X	0.14 U	0.64 U		
IPGW10A03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.55	0.64 U		
IPGW10B03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW11A03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW12A03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW13A03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW14A03		3.1 U	3.9 U	3.2 U	160.0 U	130.0 U	4.5 U	28.0 U	210.0	1.4 U	6.4 U		
IPGW14B03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW15A03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	67.2	0.14 U	0.64 U		
IPGW16A03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW16B03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW18A03		15.5 U	19.5 U	16.0 U	800.0 U	650.0 U	22.5 U	140.0 U	370.0 U	7.0 U	32.0 U		
IPGW18B03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW18C03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW19A03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW19B03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW2003		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.9 X	0.8 X	0.64 U		

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPGW01A03		NA			0.36 U			
IPGW01B03		NA			0.36 U			
IPGW02A03		NA			0.36 U			
IPGW02B03		NA			0.36 U			
IPGW03A03		NA			28.4			
IPGW03B03		NA			26.0 J			
IPGW04A03		NA			0.36 U			
IPGW04B03		NA			0.36 U			
IPGW05A03		NA			51.4			
IPGW05C03		NA			0.36 U			
IPGW06A03		NA			0.36 U			
IPGW06B03		NA			0.36 U			
IPGW07A03		NA			0.36 U			
IPGW07B03		NA			0.36 U			
IPGW07BD03	DUP	NA			0.36 U			
IPGW08A03		NA			0.36 U			
IPGW08B03		NA			0.36 U			
IPGW08BD03	DUP	NA			0.36 U			
IPGW09A03		NA			0.36 U			
IPGW09B03		NA			0.36 U			
IPGW09C03		NA			0.36 U			
IPGW10A03		NA			0.36 U			
IPGW10B03		NA			0.36 U			
IPGW11A03		NA			0.36 U			
IPGW12A03		NA			0.36 U			
IPGW13A03		NA			0.36 U			
IPGW14A03		NA			3.6 U			
IPGW14B03		NA			0.36 U			
IPGW15A03		NA			0.36 U			
IPGW16A03		NA			0.36 U			
IPGW16B03		NA			0.36 U			
IPGW18A03		NA			18.0 U			
IPGW18B03		NA			0.36 U			
IPGW18C03		NA			0.36 U			
IPGW19A03		NA			0.36 U			
IPGW19B03		NA			0.36 U			
IPGW2003		NA			0.36 U			

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPGW2103		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW2203		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	25.7	0.14 U	0.64 U		
IPGW23A03		0.41	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.14	1.1	0.64 U		
IPGW23B03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW23C03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW24A103		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW24A203		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW24B03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW25A03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW25B03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	52.0	0.14 U	0.64 U		
IPGW25BD03	DUP	0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW26A03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW26B03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW26C03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW27A03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW27B03		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	38.5	0.14 U	0.64 U		
IPGW2803		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW5003		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.5	0.64 U		
IPGW5103		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.70		
IPGW5203		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW5303		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW5403		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGW5503		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGWRES013		3.1 U	3.9 U	3.2 U	160.0 U	130.0 U	4.5 U	28.0 U	74.0 U	1.4 U	4.0 X		
IPGWRES023		16.0 U	3.9 U	3.2 U	160.0 U	130.0 U	4.5 U	28.0 U	74.0 U	1.4 U	5.7 X		
IPGWRES033		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGWRES043		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGWRES063		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGWRES073		15.5 U	19.5 U	16.0 U	800.0 U	650.0 U	22.5 U	140.0 U	370.0 U	7.0 U	32.0 U		
IPGWRES083		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGWRES093		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		
IPGWRES103		0.31 U	0.39 U	0.32 U	16.0 U	13.0 U	0.45 U	2.8 U	7.4 U	0.14 U	0.64 U		

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPGW2103		NA			0.36 U			
IPGW2203		NA			0.36 U			
IPGW23A03		NA			0.36 U			
IPGW23B03		NA			0.36 U			
IPGW23C03		NA			0.36 U			
IPGW24A103		NA			0.36 U			
IPGW24A203		NA			0.36 U			
IPGW24B03		NA			0.36 U			
IPGW25A03		NA			0.36 U			
IPGW25B03		NA			0.36 U			
IPGW25BD03	DUP	NA			0.36 U			
IPGW26A03		NA			0.36 U			
IPGW26B03		NA			0.36 U			
IPGW26C03		NA			0.36 U			
IPGW27A03		NA			0.36 U			
IPGW27B03		NA			0.36 U			
IPGW2803		NA			0.36 U			
IPGW5003		NA			3.0			
IPGW5103		NA			0.57			
IPGW5203		NA			0.36 U			
IPGW5303		NA			0.36 U			
IPGW5403		NA			0.36 U			
IPGW5503		NA			0.36 U			
IPGWRES013		NA			8.4 X			
IPGWRES023		NA			14.0 X			
IPGWRES033		NA			0.36 U			
IPGWRES043		NA			0.36 U			
IPGWRES063		NA			0.36 U			
IPGWRES073		NA			17.0 X			
IPGWRES083		NA			0.36 U			
IPGWRES093		NA			0.36 U			
IPGWRES103		NA			0.36 U			

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPGW01A04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW01B04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW02A04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW02B04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW03A04	DIL	150.0 U	180.0 U	150.0 U	1000.0 U	2800 Y	200.0 U	750.0 U	1900	60.0 U	820 J	250.0 U	250.0 U
IPGW03A04		30.0 U	35.0 U	30.0 U	200.0 U	2800 JY	40.0 U	1100 JY	1700 JCX	12.0 U	900 JY	50.0 U	50.0 U
IPGW03B04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW04A04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW04B04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW05A04	DIL	300.0 U	350.0 U	140 J	2000.0 U	4600 Y	400.0 U	2400 Y	11000	120.0 U	4200 Y	500.0 U	500.0 U
IPGW05A04		55.8 J	70.0 U	120 JY	400.0 U	16000 JY	80.0 U	300.0 U	7400 JCX	24.0 U	3800 JY	100.0 U	100.0 U
IPGW05B04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	51.1 C	0.7 JY	6.0 U	5.0 U	5.0 U
IPGW05C04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	32.7 C	1.2 U	6.0 U	5.0 U	5.0 U
IPGW06A04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW06B04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW07A04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW07B04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	9.0 JC	1.2 U	6.0 U	5.0 U	5.0 U
IPGW07BD04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	26.8	1.2 U	6.0 U	5.0 U	5.0 U
IPGW08A04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	31.2	1.2 U	6.0 U	5.0 U	5.0 U
IPGW08B04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	160	1.2 U	6.0 U	5.0 U	5.0 U
IPGW08BD04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	150 C	1.2 U	6.0 U	5.0 U	5.0 U
IPGW09A04	DIL	6.0 U	7.0 U	6.0 U	40.0 U	5.0 U	8.0 U	30.0 U	980	2.4 U	12.0 U	10.0 U	10.0 U
IPGW09A04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	700 CX	1.2 U	6.0 U	5.0 U	5.0 U
IPGW09B04	DIL	6.0 U	7.0 U	6.0 U	40.0 U	5.0 U	8.0 U	30.0 U	750	2.4 U	12.0 U	10.0 U	10.0 U
IPGW09B04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	580 CX	1.2 U	6.0 U	5.0 U	5.0 U
IPGW09C04	DIL	6.0 U	7.0 U	6.0 U	40.0 U	5.0 U	8.0 U	30.0 U	270	2.4 U	12.0 U	10.0 U	10.0 U
IPGW09C04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	360 CX	1.2 U	6.0 U	5.0 U	5.0 U
IPGW10A04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW10B04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW11A04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW12A04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW13A04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 J	1.2 U	6.0 U	5.0 U	5.0 U
IPGW14A04	DIL	6.0 U	7.0 U	6.0 U	40.0 U	5.0 U	8.0 U	15.0 U	5.4 J	1.2 U	6.0 U	5.0 U	5.0 U
IPGW14A04		3.0 U	3.5 U	3.0 U	310 JY	140 JY	4.0 U	89.1 JY	500 JCX	1.2 U	45.4 JY	5.0 U	5.0 U
IPGW14B04		6.0 U	7.0 U	6.0 U	26.6 JY	5.0 U	8.0 U	30.0 U	48.0 Y	2.4 U	12.0 U	10.0 U	10.0 U
IPGW15A04		3.0 U	10.4 JY	53.8 JY	20.0 U	2.5 U	4.0 U	56.7 JY	780 JCX	3.1 JC	28.1 JY	5.0 U	7.8 JC
IPGW15A04	DIL	6.0 U	7.0 JY	48.2 JY	40.0 U	73.1 JY	8.0 U	40.7 JY	870	1.0 J	26.6 JY	10.0 U	5.4 J

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPGW01A04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW01B04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW02A04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW02B04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW03A04	DIL	NA	200 Y	1000.0 U	110 J	250.0 U		
IPGW03A04		NA	200 JY	300 JY	180 JY	1300.0 U		
IPGW03B04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW04A04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW04B04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW05A04	DIL	NA	1000 Y	1300 J	1400 Y	18000 JY		
IPGW05A04		NA	1000 JY	730 JY	1300 JY	3500 Y		
IPGW05B04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW05C04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW06A04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW06B04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW07A04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW07B04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW07BD04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW08A04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW08B04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW08BD04		NA	3.5 U	20.1 U	3.5 U	4.7 J		
IPGW09A04	DIL	NA	7.0 U	40.2 U	7.0 U	50.6 U		
IPGW09A04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW09B04	DIL	NA	7.0 U	40.2 U	7.0 U	50.6 U		
IPGW09B04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW09C04	DIL	NA	7.0 U	40.2 U	7.0 U	50.6 U		
IPGW09C04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW10A04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW10B04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW11A04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW12A04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW13A04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW14A04	DIL	NA	22.8 Y	40.2 U	25.6 Y	50.6 U		
IPGW14A04		NA	23.2 JY	29.1 JY	25.3 JY	55.1 YJ		
IPGW14B04		NA	7.0 U	40.2 U	7.0 U	25.3 U		
IPGW15A04		NA	23.8 JY	27.1 JY	3.5 U	25.3 U		
IPGW15A04	DIL	NA	30.5 JY	35.8 J	17.6 JY	22.6 JY		

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPGW16A04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW16B04	DIL	6.0 U	7.0 U	6.0 U	40.0 U	5.0 U	8.0 U	30.0 U	340	2.4 U	12.0 U	10.0 U	10.0 U
IPGW16B04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	420 CX	1.2 U	6.0 U	5.0 U	5.0 U
IPGW18A04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW18B04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW18C04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW19A04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW19B04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW2004		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW2104		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW2204		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	140	1.2 U	6.0 U	5.0 U	5.0 U
IPGW23A04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	200 C	1.2 U	6.0 U	5.0 U	5.0 U
IPGW23B04		6.0 U	7.0 U	6.0 U	40.0 U	5.0 U	8.0 U	30.0 U	130 C	2.4 U	12.0 U	10.0 U	10.0 U
IPGW23C04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	40.0 C	1.5	6.0 U	5.0 U	5.0 U
IPGW24A104		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	70 0 C	1.2 U	6.0 U	5.0 U	5.0 U
IPGW24A204		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	60.0 C	1.2 U	6.0 U	5.0 U	5.0 U
IPGW24B04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	250 C	1.2 U	6.0 U	5.0 U	5.0 U
IPGW25A04	DIL	30.0 U	35.0 U	30.0 U	200.0 U	25.0 U	40.0 U	150.0 U	500	12.0 U	60.0 U	50.0 U	50.0 U
IPGW25A04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	480 CX	1.2 U	6.0 U	5.0 U	5.0 U
IPGW25B04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	560 CX	1.2 U	6.0 U	5.0 U	5.0 U
IPGW25B04	DIL	30.0 U	35.0 U	30.0 U	200.0 U	25.0 U	40.0 U	150.0 U	830	12.0 U	60.0 U	50.0 U	50.0 U
IPGW25BD04		3.0 U	3.5 U	3.0 U	14.5 J	2.5 U	4.0 U	15.0 U	490 CX	1.2 U	6.0 U	5.0 U	5.0 U
IPGW25BD04	DIL	6.0 U	7.0 U	6.0 U	40.0 U	5.0 U	8.0 U	30.0 U	586	2.4 U	12.0 U	10.0 U	10.0 U
IPGW26A04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW26B04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	24.3 J	1.2 U	6.0 U	5.0 U	5.0 U
IPGW26C04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	67.5 C	1.2 U	6.0 U	5.0 U	5.0 U
IPGW27A04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW27B04		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	500 CX	1.2 U	6.0 U	5.0 U	5.0 U
IPGW27B04	DIL	30.0 U	35.0 U	30.0 U	200.0 U	25.0 U	40.0 U	150.0 U	600	12.0 U	60.0 U	50.0 U	50.0 U
IPGW2804		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW5104		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW5204		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW5304		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW5304		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW5404		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW5504		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGW5804		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	46.4 C	80.4 C	72.7 C	29.7 C	33.6 C

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPGW16A04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW16B04	DIL	NA	7.0 U	40.2 U	7.0 U	50.6 U		
IPGW16B04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW18A04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW18B04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW18C04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW19A04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW19B04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW2004		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW2104		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW2204		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW23A04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW23B04		NA	7.0 U	40.2 U	7.0 U	25.3 U		
IPGW23C04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW24A104		NA	3.5 U	20.1 U	3.5 U	22.4 J		
IPGW24A204		NA	3.5 U	20.1 U	3.5 U	13.7 J		
IPGW24B04		NA	3.5 U	20.1 U	3.5 U	3.9 JU		
IPGW25A04	DIL	NA	35.0 U	200.0 U	35.0 U	250.0 U		
IPGW25A04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW25B04		NA	3.5 U	20.1 U	3.5 U	4.4 U		
IPGW25B04	DIL	NA	35.0 U	200.0 U	35.0 U	250.0 U		
IPGW25BD04		NA	3.5 U	20.1 U	3.5 U	4.3 J		
IPGW25BD04	DIL	NA	7.0 U	40.2 U	7.0 U	50.6 U		
IPGW26A04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW26B04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW26C04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW27A04		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW27B04		NA	3.5 U	20.1 U	3.5 U	6.9 U		
IPGW27B04	DIL	NA	35.0 U	200.0 U	35.0 U	4.8 J		
IPGW2804		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW5104		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW5204		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW5304		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW5304		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW5404		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW5504		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGW5B04		NA	3.5 U	20.1 U	3.5 U	25.3 U		

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPGWRES014		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGWRES024		6.0 U	7.0 U	6.0 U	40.0 U	5.0 U	8.0 U	30.0 U	50.0 U	2.4 U	12.0 U	10.0 U	10.0 U
IPGWRES034		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGWRES044		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGWRES054		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGWRES064		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGWRES074		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGWRES084		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	27.6	1.2 U	6.0 U	5.0 U	5.0 U
IPGWRES094		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U
IPGWRES104		3.0 U	3.5 U	3.0 U	20.0 U	2.5 U	4.0 U	15.0 U	25.0 U	1.2 U	6.0 U	5.0 U	5.0 U

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPGWRES014		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGWRES024		NA	7.0 U	40.2 U	7.0 U	50.6 U		
IPGWRES034		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGWRES044		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGWRES054		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGWRES064		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGWRES074		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGWRES084		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGWRES094		NA	3.5 U	20.1 U	3.5 U	25.3 U		
IPGWRES104		NA	3.5 U	20.1 U	3.5 U	25.3 U		

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPGW29C06	DIL	20.0 U	20.0 U	40.0 U	20.0 U	200.0 U	40.0 U	40.0 U	17.0 D	20.0 U	20.0 U	NA	NA
IPGW29C06		2.0 U	2.0 U	4.0 U	20.0 U	20.0 U	4.0 U	4.0 U	110.0 E	2.0 U	2.0 U	NA	NA
IPGW29D06		2.0 U	2.0 U	4.0 U	20.0 U	20.0 U	4.0 U	4.0 U	4.0 U	2.0 U	2.0 U	NA	NA
IPGW29DD06		2.0 U	2.0 U	4.0 U	20.0 U	20.0 U	4.0 U	4.0 U	4.0 U	2.0 U	2.0 U	NA	NA
IPGW5106		2.0 U	2.0 U	4.0 U	20.0 U	20.0 U	4.0 U	4.0 U	4.0 U	2.0 U	2.0 U	NA	NA
IPGW5806	DIL	20.0 U	20.0 U	40.0 U	200.0 U	200.0 U	83.0 D	40.0 U	55.0 D	22.0 D	90.0 D	NA	NA
IPGW5806		2.0 U	2.0 U	4.0 U	20.0 U	20.0 U	91.0 E	4.0 U	57.0 E	29.0 E	90.0 E	NA	NA

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPGW29C06	DIL	NA	NA	NA	40.0 U	NA	NA	NA
IPGW29C06		NA	NA	NA	4.0 U	NA	NA	NA
IPGW29D06		NA	NA	NA	4.0 U	NA	NA	NA
IPGW29DD06		NA	NA	NA	4.0 U	NA	NA	NA
IPGW5106		NA	NA	NA	4.0 U	NA	NA	NA
IPGW5806	DIL	NA	NA	NA	98.0 D	NA	NA	NA
IPGW5806		NA	NA	NA	72.0 E	NA	NA	NA

PAH ANALYSIS (ug/L; Method 8310)

SAMPLE NUMBER	SS	NAPH-THALENE	ACENAPH-THYLENE	ACENAPH-THENE	FLUORENE	PHENAN-THRENE	ANTHRA-CENE	FLUORAN-THENE	PYRENE	BENZO(A)-ANTHRACENE	CHRYSENE	BENZO(B)-FLUORAN-THENE	BENZO(K)-FLUORAN-THENE	BENZO(A)-PYRENE
IPGW01A02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW01B02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW02A02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW02B02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW03A02		18 U	23 U	18 U	91 J	72	9.6	2.1 U	2.7 U	0.13 U	4.9	0.18 U	0.17 U	0.23 U
IPGW03B02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW04A02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW04B02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW05A02		200 J	23 U	18 U	1920 J	310	100	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	13
IPGW05B02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW05C02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW06A02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW06B02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW07A02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW07B02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW08A02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW08B02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW09A02		18 U	23 U	18 U	7.3 J	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW09B02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW09C02		18 U	23 U	18 U	2.6 J	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW10A02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW10B02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW11A02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW12A02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW13A02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW14A02		6.7 J	23 U	18 U	170 J	120	6.6 U	2.1 U	12	85	11	0.18 U	0.17 U	2.2
IPGW14B02		18 U	23 U	18 U	18 J	13	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW15A02		18 U	23 U	18 U	37 J	14	6.6 U	2.1 U	58	0.13 U	1.5 U	0.18 U	0.74	0.23 U
IPGW16A02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW16B02		18 U	23 U	18 U	2.8 J	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW18A02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW18B02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW19A02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW19B02		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW2002		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW2102		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW2202		18 U	23 U	18 U	7.2 J	16	3.4	9.3 J	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW5002		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U

SAMPLE NUMBER	SS	DIBENZO-(A,H)ANTH-RACENE	BENZO-(G,H,I,)-PERYLENE	INDENO-(1,2,3CD)-PYRENE	DIBENZO-FURAN	2-METHYL-NAPHTH-ALENE
IPGW01A02		0.30 U	0.76 U	0.43 U		
IPGW01B02		0.30 U	0.76 U	0.43 U		
IPGW02A02		0.30 U	0.76 U	0.43 U		
IPGW02B02		0.30 U	0.76 U	0.43 U		
IPGW03A02		0.30 U	0.76 U	0.43 U		
IPGW03B02		0.30 U	0.76 U	0.43 U		
IPGW04A02		0.30 U	0.76 U	0.43 U		
IPGW04B02		0.30 U	0.76 U	0.43 U		
IPGW05A02		0.30 U	49 U	0.43 U		
IPGW05B02		0.30 U	0.76 U	0.43 U		
IPGW05C02		0.30 U	0.76 U	0.43 U		
IPGW06A02		0.30 U	0.76 U	0.43 U		
IPGW06B02		0.30 U	0.76 U	0.43 U		
IPGW07A02		0.30 U	0.76 U	0.43 U		
IPGW07B02		0.30 U	0.76 U	0.43 U		
IPGW08A02		0.30 U	0.76 U	0.43 U		
IPGW08B02		0.30 U	0.76 U	0.43 U		
IPGW09A02		0.30 U	0.76 U	0.43 U		
IPGW09B02		0.30 U	0.76 U	0.43 U		
IPGW09C02		0.30 U	0.76 U	0.43 U		
IPGW10A02		0.30 U	0.76 U	0.43 U		
IPGW10B02		0.30 U	9.6	0.43 U		
IPGW11A02		0.30 U	0.76 U	0.43 U		
IPGW12A02		0.30 U	0.76 U	0.43 U		
IPGW13A02		0.30 U	0.76 U	0.43 U		
IPGW14A02		0.30 U	0.76 U	0.43 U		
IPGW14B02		0.30 U	0.76 U	0.43 U		
IPGW15A02		0.30 U	0.76 U	0.43 U		
IPGW16A02		0.30 U	0.76 U	0.43 U		
IPGW16B02		0.30 U	0.76 U	0.43 U		
IPGW18A02		0.30 U	0.76 U	0.43 U		
IPGW18B02		0.30 U	0.76 U	0.43 U		
IPGW19A02		0.30 U	0.76 U	0.43 U		
IPGW19B02		0.30 U	0.76 U	0.43 U		
IPGW2002		0.30 U	0.76 U	0.43 U		
IPGW2102		0.30 U	0.76 U	0.43 U		
IPGW2202		0.30 U	0.76 U	0.43 U		
IPGW5002		0.30 U	0.76 U	0.43 U		

SAMPLE NUMBER	SS	NAPH-THALENE	ACENAPH-THYLENE	ACENAPH-THENE	FLUORENE	PHENAN-THRENE	ANTHRA-CENE	FLUORAN-THENE	PYRENE	BENZO(A)-ANTHRACENE	CHRYSENE	BENZO(B)-FLUORAN-THENE	BENZO(K)-FLUORAN-THENE	BENZO(A)-PYRENE
IPGW5102		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW5302		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW5402		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGWRES012		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGWRES022		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGWRES032		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGWRES042		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGWRES052		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGWRES062		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGWRES072		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGWRES082		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGWRES092		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGWRES102		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U

SAMPLE NUMBER	SS	DIBENZO-(A,H)ANTHRACENE	BENZO-(G,H,I,)-PERYLENE	INDENO-(1,2,3CD)-PYRENE	DIBENZOFURAN	2-METHYLNAPHTHALENE
IPGW5102		0.30 U	0.76 U	0.43 U		
IPGW5302		0.30 U	0.76 U	0.43 U		
IPGW5402		0.30 U	0.76 U	0.43 U		
IPGWRES012		0.30 U	0.76 U	0.43 U		
IPGWRES022		0.30 U	0.76 U	0.43 U		
IPGWRES032		0.30 U	0.76 U	0.43 U		
IPGWRES042		0.30 U	0.76 U	0.43 U		
IPGWRES052		0.30 U	0.76 U	0.43 U		
IPGWRES062		0.30 U	0.76 U	0.43 U		
IPGWRES072		0.30 U	0.76 U	0.43 U		
IPGWRES082		0.30 U	0.76 U	0.43 U		
IPGWRES092		0.30 U	0.76 U	0.43 U		
IPGWRES102		0.30 U	0.76 U	0.43 U		

SAMPLE NUMBER	SS	NAPH- THALENE	ACENAPH- THYLENE	ACENAPH- THENE	FLUORENE	PHENAN- THRENE	ANTHRA- CENE	FLUORAN- THENE	PYRENE	BENZO(A)- ANTHRACENE	CHRYSENE	BENZO(B)- FLUORAN- THENE	BENZO(K)- FLUORAN- THENE	BENZO(A)- PYRENE
IPGW01A03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	3.84 X	0.18 U	3.45 X	0.23 U
IPGW01B03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	7.38 X	0.18 U	0.86 X	0.23 U
IPGW02A03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	30.82 JX	0.18 U	2.59 JX	0.23 U
IPGW02B03		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	1.1 X	18 X	0.18 U	0.17 U	0.23 U
IPGW03A03		1800 U	2300 U	1800 U	1314	717	660 U	350	270 U	13 U	51.3	18 U	17 U	23 U
IPGW03B03		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.76	3.45	0.13 U	60.2	0.18 U	1.86	0.23 U
IPGW04A03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	4.7 JX	0.18 U	2.0 JX	0.23 U
IPGW04B03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	1.4 J	2.7 U	0.13 U	6.2 J	0.18 U	2.4 J	0.23 U
IPGW05A03		191	23 U	18 U	438.5	1750.78	1105	570.7	1080.4	117	700	0.18 U	1232	0.23 U
IPGW05B03		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	454 X	0.18 U	8.0 X	0.23 U
IPGW05C03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	62.6 JX	0.18 U	7.6 JX	0.23 U
IPGW06A03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	4.7 X	0.18 U	1.41 X	0.23 U
IPGW06B03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	12.76 X	0.18 U	1.84 X	0.23 U
IPGW07A03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	22.78 JX	0.18 U	1.9 JX	0.23 U
IPGW07B03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.63 JX	0.23 U
IPGW07BD03		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	15.5 J	14.0 J	1.5 U	0.18 U	0.17 U	0.23 U
IPGW08A03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	4.5 JX	0.18 U	0.9 JX	0.23 U
IPGW08B03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	4.4 JX	0.18 U	0.5 JX	0.23 U
IPGW08BD03		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.75 X	0.18 U	3.21 X	0.23 U
IPGW09A03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW09B03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	2.3 JX	0.18 U	4.2 JX	0.23 U
IPGW09C03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	5.0 JX	0.18 U	0.63 JX	0.23 U
IPGW10A03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	1.1 JX	1.90 JX	0.18 U	0.33 JX	0.23 U
IPGW10B03		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	221	0.18 U	0.17 U	0.23 U
IPGW11A03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	12.9 JX	0.18 U	0.68 JX	0.23 U
IPGW12A03		18.0 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	47.5	0.18 U	186	0.23 U
IPGW13A03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	12.8 J	0.18 U	9.1 J	0.23 U
IPGW14A03		4500 U	595 J	4500 U	2180 J	933 J	744 J	525 U	675 U	32.5 U	375 U	45 U	42.5 U	57.5 U
IPGW14B03		18.0 U	23.0 U	18.0 U	19.4 J	22.1 J	41.6 J	40.4 J	31.0 J	0.13 U	13.0 J	0.18 U	8.6 J	0.23 U
IPGW15A03		18.0 U	23.0 U	18.0 U	17.6 J	13.3 J	11.2 J	2.1 U	2.7 U	0.13 U	13.4 J	0.18 U	0.96 J	0.23 U
IPGW16A03		18 U	23 U	18 U	2.1 U	6.6 U	5.9 J	2.7 U	23.3 J	19.5 J	2.4 J	0.18 U	0.17 U	0.23 U
IPGW16B03		18 U	23 U	18 U	2.1 U	6.4 U	5.4 J	2.1 U	18.7 J	16.6 J	1.5 U	0.18 U	1.1 J	1.2 J
IPGW18A03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.9 X	3.7 X	0.13 U	2.31 X	2.98 X	0.17 U	0.23 U
IPGW18B03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.78 J	2.75 J	0.13 U	7.91 J	3.94 J	0.17 U	0.23 U
IPGW18C03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	12.67	7.66	0.13 U	59.89	5.94	0.17 U	0.23 U
IPGW19A03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 X	0.13 U	34.85 X	2.09 X	0.17 U	0.23 U
IPGW19B03		18.0 U	23.0 U	18.0 U	2.1 U	7.4 X	6.6 U	2.1 U	2.7 U	0.13 U	76.43 X	0.18 U	1.07 X	0.23 U
IPGW2003		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	14.8 X	0.18 U	0.17 U	0.23 U

SAMPLE NUMBER	SS	DIBENZO(A,H)ANTHRACENE	BENZO(G,H,I,)PERYLENE	INDENO(1,2,3CD)PYRENE	DIBENZOFURAN	2-METHYLNAPHTHALENE
IPGW01A03		0.30 U	0.76 U	0.43 U		
IPGW01B03		0.30 U	0.76 U	0.43 U		
IPGW02A03		0.30 U	0.76 U	0.43 U		
IPGW02B03		0.30 U	0.76 U	0.43 U		
IPGW03A03		30 U	76 U	43 U		
IPGW03B03		0.30 U	0.76 U	0.43 U		
IPGW04A03		0.30 U	0.76 U	0.43 U		
IPGW04B03		0.30 U	0.76 U	0.43 U		
IPGW05A03		0.30 U	0.76 U	0.43 U		
IPGW05B03		0.30 U	0.76 U	0.43 U		
IPGW05C03		0.30 U	0.76 U	0.43 U		
IPGW06A03		0.30 U	0.76 U	0.43 U		
IPGW06B03		0.30 U	0.76 U	0.43 U		
IPGW07A03		0.30 U	0.76 U	0.43 U		
IPGW07B03		0.30 U	0.76 U	0.43 U		
IPGW07BD03		0.30 U	0.76 U	0.43 U		
IPGW08A03		0.30 U	0.76 U	0.43 U		
IPGW08B03		0.30 U	0.76 U	0.43 U		
IPGW08BD03		0.30 U	0.76 U	0.43 U		
IPGW09A03		0.30 U	0.76 U	0.43 U		
IPGW09B03		0.30 U	0.76 U	0.43 U		
IPGW09C03		0.30 U	0.76 U	0.43 U		
IPGW10A03		0.30 U	0.76 U	0.43 U		
IPGW10B03		0.30 U	0.76 U	0.43 U		
IPGW11A03		0.30 U	0.76 U	0.43 U		
IPGW12A03		0.30 U	0.76 U	0.43 U		
IPGW13A03		0.30 U	0.76 U	0.43 U		
IPGW14A03		75 U	190 U	107.5 U		
IPGW14B03		0.30 U	0.76 U	0.43 U		
IPGW15A03		0.30 U	0.76 U	0.43 U		
IPGW16A03		0.30 U	0.76 U	0.43 U		
IPGW16B03		0.30 U	0.76 U	0.43 U		
IPGW18A03		0.30 U	0.76 U	0.43 U		
IPGW18B03		0.30 U	0.76 U	0.43 U		
IPGW18C03		0.30 U	0.76 U	0.43 U		
IPGW19A03		0.30 U	0.76 U	0.43 U		
IPGW19B03		0.30 U	0.76 U	0.43 U		
IPGW2003		0.30 U	0.76 U	0.43 U		

SAMPLE NUMBER	SS	NAPH-THALENE	ACENAPH-THYLENE	ACENAPH-THENE	FLUORENE	PHENAN-THRENE	ANTHRA-CENE	FLUORAN-THENE	PYRENE	BENZO(A)-ANTHRACENE	CHRYSENE	BENZO(B)-FLUORAN-THENE	BENZO(K)-FLUORAN-THENE	BENZO(A)-PYRENE
IPGW2103		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	88.5 X	0.18 U	0.17 U	0.23 U
IPGW2203		18.0 U	23.0 U	18.0 U	4.7 J	6.4 U	6.6 U	5.8 J	4.8 J	0.13 U	11.7 J	0.18 U	4.3 J	0.23 U
IPGW23A03		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	19.2	0.18 U	0.17 U	0.23 U
IPGW23B03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	189.2 X	0.18 U	5.5 X	0.23 U
IPGW23C03		18.0 U	23.0 U	18.0 U	2.1 U	7.77 JX	6.6 U	2.1 U	2.7 U	0.13 J	77.25 JX	0.18 U	37.0 JX	0.23 U
IPGW24A103		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	6.3 JX	0.18 U	1.1 JX	0.23 U
IPGW24A203		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	6.4 JX	0.18 U	0.72 JX	0.23 U
IPGW24B03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	34.7 J	0.18 U	1.0 J	0.23 U
IPGW25A03		18 U	23 U	18 U	1.94 J	6.4 U	6.6 U	2.1 U	22 J	21.1 J	1.5 U	0.18 U	0.17 U	0.23 U
IPGW25B03		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	28.1 J	0.13 U	6.3 J	0.18 U	0.17 U	0.23 U
IPGW25BD03		18 U	23 U	18 U	2.4 J	1.1 J	5.9 J	2.1 U	19.1 J	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGW26A03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	0.58 JX	0.18 U	0.66 JX	0.23 U
IPGW26B03		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	8.7 J	0.18 U	1.4 J	0.23 U
IPGW26C03		18.0 U	23.0 U	18.0 U	3.32 X	11.19 X	6.6 U	33.44 X	2.7 U	0.13 U	178.2 X	0.18 U	5.50 X	0.23 U
IPGW27A03		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	141	0.18 U	1.1 J	0.23 U
IPGW27B03		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	79.0	0.18 U	0.17 U	0.23 U
IPGW2803		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	32.4 J	0.18 U	2.6 J	0.23 U
IPGW5003		18 U	23 U	18 U	2.1 U	6.4 U	5.4 X	2.1 U	26 X	0.13 U	1.5 U	0.18 U	1.5 X	0.23 U
IPGW5103		180 U	230 U	180 U	21 U	64 U	66 U	21 U	27 U	1.3 U	15 U	1.8 U	1.7 U	2.3 U
IPGW5203		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	69.8 X	0.18 U	2.15 X	0.23 U
IPGW5303		180 U	230 U	180 U	21 U	64 U	66 U	21 U	27 U	1.3 U	15 U	1.8 U	8.6 X	2.3 U
IPGW5403		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	3.6 X	0.18 U	0.17 U	0.23 U
IPGW5503		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	4.0 X	0.18 U	0.17 U	0.23 U
IPGW5803		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	7.8	0.18 U	0.17 U	0.23 U
IPGWRES013		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	45.96X	0.18 U	3.0 X	0.23 U
IPGWRES023		18.0 U	23.0 U	18.0 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	25.43 X	0.18 U	7.4 X	0.23 U
IPGWRES033		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	21 X	0.18 U	0.17 U	0.23 U
IPGWRES043		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	12.8 X	0.18 U	0.17 U	0.23 U
IPGWRES063		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	2.2 X	0.18 U	0.17 U	0.23 U
IPGWRES073		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPGWRES083		18 U	23 U	18 U	2.8 X	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	179 X	0.18 U	11.2 X	0.23 U
IPGWRES083	A	18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	28.6 X	0.18 U	0.17 U	0.23 U
IPGWRES093		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	15.2 X	0.18 U	2.12 X	0.23 U
IPGWRES103		18 U	23 U	18 U	2.1 U	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	23.6	0.18 U	5.69	0.23 U

SAMPLE NUMBER	SS	DIBENZO-(A,H)ANTHRACENE	BENZO-(G,H,I,)-PERYLENE	INDENO-(1,2,3CD)-PYRENE	DIBENZO-FURAN	2-METHYL-NAPHTHALENE
IPGW2103		0.30 U	0.76 U	0.43 U		
IPGW2203		0.30 U	0.76 U	0.43 U		
IPGW23A03		0.30 U	0.76 U	0.43 U		
IPGW23B03		0.30 U	0.76 U	0.43 U		
IPGW23C03		0.30 U	0.76 U	0.43 U		
IPGW24A103		0.30 U	0.76 U	0.43 U		
IPGW24A203		0.30 U	0.76 U	0.43 U		
IPGW24B03		0.30 U	0.76 U	0.43 U		
IPGW25A03		0.30 U	0.76 U	0.43 U		
IPGW25B03		0.30 U	0.76 U	0.43 U		
IPGW25BD03		0.30 U	0.76 U	0.43 U		
IPGW26A03		0.30 U	0.76 U	0.43 U		
IPGW26B03		0.30 U	0.76 U	0.43 U		
IPGW26C03		0.30 U	0.76 U	0.43 U		
IPGW27A03		0.30 U	0.76 U	0.43 U		
IPGW27B03		0.30 U	0.76 U	0.43 U		
IPGW2803		0.30 U	0.76 U	0.43 U		
IPGW5003		0.30 U	0.76 U	0.43 U		
IPGW5103		3.0 U	7.6 U	4.3 U		
IPGW5203		0.30 U	0.76 U	0.43 U		
IPGW5303		3.0 U	7.6 U	4.3 U		
IPGW5403		0.30 U	0.76 U	0.43 U		
IPGW5503		0.30 U	0.76 U	0.43 U		
IPGW5803		0.30 U	0.76 U	0.43 U		
IPGWRES013		0.30 U	0.76 U	0.43 U		
IPGWRES023		0.30 U	0.76 U	0.43 U		
IPGWRES033		0.30 U	0.76 U	0.43 U		
IPGWRES043		0.30 U	0.76 U	0.43 U		
IPGWRES063		0.30 U	0.76 U	0.43 U		
IPGWRES073		0.30 U	0.76 U	0.43 U		
IPGWRES083		0.30 U	0.76 U	0.43 U		
IPGWRES083	A	0.30 U	0.76 U	0.43 U		
IPGWRES093		0.30 U	0.76 U	0.43 U		
IPGWRES103		0.30 U	0.76 U	0.43 U		

SAMPLE NUMBER	SS	NAPH-THALENE	ACENAPH-THYLENE	ACENAPH-THENE	FLUORENE	PHENAN-THRENE	ANTHRA-CENE	FLUORAN-THENE	PYRENE	BENZO(A)-ANTHRACENE	CHRYSENE	BENZO(B)-FLUORAN-THENE	BENZO(K)-FLUORAN-THENE	BENZO(A)-PYRENE
IPGW01A04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW01B04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW02A04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW02B04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW03A04		14.00 U	12.50 Y	12.50 UJ	230 Y	140 Y	9.1 Y	15.07 C	63.90 Y	54.05 Y	12.44 C	5.3 Y	1.50 Y	.50 U
IPGW03B04		1.40 U	1.25 U	1.25 UJ	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW04A04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW04B04		2.80 U	2.50 U	2.50 U	.50 U	.50 U	.02 U	.50 U	1.00 U	.26 U	.76 U	.06 U	.02 U	.10 U
IPGW05A04		270 C	25.00 U	25.00 UJ	3100 Y	5.00 U	.20 U	5.00 U	10.00 U	190 CJ	240 CJ	100 CJ	41.57 CJ	94.56 CJ
IPGW05B04		1.40 U	1.25 U	1.25 UJ	.25 U	.25 U	.03 Y	.34 Y	.10 Y	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW05C04		1.40 U	1.25 U	1.25 UJ	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW06A04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW06B04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW07A04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW07B04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW07BD04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW08A04		1.40 U	1.25 U	1.25 UJ	.46 Z	.25 U	.07 Z	.71 Z	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW08B04		1.40 U	1.25 U	1.25 U	.76 Z	.25 U	.01 Z	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW08BD04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW09A04		1.40 U	1.25 U	1.25 UJ	6.4 C	.30 Y	.03 Y	.17 Y	.50 U	.13 U	.38 U	.08 Y	.01 U	.05 U
IPGW09B04		1.40 U	1.25 U	1.25 UJ	1.5 Y	.25 U	.03 Y	.78 Y	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW09C04		4.0 Y	1.25 U	1.25 UJ	2.0 Y	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW10A04		1.40 U	1.25 U	1.25 UJ	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW10B04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW11A04		1.40 U	1.25 U	1.25 UJ	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW12A04		1.40 U	1.25 U	1.25 UJ	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW13A04		1.40 U	1.25 U	1.25 U	.45 Y	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 Y	.01 U	.05 U
IPGW14A04		8.0 C	1.25 U	1.25 UJ	65.40 C	27.08 C	2.1 Y	46.10 C	3.5 C	6.3 Y	7.7 Y	1.4 Y	.57 Y	1.1 Y
IPGW14B04		1.40 U	1.25 U	1.25 UJ	5.4 Y	.98 Z	.17 Z	3.0 Z	.50 U	.44 Y	.38 U	.13 Z	.04 Z	.05 U
IPGW15A04		26.33 U	1.25 U	3.7 CJ	48.33 C	12.80 C	.88 C	6.0 Y	.5 U	1.6 Y	.67 Y	.19 Y	.07 Y	.10 Y
IPGW16A04		1.40 U	1.25 U	1.25 UJ	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW16B04		1.40 U	1.25 U	1.25 UJ	1.4 Y	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW18A04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW18B04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW18C04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW19A04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW19B04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW2004		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U

SAMPLE NUMBER	SS	DIBENZO-(A,H)ANTHRACENE	BENZO-(G,H,I,)-PERYLENE	INDENO-(1,2,3CD)-PYRENE	DIBENZO-FURAN	2-METHYL-NAPHTHALENE
IPGW01A04		.50 U	.50 U	.13 U		
IPGW01B04		.50 U	.50 U	.13 U		
IPGW02A04		.50 U	.50 U	.13 U		
IPGW02B04		.50 U	.50 U	.13 U		
IPGW03A04		5.00 U	5.00 U	130.00 U		
IPGW03B04		.50 U	.50 U	.13 U		
IPGW04A04		.50 U	.50 U	.13 U		
IPGW04B04		1.00 U	1.00 U	.26 U		
IPGW05A04		84.66 C	77.06 C	17.62 C		
IPGW05B04		.50 U	.50 U	.13 U		
IPGW05C04		.50 U	.50 U	.13 U		
IPGW06A04		.50 U	.50 U	.13 U		
IPGW06B04		.50 U	.50 U	.13 U		
IPGW07A04		.50 U	.50 U	.13 U		
IPGW07B04		.50 U	.50 U	.13 U		
IPGW07BD04		.50 U	.50 U	.13 U		
IPGW08A04		.50 U	.50 U	.13 U		
IPGW08B04		.50 U	.50 U	.13 U		
IPGW08BD04		.50 U	.50 U	.13 U		
IPGW09A04		.50 U	.50 U	.13 U		
IPGW09B04		.50 U	.50 U	.13 U		
IPGW09C04		.50 U	.50 U	.13 U		
IPGW10A04		.50 U	.50 U	.13 U		
IPGW10B04		.50 U	.50 U	.13 U		
IPGW11A04		.50 U	.50 U	.13 U		
IPGW12A04		.50 U	.50 U	.13 U		
IPGW13A04		.50 U	.50 U	.13 U		
IPGW14A04		1.2 Y	2.3 Y	.13 U		
IPGW14B04		.50 U	.50 U	.13 U		
IPGW15A04		.50 Y	.50 U	.13 U		
IPGW16A04		.50 U	.50 U	.13 U		
IPGW16B04		.50 U	.50 U	.13 U		
IPGW18A04		.50 U	.50 U	.13 U		
IPGW18B04		.50 U	.50 U	.13 U		
IPGW18C04		.50 U	.50 U	.13 U		
IPGW19A04		.50 U	.50 U	.13 U		
IPGW19B04		.50 U	.50 U	.13 U		
IPGW2004		.50 U	.50 U	.13 U		

SAMPLE NUMBER	SS	NAPH-THALENE	ACENAPH-THYLENE	ACENAPH-THENE	FLUORENE	PHENAN-THRENE	ANTHRA-CENE	FLUORAN-THENE	PYRENE	BENZO(A)-ANTHRACENE	CHRYSENE	BENZO(B)-FLUORAN-THENE	BENZO(K)-FLUORAN-THENE	BENZO(A)-PYRENE
IPGW2104		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW2204		1.40 U	1.25 U	1.25 U	.25 U	.62 Y	.26 Y	17.42 Y	8.2 C	.75 Y	.38 U	.46 Y	.20 Y	.41 Y
IPGW2204	RE	2.80 U	2.50 U	2.50 U	.50 U	1.0 Y	.08 Y	6.2 Y	6.0 C	.72 Y	.76 U	.34 Y	.19 Y	.31 Y
IPGW23A04		.83 Y	1.25 U	1.25 U	.43 Y	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.04 Y	.01 U	.05 U
IPGW23B04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.08 Y	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW23C04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW24A104		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW24A204		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW24B04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW25A04		1.40 U	1.25 U	1.25 U	2.0 Y	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW25B04		1.40 U	1.25 U	1.25 U	3.0 Y	.25 U	.05 Y	.22 YJ	.50 U	.16 Y	.38 U	.03 U	.01 U	.05 U
IPGW25BD04		1.40 U	1.25 U	1.25 U	2.2 Y	.25 U	.03 Y	.24 Y	.50 U	.19 Y	.38 U	.03 U	.01 U	.05 U
IPGW26A04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW26B04		1.40 U	1.25 U	1.25 UJ	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW26C04		1.40 U	1.25 U	1.25 UJ	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW27A04		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW27B04		1.40 U	1.25 U	1.25 U	1.7 Y	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW2804		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW5004		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW5104		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW5204		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW5304		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW5404		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW5504		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGW5804		50.6 C	1.25 U	1.25 U	40.6 C	29.1 C	.03 Y	.25 U	.50 U	.13 U	.38 U	10.4 C	.01 U	.05 U
IPGWRES014		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGWRES024		2.80 U	2.50 U	2.50 UJ	.50 U	.50 U	.02 U	.50 U	1.00 U	.26 U	.76 U	.06 U	.02 U	.10 U
IPGWRES034		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGWRES044		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGWRES054		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGWRES064		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGWRES074		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGWRES084		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGWRES094		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U
IPGWRES104		1.40 U	1.25 U	1.25 U	.25 U	.25 U	.01 U	.25 U	.50 U	.13 U	.38 U	.03 U	.01 U	.05 U

SAMPLE NUMBER	SS	DIBENZO-(A,H)ANTHRACENE	BENZO-(G,H,I,)-PERYLENE	INDENO-(1,2,3CD)-PYRENE	DIBENZOFURAN	2-METHYLNAPHTHALENE
IPGW2104		.50 U	.50 U	.13 U		
IPGW2204		.31 Y	.60 Y	.13 U		
IPGW2204	RE	.13 Y	.22 Y	.13 U		
IPGW23A04		.50 U	.50 U	.13 U		
IPGW23B04		.50 U	.50 U	.13 U		
IPGW23C04		.50 U	.50 U	.13 U		
IPGW24A104		.50 U	.50 U	.13 U		
IPGW24A204		.50 U	.50 U	.13 U		
IPGW24B04		.50 U	.50 U	.13 U		
IPGW25A04		.50 U	.50 U	.13 U		
IPGW25B04		.50 U	.50 U	.13 U		
IPGW25BD04		.50 U	.50 U	.13 U		
IPGW26A04		.50 U	.50 U	.13 U		
IPGW26B04		.50 U	.50 U	.13 U		
IPGW26C04		.50 U	.50 U	.13 U		
IPGW27A04		.50 U	.50 U	.13 U		
IPGW27B04		.50 U	.50 U	.13 U		
IPGW2804		.50 U	.50 U	.13 U		
IPGW5004		.50 U	.50 U	.13 U		
IPGW5104		.50 U	.50 U	.13 U		
IPGW5204		.50 U	.50 U	.13 U		
IPGW5304		.50 U	.50 U	.13 U		
IPGW5404		.50 U	.50 U	.13 U		
IPGW5504		.50 U	.50 U	.13 U		
IPGW5804		.50 U	.50 U	.13		
IPGWRES014		.50 U	.50 U	.13 U		
IPGWRES024		1.00 U	1.00 U	.26 U		
IPGWRES034		.50 U	.50 U	.13 U		
IPGWRES044		.50 U	.50 U	.13 U		
IPGWRES054		.50 U	.50 U	.13 U		
IPGWRES064		.50 U	.50 U	.13 U		
IPGWRES074		.50 U	.50 U	.13 U		
IPGWRES084		.50 U	.50 U	.13 U		
IPGWRES094		.50 U	.50 U	.13 U		
IPGWRES104		.50 U	.50 U	.13 U		

SAMPLE NUMBER	SS	NAPH-THALENE	ACENAPH-THYLENE	ACENAPH-THENE	FLUORENE	PHENAN-THRENE	ANTHRA-CENE	FLUORAN-THENE	PYRENE	BENZO(A)-ANTHRACENE	CHRYSENE	BENZO(B)-FLUORAN-THENE	BENZO(K)-FLUORAN-THENE	BENZO(A)-PYRENE
IPGW18C05		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	16.59 X	2.3 U	0.27 U	0.26 U	0.37 U
IPGW23A05		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	1.10	2.3 U	0.27 U	0.26 U	0.37 U
IPGW23B05		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	3.56	2.3 U	0.27 U	0.26 U	0.37 U
IPGW23C05		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	10.38	2.3 U	0.27 U	0.26 U	0.37 U
IPGW24A105		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.45	2.3 U	0.27 U	0.26 U	0.37 U
IPGW24A205		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	1.19	2.3 U	0.27 U	0.26 U	0.37 U
IPGW24B05		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.50	2.3 U	0.27 U	0.26 U	0.37 U
IPGW25A05		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.19 U	2.3 U	0.27 U	0.26 U	0.37 U
IPGW25B05		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.82	2.3 U	0.27 U	0.26 U	0.37 U
IPGW26A05		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.82	2.3 U	0.26 U	0.27 U	0.37 U
IPGW26B05		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.19 U	2.3 U	0.27 U	0.26 U	0.37 U
IPGW26C05		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.19 U	2.3 U	0.27 U	0.26 U	0.37 U
IPGW27A05		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.19 U	2.3 U	0.27 U	0.26 U	0.37 U
IPGW27B05		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	1.05	2.3 U	0.27 U	0.26 U	0.37 U
IPGW27BD05		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.87	2.3 U	0.27 U	0.26 U	0.37 U
IPGW28B05		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.19 U	2.3 U	0.27 U	0.26 U	0.37 U
IPGW5105		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.84 X	2.3 U	0.27 U	0.26 U	0.37 U
IPGW5305		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.19 U	2.3 U	0.27 U	0.26 U	0.37 U
IPGW5805		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.73	2.3 U	0.27 U	0.26 U	0.37 U
IPGWRES015		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.97	2.3 U	0.27 U	0.26 U	0.37 U
IPGWRES025		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.65	2.3 U	0.27 U	0.26 U	0.37 U
IPGWRES035		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.19 U	2.3 U	0.27 U	0.26 U	0.37 U
IPGWRES03D		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.19 U	2.3 U	0.27 U	0.26 U	0.37 U
IPGWRES045		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.19 U	2.3 U	0.27 U	0.26 U	0.37 U
IPGWRES055		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.19 U	2.3 U	0.27 U	0.26 U	0.37 U
IPGWRES065		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	1.28	2.3 U	0.27 U	0.26 U	0.37 U
IPGWRES075		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.93	2.3 U	0.27 U	0.26 U	0.37 U
IPGWRES085		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.72	2.3 U	0.27 U	0.26 U	0.37 U
IPGWRES095		25 U	23 U	25 U	3.2 U	9.6 U	9.9 U	3.2 U	4.1 U	0.19 U	2.3 U	0.27 U	0.26 U	0.37 U

SAMPLE NUMBER	SS	DIBENZO-(A,H)ANTH-RACENE	BENZO-(G,H,I,)-PERYLENE	INDENO-(1,2,3CD)-PYRENE	DIBENZO-FURAN	2-METHYL-NAPHTH-ALENE
IPGW18C05		0.43 U	1.1 U	0.63 U	NA	NA
IPGW23A05		0.43 U	1.1 U	0.63 U	NA	NA
IPGW23B05		0.43 U	1.1 U	0.63 U	NA	NA
IPGW23C05		0.43 U	1.1 U	0.63 U	NA	NA
IPGW24A105		0.43 U	1.1 U	0.63 U	NA	NA
IPGW24A205		0.43 U	1.1 U	0.63 U	NA	NA
IPGW24B05		0.43 U	1.1 U	0.63 U	NA	NA
IPGW25A05		0.43 U	1.1 U	0.63 U	NA	NA
IPGW25B05		0.43 U	1.1 U	0.63 U	NA	NA
IPGW26A05		0.43 U	1.1 U	0.63 U	NA	NA
IPGW26B05		0.43 U	1.1 U	0.63 U	NA	NA
IPGW26C05		0.43 U	1.1 U	0.63 U	NA	NA
IPGW27A05		0.43 U	1.1 U	0.63 U	NA	NA
IPGW27B05		0.43 U	1.1 U	0.63 U	NA	NA
IPGW27BD05		0.43 U	1.1 U	0.63 U	NA	NA
IPGW28805		0.43 U	1.1 U	0.63 U	NA	NA
IPGW5105		0.43 U	1.1 U	0.63 U	NA	NA
IPGW5305		0.43 U	1.1 U	0.63 U	NA	NA
IPGW5805		0.43 U	1.1 U	0.63 U	NA	NA
IPGWRES015		0.43 U	1.1 U	0.63 U	NA	NA
IPGWRES025		0.43 U	1.1 U	0.63 U	NA	NA
IPGWRES035		0.43 U	1.1 U	0.63 U	NA	NA
IPGWRES03D		0.43 U	1.1 U	0.63 U	NA	NA
IPGWRES045		0.43 U	1.1 U	0.63 U	NA	NA
IPGWRES055		0.43 U	1.1 U	0.63 U	NA	NA
IPGWRES065		0.43 U	1.1 U	0.63 U	NA	NA
IPGWRES075		0.43 U	1.1 U	0.63 U	NA	NA
IPGWRES085		0.43 U	1.1 U	0.63 U	NA	NA
IPGWRES095		0.43 U	1.1 U	0.63 U	NA	NA

SAMPLE NUMBER	SS	NAPHTHALENE	ACENAPHTHYLENE	ACENAPHTHENE	FLUORENE	PHENANTHRENE	ANTHRACENE	FLUORANTHENE	PYRENE	BENZO(A)-ANTHRACENE	CHRYSENE	BENZO(B)-FLUORANTHENE	BENZO(K)-FLUORANTHENE	BENZO(A)-PYRENE
IPGW29C06		2.5 U	2.5 U	5.0 U	0.50 U	0.50 U	0.03 U	0.25 U	1.0 U	0.25 U	0.75 U	0.05 U	0.03 U	0.10 U
IPGW29D06		2.5 U	2.5 U	5.0 U	0.50 U	0.50 U	0.03 U	0.25 U	1.0 U	0.25 U	0.75 U	0.05 U	0.03 U	0.10 U
IPGW29DD06		2.5 U	2.5 U	5.0 U	0.50 U	0.50 U	0.03 U	0.25 U	1.0 U	0.25 U	0.75 U	0.05 U	0.03 U	0.10 U
IPGW5106		2.5 U	2.5 U	5.0 U	0.50 U	0.50 U	0.03 U	0.25 U	1.0 U	0.25 U	0.75 U	0.05 U	0.03 U	0.10 U
IPGW5806		71.4	2.5 U	5.0 U	0.50 U	0.50 U	0.03 U	0.25 U	54.7	13.3	0.75 U	0.05 U	0.03 U	0.10 U

SAMPLE NUMBER	SS	DIBENZO-(A,H)ANTHRACENE	BENZO-(G,H,I,)-PERYLENE	INDENO-(1,2,3CD)-PYRENE	DIBENZOFURAN	2-METHYL-NAPHTHALENE
IPGW29C06		1.0 U	0.25 U	1.0 U	NA	NA
IPGW29D06		1.0 U	0.25 U	1.0 U	NA	NA
IPGW29DD06		1.0 U	0.25 U	1.0 U	NA	NA
IPGW5106		1.0 U	0.25 U	1.0 U	NA	NA
IPGW5806		1.0 U	0.25 U	1.0 U	NA	NA

PCP ANALYSIS (ug/L; Method 515.1)

SAMPLE NUMBER	SS	PCP
IPGW18C05		0.1 U
IPGW23A05		236
IPGW23B05		139
IPGW23C05		60
IPGW24A105		39
IPGW24A205		31
IPGW24B05		218
IPGW25A05		549
IPGW25B05		927
IPGW26A05		4.3
IPGW26B05		54
IPGW26C05		28
IPGW27A05		14
IPGW27B05		647
IPGW27BD05		655
IPGW28B05		0.1 U
IPGW5105		0.1 U
IPGW5305		0.1 U
IPGW5805		0.1 U
IPGWRES015		0.1 U
IPGWRES025		0.51 J
IPGWRES035		0.1 U
IPGWRES03D		0.11
IPGWRES045		0.1 U
IPGWRES055		0.1 U
IPGWRES065		0.1 U
IPGWRES075		0.1 U
IPGWRES085		99
IPGWRES095		0.24

DIOXIN/FURANS (ug/L)

SAMPLE NUMBER	SS	2,3,7,8-TCDD	TOTAL TCDD	1,2,3,-7,8-PECDD	TOTAL PECDD	1,2,3,-4,7,8-HXCDD	1,2,3,-6,7,8-HXCDD	1,2,3,-7,8,9-HXCDD	TOTAL HXCDD	1,2,3,-4,6,7,8-HPCDD	TOTAL HPCDD	TOTAL OCDD
IPGW09A02		0.000039 U		0.00050 U		0.000332 U	0.000332 U	0.000332 U		0.000035 U		0.000448 U
IPGW5502		0.000027 U		0.000774 U		0.000216 U	0.000216 U	0.000216 U		0.000076 U		0.000405
IPGWRES032		0.00004 U		0.000616 U		0.000141 U	0.000141 U	0.000141 U		0.000043 U		0.000961
IPGWRES042		0.000042 U		0.000648 U		0.000135 U	0.000135 U	0.000135 U		0.000151 U		0.000706 U

SAMPLE NUMBER	SS	2,3,7,8 TCDF	TOTAL TCDF	1,2,3,-7,8-PECDF	2,3,4,-7,8-PECDF	TOTAL PECDF	1,2,3,-4,7,8-HXCDF	1,2,3,-6,7,8-HXCDF	1,2,3,-7,8,9-HXCDF	2,3,4,-6,7,8-HXCDF	TOTAL HXCDF	1,2,3,-4,6,7,8-HPCDF	1,2,3,-4,7,8,9-HPCDF	TOTAL HPCDF	TOTAL OCDF
IPGW09A02		0.000617 U		0.000177 U	0.000177 U		0.000102 U	0.000102 U	0.000102 U	0.000102 U		0.000303 U	0.000303 U		0.00021 U
IPGW5502		0.00044 U		0.000305 U	0.000305 U		0.000658 U	0.000658 U	0.000658 U	0.000658 U		0.000447 U	0.000447 U		0.000294 U
IPGWRES032		0.000024 U		0.000353 U	0.000353 U		0.00070 U	0.00070 U	0.00070 U	0.00070 U		0.000199 U	0.000199 U		0.000435 U
IPGWRES032	DIL	0.000014 U		0.000077 U	0.000077 U		0.000662 U	0.000662 U	0.000662 U	0.000662 U		0.000350 U	0.000350 U		0.000523 U
IPGWRES042		0.000518 U		0.000049 U	0.000049 U		0.000691 U	0.000691 U	0.000691 U	0.000691 U		0.000170 U	0.000170 U		0.000508 U

SAMPLE NUMBER	SS	2,3,7,8- TCDD	TOTAL TCDD	1,2,3,- 7,8- PECDD	TOTAL PECDD	1,2,3,- 4,7,8- HXCDD	1,2,3,- 6,7,8- HXCDD	1,2,3,- 7,8,9- HXCDD	TOTAL HXCDD	1,2,3,- 4,6,7,8- HPCDD	TOTAL HPCDD	TOTAL OCDD
IPGW09A03		0.000092 U	0.000092 U		0.000400 U				0.000161		0.000100 U	0.000522
IPGW27A03		0.000251 U	0.000251 U		0.000409 U				0.000403		0.000270 U	0.001076
IPGW5603		0.000018 U	0.000018 U		0.000191 U				0.000257 U		0.000036 U	0.000308 U
IPGW5703		0.000099 U	0.000099 U		0.000398 U				0.000376 U		0.000122 U	0.000117 U
IPGWRES033		0.000089 U	0.000089 U		0.000111 U				0.000109 U		0.000089 U	0.000301 U
IPGWRES033	A	0.000027 U	0.000027 U		0.000128 U				0.000039 U		0.000020 U	0.000131 U

SAMPLE NUMBER	SS	2,3,7,8 TCDF	TOTAL TCDF	1,2,3,-7,8-PECDF	2,3,4,-7,8-PECDF	TOTAL PECDF	1,2,3,-4,7,8-HXCDF	1,2,3,-6,7,8-HXCDF	1,2,3,-7,8,9-HXCDF	2,3,4,-6,7,8-HXCDF	TOTAL HXCDF	1,2,3,-4,6,7,8-HPCDF	1,2,3,-4,7,8,9-HPCDF	TOTAL HPCDF	TOTAL OCDF
IPGW09A03		0.000082 U	0.000082 U			0.000024 U					0.000084 U			0.000104 U	0.000195 U
IPGW27A03		0.000197 U	0.000197 U			0.000179 U					0.000116 U			0.000298 U	0.000742 U
IPGW5603		0.000053 U	0.000053 U			0.000010 U					0.000188 U			0.000046 U	0.000122 U
IPGW5703		0.000074 U	0.000074 U			0.000359 U					0.000118 U			0.000643 U	0.000140 U
IPGWRES033		0.000074 U	0.000074 U			0.000088 U					0.000085 U			0.000090 U	0.000273 U
IPGWRES033	A	0.000034 U	0.000034 U			0.000031 U					0.000084 U			0.000074 U	0.000050 U

SAMPLE NUMBER	SS	2,3,7,8-TCDD	TOTAL TCDD	1,2,3,-7,8-PECDD	TOTAL PECDD	1,2,3,-4,7,8-HXCDD	1,2,3,-6,7,8-HXCDD	1,2,3,-7,8,9-HXCDD	TOTAL HXCDD	1,2,3,-4,6,7,8-HPCDD	TOTAL HPCDD	TOTAL OCDD
IPGW09A04		ND	0.0003 U	ND	0.0004 U	ND	ND	ND	0.0005 U	ND	0.0004	0.0009 U
IPGW18A04		ND	0.0004 U	ND	0.0005 U	ND	ND	ND	0.0005 U	ND	0.0005 U	0.0021 U
IPGW18C04		ND	0.0008 U	ND	0.0008 U	ND	ND	ND	0.0008 U	ND	0.0021 U	0.0024 UJ
IPGW27A04		ND	0.0014 U	ND	0.0007 U	ND	ND	ND	0.0010 U	ND	0.0018 U	0.0015 U
IPGW5204		ND	0.0006 U	ND	0.0006 U	ND	ND	ND	0.0006 U	ND	0.0006 U	0.0012 U
IPGW5504		ND	0.0004 U	ND	0.0003 U	ND	ND	ND	0.0023 U	ND	0.0020 U	0.0017 U
IPGWRES014		ND	0.0005 U	ND	0.0006 U	ND	ND	ND	0.0008 U	ND	0.0017 U	0.0026 U
IPGWRES024		ND	0.0003 U	ND	0.0013	ND	ND	ND	0.0004 U	ND	0.0002 U	0.0014 U
IPGWRES034		ND	0.0002 U	ND	0.0003 U	ND	ND	ND	0.0003 U	ND	0.0003 U	0.0022 U
IPGWRES034	A	ND	0.0002 U	ND	0.0003 U	ND	ND	ND	0.0004 U	ND	0.0009 U	0.0015 U
IPGWRES044		ND	0.0002 U	ND	0.0004 U	ND	ND	ND	0.0004 U	ND	0.0011 U	0.0009 U
IPGWRES054		ND	0.0002 U	ND	0.0003 U	ND	ND	ND	0.0004 U	ND	0.0007 U	0.0014 U
IPGWRES064		ND	0.0002 U	ND	0.0004 U	ND	ND	ND	0.0006 U	ND	0.0011 U	0.0024 U
IPGWRES074		ND	0.0006 U	ND	0.0005 U	ND	ND	ND	0.0005 U	ND	0.0004 U	0.0015 U
IPGWRES084		ND	0.0003 U	ND	0.0003 U	ND	ND	ND	0.0004 U	ND	0.0015 U	0.0012 U
IPGWRES094		ND	0.0002 U	ND	0.0007 U	ND	ND	ND	0.0008 U	ND	0.0003 U	0.0011 U

SAMPLE NUMBER	SS	2,3,7,8 TCDF	TOTAL TCDF	1,2,3,-7,8-PECDF	2,3,4,-7,8-PECDF	TOTAL PECDF	1,2,3,-4,7,8-HXCDF	1,2,3,-6,7,8-HXCDF	1,2,3,-7,8,9-HXCDF	2,3,4,-6,7,8-HXCDF	TOTAL HXCDF	1,2,3,-4,6,7,8-HPCDF	1,2,3,-4,7,8,9-HPCDF	TOTAL HPCDF	TOTAL OCDF
IPGW18A04		ND	0.0004 U	ND	ND	0.0002 U	ND	ND	ND	ND	0.0004 U	ND	ND	0.0015 U	0.0009 U
IPGW18C04		ND	0.0002 U	ND	ND	0.0008 U	ND	ND	ND	ND	0.0011 U	ND	ND	0.0017 U	0.0013 UJ
IPGW27A04		ND	0.0003 U	ND	ND	0.0002 U	ND	ND	ND	ND	0.0014 U	ND	ND	0.0014 U	0.0017 U
IPGW5204		ND	0.0004 U	ND	ND	0.0004 U	ND	ND	ND	ND	0.0006 U	ND	ND	0.0012 U	0.0010 U
IPGW5504		ND	0.0003 U	ND	ND	0.0003 U	ND	ND	ND	ND	0.0007 U	ND	ND	0.0023 U	0.0010 U
IPGW9A04		ND	0.0002 U	ND	ND	0.0002 U	ND	ND	ND	ND	0.0006 U	ND	ND	0.0008 U	0.0011 U
IPGWRES014		ND	0.0004 U	ND	ND	0.0002 U	ND	ND	ND	ND	0.0006 U	ND	ND	0.0015 U	0.0022 U
IPGWRES024		ND	0.0001 U	ND	ND	0.0002 U	ND	ND	ND	ND	0.0007 U	ND	ND	0.0007 U	0.0006 U
IPGWRES034		ND	0.0001 U	ND	ND	0.0003 U	ND	ND	ND	ND	0.0006 U	ND	ND	0.0008 U	0.0013 U
IPGWRES034	A	ND	0.0001 U	ND	ND	0.0003 U	ND	ND	ND	ND	0.0006 U	ND	ND	0.0006 U	0.0018 U
IPGWRES044		ND	0.0002 U	ND	ND	0.0002 U	ND	ND	ND	ND	0.0006 U	ND	ND	0.0014 U	0.0012 U
IPGWRES054		ND	0.0002 U	ND	ND	0.0004 U	ND	ND	ND	ND	0.0007 U	ND	ND	0.0011 U	0.0011 U
IPGWRES064		ND	0.0002 U	ND	ND	0.0006 U	ND	ND	ND	ND	0.0006 U	ND	ND	0.0015 U	0.0013 U
IPGWRES074		ND	0.0004 U	ND	ND	0.0004 U	ND	ND	ND	ND	0.0004 U	ND	ND	0.0008 U	0.0012 U
IPGWRES084		ND	0.0001 U	ND	ND	0.0002 U	ND	ND	ND	ND	0.0003 U	ND	ND	0.0006 U	0.0012 U
IPGWRES094		ND	0.0001 U	ND	ND	0.0003 U	ND	ND	ND	ND	0.0033 U	ND	ND	0.0065 U	0.0012 U

SAMPLE NUMBER	SS	2,3,7,8-TCDD	TOTAL TCDD	1,2,3,-7,8-PECDD	TOTAL PECDD	1,2,3,-4,7,8-HXCDD	1,2,3,-6,7,8-HXCDD	1,2,3,-7,8,9-HXCDD	TOTAL HXCDD	1,2,3,-4,6,7,8-HPCDD	TOTAL HPCDD	TOTAL OCDD
IPGWS205		0.00002 U	0.00002 U	0.00081 U	0.00081 U	0.00042 U	0.00042 U	0.00042 U	0.00042 U	0.00009 U	0.00009 U	0.00046 UJ
IPGWRES025		0.00016 U	0.00016 U	0.00084 U	0.00084 U	0.00032 U	0.00032 U	0.00032 U	0.00032 U	0.00053 U	0.00053 U	0.00043 UJ

SAMPLE NUMBER	SS	2,3,7,8 TCDF	TOTAL TCDF	1,2,3,-7,8-PECDF	2,3,4,-7,8-PECDF	TOTAL PECDF	1,2,3,-4,7,8-HXCDF	1,2,3,-6,7,8-HXCDF	1,2,3,-7,8,9-HXCDF	2,3,4,-6,7,8-HXCDF	TOTAL HXCDF	1,2,3,-4,6,7,8-HPCDF	1,2,3,-4,7,8,9-HPCDF	TOTAL HPCDF	TOTAL OCDF
IPGW5205		0.00079 U	0.00079 U	0.00020 U	0.00020 U	0.00020 U	0.00048 U	0.00048 U	0.00048 U	0.00048 U	ND	0.00020 U	0.00020 U	ND	0.00079 U
IPGWRES025		0.00084 U	0.00084 U	0.00016 U	0.00016 U	0.00016 U	0.00045 U	0.00045 U	0.00045 U	0.00045 U	0.00045 U	0.00014 U	0.00014 U	0.00014 U	0.00115 U

SEMIVOLATILES ANALYSIS (ug/L)

SAMPLE NUMBER	SS	4-METHYL-PHENOL	BENZOIC ACID	2-METHYL-PHENOL	2,4,5-TRI-CHLORO-PHENOL	4-NITRO-ANALINE	BENZYL ALCOHOL	4-CHLORO-ANILINE	DIBENZO-FURAN	2-NITRO-ANILINE	2-METHYL-NAPH-THALENE	3-NITRO-ANILINE
IPGW02A01		10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	50 U	10 U	50 U
IPGW03A01	DIL	800 U	4000 U	800 U	4000 U	4000 U	800 U	800 U	800 U	4000 U	800 U	4000 U
IPGW03A01		40 U	200 U	40 U	200 U	200 U	40 U	40 U	48	200 U	180	200 U
IPGW03B01		10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	50 U	10 U	50 U
IPGW04B01		10 U	50 U	10 U	50 U	50 U	10 U	10 U	50 U	50 U	10 U	50 U
IPGW05A01		1000 U	5000 U	1000 U	5000 U	5000 U	1000 U	1000 U	1300	1700 J	7800	5000 U
IPGW05B01		10 U	50 U	10 U	50 U	50 U	10 U	10 U	4 J	50 U	10 U	50 U
IPGW05B01	DIL	50 U	250 U	50 U	250 U	250 U	50 U	50 U	50 U	250 U	50 U	250 U
IPGW05C01		10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	50 U	10 U	50 U
IPGW06A01		10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	50 U	10 U	50 U
IPGW06B01		10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	50 U	10 U	50 U
IPGW15A01		20 U	100 U	20 U	100 U	100 U	20 U	20 U	6 J	100 U	41	100 U
IPGW18A01		10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	50 U	10 U	50 U
IPGW18B01		10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	50 U	10 U	50 U
IPGW19A01		10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	50 U	10 U	50 U
IPGW19B01		10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	50 U	10 U	50 U
IPGW2001		10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	50 U	10 U	50 U
IPGW2101		10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	50 U	10 U	50 U
IPGW2201		10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	50 U	10 U	50 U
IPGW2201	DIL	100 U	500 U	100 U	500 U	500 U	100 U	100 U	100 U	500 U	100 U	500 U
IPGW5001		10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	50 U	10 U	50 U
IPGW5101		10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	50 U	10 U	50 U
IPGW5201		10 U	50 U	10 U	55	50 U	10 U	10 U	13	50 U	10 U	50 U

SAMPLE NUMBER	SS	2,4,6-TRI CHLORO-PHENOL	4-CHLORO-3-METHYL-PHENOL	2-CHLORO-PHENOL	2-4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	2,4-DI-NITRO-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	ACENAPH-THENE
IPGW02A01		10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPGW03A01	DIL	800 U	800 U	800 U	800 U	800 U	800 U	4000 U	4000 U	4000 U	13000 D	800 U	800 U
IPGW03A01		40 U	40 U	40 U	40 U	40 U	40 U	200 U	200 U	200 U	11000 E	40 U	40 U
IPGW03B01		10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPGW04B01		10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPGW05A01		1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	5000 U	5000 U	5000 U	14000	1000 U	1000 U
IPGW05B01		10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	880 E	10 U	10 U
IPGW05B01	DIL	50 U	50 U	50 U	50 U	50 U	50 U	250 U	250 U	250 U	800 D	50 U	50 U
IPGW05C01		10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	68	10 U	10 U
IPGW06A01		10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPGW06B01		10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPGW15A01		20 U	20 U	20 U	20 U	20 U	20 U	100 U	100 U	100 U	420	20 U	20 U
IPGW18A01		10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPGW18B01		10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPGW19A01		10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPGW19B01		10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPGW2001		10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPGW2101		10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPGW2201		10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	1400 E	10 U	10 U
IPGW2201	DIL	100 U	100 U	100 U	100 U	100 U	100 U	500 U	500 U	500 U	1300 D	100 U	100 U
IPGW5001		10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPGW5101		10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	10 U	10 U	10 U
IPGW5201		10 U	17	10 U	10 U	10 U	10 U	50 U	48 J	50 U	16 J	9 J	10 U

SAMPLE NUMBER	SS	1,2,4-TRI-CHLORO-BENZENE	HEXA-CHLORO-BENZENE	HEXA-CHLORO-ETHANE	BIS(2-CHLORO-ETHYL)-ETHER	2-CHLORO-NAPHTHA-LENE	1,2-DI-CHLORO-BENZENE	1,3-DI-CHLORO-BENZENE	1,4-DI-CHLORO-BENZENE	3,3′-DI-CHLORO-BENZIDINE	2,4-DI-NITRO-TOLUENE	2,6-DI NITRO-TOLUENE
IPGW02A01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPGW03A01	DIL	800 U	800 U	800 U	800 U	800 U	800 U	800 U	800 U	1600 U	800 U	800 U
IPGW03A01		40 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U	80 U	40 U	40 U
IPGW03B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPGW04B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPGW05A01		1000 U	1000 U	1000 U	1000 U	1380 J	1000 U	1000 U	1000 U	2000 U	1000 U	1000 U
IPGW05B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPGW05B01	DIL	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	100 U	50 U	50 U
IPGW05C01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPGW06A01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPGW06B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPGW15A01		20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	40 U	20 U	20 U
IPGW18A01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW18B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPGW19A01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPGW19B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPGW2001		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPGW2101		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPGW2201		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPGW2201	DIL	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	200 U	100 U	100 U
IPGW5001		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPGW5101		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPGW5201		26	10 U	6 J	10 U	38	10 U	10 U	10 U	20 U	10 U	10 U

SAMPLE NUMBER	SS	FLUORANTHENE	4-CHLOROPHENYL-PHENYL-ETHER	4-BROMOPHENYL-PHENYL-ETHER	BIS(2-CHLOROISOPROPYL)-ETHER	BIS(2-CHLOROETHOXY)-METHANE	HEXACHLOROBUTADIENE	HEXACHLOROCYCLOPENTADIENE	ISOPHORONE	NAPHTHALENE	NITROBENZENE
IPGW02A01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW03A01	DIL	800 U	800 U	800 U	800 U	800 U	800 U	800 U	800 U	800 U	800 U
IPGW03A01		40 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U
IPGW03B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW04B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW05A01		2100	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	600 J	1000 U
IPGW05B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	4 J	10 U
IPGW05B01	DIL	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
IPGW05C01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW06A01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW06B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW15A01		20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	6 J	20 U
IPGW18A01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW18B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW19A01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW19B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW2001		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW2101		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW2201		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW2201	DIL	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
IPGW5001		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW5101		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW5201		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	48	10 U

SAMPLE NUMBER	SS	N-NITROSO-DIPHENYL-AMINE	N-NITRO-DI-N-PROPYL-AMINE	BIS(2-ETHYL-HEXYL)-PHTHALATE	BUTYL-BENZYL-PHTHALATE	DI-N-BUTYL-PHTHALATE	DI-N-OCTYL-PHTHALATE	DIETHYL-PHTHALATE	DIMETHYL-PHTHALATE	BENZO(A)-ANTH-RACENE	BENZO(A) PYRENE	BENZO(B)-FLUORAN-THENE	BENZO(K)-FLUORAN-THENE
IPGW02A01		10 U	10 U	10 U	4 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW03A01	DIL	800 U	800 U	800 U	800 U	800 U	800 U	800 U	800 U	800 U	800 U	800 U	800 U
IPGW03A01		40 U	40 U	8 J	40 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U
IPGW03B01		10 U	10 U	3 J	3 BJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW04B01		10 U	10 U	10 U	3 BJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW05A01		1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	540 J	210 J	260 J	300 J
IPGW05B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW05B01	DIL	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
IPGW05C01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW06A01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW06B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW15A01		20 U	20 U	4 J	5 J	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
IPGW18A01		10 U	10 U	10 U	10 U	10 U	10 U	4 BJ	10 U	10 U	10 U	10 U	10 U
IPGW18B01		10 U	10 U	3 J	2 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW19A01		10 U	10 U	10 U	3 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW19B01		10 U	10 U	10 U	3 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW2001		10 U	10 U	4 J	3 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW2101		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW2201		10 U	10 U	10 U	3 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW2201	DIL	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
IPGW5001		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW5101		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW5201		10 U	10 U	10 U	10 U	33	10 U	10 U	3 J	10 U	10 U	10 U	10 U

SAMPLE NUMBER	SS	CHRYSENE	ACENAPH-THENE	ANTHRA-CENE	BENZO-(G,H,I)-PERYLENE	FLUORENE	PHENAN-THRENE	DIBENZ-(A,H)AN-THRACENE	INDENO-(1,2,3-CD)-PYRENE	PYRENE
IPGW02A01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW03A01	DIL	800 U	800 U	800 U	800 U	800 U	800 U	800 U	800 U	800 U
IPGW03A01		40 U	56	10 J	40 U	62	140	40 U	40 U	21 J
IPGW03B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW04B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW05A01		590 J	2100	830 J	1000 U	2100	4200	1000 U	1000 U	2600
IPGW05B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW05B01	DIL	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
IPGW05C01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW06A01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW06B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW15A01		20 U	5 J	20 U	20 U	9 J	11 J	20 U	20 U	20 U
IPGW18A01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW18B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW19A01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW19B01		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW2001		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW2101		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW2201		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW2201	DIL	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
IPGW5001		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW5101		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPGW5201		10 U	10 U	10 U	10 U	10 U	45	10 U	10 U	10 U

SAMPLE NUMBER IPGWC305 Clay Pipe Water Sample
SS

4-METHYLPHENOL	10 U	1,2,4-TRICHLOROBENZENE	10 U	BIS(2-ETHYLHEXYL)PHTHALATE	10 U
BENZOIC ACID	50 U	HEXACHLOROBENZENE	10 U	BUTYLBENZYLPHTHALATE	10 U
2-METHYLPHENOL	10 U	HEXACHLOROETHANE	10 U	DI-N-BUTYLPHTHALATE	10 U
2,4,5-TRICHLOROPHENOL	50 U	BIS(2-CHLOROETHYL)ETHER	10 U	DI-N-OCTYLPHTHALATE	10 U
4-NITROANILINE	50 U	2-CHLORONAPHTHALENE	10 U	DIETHYLPHTHALATE	10 U
BENZYL ALCOHOL	10 U	1,2-DICHLOROBENZENE	10 U	DIMETHYLPHTHALATE	10 U
4-CHLOROANILINE	10 U	1,3-DICHLORPBENZENE	10 U	BENZO(A)ANTHRACENE	1 JX
DIBENZOFURAN	10 U	1,4-DICHLOROBENZENE	10 U	BENZO(A)PYRENE	10 U
2-NITROANALINE	50 U	3,3-DICHLOROBENZIDINE	20 U	BENZO(B)FLUORANTHENE	10 U
2-METHYLNAPHTHALENE	8 J	2,4-DINITROTOLUENE	10 U	BENZO(K)FLUORANTHENE	10 U
3-NITROANILINE	50 U	2,6-DINITROTOLUENE	10 U	CHRYSENE	2 J
2,4,6-TRICHLOROPHEN	10 U	FLUORANTHENE	10 U	ACENAPHTHYLENE	3 J
4-CHLORO-3-METHYLPHENOL	10 U	4-CHLOROPHENYL-PHENYLETHER	10 U	ANTHRACENE	5 J
2-CHLOROPHENOL	10 U	4-BROMOPHENYL-PHENYLETHER	10 U	BENZO(G,H,I)PERYLENE	10 U
2,4-DICHLOROPHENOL	10 U	BIS(2-CHLOROISOPROPYL)ETHER	10 U	FLUORENE	8 JX
2,4-DIMETHYLPHENOL	10 U	BIS(2-CHLOROETHOXY)METHANE	10 U	PHENANTHRENE	51
2-NITROPHENOL	10 U	HEXACHLOROBUTADIENE	10 U	DIBENZ(A,H)ANTHRACENE	10 U
4-NITROPHENOL	50 U	HEXACHLOROCHCLOPENTADIENE	10 U	INDENO(1,2,3-CD)PYRENE	10 U
2,4-DINITROPHENOL	50 U	ISOPHORONE	10 U	PYRENE	6 J
4,6-DINITRO-2-METHYLPHENOL	50 U	NAPHTHALENE	10 U		
PENTACHLOROPHENOL	13 J	NITROBENZENE	10 U		
PHENOL	10 U	N-NITROSODIPHENYLAMINE	10 U		
ACENAPHTHENE	10 U	N-NITROSO-DI-N-PROPYLAMINE	10 U		

VOLATILES ANALYSIS (ug/L)

SAMPLE NUMBER	SS	BENZENE	CARBON TETRA-CHLORIDE	CHLORO-BENZENE	1,2-DI-CHLORO-ETHANE	1,1,1-TRI-CHLORO-ETHANE	1,1-DI-CHLORO-ETHANE	1,1,2-TRI-CHLORO-ETHANE	1,1,2,2-TETRA-CHLORO-ETHANE	CHLORO-ETHANE	1,2-DI-CHLORO-ETHENE	ACETONE	CARBON DISULFIDE
IPGW02A01		500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	1000 U	500 U	1000 U	500 U
IPGW03A01		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPGW03B01		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	8 BJ	5 U
IPGW04B01		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPGW05A01		25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	50 U	25 U	50 U	25 U
IPGW05B01		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPGW05C01		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPGW06A01		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPGW06B01		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPGW15A01		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPGW18A01		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPGW18B01		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPGW19A01		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPGW19B01		50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	100 U	50 U	100 U	50 U
IPGW2001		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPGW2101		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPGW2201		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPGW5001		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPGW5101		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPGW5201		5 U	8	5 U	5 U	5 U	66	19	5 U	10 U	28	10 U	57
IPGWTB01		16	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U

SAMPLE NUMBER	SS	2-BUTANONE	TOTAL XYLENES	CHLORO-FORM	1,1-DI-CHLORO-ETHENE	1,2-DI-CHLORO-PROPANE	TRANS-1,3-DI-CHLORO-PROPANE	CIS-1,3-DI-CHLORO-PROPANE	ETHYL-BENZENE	METHYLENE CHLORIDE	CHLORO-METHANE	BROMO-METHANE	BROMO-FORM
IPGW02A01		1000 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	290 BJ	1000 U	1000 U	500 U
IPGW03A01		10 U	1 JX	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPGW03B01		10 U	5 U	3 J	5 U	5 U	5 U	5 U	5 U	3 BJ	10 U	10 U	5 U
IPGW04B01		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	3 BJ	10 U	10 U	5 U
IPGW05A01		50 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	50 U	50 U	25 U
IPGW05B01		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	4 BJ	10 U	10 U	5 U
IPGW05C01		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	3 J	10 U	10 U	5 U
IPGW06A01		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	3 BJ	10 U	10 U	5 U
IPGW06B01		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	3 BJ	10 U	10 U	5 U
IPGW15A01		10 U	5 U	5 U	5 U	5 U	5 U	5 U	2 J	4 BJ	10 U	10 U	5 U
IPGW18A01		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPGW18B01		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	4 BJ	10 U	10 U	5 U
IPGW19A01		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPGW19B01		100 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	23 BJ	100 U	100 U	50 U
IPGW2001		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	3 BJ	10 U	10 U	5 U
IPGW2101		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	4 BJ	10 U	10 U	5 U
IPGW2201		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	3 BJ	10 U	10 U	5 U
IPGW5001		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	4 BJ	10 U	10 U	5 U
IPGW5101		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	4 BJ	10 U	10 U	5 U
IPGW5201		10 U	27	2 J	5 U	5 U	5 U	5 U	5 U	47 B	10 U	10 U	5 U
IPGWTB01		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	9 B	10 U	10 U	5 U

SAMPLE NUMBER	SS	BROMODICHLOROMETHANE	DIBROMOCHLOROMETHANE	1,1,2,2-TETRACHLOROETHANE	TOLUENE	TRICHLOROETHANE	VINYL CHLORIDE	STYRENE	VINYL ACETATE	METHYLISOBUTYLKETONE	2-HEXANONE
IPGW02A01		500 U	500 U	500 U	500 U	500 U	1000 U	500 U	1000 U	1000 U	1000 U
IPGW03A01		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPGW03B01		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPGW04B01		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPGW05A01		25 U	25 U	25 U	9 J	25 U	50 U	25 U	50 U	50 U	50 U
IPGW05B01		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPGW05C01		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPGW06A01		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPGW06B01		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPGW15A01		5 U	5 U	5 U	1 J	5 U	10 U	5 U	10 U	10 U	10 U
IPGW18A01		5 U	5 U	10 U	5 U	5 U	10 U	5 U	10 U	5 U	10 U
IPGW18B01		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPGW19A01		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPGW19B01		50 U	50 U	50 U	50 U	50 U	100 U	50 U	100 U	100 U	100 U
IPGW2001		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPGW2101		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPGW2201		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPGW5001		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPGW5101		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPGW5201		5 U	7	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPGWTB01		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U

SAMPLE IPGWC305 Clay Pipe Water Sample
SS

BENZENE	5 U	BROMOMETHANE	10 U
CARBON TETRACHLORIDE	5 U	BROMOFORM	5 U
CHLOROBENZENE	5 U	BROMODICHLOROMETHANE	5 U
1,2-DICHLOROETHANE	5 U	DIBROMOCHLOROMETHANE	5 U
1,1,1-TRICHLOROETHANE	5 U	1,1,2,2-TETRACHLOROETHANE	5 U
1,1-DICHLOROETHANE	5 U	TOLUENE	5 U
1,1,2-TRICHLOROETHANE	5 U	TRICHLOROETHENE	5 U
1,1,2,2-TETRACHLORETHANE	5 U	VINYL CHLORIDE	10 U
CHLOROETHANE	10 U	STYRENE	5 U
CHLOROFORM	5 U	VINYL ACETATE	10 U
1,1-DICHLOROETHENE	5 U	METHYLISOBUTYLKETONE	10 U
1,2-DICHLOROPROPANE	5 U	2-HEXANONE	10 U
TRANS-1,3-DICHLOROPROPANE	5 U	1,2-DICHLOROETHENE	5 U
CIS-1,3-DICHLOROPROPANE	5 U	ACETONE	10 U
ETHYLBENZENE	5 U	CARBON DISULFIDE	5 U
METHYLENE CHLORIDE	5 U	2-BUTANONE	10 U
CHLOROMETHANE	10 U	XYLENES (TOTAL)	5 U

TRACE METALS ANALYSIS (ug/L)

SAMPLE NUMBER	SS	ALUMINUM	ARSENIC	BARIUM	CADMIUM	CHROMIUM	COPPER	IRON	LEAD	MANGANESE	MERCURY	NICKEL
IPGW02A01		128 B	8.5 B	271	3.0 U	5.0 U	2.0 U	7950	2.0 U	799	0.20 U	15.0 U
IPGW03A01		113 B	2.0 U	128 B	3.0 U	5.0 U	2.7 B	281	2.0 U	408	0.20 U	15.0 U
IPGW03B01		115 B	2.0 U	128 B	3.0 U	5.0 U	3.5 B	24.2	2.0 U	1.2 B	0.20 U	15.0 U
IPGW04B01		95.4 B	2.0 U	118 B	3.0 U	5.0 U	2.6 B	15.0 U	2.0 U	730	0.20 U	17.3 B
IPGW05A01		108 B	2.1 B	339	3.5 B	5.0 U	7.9 B	47.4 B	2.0 U	1850	0.20 U	15.0 U
IPGW05B01		83.8 B	2.0 U	278	3.0 U	5.0 U	4.4 B	27.4 B	2.0 U	193	0.20 U	15.0 U
IPGW05C01		94.0 B	2.1 B	98.2 B	3.0 U	5.0 U	2.6 B	15.0 U	2.0 B	73.6	0.20 U	15.0 U
IPGW06A01		106 B	2.0 U	128 B	3.0 U	5.0 U	5.2 B	17.4 B	2.0 U	1.8 B	0.20 U	15.0 U
IPGW06B01		105 B	2.0 U	98.2 B	3.0 U	5.0 U	3.5 B	18.9 B	2.0 U	2.1 B	0.20 U	15.0 U
IPGW15A01		130 B	5.3 BW	359	3.0 U	5.6 B	4.2 B	5680	2.0 U	2700	0.20 U	19.8 B
IPGW18A01		119 B	2.0 U	103 B	3.0 U	5.0 U	7.0 B	15.0 U	2.0 U	6.2 B	0.20 U	15.0 U
IPGW18B01		119 B	2.0 U	87.5 B	3.0 U	5.0 U	6.1 B	17.4 B	10.3 W	5.0 B	0.20 U	15.0 U
IPGW19A01		105 B	2.0 U	128 B	3.0 U	5.0 U	2.0 U	20.6 B	2.0 UW	52.1	0.20 U	15.0 U
IPGW19B01		95.8 B	2.0 U	127 B	3.0 U	5.0 U	7.0 B	26.0 B	2.0 U	125	0.20 U	15.0 U
IPGW2001		63.1 B	2.0 U	128 B	3.0 U	5.0 U	4.4 B	15.0 U	2.0 U	7.1 B	0.20 U	15.0 U
IPGW2101		90.9 B	2.0 U	126 B	3.0 U	5.0 U	2.6 B	26.9 B	2.0 U	125	0.20 U	15.0 U
IPGW2201		114 B	2.0 U	164 B	3.0 U	5.0 U	2.0 U	15.0 U	2.0 U	142	0.20 U	15.0 U
IPGW5001		79.2 B	2.0 U	2.0 U	3.0 U	5.0 U	2.0 U	15.0 U	2.0 UW	1.0 U	0.20 U	15.0 U
IPGW5101		107 B	2.0 U	2.0 U	3.5 B	5.0 U	2.0 U	15.0 U	2.0 UW	1.1 B	0.20 U	15.0 U
IPGW5201		686	195 S	231	57.5	204	248	590	248	430	189	110

SAMPLE NUMBER	SS	ANTIMONY	SELENIUM	SILVER	BERYLLIUM	THALLIUM	VANADIUM	COBALT	ZINC
IPGW02A01		17.0 U	3.0 UJW	3.0 U	1.0 U	4.0 U	7.5 B	3.1 B	26.2
IPGW03A01		17.0 U	3.0 UJW	3.0 U	1.0 U	4.0 U	3.0 U	3.2 B	15.0 B
IPGW03B01		17.0 U	3.0 UJW	3.0 U	1.0 U	4.0 U	3.0 U	3.0 U	9.7 B
IPGW04B01		17.0 U	3.0 UJW	3.0 U	1.0 U	4.0 U	3.9 B	3.0 U	22.5
IPGW05A01		17.0 U	3.0 UJW	3.0 U	1.0 U	4.0 U	7.2 B	6.7 B	47.5
IPGW05B01		17.0 U	3.0 UJW	3.0 U	1.0 U	4.0 U	3.0 U	3.0 U	7.4 B
IPGW05C01		17.0 U	3.0 UJW	3.0 U	1.0 U	4.0 U	3.9 B	3.0 U	9.0 B
IPGW06A01		17.0 U	3.0 UJW	3.0 U	1.0 U	4.0 U	4.6 B	3.0 U	8.4 B
IPGW06B01		17.0 U	3.0 UJW	3.0 U	1.0 U	4.0 U	3.0 U	3.0 U	38.0
IPGW15A01		17.0 U	3.0 UJW	3.0 U	1.0 U	4.0 U	14.5 B	10.7 B	26.3
IPGW18A01		17.0 U	3.0 UJW	3.0 U	1.0 U	4.0 U	3.0 U	3.0 U	24.1
IPGW18B01		17.0 U	3.0 UJW	3.0 U	1.0 U	4.0 U	3.0 U	3.0 U	4690
IPGW19A01		17.0 U	3.0 UJW	3.0 U	1.0 U	4.0 U	3.0 U	3.0 U	647
IPGW19B01		17.0 U	3.0 UJW	3.0 U	1.0 U	4.0 U	3.0 U	3.0 U	2560
IPGW2001		17.0 U	3.0 UJW	3.0 U	1.0 U	4.0 U	4.0 B	3.3 B	70.7
IPGW2101		17.0 U	3.0 UJW	3.0 U	1.0 U	4.0 U	15.4 B	3.0 U	108
IPGW2201		17.0 U	3.0 UJW	3.0 U	1.0 U	4.0 U	4.1 B	3.0 U	205
IPGW5001		17.0 U	3.0 UJW	3.0 U	1.0 U	4.0 U	3.0 U	3.0 U	5.4 B
IPGW5101		17.0 U	3.0 UJ	3.0 U	1.0 U	4.0 U	3.0 U	3.0 U	2.0 U
IPGW5201		58.6 B	66.1 JS	8.1 B	23.4	34.7 S	113	184	167

SAMPLE NUMBER IPGWC305 Clay Pipe Water Sample
SS

ALUMINUM	105000
COPPER	125
ANTIMONY	5.0 UJ
SELENIUM	50.0 U
ARSENIC	72.0 UJ
IRON	158000
SILVER	6.0 U
BARIUM	2120
LEAD	134
BERYLLIUM	6.2
THALLIUM	5.0 U
MANGANESE	3110
CADMIUM	5.0 UJ
MERCURY	0.20 UJ
VANADIUM	323 J
ZINC	323
CHROMIUM	194
NICKEL	186
COBALT	93.1

CONVENTIONAL PARAMETERS (Cations/Anions; mg/L)

SAMPLE NUMBER	SS	CHLORIDE	SULFATE	DISSOLVED CALCIUM	DISSOLVED MAGNESIUM	DISSOLVED POTASSIUM	DISSOLVED SODIUM
IPGW02A01		26	14	166	41.3	4.7B	19.1
IPGW03A01		44	38	118	21.1	3.98 B	25.2
IPGW03B01		48	38	96.4	22.4	4.45 B	26.0
IPGW04B01		30	35	107	26.3	5.52	17.7
IPGW05A01		106	52	145	31.9	15.3	48.6
IPGW05B01		258	43	167	37.7	5.28	69.4
IPGW05C01		46	34	103	25.9	4.70 B	17.3
IPGW06A01		12	32	91.4	23.0	4.94 B	12.9
IPGW06B01		14	27	82.3	20.1	3.64 B	11.1
IPGW15A01		66	17	137	30.0	7.39	44.0
IPGW18A01		10	32	82.3	20.3	25.4 B	13.2
IPGW18B01		12	24	71.8	18.0	34.0 B	11.4
IPGW19A01		28	34	105	25.4	35.0 B	17.8
IPGW19B01		30	41	110	27.7	38.0 B	16.7
IPGW2001		14	49	106	24.2	36.3 B	12.1
IPGW2101		32	22	104	26.6	48.2 B	18.9
IPGW2201		50	33	108	23.7	39.5 B	27.1
IPGW5001		4.0	1.24	.139 B	0.209 U	0.372 U	0.687 B
IPGW5101		2.0	3.31	.139 B	0.209 U	0.372 U	0.776 B

SAMPLE NUMBER	SS	CHLORIDE	SULFATE	DISSOLVED CALCIUM	DISSOLVED MAGNESIUM	DISSOLVED POTASSIUM	DISSOLVED SODIUM
IPGW01A02		22	30	101	22.0	4.9	15.7
IPGW01B02		22	25	84.5	20.1	4.5	13.7
IPGW02A02		26	22	155	36.4	6.7	18.5
IPGW02B02		28	69	93.0	20.8	5.8	33.7
IPGW03A02		28	43	110	20.4	5.4	25.2
IPGW03B02		32	29	84.1	18.6	5.2	24.5
IPGW04A02		42	8	132	28.9	7.4	22.4
IPGW04B02		32	31	118	25.9	5.3	18.7
IPGW05A02		62	77	142	30.7	16.8	50.7
IPGW05B02		72	35	97.1	20.3	5.0	57.3
IPGW05C02		52	33	109	25.8	5.7	16.3
IPGW06A02		12	30	92.8	22.7	6.4	12.2
IPGW06B02		16	29	89.1	22.4	4.2	11.7
IPGW07A02		42	102	114	27.4	6.7	36.0
IPGW07B02		78	140	104	23.8	6.6	61.7
IPGW08A02		38	42	121	28.8	6.2	24.6
IPGW08B02		40	47	110	26.4	6.2	29.9
IPGW09A02		110	30	130	32.1	6.0	22.7
IPGW09B02		118	34	129	32.8	5.3	22.0
IPGW09C02		52	27	109	26.6	4.8	13.1
IPGW10A02		22	38	102	24.5	8.6	12.6
IPGW10A02		42	35	102	25.0	7.6	12.0
IPGW11A02		58	34	113	26.8	5.5	17.0
IPGW12A02		36	34	109	26.0	7.1	15.0
IPGW13A02		36	30	129	31.8	5.1	19.4
IPGW14A02		64	29	117	28.9	5.6	19.6
IPGW14B02		54	34	113	26.8	4.9	19.1
IPGW15A02		56	14	160	33.6	9.3	50.3
IPGW16A02		62	71	146	37.1	5.9	40.2
IPGW16B02		42	31	121	28.1	5.1	17.2
IPGW18A02		18	24	100	20.3	3.8	12.2
IPGW18B02		14	25	87.1	18.7	4.2	11.3
IPGW19A02		42	43	124	26.0	5.4	19.3
IPGW19B02		30	36	129	27.2	4.4	14.4
IPGW2002		14	25	105	21.4	4.2	12.4
IPGW2102		38	41	117	24.7	4.5	16.6
IPGW2202		28	29	91.5	19.0	5.0	24.8

SAMPLE NUMBER	SS	CHLORIDE	SULFATE	DISSOLVED CALCIUM	DISSOLVED MAGNESIUM	DISSOLVED POTASSIUM	DISSOLVED SODIUM
IPGW01A03		21	29	97.5	23.2	5.3	15.5
IPGW01B03		22	32	86.6	21.8	6.0	16.0
IPGW02A03		24	32	129	33.8	5.0	14.7
IPGW02B03		27	72	91.9	23.6	6.4	33.0
IPGW03A03		39	78	120	23.0	5.3	18.9
IPGW03B03		41	32	102	22.7	5.5	25.5
IPGW04A03		40	26	125	29.4	7.0	21.6
IPGW04B03		29	34	112	24.8	5.8	18.1
IPGW05A03		47	24	114	25.8	5.5	23.6
IPGW05B03		42	30	97.5	22.0	5.1	34.2
IPGW05C03		49	31	106	26.9	5.2	16.1
IPGW06A03		13	26	90.8	21.9	5.7	11.6
IPGW06B03		13	24	84.0	21.2	4.6	11.5
IPGW07A03		51	148	128	27.9	6.1	34.7
IPGW07B03		124	105	114	23.1	6.8	56.2
IPGW08A03		76	36	127	27.4	5.2	23.6
IPGW08B03		95	47	108	23.3	6.2	29.7
IPGW09A03		113	34	147	33.1	6.2	17.5
IPGW09B03		111	34	145	27.9	6.0	10.6
IPGW09C03		67	30	124	29.4	5.5	13.8
IPGW10A03		16	29	108	23.0	7.7	11.9
IPGW10B03		16	30	107	22.7	9.7	12.4
IPGW11A03		20	29	116	23.7	5.4	17.0
IPGW12A03		24	31	110	23.3	6.8	14.6
IPGW13A03		62	29	138	29.7	4.1	20.8
IPGW14A03		53	29	124	24.9	5.6	20.1
IPGW14B03		43	29	106	23.9	5.0	19.0
IPGW15A03		41	30	110	24.3	8.3	38.6
IPGW16A03		54	79	132	34.6	6.0	37.2
IPGW16B03		71	33	127	31.0	5.6	17.8
IPGW18A03		17	32	85.1	20.2	4.2	11.1
IPGW18B03		13	25	76.8	18.8	4.2	10.9
IPGW18C03		9.0	19	63.2	15.1	4.7	12.1
IPGW19A03		25	37	128	29.9	5.6	18.6
IPGW19B03		31	38	120	29.9	5.0	6.7
IPGW2003		16	28	97.2	21.8	4.1	11.8
IPGW2103		31	40	108	26.6	4.6	16.8
IPGW2203		42	27	99.3	21.3	5.1	25.8
IPGW23A03		29	32	116	23.6	6.0	24.8

SAMPLE NUMBER	SS	CHLORIDE	SULFATE	DISSOLVED CALCIUM	DISSOLVED MAGNESIUM	DISSOLVED POTASSIUM	DISSOLVED SODIUM
IPGW23B03		29	35	112	23.4	5.9	25.3
IPGW23C03		35	53	125	24.1	10.0	46.7
IPGW24A103		107	34	113	24.9	5.1	21.4
IPGW24A203		49	35	117	25.6	5.2	22.3
IPGW24B03		36	42	108	23.8	6.2	27.3
IPGW25A03		75	37	128	32.0	5.7	18.8
IPGW25B03		83	32	124	31.0	5.6	18.1
IPGW26A03		53	43	114	24.8	4.8	15.8
IPGW26B03		57	35	122	26.3	5.5	16.4
IPGW26C03		49	35	120	26.0	5.3	14.7
IPGW27A03		57	32	131	28.3	6.0	16.6
IPGW27B03		63	30	127	27.4	5.5	17.0
IPGW2803		14	63	80.9	19.8	3.4	17.4
IPGWRES023		13	26	86.5	21.5	2.6	11.4
IPGWRES043		15	31	96.8	25.4	6.2	11.5
IPGWRES083		26	29	117	25.8	4.7	13.5
IPGWRES083		23	32	105	26.4	2.3	14.4
IPGWRES093		9.0	48	79.3	20.8	3.9	10.9
IPGWRES103		47	56	128	30.6	5.4	19.4

SAMPLE NUMBER	SS	CHLORIDE	SULFATE	DISSOLVED CALCIUM	DISSOLVED MAGNESIUM	DISSOLVED POTASSIUM	DISSOLVED SODIUM
IPGW01A04		70	35	84.6	20.7	4.99	15.8
IPGW01B04		54	31	84.9	20.9	5.24	15.2
IPGW02A04		18	28	110	27.7	5.72	18.3
IPGW02B04		30	66	72.4	19.1	6.29	32.5
IPGW03A04		34	36	86.6	17.0	4.25	24.8
IPGW03B04		40	33	78.8	18.5	5.11	25.4
IPGW04A04		50	14	103	28.8	7.87	25.1
IPGW04B04		30	32	84.9	21.1	5.17	17.4
IPGW05A04		39	24	99.0	22.7	11.4	45.5
IPGW05B04		88	34	89.6	19.9	4.98	29.8
IPGW05C04		30	30	90.2	22.8	5.28	16.8
IPGW06A04		12	25	73.9	17.6	5.29	11.0
IPGW06B04		14	26	69.4	17.2	4.23	11.1
IPGW07A04		62	48	93.9	23.5	5.32	32.4
IPGW07B04		40	91	87.3	20.8	6.11	49.2
IPGW08A04		40	42	101	25.0	4.58	22.9
IPGW08B04		30	41	88.0	21.5	5.72	28.5
IPGW09A04		46	36	104	25.9	5.16	22.1
IPGW09B04		88	26	104	25.2	5.43	23.4
IPGW09C04		75	26	101	25.2	5.42	14.2
IPGW10A04		20	28	79.7	19.8	7.78	11.4
IPGW10B04		30	26	75.0	18.7	6.62	11.4
IPGW11A04		36	37	91.1	21.7	4.61	16.9
IPGW12A04		10	27	90.0	21.9	5.93	14.5
IPGW13A04		40	30	103	26.3	3.28	19.6
IPGW14A04		54	24	85.3	20.6	4.66	19.1
IPGW14B04		54	26	83.9	19.8	4.91	19.6
IPGW15A04		46	24	97.3	21.5	7.85	37.4
IPGW16A04		30	61	90.0	24.9	6.36	30.7
IPGW16B04		69	36	101	25.4	4.91	18.2
IPGW18A04		14	27	71.3	17.3	4.14	10.8
IPGW18B04		30	24	66.4	16.4	4.12	10.6
IPGW18C04		10	14	52.3	12.8	4.64	10.4
IPGW19A04		20	32	83.5	19.9	4.16	16.5
IPGW19B04		30	33	92.6	23.0	4.65	13.4
IPGW2004		<1.0	30	80.1	18.6	3.60	11.5
IPGW2104		26	40	85.5	21.3	4.90	17.5
IPGW2204		42	35	79.9	17.4	4.69	25.3
IPGW23A04		30	28	86.2	20.9	5.11	24.9

SAMPLE NUMBER	SS	CHLORIDE	SULFATE	DISSOLVED CALCIUM	DISSOLVED MAGNESIUM	DISSOLVED POTASSIUM	DISSOLVED SODIUM
IPGW23B04		14	31	82.3	19.8	5.26	24.0
IPGW23C04		30	58	83.2	21.8	5.17	26.0
IPGW24A104		32	41	92.8	22.6	4.17	20.3
IPGW24A204		34	40	89.0	22.1	4.15	21.0
IPGW24B04		30	41	81.6	19.9	5.83	26.7
IPGW25A04		76	39	101	25.9	4.88	18.2
IPGW25B04		72	31	99.7	24.7	5.46	17.6
IPGW26A04		48	41	87.1	21.7	4.11	17.6
IPGW26B04		45	30	89.7	22.4	4.86	15.7
IPGW26C04		50	32	89.6	22.3	5.04	16.4
IPGW27A04		66	35	101	25.0	5.19	16.0
IPGW27B04		80	28	101	25.2	5.25	16.4
IPGW28B04		10	62	64.4	18.1	2.98	17.3
IPGWRES014		10					
IPGWRES024		16					
IPGWRES034		50					
IPGWRES044		<1.0					
IPGWRES054		10					
IPGWRES064		<1.0					
IPGWRES074		10					
IPGWRES084		32					
IPGWRES094		10					
IPGWRES104		58	46	103	25.8	4.44	18.2

SAMPLE NUMBER	SS	CHLORIDE	SULFATE	DISSOLVED CALCIUM	DISSOLVED MAGNESIUM	DISSOLVED POTASSIUM	DISSOLVED SODIUM
IPGW18C05		4	14	52.1	13.4	4.8	10.1
IPGW23A05		27	34	92.7	23.3	5.8	25.2
IPGW23B05		30	37	86.3	21.7	5.8	24.7
IPGW23C05		31	61	96.9	26.5	6.3	24.9
IPGW24A105		35	46	110	28.0	5.5	23.7
IPGW24A205		44	46	107	27.6	5.6	24.3
IPGW24B05		33	39	93.6	24.1	6.5	27.8
IPGW25A05		75	77	122	33.6	6.2	22.3
IPGW25B05		62	30	100	26.0	5.1	15.9
IPGW26A05		42	41	106	27.1	5.1	17.9
IPGW26B05		52	29	96.8	25.3	4.9	13.5
IPGW26C05		50	32	101	26.4	6.0	17.2
IPGW27A05		45	39	105	27.3	6.7	18.9
IPGW27B05		55	32	99.7	26.3	5.6	16.9
IPGW28B05		15	76	72.6	21.8	3.2	17.4
IPGWRES015		13					
IPGWRES025		25					
IPGWRES035		23					
IPGWRES045		15					
IPGWRES055		15					
IPGWRES065		17					
IPGWRES075		18					
IPGWRES085		50					
IPGWRES095		15					

SAMPLE NUMBER	SS	CHLORIDE	SULFATE	DISSOLVED CALCIUM	DISSOLVED MAGNESIUM	DISSOLVED POTASSIUM	DISSOLVED SODIUM
IPGW29C06		25	33	113	27.5	3.99	8.78
IPGW29D06		24	30	116	26.8	4.27	8.15

FIELD PARAMETERS

SURVEY	STATION	TEMP	pH	EC
IP GW01	IPGW02A	13.3	6.78	1065
IP GW01	IPGW03A	12.0	6.84	732
IP GW01	IPGW03B	8.7	7.18	814
IP GW01	IPGW04B	10.3	7.09	789
IP GW01	IPGW05A	8.6	6.79	1074
IP GW01	IPGW05B	9.2	7.05	1370
IP GW01	IPGW05C	11.9	7.20	711
IP GW01	IPGW06A	8.4	7.26	696
IP GW01	IPGW06B	9.3	7.2	653
IP GW01	IPGW15A	9.5	6.45	1006
IP GW01	IPGW18A	8.2	7.17	630
IP GW01	IPGW18B	9.2	7.25	586
IP GW01	IPGW19A	7.4	7.09	820
IP GW01	IPGW19B	9.3	7.37	878
IP GW01	IPGW20	9.2	7.04	807
IP GW01	IPGW21	8.9	7.29	820
IP GW01	IPGW22	8.8	7.18	837

SURVEY	STATION	TEMP	pH	EC
IP GW02	IPGW01A	6.8	7.15	517
IP GW02	IPGW01B	11.6	7.19	467
IP GW02	IPGW02A	17.3	6.70	934
IP GW02	IPGW02B	11.4	7.30	718
IP GW02	IPGW03A	20.5	6.79	539
IP GW02	IPGW03B	14.1	7.10	386
IP GW02	IPGW04A	12.0	6.70	814
IP GW02	IPGW04B	9.6	7.06	682
IP GW02	IPGW05A	*	*	*
IP GW02	IPGW05B	10.0	7.05	810
IP GW02	IPGW05C	14.4	7.05	740
IP GW02	IPGW06A	17.1	7.21	400
IP GW02	IPGW06A	10.1	7.25	586
IP GW02	IPGW07A	12.9	7.27	867
IP GW02	IPGW07B	9.6	7.14	872
IP GW02	IPGW08A	14.6	7.05	795
IP GW02	IPGW08B	10.4	7.18	759
IP GW02	IPGW09A	10.4	6.93	891
IP GW02	IPGW09B	10.0	7.12	909
IP GW02	IPGW09C	10.3	7.23	718
IP GW02	IPGW10A	13.9	7.17	063
IP GW02	IPGW10B	13.6	7.22	575
IP GW02	IPGW11A	17.5	7.03	679
IP GW02	IPGW12A	16.4	7.03	562
IP GW02	IPGW13A	12.1	7.02	808
IP GW02	IPGW14B	10.3	6.96	746
IP GW02	IPGW15A	10.1	6.28	1073
IP GW02	IPGW16A	12.1	7.17	1000
IP GW02	IPGW16B	8.9	7.21	790
IP GW02	IPGW18A	10.4	6.94	618
IP GW02	IPGW18B	10.3	7.13	560
IP GW02	IPGW19A	13.4	7.06	840
IP GW02	IPGW19B	10.9	7.25	792
IP GW02	IPGW20	9.7	6.99	566
IP GW02	IPGW21	9.5	7.25	684
IP GW02	IPGW22	10.7	6.93	643
IP GW02	IPGWRES01	19.5	7.30	410
IP GW02	IPGWRES02	19.9	7.18	597
IP GW02	IPGWRES03	19.9	7.18	680
IP GW02	IPGWRES04	16.3	7.16	390
IP GW02	IPGWRES05	14.1	7.09	960

SURVEY	STATION	TEMP	pH	EC
IP GW02	IPGWRES06	10.3	7.33	770
IP GW02	IPGWRES07	15.6	7.44	504
IP GW02	IPGWRES08	17.7	7.10	646
IP GW02	IPGWRES09	13.8	7.25	548
IP GW02	IPGWRES10	20.4	7.14	670

SURVEY	STATION	TEMP	pH	EC
IP GW03	IPGW01A	11.8	7.19	319
IP GW03	IPGW01B	11.5	7.20	270
IP GW03	IPGW02A	12.6	6.91	430
IP GW03	IPGW02B	10.4	7.39	360
IP GW03	IPGW03B	11.3	7.23	472
IP GW03	IPGW04A	10.6	6.98	380
IP GW03	IPGW04B	9.6	7.19	350
IP GW03	IPGW05B	11.2	7.01	499
IP GW03	IPGW05C	10.6	7.17	511
IP GW03	IPGW06A	10.5	7.25	240
IP GW03	IPGW06B	10.9	7.30	240
IP GW03	IPGW07A	9.0	7.18	626
IP GW03	IPGW07B	9.3	7.20	643
IP GW03	IPGW07B	9.3	7.20	643
IP GW03	IPGW08A	9.0	7.02	601
IP GW03	IPGW08B	10.1	7.26	576
IP GW03	IPGW08B	10.1	7.26	576
IP GW03	IPGW09A	9.5	6.94	662
IP GW03	IPGW09B	10.0	7.08	640
IP GW03	IPGW09C	9.7	7.26	533
IP GW03	IPGW10A	10.9	7.17	323
IP GW03	IPGW10B	10.8	7.21	331
IP GW03	IPGW11A	10.0	7.11	493
IP GW03	IPGW12A	10.1	7.15	342
IP GW03	IPGW13A	9.1	7.11	630
IP GW03	IPGW14B	9.6	6.69	472
IP GW03	IPGW15A	12.0	6.71	561
IP GW03	IPGW16A	9.4	7.12	686
IP GW03	IPGW16B	11.1	7.14	631
IP GW03	IPGW18A	10.5	7.35	340
IP GW03	IPGW18B	10.0	7.45	270
IP GW03	IPGW18C	9.7	7.48	240
IP GW03	IPGW19A	9.9	7.18	430
IP GW03	IPGW19B	9.4	7.27	420
IP GW03	IPGW20	9.5	7.15	290
IP GW03	IPGW21	9.7	7.32	350
IP GW03	IPGW22	13.3	7.06	476
IP GW03	IPGW23A	10.2	6.68	483
IP GW03	IPGW23B	10.4	6.74	462
IP GW03	IPGW23C	10.3	7.01	491
IP GW03	IPGW24A1	9.4	7.19	588

SURVEY	STATION	TEMP	pH	EC
IP GW03	IPGW24A2	9.3	7.18	608
IP GW03	IPGW24B	9.0	7.36	623
IP GW03	IPGW25A	9.1	7.14	652
IP GW03	IPGW25B	9.1	7.17	655
IP GW03	IPGW25B	9.1	7.17	655
IP GW03	IPGW26A	9.9	7.10	510
IP GW03	IPGW26B	9.0	7.19	510
IP GW03	IPGW26C	9.3	7.20	506
IP GW03	IPGW27A	8.3	7.22	543
IP GW03	IPGW27B	9.0	7.26	593
IP GW03	IPGW28B	11.2	7.39	319
IP GW03	IPGWRES01	9.5	7.26	592
IP GW03	IPGWRES02	9.1	7.40	438
IP GW03	IPGWRES03	10.7	7.22	494
IP GW03	IPGWRES03	10.7	7.22	494
IP GW03	IPGWRES04	10.7	7.14	444
IP GW03	IPGWRES06	11.1	7.01	380
IP GW03	IPGWRES07	9.7	7.57	378
IP GW03	IPGWRES08	9.2	7.32	465
IP GW03	IPGWRES08A	9.6	7.21	451
IP GW03	IPGWRES09	10.3	7.45	361
IP GW03	IPGWRES10	9.8	6.76	556

SURVEY	STATION	TEMP	pH	EC
IP GW04	IPGW01A	9.1	7.40	649
IP GW04	IPGW01B	9.9	7.47	668
IP GW04	IPGW02A	11.7	7.12	716
IP GW04	IPGW02B	10.8	7.71	564
IP GW04	IPGW03A	5.4	7.17	687
IP GW04	IPGW03B	8.4	7.34	686
IP GW04	IPGW04A	8.6	6.79	610
IP GW04	IPGW04B	10.3	7.34	484
IP GW04	IPGW05B	11.2	7.21	804
IP GW04	IPGW05C	11.1	7.41	773
IP GW04	IPGW06A	7.3	7.51	407
IP GW04	IPGW06B	10.0	7.46	453
IP GW04	IPGW07A	7.7	7.29	702
IP GW04	IPGW07B	9.0	7.33	731
IP GW04	IPGW07B	9.0	7.33	731
IP GW04	IPGW08A	5.6	7.12	728
IP GW04	IPGW08B	9.2	7.28	670
IP GW04	IPGW08B	9.2	7.28	670
IP GW04	IPGW09A	6.1	6.84	731
IP GW04	IPGW09B	9.4	7.23	732
IP GW04	IPGW09C	9.7	7.34	730
IP GW04	IPGW10A	7.3	7.31	434
IP GW04	IPGW10B	8.7	7.23	380
IP GW04	IPGW11A	6.7	7.15	661
IP GW04	IPGW12A	5.7	7.43	383
IP GW04	IPGW13A	5.5	7.19	771
IP GW04	IPGW14A	7.6	7.12	749
IP GW04	IPGW14B	8.9	7.15	755
IP GW04	IPGW15A	10.5	6.86	847
IP GW04	IPGW16A	4.2	7.03	710
IP GW04	IPGW16B	6.4	6.99	769
IP GW04	IPGW18A	8.6	7.34	516
IP GW04	IPGW18B	9.0	7.40	513
IP GW04	IPGW18C	8.9	7.81	446
IP GW04	IPGW19A	6.1	7.52	590
IP GW04	IPGW19B	10.4	7.42	599
IP GW04	IPGW20	7.6	7.53	532
IP GW04	IPGW21	9.2	7.51	596
IP GW04	IPGW22	9.3	7.45	697
IP GW04	IPGW23A	7.9	7.30	664
IP GW04	IPGW23B	9.5	7.21	635

SURVEY	STATION	TEMP	pH	EC
IP GW04	IPGW23C	10.2	7.41	705
IP GW04	IPGW24A1	6.8	7.21	631
IP GW04	IPGW24A2	7.1	7.07	658
IP GW04	IPGW24B	9.5	7.14	685
IP GW04	IPGW25A	6.6	7.31	802
IP GW04	IPGW25B	8.1	7.38	771
IP GW04	IPGW25B	8.1	7.38	771
IP GW04	IPGW26A	6.9	7.00	680
IP GW04	IPGW26B	8.5	7.04	687
IP GW04	IPGW26C	8.0	6.93	742
IP GW04	IPGW27A	5.6	7.12	759
IP GW04	IPGW27B	8.4	7.94	764
IP GW04	IPGW28B	7.7	7.58	372
IP GW04	IPGWRES01	9.0	7.43	527
IP GW04	IPGWRES02	8.1	7.7	450
IP GW04	IPGWRES03	10.3	7.45	590
IP GW04	IPGWRES03	10.3	7.45	590
IP GW04	IPGWRES04	8.8	7.66	517
IP GW04	IPGWRES05	9.4	7.37	552
IP GW04	IPGWRES06	9.7	7.42	548
IP GW04	IPGWRES07	8.0	8.09	424
IP GW04	IPGWRES08	8.8	7.31	634
IP GW04	IPGWRES09	9.6	8.02	482
IP GW04	IPGWRES10	4.6	7.18	754

SURVEY	STATION	TEMP	pH	EC
IP GW05	IPGW18C	10.9	7.59	254
IP GW05	IPGW23A	11.0	7.00	532
IP GW05	IPGW23B	12.0	7.18	442
IP GW05	IPGW23C	12.4	7.18	472
IP GW05	IPGW24A1	8.7	7.07	796
IP GW05	IPGW24A2	8.7	7.10	737
IP GW05	IPGW24B	9.4	7.22	671
IP GW05	IPGW25A	8.7	7.29	861
IP GW05	IPGW25B	9.6	7.26	711
IP GW05	IPGW26A	9.1	7.26	702
IP GW05	IPGW26B	9.3	7.24	711
IP GW05	IPGW26C	9.7	7.62	693
IP GW05	IPGW27A	9.7	7.18	541
IP GW05	IPGW27B	10.9	7.14	576
IP GW05	IPGW28B	9.5	7.24	388
IP GW05	IPGWRES01	12.6	7.28	348
IP GW05	IPGWRES02	12.1	7.24	446
IP GW05	IPGWRES03	16.1	7.10	392
IP GW05	IPGWRES04	14.6	7.18	367
IP GW05	IPGWRES05	12.8	7.18	381
IP GW05	IPGWRES06	13.1	7.21	352
IP GW05	IPGWRES07	11.4	7.60	355
IP GW05	IPGWRES08	11.5	7.29	504
IP GW05	IPGWRES09	12.4	7.25	336

SURVEY	STATION	TEMP	pH	EC
IP GW06	IPGW29C	13.6	7.25	881
IP GW06	IPGW29D	10.5	7.46	713

SURFACE WATER ANALYTICAL DATA

SW01A - Sample Number

SW/ID - Surface Water or Intermittent Ditch

01 - Surface Water Station (SW01 through 11); Intermittent Ditch Station (ID 01 through 10); QA/QC (11 through 13 and 15; blank, rinsate duplicate, trip blank)

A - Sample round
  A - April 1990
  B - September 1990
  C - February 1991

D - Field Duplicate Indicator

PHENOLS ANALYSIS (ug/L; Method 8040)

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPID06B		2.95 U	2.95 U	2.95 U	29.5 U	12.5 U	6.0 U	6.0 U	2.95 U	10.0 U	2.95 U		
IPID08B		2.95 U	2.95 U	2.95 U	29.5 U	12.5 U	6.0 U	6.0 U	2.95 U	10.0 U	2.95 U		
IPSW01B		2.95 U	2.95 U	2.95 U	29.5 U	12.5 U	6.0 U	6.0 U	2.95 U	10.0 U	2.95 U		
IPSW02B		2.95 U	2.95 U	2.95 U	29.5 U	12.5 U	6.0 U	6.0 U	2.95 U	10.0 U	2.95 U		
IPSW04B		2.95 U	2.95 U	2.95 U	29.5 U	12.5 U	6.0 U	6.0 U	2.95 U	10.0 U	2.95 U		
IPSW05B		2.95 U	2.95 U	2.95 U	29.5 U	12.5 U	6.0 U	6.0 U	2.95 U	10.0 U	2.95 U		
IPSW06B		2.95 U	2.95 U	2.95 U	29.5 U	12.5 U	6.0 U	6.0 U	2.95 U	10.0 U	2.95 U		
IPSW07B		2.95 U	2.95 U	2.95 U	29.5 U	12.5 U	6.0 U	6.0 U	2.95 U	10.0 U	2.95 U		
IPSW10B		2.95 U	2.95 U	2.95 U	29.5 U	12.5 U	6.0 U	6.0 U	2.95 U	10.0 U	2.95 U		
IPSW11B		2.95 U	2.95 U	2.95 U	29.5 U	12.5 U	6.0 U	6.0 U	2.95 U	10.0 U	2.95 U		

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPID06B		10 U						
IPID08B		10 U						
IPSW01B		10 U						
IPSW02B		10 U						
IPSW04B		10 U						
IPSW05B		10 U						
IPSW06B		10 U						
IPSW07B		10 U						
IPSW10B		10 U						
IPSW11B		10 U						

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPSW01C		0.2 U	0.2 U	0.2 U	1 U	0.6 U	0.2 U	1 U	1 U	0.2 UX	0.6 U		
IPSW02C		0.2 U	0.2 U	0.2 U	1 U	.66	0.2 U	.48	1 U	0.2 UX	0.6 U		
IPSW03C		0.2 U	0.2 U	0.2 U	1 U	0.6 U	0.2 U	1 U	1 U	0.2 UX	0.6 U		
IPSW04C		0.2 U	0.2 U	0.2 U	1 U	0.6 U	0.2 U	1 U	1 U	0.2 UX	.36		
IPSW05C		0.2 U	0.2 U	0.2 U	1 U	0.6 U	0.2 U	1 U	1 U	0.2 UX	0.6 U		
IPSW05C		0.2 U	0.2 U	0.2 U	1 U	.74 J	0.2 U	1 U	1 U	0.2 UX	0.6 U		
IPSW05C		0.2 U	0.2 U	0.2 U	1 U	1.8	0.2 U	.45	1 U	0.2 UX	0.6 U		
IPSW05C		0.2 U	0.2 U	0.2 U	1 U	0.6 U	0.2 U	25	38	4.6	5.8		
IPSW06AC		0.2 U	0.2 U	0.2 U	1 U	1.3	0.2 U	.49	1 U	0.2 UX	0.6 U		
IPSW07C		0.2 U	0.2 U	0.2 U	1 U	0.6 U	0.2 U	1 U	1 U	0.2 UX	0.6 U		
IPSW10C		0.2 U	0.2 U	0.2 U	1.2	1.2	0.2 U	3.8	1 U	0.2 UX	1.6		
IPSW13C		0.2 U	0.2 U	0.2 U	1 U	0.6 U	0.2 U	1 U	1 U	0.2 UX	0.6 U		

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPSW01C					1 U			
IPSW02C					1 U			
IPSW03C					1 U			
IPSW04C					1.5			
IPSW05C					1 U			
IPSW05C					1 U			
IPSW05C					1 U			
IPSW05C					1 U			
IPSW06AC					1 U			
IPSW07C					1 U			
IPSW10C					1 U			
IPSW13C					1 U			

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPSWG1		10. U	10. U	10. U	10. U	20. U	10. U	10. U	10. U	10. U	10. U	10. U	10. U
IPSWIT1		10. U	10. U	10. U	10. U	20. U	10. U	10. U	900. E	10. U	10. U	10. U	10. U
IPSWIT1DL		50. U	50. U	50. U	50. U	100. U	50. U	50. U	740. D	50. U	50. U	50. U	50. U

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPSWG1		NA	NA	NA	10. U	NA	10. U	50. U
IPSWIT1		NA	NA	NA	10. U	NA	10. U	50. U
IPSWIT1DL		NA	NA	NA	50. U	NA	50. U	250. U

PAH ANALYSIS (ug/L; Method 8310)

SAMPLE NUMBER	SS	NAPHTHALENE	ACENAPHTHYLENE	ACENAPHTHENE	FLUORENE	PHENANTHRENE	ANTHRACENE	FLUORANTHENE	PYRENE	BENZO(A)ANTHRACENE	CHRYSENE	BENZO(B)FLUORANTHENE	BENZO(K)FLUORANTHENE	BENZO(A)PYRENE
IPID06B		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPID08B		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	1.1	0.23
IPSW01B		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPSW02B		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPSW04B		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPSW05B		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPSW06B		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPSW07B		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPSW10B		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U
IPSW11B		18 U	23 U	18 U	2.1 UJ	6.4 U	6.6 U	2.1 U	2.7 U	0.13 U	1.5 U	0.18 U	0.17 U	0.23 U

SAMPLE NUMBER	SS	DIBENZO-(A,H)ANTHRACENE	BENZO-(G,H,I,)-PERYLENE	INDENO-(1,2,3CD)-PYRENE	DIBENZOFURAN	2-METHYLNAPHTHALENE
IPID06B		0.30 U	0.76 U	0.43 U		
IPID08B		0.30 U	0.76 U	0.43 U		
IPSW01B		0.30 U	0.76 U	0.43 U		
IPSW02B		0.30 U	0.76 U	0.43 U		
IPSW04B		0.30 U	0.76 U	0.43 U		
IPSW05B		0.30 U	0.76 U	0.43 U		
IPSW06B		0.30 U	0.76 U	0.43 U		
IPSW07B		0.30 U	0.76 U	0.43 U		
IPSW10B		0.30 U	0.76 U	0.43 U		
IPSW11B		0.30 U	0.76 U	0.43 U		

SAMPLE NUMBER	SS	NAPHTHALENE	ACENAPHTHYLENE	ACENAPHTHENE	FLUORENE	PHENANTHRENE	ANTHRACENE	FLUORANTHENE	PYRENE	BENZO(A)ANTHRACENE	CHRYSENE	BENZO(B)FLUORANTHENE	BENZO(K)FLUORANTHENE	BENZO(A)PYRENE
IPID06C		0.10 U	15.0 U	7.50 U	.06800 BJ	0.010 U	.58000 BJ	0.020 U	0.010 U	.00500 J	.01030 J	0.020 U	0.010 U	0.010 U
IPID08C		0.01 U	1.5 U	0.75 U	0.002 U	0.001 U	0.0660 B	0.002 U	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	0.001 U
IPSW01C		0.01 U	<1.5	0.75 U	0.1000 B	0.001 U	0.001 U	0.002 U	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	0.001 U
IPSW02C		0.01 U	1.5 U	0.75 U	0.002 U	0.001 U	0.001 U	0.002 U	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	0.001 U
IPSW03C		0.01 U	1.5 U	0.75 U	0.002 U	0.001 U	0.0060 BJ	0.002 U	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	0.001 U
IPSW04C		0.01 U	1.5 U	0.75 U	0.002 U	0.0550	0.001 U	0.002 U	0.001	0.001 U	0.0069	0.002 U	0.0024	0.037
IPSW05C		0.01 U	1.5 U	0.75 U	0.1020 B	0.001 U	0.0320 B	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U
IPSW06AC		0.01 U	1.5 U	0.75 U	0.002 U	0.0019 U	<0.001 U	0.002 U	0.001 U	0.001 U	<0.001	0.0024	0.001 U	0.001 U
IPSW07C		0.01 U	1.5 U	0.75 U	0.1380 B	0.001 U	0.001 U	0.002 U	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	0.001 U
IPSW10C		0.01 U	<1.5	0.75 U	0.1000 B	0.001 U	0.001 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U
IPSW11C		0.01 U	1.5 U	0.75 U	0.002 U	0.001 U	0.0970 B	0.002 U	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	0.001 U
IPSW13C		0.01 U	<1.5	0.75 U	0.1000 B	0.001 U	0.001 U	0.002 U	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	0.001 U

SAMPLE NUMBER	SS	DIBENZO-(A,H)ANTHRACENE	BENZO-(G,H,I,)-PERYLENE	INDENO-(1,2,3CD)-PYRENE	DIBENZO-FURAN	2-METHYLNAPHTHALENE
IPID06C		0.020 U	0.020 U	0.750 U		
IPID08C		0.002 U	0.002 U	0.075 U		
IPSW01C		0.002 U	0.002 U	0.075 U		
IPSW02C		0.002 U	0.002 U	0.075 U		
IPSW03C		0.002 U	0.002 U	0.075 U		
IPSW04C		0.0042	0.0138	0.075 U		
IPSW05C		0.002 U	0.002 U	0.075 U		
IPSW06AC		0.002 U	0.002 U	0.075 U		
IPSW07C		0.002 U	0.002 U	0.075 U		
IPSW10C		0.002 U	0.002 U	0.075 U		
IPSW11C		0.002 U	0.002 U	0.075 U		
IPSW13C		0.002 U	0.002 U	0.075 U		

SAMPLE NUMBER	SS	NAPHTHALENE	ACENAPHTHYLENE	ACENAPHTHENE	FLUORENE	PHENANTHRENE	ANTHRACENE	FLUORANTHENE	PYRENE	BENZO(A)ANTHRACENE	CHRYSENE	BENZO(B)FLUORANTHENE	BENZO(K)FLUORANTHENE	BENZO(A)PYRENE
IPSWG1		3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U
IPSWIT1		3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U
IPSWIT1DL		15. U	15. U	15. U	15. U	15. U	15. U	15. U	15. U	15. U	15. U	15. U	15. U	15. U

SAMPLE NUMBER	SS	DIBENZO-(A,H)ANTHRACENE	BENZO-(G,H,I,)-PERYLENE	INDENO-(1,2,3CD)-PYRENE	DIBENZOFURAN	2-METHYLNAPHTHALENE
IPSWG1		3. U	3. U	3. U	3. U	3. U
IPSWIT1		3. U	3. U	3. U	3. U	3. U
IPSWIT1DL		15. U	15. U	15. U	15. U	15. U

SEMIVOLATILES ANALYSIS (ug/L)

SAMPLE NUMBER	4-METHYL-PHENOL	BENZOIC ACID	2-METHYL-PHENOL	2,4,5-TRI-CHLORO-PHENOL	4-NITRO-ANALINE	BENZYL ALCOHOL	4-CHLORO-ANILINE	DIBENZO-FURAN	ANILINE	2-NITRO-ANILINE	2-METHYL-NAPH-THALENE	3-NITRO-ANILINE
1PID02A	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPID04A	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPID05A	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPID06A	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPID06AD	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPID07A	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPID07B	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPID07C	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPID07D	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPID08A	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPSW01A	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPSW02A	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPSW04A	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPSW05A	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPSW06A	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPSW07A	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPSW10A	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPSW11A	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPSW12A	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U

SAMPLE NUMBER	2,4,6-TRI CHLORO-PHENOL	4-CHLORO-3-METHYL-PHENOL	2-CHLORO-PHENOL	2-4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	2,4-DI-NITRO-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	ACENAPH-THENE
1PID02A	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPID04A	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	140	10 U	10 U
IPID05A	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	36 J	10 U	10 U
IPID06A	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	16 J	10 U	10 U
IPID06AD	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	14 J	10 U	10 U
IPID07A	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	6 J	10 U	10 U
IPID07B	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	3 J	10 U	10 U
IPID07C	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	2 J	10 U	10 U
IPID07D	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	3 J	10 U	10 U
IPID08A	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPSW01A	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPSW02A	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPSW04A	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPSW05A	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPSW06A	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPSW07A	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPSW10A	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPSW11A	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPSW12A	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U

SAMPLE NUMBER	BENZIDINE	1,2,4-TRI-CHLORO-BENZENE	HEXA-CHLORO-BENZENE	HEXA-CHLORO-ETHANE	BIS(2-CHLORO-ETHYL)-ETHER	2-CHLORO-NAPHTHA-LENE	1,2-DI-CHLORO-BENZENE	1,3-DI-CHLORO-BENZENE	1,4-DI-CHLORO-BENZENE	3,3'-DI-CHLORO-BENZIDINE	2,4-DI-NITRO-TOLUENE	2,6-DI NITRO-TOLUENE
1PID02A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPID04A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPID05A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPID06A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPID06AD	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPID07A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPID07B	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPID07C	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPID07D	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPID08A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPSW01A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPSW02A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPSW04A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPSW05A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPSW06A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPSW07A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPSW10A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPSW11A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPSW12A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U

SAMPLE NUMBER	1,2-DI-PHENYL-HYDRAZINE	FLUORAN-THENE	4-CHLORO-PHENYL-PHENYL-ETHER	4-BROMO-PHENYL-PHENYL-ETHER	BIS(2-CHLOROISO-PROPYL)-ETHER	BIS(2-CHLORO-ETHOXY)-METHANE	HEXA-CHLORO-BUTADIENE	HEXA-CHLORO-CYCLO-PENTADIENE	ISO-PHORONE	NAPH-THALENE	NITRO-BENZENE	N-NITROSO-DIMETHYL-AMINE
1PID02A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPID04A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPID05A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPID06A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPID06AD	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPID07A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPID07B	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPID07C	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPID07D	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPID08A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPSW01A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPSW02A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPSW04A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPSW05A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPSW06A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPSW07A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPSW10A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPSW11A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPSW12A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR

SAMPLE NUMBER	N-NITROSO-DIPHENYL-AMINE	N-NITRO-DI-N-PROPYL-AMINE	BIS(2-ETHYL-HEXYL)-PHTHALATE	BUTYL-BENZYL-PHTHALATE	DI-N-BUTYL-PHTHALATE	DI-N-OCTYL-PHTHALATE	DIETHYL-PHTHALATE	DIMETHYL-PHTHALATE	BENZO(A)-ANTH-RACENE	BENZO(A) PYRENE	BENZO(B)-FLUORAN-THENE	BENZO(K)-FLUORAN-THENE
1PID02A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPID04A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPID05A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPID06A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPID06AD	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPID07A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPID07B	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPID07C	10 U	10 U	2 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPID07D	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPID08A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPSW01A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPSW02A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPSW04A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPSW05A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPSW06A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPSW07A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPSW10A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPSW11A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPSW12A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

SAMPLE NUMBER	CHRYSENE	ACENAPHTHENE	ANTHRACENE	BENZO-(G,H,I)-PERYLENE	FLUORENE	PHENANTHRENE	DIBENZ-(A,H)ANTHRACENE	INDENO-(1,2,3-CD)-PYRENE	PYRENE	BENZOQUINONE	2-BENZYL-4-CHLOROPHENOL	N,N-DIMETHYL-BENZENAMINE
1PID02A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPID04A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPID05A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPID06A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPID06AD	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPID07A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPID07B	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPID07C	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPID07D	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPID08A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPSW01A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPSW02A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPSW04A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPSW05A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPSW06A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPSW07A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPSW10A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPSW11A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPSW12A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR

SAMPLE NUMBER	2,3,4,6-TETRA-CHLORO-PHENOL	P-TERT-BUTYL-PHENOL	DIOXIN	2,3,4,5-TETRA-CHLORO-PHENOL
1PID02A	NR	NR	NR	NR
IPID04A	NR	NR	NR	NR
IPID05A	NR	NR	NR	NR
IPID06A	NR	NR	NR	NR
IPID06AD	NR	NR	NR	NR
IPID07A	NR	NR	NR	NR
IPID07B	NR	NR	NR	NR
IPID07C	NR	NR	NR	NR
IPID07D	NR	NR	NR	NR
IPID08A	NR	NR	NR	NR
IPSW01A	NR	NR	NR	NR
IPSW02A	NR	NR	NR	NR
IPSW04A	NR	NR	NR	NR
IPSW05A	NR	NR	NR	NR
IPSW06A	NR	NR	NR	NR
IPSW07A	NR	NR	NR	NR
IPSW10A	NR	NR	NR	NR
IPSW11A	NR	NR	NR	NR
IPSW12A	NR	NR	NR	NR

VOLATILES ANALYSIS (ug/L)

SAMPLE NUMBER	SS	BENZENE	CARBON TETRA-CHLORIDE	CHLORO-BENZENE	1,2-DI-CHLORO-ETHANE	1,1,1-TRI-CHLORO-ETHANE	1,1-DI-CHLORO-ETHANE	1,1,2-TRI-CHLORO-ETHANE	1,1,2,2-TETRA-CHLORO-ETHANE	CHLORO-ETHANE	1,2-DI-CHLORO-ETHENE	ACETONE	CARBON DISULFIDE
IPID02A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPID04A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPID05A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPID06A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPID06A	D	5 U	5 U	5 U	37	10 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPID07A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPID07B	D	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPID07B	C	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPID07B		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPID08A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSSW16A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSW01A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSW02A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSW04A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSW05A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSW06A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSW07A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSW10A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSW11A		5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSW12A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSW15A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U

SAMPLE NUMBER	SS	2-BUTANONE	TOTAL XYLENES	CHLORO-FORM	1,1-DI-CHLORO-ETHENE	1,2-DI-CHLORO-PROPANE	TRANS-1,3-DI-CHLORO-PROPANE	CIS-1,3-DI-CHLORO-PROPANE	ETHYL-BENZENE	METHYLENE CHLORIDE	CHLORO-METHANE	BROMO-METHANE	BROMO-FORM
IPID02A		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPID04A		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2 BJ	10 U	10 U	5 U
IPID05A		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPID06A		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPID06A	D	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPID07A		10 U	5 U	9	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPID07B	D	10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	3 BJ	10 U	10 U	5 U
IPID07B	C	10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 B	10 U	10 U	5 U
IPID07B		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2 BJ	10 U	10 U	5 U
IPID08A		10 U	5 U	4 J	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPSSW16A		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPSW01A		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2 BJ	10 U	10 U	5 U
IPSW02A		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPSW04A		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	4 BJ	10 U	10 U	5 U
IPSW05A		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPSW06A		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPSW07A		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPSW10A		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPSW11A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPSW12A		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPSW15A		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U

SAMPLE NUMBER	SS	BROMO-DICHLORO-METHANE	DIBROMO-CHLORO-METHANE	1,1,2,2-TETRA-CHLORO-ETHANE	TOLUENE	TRICHLORO-ETHANE	VINYL CHLORIDE	STYRENE	VINYL ACETATE	METHYL-ISOBUTYL-KETONE	2-HEXANONE
IPID02A		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPID04A		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPID05A		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPID06A		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPID06A	D	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U	10 U	10 U
IPID07A		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPID07B	D	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPID07B	C	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPID07B		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPID08A		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSW16A		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSW01A		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSW02A		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSW04A		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSW05A		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSW06A		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSW07A		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSW10A		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSW11A		10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U	10 U	10 U
IPSW12A		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSW15A		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U

TRACE METALS ANALYSIS (ug/L)

SAMPLE NUMBER	SS	ALUMINUM	ARSENIC	BARIUM	CADMIUM	CHROMIUM	COPPER	IRON	LEAD	MANGANESE	MERCURY	NICKEL
IPID02A		906.00	2.00 B	153.00 B	7.40	5.00 U	5.00 U	934.00	2.70 BJ	60.70	0.20 UN	6.00 U
IPID04A		126.00 B	2.00 UW	182.00 B	2.00 U	5.00 U	5.00 U	307.00	1.00 UJ	379.00	0.20 UNB	6.00 U
IPID05A		773.00	2.60 B	262.00	2.00 U	5.00 U	5.00 U	1090.00	2.80 BJ	1070.00	0.20 UN	6.00 U
IPID06A	D	1800.00	2.00 U	61.40 B	2.00 U	5.00 U	5.90 B	1690.00	3.50 J	65.60	0.20 UN	6.50 B
IPID06A		1340.00	2.00 U	53.60 B	3.20 B	5.00 U	5.00 U	1300.00	5.60 J	65.80	0.20 UN	6.00 U
IPID07A		548.00	2.00 U	72.60 B	2.00 U	5.00 U	5.00 U	1160.00	68.60 J	224.00	0.20 UN	6.00 U
IPID07A	D	926.00	3.60 B	133.00 B	2.00 U	5.00 U	5.00 U	3500.00	7.10	920.00	0.20 UN	6.00 U
IPID08A		362.00	2.20 B	119.00 B	2.00 U	5.00 U	8.30 B	746.00	2.50 BJ	114.00	0.20 UN	6.00 U
IPSW01A		200.00	2.60 B	82.60 B	3.00 B	6.70 B	5.00 U	2650.00	22.8 J	79.00	0.20 UN	7.30 B
IPSW02A		2460.00	2.00 U	79.60 B	2.00 U	5.00 U	7.50 B	2330.00	6.00 J	75.60	0.20 UN	6.00 U
IPSW04A		0670.00	2.00 B	85.10 B	2.00 U	5.00 U	6.90 B	2950.00	3.00 BJ	82.20	0.20 UN	6.00 U
IPSW05A		3480.00	2.00 U	90.80 B	2.00 U	8.60 B	5.00 U	3030.00	13.40 J	90.10	0.20 UN	6.00 U
IPSW06A		109.00 B	3.80 B	143.00 B	2.00 U	5.00 U	5.00 U	159.00	4.60 J	139.00	0.20 UN	6.00 U
IPSW07A		189.00 B	3.80 B	136.00 B	2.00 U	5.00 U	5.00 U	625.00	52.60 J	262.00	0.20 UN	6.00 U
IPSW10A		3260.00	2.00 B	84.80 B	2.00 U	5.80 B	6.90 B	2940.00	3.30 J	86.30	0.20 UN	6.00 U
IPSW11A		40.70 B	2.00 U	2.00 U	2.00 U	5.00 U	5.00 U	27.60 B	1.90 BJ	1.00 U	0.20 UN	6.00 U
IPSW12A		42.40 B	2.00 U	2.00 U	2.00 U	5.00 U	5.00 U	22.10 B	1.00 U	2.00 B	0.20 UN	6.00 U

SAMPLE NUMBER	SS	ANTIMONY	SELENIUM	SILVER	BERYLLIUM	THALLIUM	VANADIUM	COBALT	ZINC
IPID02A		26.00 U	3.00 UJ	6.00 U	1.00 U	1.00 UNW	6.00 U	4.00 U	52.10
IPID04A		26.00 U	3.00 UJ	6.00 U	1.00 U	5.00 UNW	6.00 U	4.00 U	15.80 B
IPID05A		26.00 U	3.00 UJ	6.00 U	1.00 U	5.00 UNW	6.00 U	6.40 B	63.50
IPID06A	D	26.00 U	3.00 UJ	6.00 U	1.00 U	1.00 UNW	6.00 U	4.00 U	14.60 B
IPID06A		37.60 B	3.00 UJ	6.00 U	1.00 U	1.00 UNW	6.00 U	9.20 B	28.00
IPID07A		26.00 U	3.00 UJ	6.00 U	1.00 U	1.00 UNW	6.00 U	4.00 U	16.00 B
IPID07A	D	26.00 U	15.00 UJ	6.00 U	1.00 U	1.00 UNW	6.00 U	7.10 B	55.60
IPID08A		26.00 U	3.00 UJ	6.00 U	1.00 U	1.00 UNW	6.00 U	5.10 B	6.90 B
IPSW01A		32.90 B	3.00 UJ	6.00 U	1.00 U	1.00 UJ	6.00 U	5.90 B	25.00
IPSW02A		26.00 U	3.00 UJ	6.00 U	1.00 U	1.00 UNW	6.00 U	4.00 U	12.00 B
IPSW04A		26.00 U	3.00 UJ	6.00 U	1.00 U	1.00 UNW	6.00 U	4.50 B	31.30
IPSW05A		26.00 U	3.00 UJ	6.00 U	1.00 U	1.00 UNW	6.00 U	4.00 U	16.10 B
IPSW06A		26.00 U	3.00 UJ	6.00 U	1.00 U	1.00 UNW	6.00 U	4.00 U	7.60 B
IPSW07A		26.00 U	3.00 UJ	6.00 U	1.00 U	5.00 UNW	6.00 U	4.00 U	9.40 B
IPSW10A		26.00 U	3.00 UJ	6.00 U	1.00 U	1.00 UNW	6.00 U	4.00 U	16.10 B
IPSW11A		26.00 U	3.00 UJ	6.00 U	1.00 U	1.00 UN	6.00 U	4.00 U	4.00 U
IPSW12A		26.00 U	3.00 UJ	6.00 U	1.00 U	1.00 UN	6.00 U	4.00 U	76.30

CONVENTIONAL PARAMETERS (Cations/Anions; mg/L)

SAMPLE NUMBER	SS	CHLORIDE	SULFATE	DISSOLVED CALCIUM	DISSOLVED MAGNESIUM	DISSOLVED POTASSIUM	DISSOLVED SODIUM
IPID02A		34	47	114	280	5.30	17.3
IPID04A		92	27	116	284	6.03	24.4
IPID05A		96	29	151	292	6.58	24.7
IPID06A		4.0	7.5	25.3	7.49	2.08 B	4.24 B
IPID06A		6.0	8.0	26.0	7.58	2.24 B	4.41 B
IPID07A		8.0	9.4	42.5	9.82	3.54 B	6.91
IPID08A		16	14	68.1	17.3	4.97 B	12.3
IPSW01A		<1.0	20	33.6	9.03	1.79 B	7.07
IPSW02A		<1.0	20	33.3	8.85	1.37 B	0.00
IPSW04A		<1.0	18	33.4	9.00	1.91 B	6.96
IPSW05A		<1.0	20	32.9	8.93	1.80 B	7.43
IPSW06A		22	38	94.7	24.8	4.95 B	1.61
IPSW07A		28	48	90.2	24.3	5.23 B	2.25
IPSW10A		4.0	20	33.7	9.09	1.83 B	7.03
IPSW11A		10	1.0	.0937 B	0.38 U	.139 U	.546 B
IPSW12A		8.0	1.0	.0747 B	.039 U	.139 U	.401 B

SAMPLE NUMBER	SS	CHLORIDE	SULFATE	DISSOLVED CALCIUM	DISSOLVED MAGNESIUM	DISSOLVED POTASSIUM	DISSOLVED SODIUM
IPID06B		2.0	0.03	27.0	3.9	1.6	7.4
IPID08B		42	34	165	34.7	5.8	24.3
IPSW01B		2.0	36	72.1	19.4	1.5	7.6
IPSW04B		2.0	35	74.2	19.1	1.8	7.2
IPSW05B		4.0	33	76.4	19.2	1.9	7.6
IPSW06AB		2.0	5.89	56.2	11.2	2.4	4.7
IPSW07B		2.0	7.10	60.1	12.0	2.9	5.5
IPSW10B		4.0	33	72.0	18.5	1.8	7.0
IPSW11B		<0.5	0.03	0.1	<0.1	0.3	0.3
IPSW02B		2.0	32	71.6	19.1	1.8	7.5

SAMPLE NUMBER	SS	CHLORIDE	SULFATE	DISSOLVED CALCIUM	DISSOLVED MAGNESIUM	DISSOLVED POTASSIUM	DISSOLVED SODIUM
IPID06C		<10	31	36.2	6.18	4.47	7.18
IPID08C		20	28	62.5	19.5	8.56	18.0
IPSW01C		<10	42	56.2	19.2	1.84	8.59
IPSW02C		<10	46	57.7	19.7	1.89	8.70
IPSW03C		<10	41	58.0	19.5	1.86	8.72
IPSW04C		<10	46	57.8	19.5	1.94	8.91
IPSW05C		<10	44	58.7	19.4	1.91	8.87
IPSW06AC		30	34	86.7	23.4	6.28	13.2
IPSW07C		<10	44	83.0	23.2	7.27	19.2
IPSW10C		<10	43	58.3	19.8	2.00	9.00
IPSW13C		<10	45	56.8	19.5	1.87	8.65

FIELD PARAMETERS

SURVEY	STATION	TEMP	pH	EC
IP SW01	IPID02	6.9	7.57	903
IP SW01	IPID04	16.6	7.58	943
IP SW01	IPID05	13.8	7.99	930
IP SW01	IPID06	18.8	6.68	158
IP SW01	IPID06	12.4	7.57	205
IP SW01	IPID07	12.1	6.68	604
IP SW01	IPID07	12.5	7.18	332
IP SW01	IPID08	18.8	7.66	551
IP SW01	IPID08	17.1	7.24	1047
IP SW01	IPSW01	17.4	8.74	466
IP SW01	IPSW01	7.8	8.3	278
IP SW01	IPSW02	7.6	8.11	274
IP SW01	IPSW02	16.9	8.71	480
IP SW01	IPSW04	3.0	8.14	255
IP SW01	IPSW05	3.0	8.1	300
IP SW01	IPSW06	12.5	8.1	736
IP SW01	IPSW06A	15.0	8.18	359
IP SW01	IPSW07	17.4	8.04	778
IP SW01	IPSW07	17.4	8.39	382
IP SW01	IPSW10	3.93	8.18	270

SURVEY	STATION	TEMP	pH	EC
IP SW02	IPSW04	15.4	7.94	438
IP SW02	IPSW05	12.3	8.20	618
IP SW02	IPSW10	13.3	8.43	488

SURVEY	STATION	TEMP	pH	EC
IP SW03	IPID06	3.80	8.05	141
IP SW03	IPID08	3.7	7.69	320
IP SW03	IPSW01	4.6	8.36	280
IP SW03	IPSW02	4.1	8.33	310
IP SW03	IPSW03	4.9	8.13	240
IP SW03	IPSW04	4.2	8.13	230
IP SW03	IPSW05	3.1	7.46	250
IP SW03	IPSW06A	5.2	7.84	444
IP SW03	IPSW07	6.2	7.7	451
IP SW03	IPSW10	1.7	7.99	250
IP SW03	IPSW13	4.6	8.36	280
IP SW03	IPSWG1	0.01	7.30	407

SOIL ANALYTICAL DATA

SSB12A - Sample Number

SS - Soil or Sediment Media

B - Area designation

12 - Location

A - Depth Interval
- A - Upper Interval
- B - Lower Interval
- C - Bottom Interval

SOIL QA/QC Sample Numbers:

Rinsates	Blanks	Trip Blanks	Standards
IPSS33	IPSS11	IPSS00	IPSSCMC
IPSS44	IPSS22	IPSS100	
IPSSRIN	IPSS55	IPSSW16	
IPSSSB1	IPSS66		
IPSSJF1	IPSS77		
IPSSJD1	IPSS88		
IPSSKM1	IPSS99		
IPSSKK1	IPSSBLK		
IPSSBB	IPSSDT		
IPSS000	IPSS099		
IPSS101	IPSSBL		
IPSSR	IPSS6WB		
IPSS6WK	IPSSY		
IPSSW13	IPSSZ		
IPSSW14			
IPSSX			
IPSSBWR01			

PHENOLS ANALYSIS (ug/Kg)

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPSS27A03		NA			250 U			
IPSSBB03		NA			5.0 U			
IPSSDT03		NA			5.0 U			
IPSST01A		NA	NA	NA	270. U	NA	270. U	1400. U
IPSST02A		NA	NA	NA	280. U	NA	280. U	1400. U
IPSST02B		NA	NA	NA	270. U	NA	270. U	1300. U
IPSST02C		NA	NA	NA	300. U	NA	300 U	1500. U
IPSST03A		NA	NA	NA	280. U	NA	280. U	1400. U
IPSST03ADL		NA	NA	NA	1400. U	NA	1400. U	6900. U
IPSST03B		NA	NA	NA	290. U	NA	290. U	1500. U
IPSST03C		NA	NA	NA	320. U	NA	320. U	1600. U
IPSST04A		NA	NA	NA	280. U	NA	280. U	1400. U
IPSST04B		NA	NA	NA	280. U	NA	280. U	1400. U
IPSST04C		NA	NA	NA	320. U	NA	320. U	1600. U
IPSST05A		NA	NA	NA	270. U	NA	270. U	1400. U
IPSST05B		NA	NA	NA	280. U	NA	280. U	1400. U
IPSST05C		NA	NA	NA	330. U	NA	330. U	1600. U
IPSST06A		NA	NA	NA	270. U	NA	270. U	1400. U
IPSST06ADL		NA	NA	NA	1400. U	NA	1400. U	6800. U
IPSST06B		NA	NA	NA	280. U	NA	280. U	1400. U
IPSST06C		NA	NA	NA	330. U	NA	330. U	1700. U
IPSST19A		NA	NA	NA	270. U	NA	270. U	1400. U
IPSST19ADL		NA	NA	NA	2700. U	NA	2700. U	14000. U
IPSST19B		NA	NA	NA	270. U	NA	270. U	1400. U
IPSST19C		NA	NA	NA	290. U	NA	290. U	1400. U

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPSS27A03		250 U	250 U	250 U	500 U	500 U	250 U	250 U	500 U	250 U	500 U		
IPSSBB03		5.0 U	5.0 U	5.0 U	10 U	10 U	5.0 U	5.0 U	10 U	5.0 U	10 U		
SSDT03		5.0 U	5.0 U	5.0 U	10 U	10 U	5.0 U	5.0 U	10 U	5.0 U	10 U		
IPSST01A		270. U	270. U	270. U	270. U	550. U	270. U	270. U	700.	270. U	270. U	270. U	270. U
IPSST02A		280. U	280. U	280. U	280. U	560. U	280. U	280. U	890.	280. U	280. U	280. U	280. U
IPSST02B		270. U	270. U	270. U	270. U	540. U	270. U	270. U	260. J	270. U	270. U	270. U	270. U
IPSST02C		300. U	300. U	300. U	300. U	590. U	300. U	300. U	180. J	300. U	300. U	300. U	300. U
PSST03A		280. U	280. U	280. U	280. U	550. U	280. U	280. U	14000. E	280. U	280. U	280. U	280. U
SST03ADL		1400. U	1400. U	1400. U	1400. U	2800. U	1400. U	1400. U	17000. D	1400. U	1400. U	1400. U	1400. U
IPSST03B		290. U	290. U	290. U	290. U	580. U	290. U	290. U	1200.	290. U	290. U	290. U	290. U
IPSST03C		320. U	320. U	320. U	320. U	650. U	320. U	320. U	85. J	320. U	320. U	320. U	320. U
IPSST04A		280. U	280. U	280. U	280. U	570. U	280. U	280. U	600.	280. U	280. U	280. U	280. U
IPSST04B		280. U	280. U	280. U	280. U	560. U	280. U	280. U	230. J	280. U	280. U	280. U	280. U
IPSST04C		320. U	320. U	320. U	320. U	640. U	320. U	320. U	170. J	320. U	320. U	320. U	320. U
PSST05A		270. U	270. U	270. U	270. U	540. U	270. U	270. U	530.	270. U	270. U	270. U	270. U
IPSST05B		280. U	280. U	280. U	280. U	560. U	280. U	280. U	93. J	280. U	280. U	280. U	280. U
IPSST05C		330. U	330. U	330. U	330. U	650. U	330. U	330. U	63. J	330. U	330. U	330. U	330. U
IPSST06A		270. U	270. U	270. U	270. U	540. U	270. U	270. U	4200.	270. U	270. U	270. U	270. U
IPSST06ADL		1400. U	1400. U	1400. U	1400. U	2700. U	1400. U	1400. U	5100. D	1400. U	1400. U	1400. U	1400. U
IPSST06B		280. U	280. U	280. U	280. U	560. U	280. U	280. U	1600.	280. U	280. U	280. U	280. U
IPSST06C		330. U	330. U	330. U	330. U	660. U	330. U	330. U	240. J	330. U	330. U	330. U	330. U
IPSST19A		270. U	270. U	270. U	270. U	540. U	270. U	270. U	43000. E	270. U	270. U	270. U	270. U
IPSST19ADL		2700. U	2700. U	2700. U	2700. U	5400. U	2700. U	2700. U	58000. D	2700. U	2700. U	2700. U	2700. U
IPSST19B		270. U	270. U	270. U	270. U	540. U	270. U	270. U	8100.	270. U	270. U	270. U	270. U
IPSST19C		290. U	290. U	290. U	290. U	580. U	290. U	290. U	9100.	290. U	290. U	290. U	290. U

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPSS55		10. U	10. U	10. U	10. U	20. U	10. U	10. U	10. U	10. U	10. U	10. U	10. U
IPSS66		10. U	10. U	10. U	10. U	20. U	10. U	10. U	10. U	10. U	10. U	10. U	10. U
IPSS77		10. U	10. U	10. U	10. U	20. U	10. U	10. U	10. U	10. U	10. U	10. U	10. U
IPSS88		10. U	10. U	10. U	10. U	20. U	10. U	10. U	10. U	10. U	10. U	10. U	10. U
IPSS99		10. U	10. U	10. U	10. U	20. U	10. U	10. U	10. U	10. U	10. U	10. U	10. U
IPSSAA2		320. U	320. U	320. U	320. U	640. U	320. U	320. U	320. U	320. U	320. U	320. U	320. U
IPSSAB2		330. U	330. U	330. U	330. U	660. U	330. U	330. U	330. U	330. U	330. U	330. U	330. U
IPSSAC2		330. U	330. U	330.U	330. U	660. U	330. U	330. U	330. U	330. U	330. U	330. U	330. U
IPSSBA2		370. U	370. U	370. U	370. U	740. U	370. U	370. U	370. U	370. U	370. U	370. U	370. U
IPSSBB2		320. U	320. U	320. U	320. U	640. U	320. U	320. U	320. U	320. U	320. U	320. U	320. U
IPSSBC2		330. U	330. U	330. U	330. U	670. U	330. U	330. U	330. U	330. U	330. U	330. U	330. U
IPSSCO2		360. U	360. U	360. U	360. U	710. U	360. U	360. U	2200.	360. U	360. U	360. U	42. J
IPSSJD1		10. U	10. U	10. U	10. U	20. U	10. U	10. U	10. U	10. U	10. U	10. U	10. U
IPSSJF1		10. U	10 .U	10. U	10. U	20. U	10. U	10. U	10. U	10. U	10. U	10. U	10. U
IPSSKK1		10. U	10. U	10. U	10. U	20. U	10. U	10. U	10. U	10. U	10. U	10. U	10. U
IPSSKM1		10. U	10. U	10. U	10. U	20. U	10. U	10. U	10. U	10. U	10. U	10. U	10. U
IPSSPP2		3300. U	3300. U	3300. U	3300. U	6600. U	3300. U	3300. U	83000.	3300. U	3300. U	3300. U	3300. U
IPSSSB1		10. U	10. U	10. U	10. U	20. U	10. U	10. U	10. U	10. U	10. U	10. U	10. U
IPSST01B		280. U	280. U	280. U	280. U	560. U	280. U	280. U	280. U	280. U	280. U	280. U	280. U
IPSST01C		330. U	330. U	330. U	330. U	660. U	330. U	330. U	330. U	330. U	330. U	330. U	330. U
IPSST07A		280. U	280. U	280. U	280. U	560. U	280. U	280. U	3000.	280. U	280. U	280. U	280. U
IPSST07B		2800. U	2800. U	2800. U	2800. U	5600. U	2800. U	2800. U	100000. E	2800. U	2800. U	2800. U	2800. U
IPSST07BDL		11000. U	11000. U	11000. U	11000. U	22000. U	11000. U	11000. U	93000. D	11000. U	11000. U	11000. U	11000. U
IPSST07C		11000. U	11000. U	11000. U	11000. U	22000. U	11000. U	11000. U	280000.	11000. U	11000. U	11000. U	11000. U
IPSST08A		290. U	290. U	290. U	290. U	590. U	290. U	290. U	610.	290. U	290. U	290. U	290. U
IPSST08B		3400. U	3400. U	3400. U	3400. U	6800. U	3400. U	3400. U	250000. E	3400. U	3400. U	3400. U	3400. U
IPSST08BDL		34000. U	34000. U	34000. U	34000. U	68000. U	34000. U	34000. U	220000. D	34000. U	34000. U	34000. U	34000. U
IPSST08C		3400. U	3400. U	3400. U	3400. U	6800. U	3400. U	3400. U	110000.	3400. U	3400. U	3400. U	600. U
IPSST09A		540. U	540. U	540. U	540. U	1100. U	540. U	540. U	16000.	540. U	540 .U	540. U	540. U
IPSST09B		5900. U	5900. U	5900. U	5900. U	12000. U	5900. U	5900. U	84000.	5900. U	5900. U	5900. U	5900. U
IPSST09C		3000. U	3000. U	3000. U	3000. U	6000. U	3000. U	3000. U	23000.	3000. U	3000. U	3000. U	3000. U
IPSST10A		2800. U	2800. U	2800. U	2800. U	5600. UR	2800. U	2800. UR	48000.	2800. U	2800. UR	2800. U	2800. U
IPSST10B		3100. U	3100. U	3100. U	3100. U	6200. U	3100. U	3100. U	480000. E	3100. U	3100. U	3100. U	3100. U
IPSST10BDL		31000. U	31000. U	31000. U	31000. U	62000. U	31000. U	31000. U	570000. D	31000. U	31000. U	31000. U	31000. U
IPSST10C		3000. U	3000. U	3000. U	3000. U	6000. UR	3000. U	3000. UR	110000. E		3000. UR	3000. U	3000. U
IPSST10CDL		6000. U	6000. U	6000. U	6000. U	12000. U	6000. U	6000. U	100000. D	6000. U	6000. U	6000. U	6000. U
IPSST11A		1500. U	1500. U	1500. U	1500. U	2900. U	1500. U	1500. U	40000.	1500. U	1500. U	1500. U	1500. U

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPSS55		NA	NA	NA	10. U	NA	10. U	50. U
IPSS66		NA	NA	NA	10. U	NA	10. U	50. U
IPSS77		NA	NA	NA	10. U	NA	10. U	50. U
IPSS88		NA	NA	NA	10. U	NA	10. U	50. U
IPSS99		NA	NA	NA	10. U	NA	10. U	50. U
IPSSAA2		NA	NA	NA	320. U	NA	320. U	1600. U
IPSSAB2		NA	NA	NA	330. U	NA	330. U	1700. U
IPSSAC2		NA	NA	NA	330. U	NA	330. U	1700. U
IPSSBA2		NA	NA	NA	370. U	NA	370. U	1900. U
IPSSBB2		NA	NA	NA	31. J	NA	320 .U	1600. U
IPSSBC2		NA	NA	NA	330. U	NA	330. U	1700. U
IPSSC02		NA	NA	NA	360. U	NA	360. U	1800. U
IPSSJD1		NA	NA	NA	10. U	NA	10. U	50. U
IPSSJF1		NA	NA	NA	10. U	NA	10. U	50. U
IPSSKK1		NA	NA	NA	10. U	NA	10. U	50. U
IPSSKM1		NA	NA	NA	10. U	NA	10. U	50. U
IPSSPP2		NA	NA	NA	3300. U	NA	3300. U	17000. U
IPSSSB1		NA	NA	NA	10. U	NA	10. U	50. U
IPSST01B		NA	NA	NA	280. U	NA	280. U	1400. U
IPSST01C		NA	NA	NA	330. U	NA	330. U	1600. U
IPSST07A		NA	NA	NA	280. U	NA	280. U	1400. U
IPSST07B		NA	NA	NA	2800. U	NA	2800. U	14000. U
IPSST07BDL		NA	NA	NA	11000. U	NA	11000. U	56000. U
IPSST07C		NA	NA	NA	11000. U	NA	11000. U	54000. U
IPSST08A		NA	NA	NA	290. U	NA	290. U	1500. U
IPSST08B		NA	NA	NA	3400. U	NA	1200. J	17000. U
IPSST08BDL		NA	NA	NA	34000. U	NA	34000. U	170000. U
IPSST08C		NA	NA	NA	3400. U	NA	3400. U	17000. U
IPSST09A		NA	NA	NA	540. U	NA	540. U	2700. U
IPSST09B		NA	NA	NA	5900. U	NA	5900. U	30000. U
IPSST09C		NA	NA	NA	3000. U	NA	3000. U	15000. U
IPSST10A		NA	NA	NA	2800. U	NA	2800. UR	14000. U
IPSST10B		NA	NA	NA	3100. U	NA	3100. U	16000. U
IPSST10BDL		NA	NA	NA	31000. U	NA	31000. U	160000. U
IPSST10C		NA	NA	NA	3000. U	NA	3000. UR	15000. U
IPSST10CDL		NA	NA	NA	6000. U	NA	6000. U	30000. U
IPSST11A		NA	NA	NA	1500. U	NA	1500. U	7300. U

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPSST11B		2900. U	2900. U	2900. U	2900. U	5800. UR	2900. U	2900. UR	350000. E	2900. U	2900. UR	2900. U	2900. U
IPSST11BDL		29000. U	29000. U	29000. U	29000. U	58000. U	29000. U	29000. U	550000. D	29000. U	29000. U	29000. U	29000. U
IPSST11C		6700. UJ	6700. UJ	6700. UJ	6700. U	13000. UR	6700. UJ	6700. UR	910000. E	6700. UJ	6700. UR	6700. UJ	6700. UJ
IPSST11CDL		170000. U	170000. U	170000. U	170000. U	340000. U	170000. U	170000. U	1800000. D	170000. U	170000. U	170000. U	170000. U
IPSST12A		290. U	290. U	290. U	290. U	570. U	290. U	290. U	11000. E	290. U	290. U	290. U	290. U
IPSST12ADL		1400. U	1400. U	1400. U	1400. U	2900. U	1400. U	1400. U	12000. D	1400. U	1400. U	1400. U	1400. U
IPSST12B		1500. U	1500. U	1500. U	1500. U	3000. U	1500. U	1500. U	340000. E	1500. U	1500. U	1500. U	540. J
IPSST12BDL		15000. U	15000. U	15000. U	15000. U	30000. U	15000. U	15000. U	370000. D	15000. U	15000. U	15000. U	15000. U
IPSST12C		270. U	270. U	270. U	270. U	550. U	270. U	270. U	15000. E	270. U	270. U	270. U	100. J
IPSST12CDL		1400. U	1400. U	1400. U	1400. U	2700. U	1400. U	1400. U	15000. D	1400. U	1400. U	1400. U	1400. U
IPSST13A		590. U	590. U	590. U	590. U	1200. U	590. U	590. U	4300.	590. U	590. U	590. U	590. U
IPSST13B		690. U	690. U	690. U	690. U	1400. U	690. U	690. U	6000.	690. U	690. U	690. U	690. U
IPSST13C		1300. U	1300. U	1300. U	1300. U	2700. U	1300. U	1300. U	23000.	1300. U	1300. U	1300. U	1300. U
IPSST14A		1500. U	1500. U	1500. U	1500. U	3000. U	1500. U	1500. U	35000.	1500. U	1500. U	1500. U	1500. U
IPSST14B		300. U	300. U	300. U	300. U	600. U	300. U	300. U	54. J	300. U	300. U	300. U	300. U
IPSST14C		2700. U	2700. U	2700. U	2700. U	5400. U	2700. U	2700. U	66000.	2700. U	2700. U	2700. U	2700. U
IPSST15A		300. U	300. U	300. U	300. U	590. U	300. U	300. U	4000.	300. U	300. U	300. U	300. U
IPSST15B		310. U	310. U	310. U	310. U	620. U	310. U	310. U	100. J	310. U	310. U	310. U	310. U
IPSST15C		260. U	260. U	260. U	260. U	530. U	260. U	260. U	300.	260. U	260. U	260. U	260. U
IPSST16A		270. U	270. U	270. U	270. U	540. U	270. U	270. U	1700.	270. U	270. U	270. U	270. U
IPSST16B		280. U	280. U	280. U	280. U	570. U	280. U	280. U	280. U	280. U	280. U	280. U	280. U
IPSST16C		270. U	270. U	270. U	270. U	540. U	270. U	270. U	270. U	270. U	270. U	270. U	270. U
IPSST17A		270. U	270. U	270. U	270. U	540. U	270. U	270. U	440.	270. U	270. U	270. U	270. U
IPSST17B		270. U	270. U	270. U	270. U	540. U	270. U	270. U	270. U	270. U	270. U	270. U	270. U
IPSST17C		270. U	270. U	270. U	270. U	540. U	270. U	270. U	270. U	270. U	270. U	270. U	270. U
IPSST18A		270. U	270. U	270. U	270. U	540. U	270. U	270. U	18000. E	270. U	270. U	270. U	270. U
IPSST18ADL		1400. U	1400. U	1400. U	1400. U	2700. U	1400. U	1400. U	27000. D	1400. U	1400. U	1400. U	1400. U
IPSST18B		270. U	270. U	270. U	270. U	540. U	270. U	270. U	950.	270. U	270. U	270. U	270. U
IPSST18C		270. U	270. U	270. U	270. U	530. U	270. U	270. U	330.	270. U	270. U	270. U	270. U
IPSST20A		2800. U	2800. U	2800. U	2800. U	5500. U	2800. U	2800. U	99000. E	2800. U	2800. U	2800. U	2800. U
IPSST20ADL		5500. U	5500. U	5500. U	5500. U	11000. U	5500. U	5500. U	120000. D	5500. U	5500. U	5500. U	5500. U
IPSST20B		300. U	300. U	300. U	300. U	600. U	300. U	300. U	39000. E	300. U	300. U	300. U	300. U
IPSST20BDL		3000. U	3000. U	3000. U	3000. U	6000. U	3000. U	3000. U	75000. D	3000. U	3000. U	3000. U	3000. U
IPSST20C		330. U	330. U	330. U	330. U	650. U	330. U	330. U	78000. EJ	330. U	330. U	330. U	330. U
IPSST20CDL		6500. U	6500. U	6500. U	6500. U	13000. U	6500. U	6500. U	86000. D	6500. U	6500. U	6500. U	6500. U
IPSST21A		27000. U	27000. U	27000. U	27000. U	55000. U	27000. U	27000. U	380000.	27000. U	27000. U	27000. U	27000. U
IPSST21B		570. U	570. UR	570. U	570. U	1100. U	570. U	570. UR	200000. E	570. U	570. UR	570. U	570. U

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPSST11B		NA	NA	NA	2900. U	NA	2900. UR	14000. U
IPSST11BDL		NA	NA	NA	29000. U	NA	29000. U	140000. U
IPSST11C		NA	NA	NA	6700. UJ	NA	6700. UR	34000. U
IPSST11CDL		NA	NA	NA	170000. U	NA	170000. U	840000. U
IPSST12A		NA	NA	NA	290. U	NA	290. U	230. J
IPSST12ADL		NA	NA	NA	1400. U	NA	1400. U	7200. U
IPSST12B		NA	NA	NA	1500. U	NA	1500. U	7500. U
IPSST12BDL		NA	NA	NA	15000. U	NA	15000. U	75000. U
IPSST12C		NA	NA	NA	270. U	NA	270. U	1400. U
IPSST12CDL		NA	NA	NA	1400. U	NA	1400. U	6900. U
IPSST13A		NA	NA	NA	590. U	NA	590. U	3000. U
IPSST13B		NA	NA	NA	690. U	NA	690. U	3500. U
IPSST13C		NA	NA	NA	1300. U	NA	1300. U	6700. U
IPSST14A		NA	NA	NA	1500. U	NA	1500. U	7600. U
IPSST14B		NA	NA	NA	300. U	NA	300. U	1500. U
IPSST14C		NA	NA	NA	2700. U	NA	2700. U	13000. U
IPSST15A		NA	NA	NA	300. U	NA	300. U	1500. U
IPSST15B		NA	NA	NA	310. U	NA	310. U	1500. U
IPSST15C		NA	NA	NA	260. U	NA	260. U	1300. U
IPSST16A		NA	NA	NA	270. U	NA	270. U	1400. U
IPSST16B		NA	NA	NA	280. U	NA	280. U	1400. U
IPSST16C		NA	NA	NA	270. U	NA	270. U	1400. U
IPSST17A		NA	NA	NA	270. U	NA	270. U	1300. U
IPSST17B		NA	NA	NA	270. U	NA	270. U	1300. U
IPSST17C		NA	NA	NA	270. U	NA	270. U	1400. U
IPSST18A		NA	NA	NA	270. U	NA	270. U	1400. U
IPSST18ADL		NA	NA	NA	1400. U	NA	1400. U	6800. U
IPSST18B		NA	NA	NA	270. U	NA	270. U	1400. U
IPSST18C		NA	NA	NA	270. U	NA	270. U	1300. U
IPSST20A		NA	NA	NA	2800. U	NA	2800. U	14000. U
IPSST20ADL		NA	NA	NA	5500. U	NA	5500. U	28000. U
IPSST20B		NA	NA	NA	300. U	NA	300 .U	1500. U
IPSST20BDL		NA	NA	NA	3000. U	NA	3000. U	15000. U
IPSST20C		NA	NA	NA	330. U	NA	330. U	1600. U
IPSST20CDL		NA	NA	NA	6500. U	NA	6500. U	33000. U
IPSST21A		NA	NA	NA	27000. U	NA	27000. U	140000. U
IPSST21B		NA	NA	NA	570. U	NA	570. UR	2900. U

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPSST21BDL		29000. U	29000. U	29000. U	29000. U	57000. U	29000. U	29000. U	94000. D	29000. U	29000. U	29000. U	29000. U
IPSST21C		660. U	660. U	660. U	660. U	1300. U	660. U	660. U	180000. E	660. U	660. U	660. U	660. U
IPSST21CDL		33000. U	33000. U	33000. U	33000. U	66000. U	33000. U	33000. U	180000. D	33000. U	33000. U	33000. U	33000. U
IPSST22A		280. U	280. U	280. U	280. U	550. U	280. U	280. U	1400.	280. U	280. U	280. U	280. U
IPSST22B		290. U	290. U	290. U	290. U	570. U	290. U	290. U	7800.	290. U	290. U	290. U	290. U
IPSST22C		320. U	320. U	320. U	320. U	640. U	320. U	320. U	40000. E	320. U	320. U	320. U	320. U
IPSST22CDL		3200. U	3200. U	3200. U	3200. U	6400. U	3200. U	3200. U	61000. D	3200. U	3200. U	3200. U	3200. U
IPSST23A		280. U	280. U	280. U	280. U	550. U	280. U	280. U	110. J	280. U	280. U	280. U	280. U
IPSST23B		280. U	280. U	280. U	280. U	560. U	280. U	280. U	7700.	280. U	280. U	280. U	280. U
IPSST23C		12000. U	12000. U	12000. U	12000. U	24000. U	12000. U	12000. U	47000.	12000. U	12000. U	12000. U	12000. U
IPSST24A		11000. U	11000. U	11000. U	11000. U	23000. U	11000. U	11000. U	230000.	11000. U	11000. U	11000. U	11000. U
IPSST24B		310. U	310. U	310. U	310. U	630. U	310. U	310. U	6400.	310. U	310. U	310. U	310. U
IPSST24C		11000. U	11000. U	11000. U	11000. U	22000. U	11000. U	11000. U	190000.	11000. U	11000. U	11000. U	11000. U
IPSST25A		290. U	190. U	290. U	290. U	590. U	290. U	290. U	22000. E	290. U	190. U	290. U	290. U
IPSST25ADL		1500. U	1500. U	1500. U	1500. U	2900. U	1500. U	1500. U	29000. D	1500. U	1500. U	1500. U	1000. U
IPSST25B		280. U	280. U	280. U	280. U	550. U	280. U	280. U	12000. E	280. U	280. U	280. U	280. U
IPSST25BDL		1400. U	1400. U	1400. U	1400. U	2800. U	1400. U	1400. U	15000. D	1400. U	1400. U	1400. U	1400. U
IPSST25C		540. U	540. U	540. U	540. U	1100. U	540. U	540. U	23000. E	540. U	540. U	540. U	540. U
IPSST25CDL		2700. U	2700. U	2700. U	2700. U	5400. U	2700. U	2700. U	27000. D	2700. U	2700. U	2700. U	2700. U
IPSST30A		530. U	530. U	530. U	530. U	1100. U	530. U	530. U	74000. E	530. U	530. U	530. U	530. U
IPSST30ADL		2700. U	2700. U	2700. U	2700. U	5300. U	2700. U	2700. U	100000. ED	2700. U	2700. U	2700. U	2700. U
IPSST30ADL		13000. U	13000. U	13000. U	13000. U	26000. U	13000. U	13000. U	83000. D	13000. U	13000. U	13000. U	13000. U
IPSST30B		680. U	680. U	680. U	680. U	1400. U	680. U	680. U	71000. E	680. U	680. U	680. U	680. U
IPSST30BDL		3400. U	3400. U	3400. U	3400. U	6800. U	3400. U	3400. U	84000. D	3400. U	3400. U	3400. U	3400. U
IPSST30C		550. U	550. U	550. U	550. U	1100. U	550. U	550. U	4200.	550. U	550. U	550. U	550. U
IPSST30CDL		2700. U	2700. U	2700. U	2700. U	5500. U	2700. U	2700. U	3900. D	2700. U	2700. U	2700. U	2700. U
IPSST31A		660. U	660. U	660. U	660. U	1300. U	660. U	660. U	1200000.EJ	660. U	660. U	660. U	660. U
IPSST31ADL		33000. U	33000. U	33000. U	33000. U	66000. U	33000. U	33000. U	380000. D	33000. U	33000. U	33000. U	33000. U
IPSST31B		320. U	320. U	320. U	320. U	640. U	320. U	320. U	1300.	320. U	320. U	320. U	320. U
IPSST31C		540. U	540. U	540. U	540. U	1100. U	540. U	540. U	14000.	540. U	540. U	540. U	540. U
IPSST31CDL		2700. U	2700. U	2700. U	2700. U	5400. U	2700. U	2700. U	13000. D	2700. U	2700. U	2700. U	2700. U
IPSST32A		2800. U	2800. U	2800. U	2800. U	5600. U	2800. U	2800. U	11000.	2800. U	2800. U	2800. U	2800. U
IPSST32B		610. U	610. U	610. U	610. U	1200. U	610. U	610. U	130000. E	610. U	610. U	610. U	1200.
IPSST32BDL		15000. U	15000. U	15000. U	15000. U	31000. U	15000. U	15000. U	180000. D	15000. U	15000. U	15000. U	15000. U
IPSST32C		630. U	630. U	630. U	630. U	1300. U	630. U	630. U	170000. EJ	630. U	630. U	630. U	630. U
IPSST32CDL		16000. U	16000. U	16000. U	16000. U	32000. U	16000. U	16000. U	210000. D	16000. U	16000. U	16000. U	16000. U
IPSST34A		280. U	280. U	280. U	280. U	570. U	280. U	280. U	2300.	280. U	280. U	280. U	280. U

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPSST21BDL		NA	NA	NA	29000. U	NA	29000. U	140000. U
IPSST21C		NA	NA	NA	660. U	NA	660. U	3300. U
IPSST21CDL		NA	NA	NA	33000. U	NA	33000. U	170000. U
IPSST22A		NA	NA	NA	280. U	NA	280. U	1400. U
IPSST22B		NA	NA	NA	290. U	NA	290. U	1400. U
IPSST22C		NA	NA	NA	320. U	NA	320. U	1600. U
ST22CDL		NA	NA	NA	3200. U	NA	3200. U	16000. U
SST23A		NA	NA	NA	280. U	NA	280. U	1400. U
IPSST23B		NA	NA	NA	280. U	NA	280. U	1400. U
IPSST23C		NA	NA	NA	12000. U	NA	12000. U	61000. U
IPSST24A		NA	NA	NA	11000. U	NA	11000. U	57000. U
IPSST24B		NA	NA	NA	310. U	NA	310. U	1600. U
IPSST24C		NA	NA	NA	11000. U	NA	11000. U	56000. U
IPSST25A		NA	NA	NA	190. U	NA	190. U	1500. U
IPSST25ADL		NA	NA	NA	1500. U	NA	1500. U	7300. U
IPSST25B		NA	NA	NA	280. U	NA	280. U	1400. U
IPSST25BDL		NA	NA	NA	1400. U	NA	1400. U	6900. U
IPSST25C		NA	NA	NA	540. U	NA	540. U	2700. U
IPSST25CDL		NA	NA	NA	2700. U	NA	2700. U	14000. U
IPSST30A		NA	NA	NA	530. U	NA	530. U	2700. U
IPSST30ADL		NA	NA	NA	2700. U	NA	2700. U	13000. U
IPSST30ADL		NA	NA	NA	13000. U	NA	13000. U	66000. U
IPSST30B		NA	NA	NA	680. U	NA	680. U	470. J
IPSST30BDL		NA	NA	NA	3400. U	NA	3400. U	17000. U
IPSST30C		NA	NA	NA	550. U	NA	550. U	2700. U
IPSST30CDL		NA	NA	NA	2700. U	NA	2700. U	14000. U
IPSST31A		NA	NA	NA	660. U	NA	660. U	420. J
IPSST31ADL		NA	NA	NA	33000. U	NA	33000. U	160000. U
IPSST31B		NA	NA	NA	320. U	NA	320. U	1600. U
IPSST31C		NA	NA	NA	540. U	NA	540. U	2700. U
IPSST31CDL		NA	NA	NA	2700. U	NA	2700. U	13000. U
IPSST32A		NA	NA	NA	2800. U	NA	2800. U	14000. U
IPSST32B		NA	NA	NA	610. U	NA	610. U	3100. U
IPSST32BDL		NA	NA	NA	15000. U	NA	15000. U	77000. U
IPSST32C		NA	NA	NA	630. U	NA	630. U	3200. U
IPSST32CDL		NA	NA	NA	16000. U	NA	16000. U	79000. U
IPSST34A		NA	NA	NA	280. U	NA	280. U	1400. U

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPSST34B		300. U	300. U	300. U	300. U	600. U	300. U	300. U	130. J	300. U	300. U	300. U	300. U
IPSST34C		270. U	270. U	270. U	270. U	530. U	270. U	270. U	270. U	270. U	270. U	270. U	270. U
IPSST35A		280. U	280. U	280. U	280. U	550. U	280. U	280. U	2900.	280. U	280. U	280. U	280. U
IPSST35B		290. U	290. U	290. U	290. U	570. U	290. U	290. U	4000.	290. U	290. U	290. U	290. U
IPSST35C		310. U	310. U	310. U	310. U	610. U	310. U	310. U	74000. E	310. U	310. U	310. U	310. U
IPSST35CDL		6100. U	6100. U	6100. U	6100. U	12000. U	6100. U	6100. U	110000. D	6100. U	6100. U	6100. U	6100. U

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPSST34B		NA	NA	NA	300. U	NA	300. U	1500. U
IPSST34C		NA	NA	NA	270. U	NA	270. U	1300. U
IPSST35A		NA	NA	NA	280. U	NA	280. U	1400. U
IPSST35B		NA	NA	NA	290. U	NA	290. U	1400. U
IPSST35C		NA	NA	NA	310. U	NA	310. U	1500. U
IPSST35CDL		NA	NA	NA	6100. U	NA	6100. U	31000. U

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPSS11		10. U	10. U	10. U	10. U	20. U	10. U	10. U	10. U	10. U	10. U	10. U	10. U
IPSS22		10. U	10. U	10. U	10. U	20. U	10. U	10. U	10. U	10. U	10. U	10. U	10. U
IPSS33		10. U	10. U	10. U	10. U	20. U	10. U	10. U	10. U	10. U	10. U	10. U	10. U
IPSS44		10. U	10. U	10. U	10. U	20. U	10. U	10. U	10. U	10. U	10. U	10. U	10. U
IPSSBL1		320. U	320. U	320. U	320. U	630. U	320. U	320. U	410.	320. U	320. U	320. U	320. U
IPSSBL2		320. U	320. U	320. U	320. U	640. U	320. U	320. U	320. U	320. U	320. U	320. U	320. U
IPSSC03		320. U	320. U	320. U	320. U	630. U	320. U	320. U	1400.	320. U	320. U	320. U	320. U
IPSSC04		330. U	330. U	330. U	330. U	660. U	330. U	330. U	75000. E	330. U	330. U	330. U	460.
IPSSC04DL		3300. U	3300. U	3300. U	3300. U	6600. U	3300. U	3300. U	52000. D	3300. U	3300. U	3300. U	3300. U
IPSSC05		560. U	560. U	560. U	560. U	1100. U	560. U	560. U	19000. E	560. U	560. U	560. U	630.
IPSSC05DL		1100. U	1100. U	1100. U	1100. U	2200. U	1100. U	1100. U	19000. D	1100. U	1100. U	1100. U	620. JD
IPSSC06		6200. U	6200. U	6200. U	6200. U	12000. U	6200. U	6200. U	22000.	6200. U	6200. U	6200. U	6200. U
IPSSC07		6000. U	6000. U	6000. U	6000. U	12000. U	6000. U	6000. U	22000.	6000. U	6000. U	6000. U	6000. U
IPSSC08		3900. U	3900. U	3900. U	3900. U	7800. U	3900. U	3900. U	13000.	3900. U	3900. U	3900. U	3900. U
IPSSC09		470. U	470. U	470. U	470. U	930. U	470. U	470. U	8000.	470. U	470. U	470. U	130. J
IPSSC10		310. U	310. U	310. U	310. U	630. U	310. U	310. U	310. U	310. U	310. U	310. U	310. U
IPSSD07		300. U	300. U	300. U	300. U	600. U	300. U	300. U	4300.	300. U	300. U	300. U	300. U
IPSSD08		290. U	290. U	290. U	290. U	570. U	290. U	290. U	4000.	290. U	290. U	290. U	290. U
IPSSD09		280. U	280. U	280. U	280. U	570. U	280. U	280. U	3700.	280. U	280. U	280. U	280. U
IPSSD10		590. U	590. U	590. U	590. U	1200. U	590. U	590. U	21000. E	590. U	590. U	590. U	590. U
IPSSD10DL		1200. U	1200. U	1200. U	1200. U	2400. U	1200. U	1200. U	23000.	1200. U	1200. U	1200. U	1200. U
IPSSD11		420. U	420. U	420. U	420. U	840. U	420. U	420. U	3900.	420. U	420. U	420. U	420. U
IPSSD12		1700. U	1700. U	1700. U	1700. U	3400. U	1700. U	1700. U	25000.	1700. U	1700. U	1700. U	1700. U
IPSSD13		440. U	440. U	440. U	440. U	880. U	440. U	440. U	7500.	440. U	440. U	440. U	440. U
IPSSD14		790. U	790. U	790. U	790. U	1600. U	790. U	790. U	2700.	790.U	790. U	790. U	790. U
IPSSD15		570. U	570. U	570. U	570. U	1100. U	570. U	570. U	2300.	570. U	570. U	570. U	570. U
IPSSG1		400. U	400. U	400. U	400. U	810. U	400. U	400. U	400. U	400. U	400. U	400. U	400. U
IPSSG2		640. U	640. U	640. U	640. U	1300. U	640. U	640. U	640. U	640. U	640. U	640. U	640. U
IPSSM2		940. U	940. U	940. U	940. U	1900. U	940. U	940. U	940. U	940. U	940. U	940. U	940. U
IPSSR09		340. U	340. U	340. U	340. U	680. U	340. U	340. U	360.	340. U	340. U	340. U	40. J
IPSSR10		290. U	290. U	290. U	290. U	580. U	290. U	290. U	71. J	290. U	190. U	290. U	290. U
IPSSR11		280. U	280. U	280. U	280. U	560. U	280. U	280. U	35. J	280. U	280. U	280. U	280. U
IPSSR12		930. U	930. U	930. U	930. U	1900. U	930. U	930. U	1100.	930. U	930. U	930. U	930. U
IPSSR13		1100. U	1100. U	1100. U	1100. U	2100. U	1100. U	1100. U	2400.	1100. U	1100. U	1100. U	1100. U
IPSSR14		1100. U	1100. U	1100. U	1100. U	2200. U	1100. U	1100. U	1600.	1100. U	1100. U	1100. U	1100. U
IPSSR15		530. U	530. U	530. U	530. U	1100. U	530. U	530. U	2400.	530. U	530. U	530. U	290. J
IPSSR15RE		530. U	530. U	530. U	530. U	1100. U	530. U	530. U	2200.	530. U	530. U	530. U	250. J

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPSS11		NA	NA	NA	10. U	NA	10. U	50. U
IPSS22		NA	NA	NA	10. U	NA	10. U	50. U
IPSS33		NA	NA	NA	10. U	NA	10. U	50. U
IPSS44		NA	NA	NA	10. U	NA	10. U	50. U
IPSSBL1		NA	NA	NA	320. U	NA	320. U	1600. U
IPSSBL2		NA	NA	NA	320. U	NA	320. U	1600. U
IPSSC03		NA	NA	NA	320. U	NA	320. U	1600. U
IPSSC04		NA	NA	NA	330. U	NA	800.	1600. U
IPSSC04DL		NA	NA	NA	3300. U	NA	760. JD	16000. U
IPSSC05		NA	NA	NA	560. U	NA	560. U	370. J
IPSSC05DL		NA	NA	NA	1100. U	NA	1100. U	5600. U
IPSSC06		NA	NA	NA	6200. U	NA	6200. U	31000. U
IPSSC07		NA	NA	NA	6000. U	NA	6000. U	30000. U
IPSSC08		NA	NA	NA	3900. U	NA	3900. U	20000. U
IPSSC09		NA	NA	NA	470. U	NA	470. U	2300. U
IPSSC10		NA	NA	NA	310. U	NA	310. U	1600. U
IPSSD07		NA	NA	NA	300. U	NA	300. U	1500. U
IPSSD08		NA	NA	NA	290. U	NA	290. U	1400. U
IPSSD09		NA	NA	NA	280. U	NA	280. U	1400. U
IPSSD10		NA	NA	NA	590. U	NA	590. U	710. J
IPSSD10DL		NA	NA	NA	1200. U	NA	1200. U	5900. U
IPSSD11		NA	NA	NA	420. U	NA	420. U	520. J
IPSSD12		NA	NA	NA	1700. U	NA	1700. U	8500. U
IPSSD13		NA	NA	NA	440. U	NA	440. U	2200. U
IPSSD14		NA	NA	NA	790. U	NA	790. U	4000. U
IPSSD15		NA	NA	NA	570. U	NA	570. U	2800. U
IPSSG1		NA	NA	NA	400. U	NA	400. U	440. J
IPSSG2		NA	NA	NA	640. U	NA	640. U	930. J
IPSSM2		NA	NA	NA	940. U	NA	940. U	1300. J
IPSSR09		NA	NA	NA	340. U	NA	340. U	1700. U
IPSSR10		NA	NA	NA	190. U	NA	190. U	1500. U
IPSSR11		NA	NA	NA	280. U	NA	280. U	1400. U
IPSSR12		NA	NA	NA	930. U	NA	930. U	4600. U
IPSSR13		NA	NA	NA	1100. U	NA	1100. U	5400. U
IPSSR14		NA	NA	NA	1100. U	NA	1100. U	1200. J
IPSSR15		NA	NA	NA	530. U	NA	530. U	1000. J
IPSSR15RE		NA	NA	NA	530. U	NA	530. U	860. J

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPSSR16		540. U	540. U	540. U	540. U	1100. U	540. U	540. U	640.	540. U	540. U	540. U	540. U
IPSSR17		310. U	310. U	310. U	310. U	630. U	310. U	310. U	220. J	310. U	310. U	310. U	310. U
IPSSR18		610. U	610. U	610. U	610. U	1200. U	610. U	610. U	610. U	300. J	610. U	610. U	3900. U
IPSSR19		680. U	680. J	680. U	680. U	1400. U	680. U	680. U	680. U	680. U	680. U	680. U	920.
IPSSR20		650. U	650. U	650. U	650. U	1300. U	650. U	650. U	650. U	650. U	650. U	650. U	2400.
IPSSR21		630. U	630. U	630. U	630. U	1300. U	630. U	630. U	630. U	630. U	630. U	630. U	3400.
IPSSR22		920. U	920. U	920. U	920. U	1800. U	920. U	920. U	760. J	920. U	920. U	920. U	840. J
IPSSR26		880. U	880. U	880. U	880. U	1800. U	880. U	880. U	880. U	880. U	880. U	880. U	880. U
IPSSY7		300. U	300. U	300. U	300. U	600. U	300. U	300. U	1200.	300. U	300. U	300. U	300. U
IPSSY8		300. U	300. U	300. U	300. U	600. U	300. U	300. U	190. J	300. U	300. U	300. U	300. U
IPSSY9		330. U	330. U	330. U	330. U	650. U	330. U	330. U	750.	330. U	330. U	330. U	330. U

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPSSR16		NA	NA	NA	540. U	NA	540. U	410. J
IPSSR17		NA	NA	NA	310. U	NA	310. U	1600. U
IPSSR18		NA	NA	NA	610. U	NA	610. U	1100. J
IPSSR19		NA	NA	NA	680. U	NA	680. U	100. J
IPSSR20		NA	NA	NA	650. U	NA	650. U	790. J
IPSSR21		NA	NA	NA	630. U	NA	630. U	940. J
IPSSR22		NA	NA	NA	920. U	NA	920. U	4600. U
IPSSR26		NA	NA	NA	880. U	NA	880. U	4400. U
IPSSY7		NA	NA	NA	300. U	NA	300. U	1500. U
IPSSY8		NA	NA	NA	300. U	NA	300. U	1500. U
IPSSY9		NA	NA	NA	330. U	NA	330. U	1600. U

SAMPLE NUMBER	SS	2-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	2,4,6-TRI-CHLORO-PHENOL	2-METHYL-PHENOL	4-METHYL-PHENOL
IPSSBLK		10. U	10. U	10. U	10. U	20. U	10. U	10. U	10. U	10. U	10. U	10. U	10. U
IPSSN1		50000. U	50000. U	50000. U	50000. U	100000. U	50000. U	50000. U	280000.	50000. U	50000. U	50000. U	50000. U
IPSSN2		49000. U	49000. U	49000. U	49000. U	98000. U	49000. U	49000. U	170000	49000. U	49000. U	49000. U	49000. U
IPSSR23		670. U	670. U	670. U	670. U	1300. U	670. U	670. U	1100.	670. U	670. U	670. U	670. U
IPSSR24		760. U	760. U	760. U	760. U	1500. U	760. U	760. U	760. U	760. U	760. U	760. U	760. U
IPSSR25		350. U	350. U	350. U	350. U	700. U	350. U	350. U	350. U	350. U	350. U	350. U	350. U
IPSSRIN		10. U	10. U	10. U	10. U	20. U	10. U	10. U	10. U	10. U	10. U	10. U	10. U
IPSSV1		6000. U	6000. U	6000. U	6000. U	12000. U	6000. U	6000. U	6000. U	6000. U	6000. U	6000. U	6000. U
IPSSV2		5000. U	5000. U	5000. U	5000. U	10000. U	5000. U	5000. U	5000. U	5000. U	5000. U	5000. U	5000. U
IPSSV3		10000. U	10000. U	10000. U	10000. U	20000. U	10000. U	10000. U	10000. U	10000. U	10000. U	10000. U	10000. U

SAMPLE NUMBER	SS	4-CHLORO-2-METHYL-PHENOL	4,6-DI-CHLORO-PHENOL	DINOSEB	4-CHLORO-3-METHYL-PHENOL	2,3,5,6-TETRACHLORO-PHENOL	2,4,5-TRI-CHLORO-PHENOL	BENZOIC ACID
IPSSBLK		NA	NA	NA	10. U	NA	10. U	50. U
IPSSN1		NA	NA	NA	50000. U	NA	50000. U	250000. U
IPSSN2		NA	NA	NA	49000. U	NA	49000. U	250000. U
IPSSR23		NA	NA	NA	670. U	NA	670. U	1600. J
IPSSR24		NA	NA	NA	760. U	NA	760. U	1800. J
IPSSR25		NA	NA	NA	350. U	NA	350. U	410. J
IPSSRIN		NA	NA	NA	10. U	NA	10. U	50. U
IPSSV1		NA	NA	NA	6000. U	NA	6000. U	30000. U
IPSSV2		NA	NA	NA	5000. U	NA	5000. U	25000. U
IPSSV3		NA	NA	NA	10000. U	NA	10000. U	50000. U

PAH ANALYSIS (ug/Kg)

SAMPLE NUMBER	SS	NAPH-THALENE	ACENAPH-THYLENE	ACENAPH-THENE	FLUORENE	PHENAN-THRENE	ANTHRA-CENE	FLUORAN-THENE	PYRENE	BENZO(A)-ANTHRACENE	CHRYSENE	BENZO(B)-FLUORAN-THENE	BENZO(K)-FLUORAN-THENE	BENZO(A)-PYRENE
IPSST01A		82. U	82. U	82. U	82. U	12. J	82. U	82. U	24. J	82. U	32. J	13. J	82. U	82. U
IPSST02A		85. U	85. U	85. U	85. U	85. U	85. U	85. U	85. U	85. U	85. U	33. J	25. J	85. U
IPSST02B		81. U	81. U	81. U	81. U	16. J	81. U	81. U	39. J	81. U	81. U	27. J	81. U	81. U
IPSST02C		100.	89. U	89. U	89. U	170.	40. J	220.	180.	91.	150.	200.	89. U	74. J
IPSST03A		83. U	83. U	83. U	83. U	97.	11. J	40. J	130.	83. U	83. U	26. J	83. U	83. U
IPSST03ADL		410. U	410. U	410. U	410. U	140. JD	410. U	410. U	150. JD	410. U	160. JD	410. U	410. U	410. U
IPSST03B		87. U	87. U	87. U	87. U	63. J	87. U	58. J	57. J	87. U	87. U	58. J	87. U	87. U
IPSST03C		97. U	97. U	97. U	97. U	97. U	97. U	97. U	97. U	97. U	97. U	97. U	97. U	97. U
IPSST04A		85. U	85. U	85. U	85. U	12. J	85. U	85. U	85. U	85. U	85. U	85. U	85. U	85. U
IPSST04B		85. U	85. U	85. U	85. U	24. J	85. U	85. U	33. J	85. U	85. U	41. J	85. U	85. U
IPSST04C		96. U	96. U	96. U	96. U	15. J	96. U	96. U	96. U	96. U	96. U	96. U	96. U	96. U
IPSST05A		81. U	81. U	81. U	81. U	81. U	81. U	81. U	81. U	81. U	81. U	81. U	81. U	81. U
IPSST05B		84. U	84. U	84. U	84. U	42. J	11. J	54. J	46. J	37. J	78. J	92.	84. U	43. J
IPSST05C		73. J	98. U	98. U	98. U	72. J	23. J	150.	140.	110.	170.	170.	98. U	74. J
IPSST06A		81. U	81. U	81. U	81. U	210.	81. U	81. U	40. J	81. U	81. U	81. U	81. U	81. U
IPSST06ADL		410. U	410. U	410. U	410. U	260. JD	410. U	410. U	410. U	410. U	410. U	410. U	410. U	410. U
IPSST06B		84. U	84. U	84. U	84. U	84. U	84. U	84. U	84. U	84. U	84. U	84. U	84. U	84. U
IPSST06C		22. J	99. U	99. U	99. U	33. J	99. U	40. J	60. J	99. U	99. U	71. J	99. U	99. U
IPSST19A		81. U	81. U	81. U	81. U	140.	170.	72. J	1200.	130.	570.	130.	81. U	120.
IPSST19ADL		810. U	810. U	810. U	810. U	170. JD	810. U	810. U	1900. D	810. U	940. D	220. JD	810. U	810. U
IPSST19B		82. U	82. U	82. U	82. U	82. U	82. U	82. U	220.	82. U	82. U	82. U	82. U	82. U
IPSST19C		86. U	86. U	86. U	86. U	120.	86. U	86. U	290.	86. U	120.	86. U	86. U	86. U

SAMPLE NUMBER	SS	DIBENZO-(A,H)ANTHRACENE	BENZO-(G,H,I,)-PERYLENE	INDENO-(1,2,3CD)-PYRENE	DIBENZOFURAN	2-METHYLNAPHTHALENE
IPSST01A		82. U	82. U	82. U	82. U	82. U
IPSST02A		85. U	85. U	85. U	85. U	85. U
IPSST02B		81. U	81. U	81. U	81. U	81. U
IPSST02C		89. U	44. J	54. J	89. U	89.
IPSST03A		83. U	83. U	83. U	83. U	83. U
IPSST03ADL		410. U	410. U	410. U	410. U	410. U
IPSST03B		87. U	87. U	87. U	87. U	34. J
IPSST03C		97. U	97. U	97. U	97. U	97. U
IPSST04A		85. U	85. U	85. U	85. U	85. U
IPSST04B		85. U	85. U	85. U	85. U	85. U
IPSST04C		96. U	96. U	96. U	96. U	96. U
IPSST05A		81. U	81. U	81. U	81. U	81. U
IPSST05B		84. U	26. J	26. J	84. U	84. U
IPSST05C		98. U	33. J	37. J	98. U	84. J
IPSST06A		81. U	81. U	81. U	81. U	81. U
IPSST06ADL		410. U	410. U	410. U	410. U	410. U
IPSST06B		84. U	84. U	84. U	84. U	84. U
IPSST06C		99. U	99. U	99. U	99. U	99. U
IPSST19A		81. U	81. U	81. U	81. U	39. J
IPSST19ADL		810. U	810. U	810. U	810. U	810. U
IPSST19B		82. U	82. U	82. U	82. U	82. U
IPSST19C		86. U	86. U	86. U	86. U	86. U

SAMPLE NUMBER	SS	NAPH-THALENE	ACENAPH-THYLENE	ACENAPH-THENE	FLUORENE	PHENAN-THRENE	ANTHRA-CENE	FLUORAN-THENE	PYRENE	BENZO(A)-ANTHRACENE	CHRYSENE	BENZO(B)-FLUORAN-THENE	BENZO(K)-FLUORAN-THENE	BENZO(A)-PYRENE
IPSS55		3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U
IPSS66		3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U
IPSS77		3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U
IPSS88		3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U
IPSS99		3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U
IPSSAA2		97. U	97. U	97. U	97. U	97. U	97. U	97. U	97. U	97. U	97. U	97. U	97. U	97. U
IPSSAB2		99. U	99. U	99. U	99. U	99. U	99. U	99. U	99. U	99. U	99. U	99. U	99. U	99. U
IPSSAC2		99. U	99. U	99. U	99. U	99. U	99. U	99. U	99. U	99. U	99. U	99. U	99. U	99. U
IPSSBA2		39. J	110. U	110. U	110. U	61. J	110. U	110. U	110. U	110. U	110. U	110. U	110. U	110. U
IPSSBB2		96. U	96. U	96. U	96. U	27. J	96. U	96. U	96. U	96. U	96. U	96. U	96. U	96. U
IPSSBC2		100. U	100. U	100. U	100. U	100. U	100. U	100. U	100. U	100. U	100. U	100. U	100. U	100. U
IPSSC02		93. J	110. U	110. U	110. U	250.	66. J	370.	380.	180.	260.	370.	110. U	99. J
IPSSJD1		3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U
IPSSJF1		3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U
IPSSKK1		3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U
IPSSKM1		3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U
IPSSSB1		3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U
IPSST01B		84. U	84. U	84. U	84. U	18. J	84. U	21. J	20. J	84. U	84. U	25. J	84. U	84. U
IPSST01C		99. U	99. U	99. U	99. U	99. U	99. U	99. U	99. U	99. U	99. U	99. U	99. U	99. U
IPSST07A		340.	84. U	84. U	84. U	1100.	240.	1500.	1400.	690.	1200.	1700.	84. U	430.
IPSST07B		5600.	840. U	6500.	7800.	32000.	2200.	1700.	2300.	850.	840. U	840. U	840. U	840. U
IPSST07BDL		7900. D	3400. U	7600. D	10000. D	39000. D	3100. J D	1700. J D	2400. J D	3400. U	3400. U	3400. U	3400. U	3400. U
IPSST07C		15000.	3200. U	15000.	18000.	92000.	9100.	5900.	7700.	3200. U	1800. J	3200. U	3200. U	3200. U
IPSST08A		39. J	88. U	88. U	88. U	99.	22. J	130.	110.	80. J	120.	160.	88. U	65. J
IPSST08B		360. J	1000. U	1000. U	1000. U	1100.	550. J	970. J	1800.	530. J	1100.	1800.	1000. U	580. J
IPSST08BDL		10000. U	10000. U	10000. U	10000. U	1100. J D	10000. U	10000. U	1500. J D	10000. U	10000. U	10000. U	10000. U	10000. U
IPSST08C		4900.	1000. U	6100.	8600.	19000.	2700.	6800.	5400.	2000.	3400.	4000.	1000. U	1300.
IPSST09A		690.	150. J	300.	220.	2500.	830.	3100.	3500.	1500.	2200.	3900.	160. U	1300.
IPSST09B		7300.	1800. U	1800. U	1800. U	16000.	6300.	19000.	20000.	8700.	16000.	19000.	1800. U	8200.
IPSST09C		3700.	890. U	5000.	4700.	15000.	2000.	4300.	4600.	1200.	2100.	2400.	890. U	850. J
IPSST10A		2900.	840. UR	840. UR	840. UR	5500.	8100.	12000.	10000.	5800.	10000.	13000.	840. U	4100.
IPSST10B		2600.	930.	4600.	3900.	15000.	2200.	4000.	3400.	760. J	1400.	1900.	930. U	930. U
IPSST10BDL		9300. U	9300. U	9300. U	9300. U	9300. U	9300. U	9300. U	9300. U	9300. U	9300. U	9300. U	9300. U	9300. U
IPSST10C		8500.	910. UR	11000. J	14000. J	39000.	4100.	6000.	5100.	1400.	2400.	2900.	910. U	1100.
IPSST10CDL		9100. D	1800. U	11000. D	13000. D	42000. D	4700. D	5900. D	5500. D	1800. U	2500. D	2800. D	1800. U	1800. U
IPSST11A		410. J	160. J	140. J	120. J	1400.	500.	1900.	2500.	900.	1300.	3000.	440. U	1100.
IPSST11B		1700.	860. UR	15000. J	10000. J	19000.	3400.	6800.	5100.	1600.	2900.	2800.	860. U	920.
IPSST11BDL		8600. U	8600. U	8600. U	8600. U	20000. D	8600. U	8600. U	8600. U	8600. U	8600. U	8600. U	8600. U	8600. U

SAMPLE NUMBER	SS	DIBENZO-(A,H)ANTHRACENE	BENZO-(G,H,I,)-PERYLENE	INDENO-(1,2,3CD)-PYRENE	DIBENZO-FURAN	2-METHYL-NAPHTHALENE
IPSS55		3. U	3. U	3. U	3. U	3. U
IPSS66		3. U	3. U	3. U	3. U	3. U
IPSS77		3. U	3. U	3. U	3. U	3. U
IPSS88		3. U	3. U	3. U	3. U	3. U
IPSS99		3. U	3. U	3. U	3. U	3. U
IPSSAA2		97. U	97. U	97. U	97. U	97. U
IPSSAB2		99. U	99. U	99. U	99. U	99. U
IPSSAC2		99. U	99. U	99. U	99. U	99. U
IPSSBA2		110. U	110. U	110. U	110. U	110. U
IPSSBB2		96. U	96. U	96. U	96. U	96. U
IPSSBC2		100. U	100. U	100. U	100. U	100. U
IPSSC02		37. J	67. J	84. J	50. J	140.
IPSSJD1		3. U	3. U	3. U	3. U	3. U
IPSSJF1		3. U	3. U	3. U	3. U	3. U
IPSSKK1		3. U	3. U	3. U	3. U	3. U
IPSSKM1		3. U	3. U	3. U	3. U	3. U
IPSSSB1		3. U	3. U	3. U	3. U	3. U
IPSST01B		84. U	84. U	84. U	84. U	84. U
IPSST01C		99. U	99. U	99. U	99. U	99. U
IPSST07A		170.	340.	370.	270.	220.
IPSST07B		840. U	840. U	840. U	4200.	41000.
IPSST07BDL		3400. U	3400. U	3400. U	6500. D	86000. D
IPSST07C		3200. U	3200. U	3200. U	11000.	120000.
IPSST08A		88. U	37. J	48. J	19. J	55. J
IPSST08B		1000. U	520. J	340. J	400. J	1400.
IPSST08BDL		10000. U	10000. U	10000. U	10000. U	10000. U
IPSST08C		250. J	470. J	620. J	5300.	43000.
IPSST09A		350.	960.	1100.	720.	900.
IPSST09B		1800.	5000.	5600.	5000.	5600.
IPSST09C		890. U	350. J	430. J	3500.	27000.
IPSST10A		1000.	2200.	2700.	2000. J	3400.
IPSST10B		930. U	930. U	930. U	3900.	20000.
IPSST10BDL		9300. U	9300. U	9300. U	9300. U	31000. D
IPSST10C		910. U	480. J	670. J	8000. J	51000.
IPSST10CDL		1800. U	1800. U	1800. U	7900. D	86000. D
IPSST11A		200. J	550.	760.	420. J	970.
IPSST11B		860. U	470. J	620. J	860. UR	17000.
IPSST11BDL		8600. U	8600. U	8600. U	8600. U	28000. D

SAMPLE NUMBER	SS	NAPH-THALENE	ACENAPH-THYLENE	ACENAPH-THENE	FLUORENE	PHENAN-THRENE	ANTHRA-CENE	FLUORAN-THENE	PYRENE	BENZO(A)-ANTHRACENE	CHRYSENE	BENZO(B)-FLUORAN-THENE	BENZO(K)-FLUORAN-THENE	BENZO(A)-PYRENE
IPSST11C		29000. J	2000. UR	49000. R	46000. J	110000.	280000. E	130000.	120000.	70000.	160000.	140000.	2000. U	56000.
IPSST11CDL		50000. U	50000. U	50000. U	50000. U	130000. D	460000. D	160000. D	190000. D	80000. D	250000. D	160000. D	50000. U	66000. D
IPSST12A		150.	33. J	86. U	35. J	360.	140.	86. U	470.	230.	390.	800.	86. U	360.
IPSST12ADL		170. JD	430. U	430. U	430. U	430. JD	180. JD	430. U	540. D	280. JD	540. D	820. D	430. U	400. JD
IPSST12B		2000.	3200.	4200.	6200.	23000.	1700.	450. U	2800.	950.	1700.	1700.	450. U	560.
IPSST12BDL		4500. U	4500. U	3500. JD	5900. D	20000. D	1500. JD	2600. JD	2900. JD	4500. U	4500. U	4500. U	4500. U	4500. U
IPSST12C		650.	930.	1300.	1900.	6700.	400.	190.	630.	110.	120.	82. U	82. U	82. U
IPSST12CDL		650. D	410. U	1300. D	2000. D	6500. D	480. D	410. U	570. D	410. U	410. U	410. U	410. U	410. U
IPSST13A		180. U	180. U	180. U	180. U	29. J	180. U	180. U	58. J	180. U	180. U	180. U	180. U	180. U
IPSST13B		550.	210. U	59. J	73. J	690.	190. J	540.	710.	240.	420.	630.	210. U	220.
IPSST13C		400. U	400. U	270. J	400. U	94. J	400. U	400. U	530.	400. U	400. U	400. U	400. U	400. U
IPSST14A		160. J	68. J	450. U	120. J	2000.	200. J	1300.	1200.	570.	820.	1000.	450. U	360. J
IPSST14B		91. U	91. U	91. U	91. U	50. J	91. U	91. U	23. J	91. J	91. J	31. J	91. U	91. U
IPSST14C		800. U	800. U	4600.	1900.	1400.	850.	1200.	1400.	800. U	800. U	800. U	800. U	800. U
IPSST15A		55. J	89. U	89. U	89. U	250.	40. J	140.	150.	59. J	120.	160.	89. U	59. J
IPSST15B		45. J	93. U	93. U	93. U	86. J	93. U	92. J	58. J	93. U	93. U	71. J	93. U	93. U
IPSST15C		79. U	79. U	79. U	79. U	11. J	79. U	79. U	79. U	79. U	79. U	79. U	79. U	79. U
IPSST16A		82. U	82. U	82. U	82. U	71. J	36. J	78. J	230.	130.	82. U	130.	82. U	82. U
IPSST16B		85. U	85. U	85. U	85. U	85. U	85. U	85. U	85. U	85. U	85. U	85. U	85. U	85. U
IPSST16C		82. U	82. U	82. U	82. U	82. U	82. U	82. U	82. U	82. U	82. U	82. U	82. U	82. U
IPSST17A		81. U	81. U	81. U	81. U	33. J	24. J	37. J	50. J	81. U	81. U	64. J	81. U	81. U
IPSST17B		81. U	81. U	81. U	81. U	18. J	81. U	42. J	38. J	81. U	81. U	62. J	81. U	81. U
IPSST17C		82. U	82. U	82. U	82. U	82. U	82. U	82. U	82. U	82. U	82. U	65. J	82. U	82. U
IPSST18A		82. U	82. U	82. U	82. U	380.	58. J	82. U	220. J	82. U	82. U	82. U	82. U	82. U
IPSST18ADL		410. U	410. U	410. U	410. U	730. D	410. U	410. U	410. U	410. U	410. U	410. U	410. U	410. U
IPSST18B		81. U	81. U	81. U	81. U	270.	98.	400.	310.	210.	490.	540.	81. U	200.
IPSST18C		80. U	80. U	80. U	80. U	80. U	80. U	80. U	80. U	80. U	80. U	80. U	80. U	80. U
IPSST20A		830. U	830. U	830. U	830. U	8500.	930.	1700.	4300.	360. J	1200.	830. U	830. U	830. U
IPSST20ADL		1700. U	1700. U	1700. U	1700. U	10000. D	1700. U	2200. D	5600. D	1700. U	1800. D	1700. U	1700. U	1700. U
IPSST20B		89. U	89. U	89. U	89. U	440.	39. J	460.	1400.	140.	440.	89. U	89. U	89. U
IPSST20BDL		890. U	890. U	890. U	890. U	890. U	890. U	1100. D	2600. D	890. U	890. U	890. U	890. U	890. U
IPSST20C		5500.	4300.	650. U	5900. J	40000. E	6300. J	1500. J	510.	750.	1400.	98. U	98. U	110.
IPSST20CDL		6600. D	2000. U	7200. D	12000. D	62000. D	5500. D	2000.U	8900. D	980. JD	2300. D	2000. U	2000. U	2000. U
IPSST21A		8200. U	8200. U	7600. J	18000.	46000.	3100. J	4500. J	8900.	8200. U	8200. U	8200. U	8200. U	8200. U
IPSST21B		170. U	1100. J	1300. J	2600. J	36000. E	3300.	170. U	470.	480.	1100.	94. J	170. U	170. U
IPSST21BDL		8600. U	8600. U	8600. U	2800. J D	23000. D	2500. J D	3400. J D	5600. J D	8600. U	8600. U	8600. U	8600. U	8600. U
IPSST21C		120. J	200. U	200. U	490.	3900.	330.	1400.	200. U	410.	1000.	280.	200. U	170. J
IPSST21CDL		10000. U	10000. U	10000. U	10000. U	3600. J D	10000. U	1600. J D	5000. J D	10000. U	10000. U	10000. U	10000. U	10000. U

SAMPLE NUMBER	SS	DIBENZO-(A,H)ANTH-RACENE	BENZO-(G,H,I,)-PERYLENE	INDENO-(1,2,3CD)-PYRENE	DIBENZO-FURAN	2-METHYL-NAPHTH-ALENE
IPSST11C		12000.	19000.	28000.	31000. J	150000. J
IPSST11CDL		50000. U	50000. U	24000. JD	50000. U	470000. D
IPSST12A		64. J	190.	210.	140.	280.
IPSST12ADL		430. U	370. JD	400. JD	150. JD	300. JD
IPSST12B		450. U	370. J	430. J	4000.	26000.
IPSST12BDL		4500. U	4500. U	4500. U	3900. JD	24000. D
IPSST12C		82. U	82. U	82. U	1000.	10000. E
IPSST12CDL		410. U	410. U	410. U	660. D	12000. D
IPSST13A		180. U	180. U	180. U	180. U	180. U
IPSST13B		210. U	150 .J	180. J	280.	1300.
IPSST13C		400. U	400. U	400. U	400. U	400. U
IPSST14A		450. U	200. J	260. J	190. J	360. J
IPSST14B		91. U	91. U	91. U	91. U	91. U
IPSST14C		800. U	800. U	800. U	800. U	1500.
IPSST15A		89. U	57. J	49. J	50. J	85. J
IPSST15B		93. U	93. U	93. U	23. J	93. U
IPSST15C		79. U	79. U	79. U	79. U	79. U
IPSST16A		82. U	82. U	82. U	82. U	82. U
IPSST16B		85. U	85. U	85. U	85. U	85. U
IPSST16C		82. U	82. U	82. U	82. U	82. U
IPSST17A		81. U	81. U	81. U	81. U	81. U
IPSST17B		81. U	81. U	81. U	81. U	81. U
IPSST17C		82. U	82. U	82. U	82. U	82. U
IPSST18A		82. U	82. U	82. U	82. U	82. U
IPSST18ADL		410. U	410. U	410. U	410. U	410. U
IPSST18B		73. J	310.	250.	81. U	81. U
IPSST18C		80. U	80. U	80. U	80. U	80. U
IPSST20A		830. U	830. U	830. U	830. U	1900.
IPSST20ADL		1700. U	1700. U	1700. U	1700. U	1700. U
IPSST20B		89. U	89. U	89. U	89. U	89. U
IPSST20BDL		890. U	890. U	890. U	890. U	890. U
IPSST20C		98. U	98. U	98. U	2100.	17000. E
IPSST20CDL		2000. U	2000. U	2000. U	5600. D	49000. D
IPSST21A		8200. U	8200. U	8200. U	7600. J	8200. U
IPSST21B		170. U	170. U	170. U	1400. J	1200.
IPSST21BDL		8600. U	8600. U	8600. U	8600. U	8600. U
IPSST21C		200. U	200. U	200. U	200. U	200. U
IPSST21CDL		10000. U	10000. U	10000. U	10000. U	10000. U

SAMPLE NUMBER	SS	NAPH-THALENE	ACENAPH-THYLENE	ACENAPH-THENE	FLUORENE	PHENAN-THRENE	ANTHRA-CENE	FLUORAN-THENE	PYRENE	BENZO(A)-ANTHRACENE	CHRYSENE	BENZO(B)-FLUORAN-THENE	BENZO(K)-FLUORAN-THENE	BENZO(A)-PYRENE
IPSST22A		83. U	83. U	83. U	83. U	83. U	83. U	83. U	83. U	83. U	83. U	83. U	83. U	83. U
IPSST22B		65. J	18. J	86. U	96.	700.	61. J	190.	190.	110.	150.	210.	86. U	82. J
IPSST22C		180.	60. J	190.	400.	2300.	210.	190.	290.	96. U	96. U	48. J	96. U	96. U
IPSST22CDL		230. J D	960. U	220. J D	480. J D	3000. D	320. J D	960. U	400. J D	960. U	220. J D	960. U	960. U	960. U
IPSST23A		83. U	83. U	83. U	83. U	83. U	83. U	83. U	83. U	83. U	83. U	83. U	83. U	83. U
IPSST23B		240.	85. U	160.	260.	1000.	65. J	120.	130.	48. J	100.	110.	85. U	85. U
IPSST23C		2500. J	3700. U	3700. U	4400.	24000.	2100. J	3700. U	1500. J	3700. U	3700. U	3700. U	3700. U	3700. U
IPSST24A		3400. U	3400. U	3400. U	3400. U	3400. U	3400. U	3400. U	3400. U	3400. U	3400. U	3400. U	3400. U	3400. U
IPSST24B		94. U	94. U	94. U	94. U	230.	94. U	68. J	61. J	94. U	94. U	67. J	94. U	94. U
IPSST24C		11000.	3300. U	10000.	14000.	71000.	7000.	3600.	4800.	3300. U	1400. J	3300. U	3300. U	3300. U
IPSST25A		310.	81. J	88. U	88. U	690.	220.	310.	410.	180.	440.	730.	88. U	160.
IPSST25ADL		440. U	440. U	440. U	440. U	660. D	210. J D	420. J D	520. D	460. D	440. U	660. D	440. U	400. J D
IPSST25B		83. U	83. U	83. U	83. U	83. U	83. U	83. U	83. U	83. U	83. U	83. U	83. U	83. U
IPSST25BDL		420. U	420. U	420. U	420. U	420. U	420. U	420. U	420. U	420. U	420. U	420. U	420. U	420. U
IPSST25C		550.	160. U	2100.	2600.	8400.	980.	480.	140. J	160. J	370.	66. J	160. U	160. U
IPSST25CDL		610. J D	820. U	2700. D	3200. D	12000. D	1300. D	590. J D	2000. D	820. U	820. U	100. J D	820. U	820. U
IPSST30A		160. U	160. U	160. U	160. U	190.	91. J	160. U	900.	190.	390.	330.	160. U	150. J
IPSST30ADL		800. U	800. U	800. U	800. U	200. JD	800. U	800. U	1100. D	800. U	800. U	320. JD	800. U	800. U
IPSST30ADL		4000. U	4000. U	4000. U	4000. U	4000. U	4000. U	4000. U	1200. JD	4000. U	4000. U	4000. U	4000. U	4000. U
IPSST30B		1700.	130. J	150. J	56. J	4300.	1000.	6600.	5600.	2900.	3200.	6400.	200. U	1900.
IPSST30BDL		1800. D	1000. U	1000. U	1000. U	5100. D	1100. D	7100. D	6000. D	3200. D	3600. D	5600. D	1000. U	1800. D
IPSST30C		630.	1800.	3100.	4000.	11000.	1100.	910.	160. U	180.	290.	250.	160. U	120. J
IPSST30CDL		640. JD	820. U	3200. D	4400. D	13000. D	1100.D	920. D	1000. D	820. U	820. U	150. JD	820. U	820. U
IPSST31A		1600.	220.	120. J	200. U	9800. J	2700. J	8600. J	200. U	1200.	2700.	4100. J	200. U	790. J
IPSST31ADL		9900. U	9900. U	9900. U	9900. U	3900. JD	1200. JD	3200. JD	5600. JD	9900. U	9900. U	9900. U	9900. U	9900. U
IPSST31B		120.	17. J	95. U	95. U	470.	110.	530.	410.	190.	250.	330.	95.U	110.
IPSST31C		810.	1700.	3200.	3700.	11000.	1500.	610.	160. U	190.	440.	110. J	160. U	160. U
IPSST31CDL		840. D	810. U	3300. D	4100. D	14000. D	1600. D	1200. D	1800. D	810. U	810. U	810. U	810. U	810. U
IPSST32A		840. U	840. U	840. U	840. U	1700.	580. J	1600.	1500.	840. U	840. U	1600.	840. U	840. U
IPSST32B		5000.	180. U	7600.	8500.	21000. E	2900.	2100.	1600.	380.	820.	780.	180. U	330.
IPSST32BDL		4600. U	4600. U	4600. U	12000. D	28000. D	3100. JD	4600. U	4600. U	4600. U	4600. U	4600. U	4600. U	4600. U
IPSST32C		31000. E	190. U	19000.	17000.	51000. EJ	15000. J	22000. EJ	9800.	5800.	5500.	6200.	190. U	2800.
IPSST32CDL		46000. D	4800. U	30000. D	28000. D	78000. D	15000. D	23000. D	19000. D	6400. D	6400. D	6200. D	4800. U	4800. U
IPSST34A		150.	85. U	85. U	85. U	290.	64. J	280.	280.	140.	210.	380.	85. U	99.
IPSST34B		90. U	90. U	90. U	90. U	26. J	90. U	90. U	12. J	90. U	25. J	90. U	90. U	90. U
IPSST34C		80. U	80. U	80. U	80. U	80. U	80. U	80. U	80. U	80. U	80. U	80. U	80. U	80. U
IPSST35A		83. U	83. U	83. U	83. U	290.	85.	380.	460.	130.	200.	230.	83. U	110.
IPSST35B		240.	86. U	86. U	86. U	960.	150.	410.	410.	120.	200.	310.	86. U	140.

SAMPLE NUMBER	SS	DIBENZO-(A,H)ANTH-RACENE	BENZO-(G,H,I,)-PERYLENE	INDENO-(1,2,3CD)-PYRENE	DIBENZO-FURAN	2-METHYL-NAPHTH-ALENE
IPSST22A		83. U	83. U	83. U	83. U	83. U
IPSST22B		86. U	52. J	55. J	75. J	240.
IPSST22C		96. U	96. U	96. U	190.	1700.
IPSST22CDL		960. U	960. U	960. U	960. U	2100. D
IPSST23A		83. U	83. U	83. U	83. U	83. U
IPSST23B		85. U	85. U	29. J	150.	1200.
IPSST23C		3700. U	3700. U	3700. U	3700. U	23000.
IPSST24A		3400. U	3400. U	3400. U	3400. U	3400. U
IPSST24B		94. U	94. U	94. U	94. U	94. U
IPSST24C		3300. U	3300. U	3300. U	7500.	78000.
IPSST25A		72. J	160.	200.	180.	410.
IPSST25ADL		440. U	310. J D	300. J D	440. U	440. U
IPSST25B		83. U	83. U	83. U	83. U	83. U
IPSST25BDL		420. U	420. U	420. U	420. U	420. U
IPSST25C		160. U	160. U	160. U	1700.	16000.
IPSST25CDL		820. U	820. U	820. U	2400. D	21000. D
IPSST30A		160. U	160. U	160. U	42. J	39. J
IPSST30ADL		800. U	800. U	800. U	800. U	800. U
IPSST30ADL		4000. U	4000. U	4000. U	4000. U	4000. U
IPSST30B		360.	720.	920.	1100.	1000.
IPSST30BDL		550. JD	1400. D	1600. D	1100. D	1100. D
IPSST30C		160. U	160. U	160. U	2600.	30000. E
IPSST30CDL		820. U	820. U	820. U	3100. D	39000. D
IPSST31A		330. J	650. J	550. J	1000.	4600.
IPSST31ADL		9900. U	9900. U	9900. U	9900. U	3900. JD
IPSST31B		95. U	48. J	59. J	130.	92. J
IPSST31C		160. U	160. U	160. U	2200.	22000. E
IPSST31CDL		810. U	810. U	810. U	2800. D	28000. D
IPSST32A		840. U	840. U	840. U	840. U	840. U
IPSST32B		180. U	220. U	260.	3500.	21000. E
IPSST32BDL		4600. U	4600. U	4600. U	8300. D	66000. D
IPSST32C		430.	640.	950.	8200.	47000. E
IPSST32CDL		4800. U	4800. U	4800. U	18000. D	190000. D
IPSST34A		85. U	98.	89.	97.	180.
IPSST34B		90. U	90. U	90. U	90. U	90. U
IPSST34C		80. U	80. U	80. U	80. U	80. U
IPSST35A		83. U	96.	90.	83. U	83. U
IPSST35B		86. U	94.	90.	150.	370.

SAMPLE NUMBER	SS	NAPHTHALENE	ACENAPHTHYLENE	ACENAPHTHENE	FLUORENE	PHENANTHRENE	ANTHRACENE	FLUORANTHENE	PYRENE	BENZO(A)-ANTHRACENE	CHRYSENE	BENZO(B)-FLUORANTHENE	BENZO(K)-FLUORANTHENE	BENZO(A)-PYRENE
IPSST35C		5800.	92. U	8100. J	8100. J	19000. E	3100.	92. U	140.	460.	660.	380.	92. U	190.
IPSST35CDL		7300. D	1800. U	12000. D	12000. D	33000. D	2100. D	3000. D	3900. D	760. JD	930. JD	1800. U	1800. U	1800. U

SAMPLE NUMBER	SS	DIBENZO-(A,H)ANTHRACENE	BENZO-(G,H,I,)-PERYLENE	INDENO-(1,2,3CD)-PYRENE	DIBENZOFURAN	2-METHYLNAPHTHALENE
IPS$T35C		92. U	77. J	94.	92. U	21000. E
IPS$T35CDL		1800. U	1800. U	1800. U	8500. D	90000. D

SAMPLE NUMBER	SS	NAPH-THALENE	ACENAPH-THYLENE	ACENAPH-THENE	FLUORENE	PHENAN-THRENE	ANTHRA-CENE	FLUORAN-THENE	PYRENE	BENZO(A)-ANTHRACENE	CHRYSENE	BENZO(B)-FLUORAN-THENE	BENZO(K)-FLUORAN-THENE	BENZO(A)-PYRENE
IPSS11		3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U
IPSS22		3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U
IPSS33		3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U
IPSS44		3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U
IPSSBL1		34. J	95. U	95. U	95. U	120.	27. J	150.	150.	80. J	120.	170.	95. U	62. J
IPSSBL2		97. U	97. U	97. U	97. U	18. J	97. U	26. J	19. J	97. U	97. U	20. J	97. U	97. U
IPSSC03		29. J	95. U	95. U	95. U	73. J	22. J	120.	160.	95. U	130.	190.	95. U	78. J
IPSSC04		310.	99. U	570.	1000.	4900.	410.	700.	200.	360.	530.	660.	99. U	220.
IPSSC04DL		180. JD	990. U	380. JD	740. JD	3000. D	320. JD	560. JD	1100. D	990. U	990. U	990. U	990. U	990. U
IPSSC05		160. J	170. U	64. J	150. J	1200.	330.	880.	20000. EJ	4600. J	7100. J	1200. J	170. U	720. J
IPSSC05DL		340. U	97. JD	340. U	210. JD	1200. D	370. D	1500. D	3800. D	1100. D	1300. D	1500. D	340. U	810. D
IPSSC06		1900. U	1900. U	1900. U	1900. U	2300.	470. J	1700. J	2700.	950. J	1400. J	1100. J	1900. U	1900. U
IPSSC07		1800. U	1800. U	1800. U	1800. U	1900.	520. J	1100. J	2000.	1800. U	1800. U	620. J	1800. U	1800. U
IPSSC08		1200. U	1200. U	1200. U	1200. U	300. J	1200. U	260. J	430. J	1200. U	1200. U	540. J	1200. U	1200. U
IPSSC09		50. J	140. U	140. U	140. U	200.	140. J	180.	320.	140. J	270.	430. J	140. U	140. J
IPSSC10		94. J	94. U	94. U	94. U	56. J	94. U	42. J	33. J	94. U	94. U	94. U	94. U	94. U
IPSSD07		90. U	90. U	41. J	110.	260.	53. J	55. J	58. J	90. U	90. U	56. J	90. U	90. U
IPSSD08		86. U	86. U	45. J	110.	350.	58. J	86.	78. J	86. U	86. U	78. J	86. U	86. U
IPSSD09		85. U	85. U	85. U	120.	390.	65. J	85. U	63. J	85. U	85. U	85. U	85. U	85. U
IPSSD10		180. U	180. U	180. U	240.	150. J	77. J	180. U	110 .J	180. U	180. U	180. U	180. U	320.
IPSSD10DL		350. U	350. U	350. U	350. U	350. U	350. U	350. U	350. U	350. U	350. U	350. U	350. U	350. U
IPSSD11		130. U	130. U	130. U	130. U	130. U	130. U	130. U	130. U	130. U	130. U	130. U	130. U	130. U
IPSSD12		510. U	510. U	510. U	510. U	510. U	510. U	510. U	510. U	510. U	510. U	400. J	380. J	500. J
IPSSD13		130. U	130. U	130. U	130. U	130. U	130. U	130. U	130. U	130. U	130. U	130. U	130. U	130. U
IPSSD14		240. U	240. U	240. U	240. U	240. U	240. U	240. U	240. U	240. U	240. U	240. U	240. U	240. U
IPSSD15		170. U	170. U	170. U	170. U	170. U	170. U	170. U	170. U	170. U	170. U	170. U	170. U	170. U
IPSSG1		62. J	120. U	120. U	120. U	190.	32. J	94. J	100. J	66. J	65. J	120.	120. U	110. J
IPSSG2		190. U	190. U	190. U	190. U	66. J	190. U	56. J	190. U	190. U	190. U	190. U	190. U	190. U
IPSSM2		120. J	280. U	280. U	280. U	270. J	280. U	290.	170. J	94. J	130. J	200. J	280. U	280. U
IPSSPP2		260. U	260. U	260. U	260. U	160. J	260. U	260. U	81. J	260. U	260. U	260. U	260. U	260. U
IPSSR09		100. U	100. U	100. U	100. U	200.	27. J	180.	200.	100. U	130.	160.	100. U	85. J
IPSSR10		88. U	88. U	88. U	88. U	43. J	88. U	45. J	52. J	88. U	88. U	51. J	88. U	88. U
IPSSR11		84. U	84. U	84. U	84. U	84. U	84. U	84. U	84. U	84. U	84. U	84. U	84. U	84. U
IPSSR12		280. U	280. U	280. U	280. U	280. U	280. U	150. J	270. J	280. U	280. U	280. U	280. U	280. U
IPSSR13		320. U	320. U	320. U	320. U	280. J	320. U	260. J	460.	320. U	360. U	440.	320. U	320. U
IPSSR14		320. U	320. U	320. U	320. U	220. J	320. U	190. J	370.	320. U	270. J	330.	320. U	320. U
IPSSR15		50. J	160. U	160. U	160. U	170.	48. J	180.	270.	120. J	190.	160. U	160. U	160. U
IPSSR15RE		49. J	160. U	160. U	160. U	170.	52. J	160.	240.	110. J	190.	290.	160. U	160. U

SAMPLE NUMBER	SS	DIBENZO-(A,H)ANTH-RACENE	BENZO-(G,H,I,)-PERYLENE	INDENO-(1,2,3CD)-PYRENE	DIBENZO-FURAN	2-METHYL-NAPHTH-ALENE
IPSS11		3. U	3. U	3. U	3. U	3. U
IPSS22		3. U	3. U	3. U	3. U	3. U
IPSS33		3. U	3. U	3. U	3. U	3. U
IPSS44		3. U	3. U	3. U	3. U	3. U
IPSSBL1		95. U	54. J	41. J	95. U	46. J
IPSSBL2		97. U	97. U	97. U	97. U	97. U
IPSSC03		95. U	95. U	95. U	17. J	39. J
IPSSC04		99. U	100.	86. J	480.	2800.
IPSSC04DL		990. U	990. U	990. U	250. JD	1800. D
IPSSC05		170.U	250. J	260. J	200.	280.
IPSSC05DL		260. JD	280. JD	340. U	200. JD	290. JD
IPSSC06		1900. U	1900. U	1900. U	1900. U	1900. U
IPSSC07		1800. U	1800. U	1800. U	1800. U	400. J
IPSSC08		1200. U	1200. U	1200. U	1200. U	210. J
IPSSC09		140. U	80. J	87. J	140. U	120. J
IPSSC10		94. U	94. U	94. U	13. J	21. J
IPSSD07		90. U	90. U	90. U	170.	90. U
IPSSD08		86. U	86. U	86. U	180.	86. U
IPSSD09		85. U	85. U	85. U	200.	85. U
IPSSD10		180. U	180. U	180. U	360.	180. U
IPSSD10DL		350. U	350. U	350. U	350. U	350. U
IPSSD11		130. U	130. U	130. U	130. U	130. U
IPSSD12		510. U	210. J	220. J	510. U	510. U
IPSSD13		130. U	130. U	130. U	130. U	130. U
IPSSD14		240. U	240. U	240. U	240. U	240. U
IPSSD15		170. U	170. U	170. U	170. U	170. U
IPSSG1		120. U	120. U	120. U	120. U	120. U
IPSSG2		190. U	190. U	190. U	190. U	190. U
IPSSM2		280. U	280. U	280. U	280. U	280. U
IPSSPP2		260. U	260. U	260. U	260. U	260. U
IPSSR09		100. U	54. J	100. U	28. J	61. J
IPSSR10		88. U	88. U	88. U	88. U	17. J
IPSSR11		84. U	84. U	84. U	84. U	84. U
IPSSR12		280. U	280. U	280. U	280. U	280. U
IPSSR13		320. U	320. U	320. U	320. U	320. U
IPSSR14		320. U	320. U	320. U	320. U	320. U
IPSSR15		160. U	160. U	160. U	160. U	87. J
IPSSR15RE		160. U	160. U	160. U	160. U	71. J

SAMPLE NUMBER	SS	NAPH-THALENE	ACENAPH-THYLENE	ACENAPH-THENE	FLUORENE	PHENAN-THRENE	ANTHRA-CENE	FLUORAN-THENE	PYRENE	BENZO(A)-ANTHRACENE	CHRYSENE	BENZO(B)-FLUORAN-THENE	BENZO(K)-FLUORAN-THENE	BENZO(A)-PYRENE
IPSSR16		160. U	160. U	160. U	160. U	110. J	160. U	140. J	170.	87. J	130. J	170.	160. U	87. J
IPSSR17		94. U	94. U	94. U	94. U	39. J	94. U	47. J	65. J	94. U	94. U	73. J	94. U	94. U
IPSSR18		180. U	180. U	180. U	180. U	400.	180. J	310.	210.	62. J	120. J	87. J	180. U	180. U
IPSSR19		200. U	200. U	200. U	200. U	280.	200. U	270.	190. J	200. U	120. J	120. J	200. U	200. U
IPSSR20		200. U	200. U	200. U	200. U	140. J	200. U	180. J	120. J	200. U	66. J	70. J	200. U	200. U
IPSSR21		190. U	190. U	190. U	190. U	160. J	190. U	130. J	82. J	190. U	190. U	59. J	190. U	190. U
IPSSR22		280. U	280. U	280. U	280. U	170. J	280. U	280. U	68. J	280. U	280. U	76. J	280. U	280. U
IPSSR26		260. U	260. U	260. U	260. U	160. J	260. U	260. U	81. J	260. U	260. U	260. U	260. U	260. U
IPSSY7		89. U	89. U	89. U	89. U	58. J	19. J	63. J	85. J	89. U	89. U	59. J	89. U	89. U
IPSSY8		90. U	90. U	90. U	90. U	69. J	90. U	72. J	73. J	29. J	47. J	60. J	90. U	90. U
IPSSY9		98. U	98. U	98. U	98. U	180.	37. J	230.	200.	100.	170.	230.	98. U	89. J

SAMPLE NUMBER	SS	DIBENZO-(A,H)ANTHRACENE	BENZO-(G,H,I,)-PERYLENE	INDENO-(1,2,3CD)-PYRENE	DIBENZOFURAN	2-METHYLNAPHTHALENE
IPSSR16		160. U	58. J	45. J	160. U	53. J
IPSSR17		94. U	94. U	94. U	94. U	94. U
IPSSR18		180. U	180. U	180. U	180. U	180. U
IPSSR19		200. U	200. U	200. U	200. U	200. U
IPSSR20		200. U	200. U	200. U	200. U	200. U
IPSSR21		190. U	190. U	190. U	190. U	190. U
IPSSR22		280. U	280. U	280. U	49. J	69. J
IPSSR26		260. U	260. U	260. U	260. U	260. U
IPSSY7		89. U	89. U	89. U	89. U	89. U
IPSSY8		90. U	90. U	90. U	90. U	90. U
IPSSY9		98. U	68. J	68. J	98. U	98. U

SAMPLE NUMBER	SS	NAPHTHALENE	ACENAPHTHYLENE	ACENAPHTHENE	FLUORENE	PHENANTHRENE	ANTHRACENE	FLUORANTHENE	PYRENE	BENZO(A)-ANTHRACENE	CHRYSENE	BENZO(B)-FLUORANTHENE	BENZO(K)-FLUORANTHENE	BENZO(A)-PYRENE
IPSSBLK		3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U
IPSSN1		88000. J	15000. UR	590000. J	560000. J	1500000. J	68000. J	450000. J	18000. J	49000. J	130000. J	80000. J	15000. UR	14000. J
IPSSN1		56000. JD	75000. UR	420000 JD	510000. JD	1500000.JD	46000. JD	330000. JD	230000. JD	75000. UR	86000. JD	49000. JD	75000. UR	75000. UR
IPSSN2		88000. J	15000. UR	540000. J	550000. J	1600000. J	61000. J	390000. J	17000. J	30000. J	110000. J	68000. J	15000. UR	8700. J
IPSSN2		55000. JD	74000. UR	360000. JD	510000. JD	1500000.JD	37000. JD	280000. JD	200000. JD	74000. UR	78000. JD	44000. JD	74000. UR	74000. UR
IPSSR23		200. U	200. U	200. U	200. U	130. J	200. U	200. U	49. J	200 U	200 U	200 U	200 U	200 U
IPSSR24		230. U	230. U	230. U	230. U	160. J	230. U	.110. J	230. U	230. U	230. U	230. U	230. U	230. U
IPSSRIN		3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U	3. U
IPSSV1		1800. U	1800. U	1800. U	1800. U	1800. U	1800. U	1800. U	1800. U	1800. U	1800. U	1800. U	1800. U	1800. U
IPSSV2		1500. U	1500. U	1500. U	1500. U	1500. U	1500. U	1500. U	1500. U	1500. U	1500. U	1500. U	1500. U	1500. U
IPSSV3		3000. U	3000. U	3000. U	3000. U	3000. U	3000. U	3000. U	3000. U	3000. U	3000. U	3000. U	3000. U	3000. U

SAMPLE NUMBER	SS	DIBENZO-(A,H)ANTH-RACENE	BENZO-(G,H,I,)-PERYLENE	INDENO-(1,2,3CD)-PYRENE	DIBENZO-FURAN	2-METHYL-NAPHTH-ALENE
IPSSBLK		3. U	3. U	3. U	3. U	3. U
IPSSN1		15000. UR	11000. J	10000. J	200000. J	1300000. J
IPSSN1		75000. UR	75000. UR	75000. UR	340000. JD	1700000.JD
IPSSN2		15000. UR	8100. J	11000. J	210000. J	1300000. J
IPSSN2		74000. UR	74000. UR	74000. UR	340000. JD	1500000.JD
IPSSR23		200 U	200 U	200 U	200. U	200. U
IPSSR24		230. U	230. U	230. U	230. U	230. U
IPSSRIN		3. U	3. U	3. U	3. U	3. U
IPSSV1		1800. U	1800. U	1800. U	1800. U	1800. U
IPSSV2		1500. U	1500. U	1500. U	1500. U	1500. U
IPSSV3		3000. U	3000. U	3000. U	3000. U	3000. U

DIOXIN/FURANS (ug/Kg)

SAMPLE NUMBER	SS	2,3,7,8-TCDD	TOTAL TCDD	1,2,3,-7,8-PECDD	TOTAL PECDD	1,2,3,-4,7,8-HXCDD	1,2,3,-6,7,8-HXCDD	1,2,3,-7,8,9-HXCDD	TOTAL HXCDD	1,2,3,-4,6,7,8-HPCDD	TOTAL HPCDD	TOTAL OCDD
IPSSAG5A01		1.16 U										
IPSSB01		1.93 U										
IPSSBWR01		2.38 U										
IPSSC101		0.19 U										
IPSSD601		0.73 U										
IPSSD6D01		0.64 U										
IPSSD6D1		0.50 U										
IPSSGWB01		2.50 U										
IPSSR01		2.81 U										
IPSSR701		0.24 U										
IPSSTP501		18.41 U										

SAMPLE NUMBER	SS	2,3,7,8-TCDD	TOTAL TCDD	1,2,3,-7,8-PECDD	TOTAL PECDD	1,2,3,-4,7,8-HXCDD	1,2,3,-6,7,8-HXCDD	1,2,3,-7,8,9-HXCDD	TOTAL HXCDD	1,2,3,-4,6,7,8-HPCDD	TOTAL HPCDD	TOTAL OCDD
IPSS099		.0011 U	.0011 U	.0012 U	.0021 U	.0044 U	.0038 U	.0038 U	.0040 U	.0041 U	.0042 U	.0044
IPSS27A		ND	EMPC	ND	ND	ND	ND	ND	ND	0.05	0.05	0.66
IPSSA2A		0.066 U	0.094 U	0.19 U	0.19 U	0.19 U	0.17 U	0.17 U	0.17 U	0.30 U	0.30 U	0.35 U
IPSSA2B		0.11 U	0.11 U	0.099 U	0.12 U	0.41 U	0.36 U	0.35 U	0.37 U	0.16 U	0.19 U	0.35 U
IPSSA2C		0.73 U	0.79 U	0.59 U	0.60 U	0.22 U	0.19 U	0.19 U	0.20 U	0.64 U	0.64 U	0.80
IPSSAG5A2		6.0 U	7.1 U	16.6 U	16.6 U	11.0	291.	14.0	596.	6580	10800	19100
IPSSB2A		0.17 U	0.17 U	0.27 U	0.44 U	0.46 U	0.41 U	0.40 U	0.42 U	0.54	0.58 U	0.57 U
IPSSB2B		0.12 U	0.13 U	0.15 U	0.19 U	0.24 U	0.21 U	0.21 U	0.22 U	0.46 U	0.46 U	0.56 U
IPSSB2C		0.062 U	0.078 U	0.26 U	0.26 U	0.28 U	0.24 U	0.24 U	0.25 U	0.22 U	0.22 U	0.25 U
IPSSBB		ND	EMPC	ND	EMPC	ND	ND	ND	ND	ND	ND	3.1
IPSSC01A		ND	0.05 J	EMPC	0.13 J	0.64 J	3.9 J	1.4 J	13.8 J	88.0 J	142 J	474 J
IPSSD06A		0.04	0.20	1.6	4.8	4.2	56.1	10.7	168	1050	1610	7040
IPSSDT		ND	EMPC	ND	EMPC	ND	0.88	EMPC	0.89	ND	ND	5.5
IPSSN1		38.9 U	38.9 U	87.6 U	102. U	110.	987.	135.	2740	16200 J	26500 J	37900 J
IPSSN2		33.1 U	33.1 U	139. U	139. U	186. U	948.	182.	2590	12300	22200	26700
IPSSR07A		ND	EMPC	ND	ND	EMPC	EMPC	EMPC	0.31	2.4	4.4	23.9
IPSSR23		0.057 U	0.12 U	0.23 U	0.23 U	0.20 U	0.18 U	0.17 U	0.18 U	1.2 U	1.2 U	4.3
IPSSR24		0.028 U	0.028 U	0.048 U	0.048 U	0.067 U	0.059 U	0.058 U	0.061 U	0.061 U	0.061 U	0.11
IPSSR25		0.025 U	0.025 U	0.069 U	0.069 U	0.085 U	0.075 U	0.074 U	0.078 U	0.073 U	0.088 U	0.078
IPSSRIN		.00042 U	.00042 U	.00043 U	.00043 U	.00072 U	.00063 U	.00063 U	.00066 U	.0010 U	.0010 U	.0052 U
IPSST07C		0.29 U	0.29 U	0.19 U	0.24 U	0.16 U	4.6	0.34	10.1	66.7	107	134 J
IPSSV1		0.046 U	0.046 U	0.070 U	0.073 U	0.14 U	0.12 U	0.12 U	0.13 U	0.43	0.43	2.8
IPSSV2		0.095 U	0.095 U	0.12 U	0.12 U	0.14 U	0.12 U	0.12 U	0.12 U	0.48 U	0.48 U	1.2
IPSSV3		0.10 U	0.10 U	0.14 U	0.15 U	0.14 U	0.13 U	0.13 U	0.13 U	0.17 U	0.17 U	0.35 U

SAMPLE NUMBER	SS	2,3,7,8 TCDF	TOTAL TCDF	1,2,3,-7,8-PECDF	2,3,4,-7,8-PECDF	TOTAL PECDF	1,2,3,-4,7,8-HXCDF	1,2,3,-6,7,8-HXCDF	1,2,3,-7,8,9-HXCDF	2,3,4,-6,7,8-HXCDF	TOTAL HXCDF	1,2,3,-4,6,7,8-HPCDF	1,2,3,-4,7,8,9-HPCDF	TOTAL HPCDF	TOTAL OCDF
IPSS099		0.46 U	0.64 U	1.4 U	0.79 U	1.5 U	4.2 U	3.9 U	4.7 U	4.4 U	4.3 U	3.4 U	2.8 U	5.6 U	4.7 U
IPSS27A		ND	EMPC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.02
IPSSA2A		0.078 U	0.078 U	0.072 U	0.099 U	0.11 U	0.23 U	0.22 U	0.26 U	0.25 U	0.24 U	0.32 U	0.26 U	0.79 U	0.29 U
IPSSA2B		0.039 U	0.065 U	0.075 U	0.092 U	0.14 U	0.33 U	0.31 U	0.38 U	0.36 U	0.34 U	0.35 U	0.29 U	1.1 U	0.22 U
IPSSA2C		0.039 U	0.057 U	0.037 U	0.040 U	0.062 U	0.23 U	0.21 U	0.26 U	0.24 U	0.24 U	0.20 U	0.32 U	0.44 U	0.92 U
IPSSAGI5A		10.8	246.	24.3	19.7	595.	129.	65.7	49.5	23.7 U	2780	1570	105.	7990	3150
IPSSB2A		0.064 U	0.16 U	0.13 U	0.11 U	0.16 U	0.40 U	0.37 U	0.45 U	0.42 U	0.41 U	1.1 U	0.29 U	2.1 U	0.55 U
IPSSB2C		0.040 U	0.077 U	0.14 U	0.11 U	0.14 U	0.30 U	0.28 U	0.34 U	0.31 U	0.56 U	0.32 U	0.38 U	1.2 U	0.41 U
IPSSBB		ND	EMPC	ND	EMPC	EMPC	ND	ND	ND	ND	ND	ND	ND	ND	ND
IPSSBC2		0.052 U	0.052 U	0.077 U	0.070 U	0.12 U	0.32 U	0.30 U	0.36 U	0.34 U	0.33 U	0.17 U	0.095 U	0.39 U	0.11 U
IPSSC1A		0.02	0.19	0.07	EMPC	2.9	0.33	0.20	1.7	0.19	10.4	6.2	0.22	17.6	8.8
IPSSD06A		1.3	3.5	3.9	4.0	71.2	15.5	4.0	0.53	2.5	339	138	5.6	594	559
IPSSDT		ND	EMPC	ND	EMPC	EMPC	0.58	0.61	0.59	0.59	2.4	0.73	ND	0.87	1.7
IPSSN1		73.8 U	1130 J	204. U	168 U	2560 J	329	207	99.3 U	93.1 U	8220 J	2760 J	660. U	12600 J	2950 J
IPSSN2		40.0	991.	87.9 U	167. U	2180	300.	175.	522. U	50.9 U	7110	2670	506. U	10900	1890
IPSSR07A		0.003	0.02	ND	ND	0.08	0.01	EMPC	ND	ND	0.54	0.03	ND	0.73	0.47
IPSSR23		0.039 U	0.090 U	0.13 U	0.13 U	0.13 U	0.24 U	0.22 U	0.27 U	0.25 U	0.24 U	0.31 U	0.90 U	1.7 U	0.82 U
IPSSR24		0.20 U	0.43 U	0.21 U	0.21 U	0.21 U	0.50 U	0.47 U	0.57 U	0.53	0.51	0.47	0.56	0.51	0.63
IPSSR25		0.017 U	0.037 U	0.023 U	0.023 U	0.023 U	0.063 U	0.058 U	0.071 U	0.063	0.064	0.033	0.077	0.084	0.068
IPSSRIN		0.00041 U	0.00041 U	0.00028 U	0.00028 U	0.00028 U	0.0013 U	0.0012 U	0.0014 U	0.0014 U	0.0013 U	0.00096 U	0.0011 U	0.0010 U	0.0018 U
IPSST7C		0.26 U	3.0 J	0.54 U	0.55 U	6.3 J	0.47	0.43	0.37	0.68 U	18.4 J	5.4	1.2 U	22.4 J	11.4
IPSSV1		0.050 U	0.050 U	0.084 U	0.076 U	0.076 U	0.19 U	0.18 U	0.22 U	0.20 U	0.19 U	0.14	0.24 U	0.14	0.30
IPSSV2		0.074 U	0.14 U	0.080 UY	0.082 U	0.059 U	0.13 U	0.12 U	0.15 U	0.14 U	0.13 U	0.15 U	0.45 U	0.53 U	0.45 U
IPSSV3		0.040 U	0.075 U	0.062 U	0.048 U	0.72 U	0.13 U	0.12 U	0.15 U	0.14 U	0.14 U	0.23 U	0.13 U	0.99 U	0.16 U

SEMIVOLATILES ANALYSIS (ug/Kg)

SAMPLE NUMBER	4-METHYL-PHENOL	BENZOIC ACID	2-METHYL-PHENOL	2,4,5-TRI-CHLORO-PHENOL	4-NITRO-ANALINE	BENZYL ALCOHOL	4-CHLORO-ANILINE	DIBENZO-FURAN	ANILINE	2-NITRO-ANILINE	2-METHYL-NAPH-THALENE	3-NITRO-ANILINE
1PSSB02C	340 U	1600 U	340 U	1600 U	1600 U	340 U	340 U	340 U	NR	1600 U	340 U	1600 U
1PSSGWR	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPSS000	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPSS099	17 U	84 U	17 U	84 U	84 U	17 U	17 U	17 U	NR	84 U	17 U	84 U
IPSS101	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPSS5A	200 U	1000 U	200 U	1000 U	1000 U	200 U	200 U	340	NR	1000 U	4300 E	1000 U
IPSS5AR	1000 U	5000 U	1000 U	5000 U	5000 U	1000 U	1000 U	380 J	NR	5000 U	3900	5000 U
IPSSAA	830 U	4000 J	830 U	4000 U	4000 U	830 U	830 U	830 U	NR	4000 U	830 U	4000 U
IPSSAB	880 U	4300 U	880 U	4300 U	4300 U	880 U	880 U	880 U	NR	4300 U	880 U	4300 U
IPSSAC	920 U	4500 U	920 U	4500 U	4500 U	920 U	920 U	920 U	NR	4500 U	920 U	4500 U
IPSSB01B	380 U	1900 U	380 U	1900 U	1900 U	380 U	380 U	380 U	NR	1900 U	380 U	1900 U
IPSSB01C	340 U	1600 U	340 U	1600 U	1600 U	340 U	340 U	340 U	NR	1600 U	340 U	1600 U
IPSSB01D	340 U	1700 U	340 U	1700 U	1700 U	340 U	340 U	340 U	NR	1700 U	340 U	1700 U
IPSSB02A	370 U	1800 U	370 U	1800 U	1800 U	370 U	370 U	370 U	NR	1800 U	370 U	1800 U
IPSSB02B	380 U	1800 U	380 U	1800 U	1800 U	380 U	380 U	380 U	NR	1800 U	380 U	1800 U
IPSSB03A	380 U	1900 U	380 U	1900 U	1900 U	380 U	380 U	380 U	NR	1900 U	380 U	1900 U
IPSSB03B	1200 U	5800 U	1200 U	5800 U	5800 U	1200 U	1200 U	340 J	NR	5800 U	240 J	5800 U
IPSSB03C	340 U	1600 U	340 U	1600 U	1600 U	340 U	340 U	340 U	NR	1600 U	340 U	1600 U
IPSSB04A	380 U	1800 U	380 U	1800 U	1800 U	380 U	380 U	39 J	NR	1800 U	120 J	1800 U
IPSSB04B	400 U	2000 U	400 U	2000 U	2000 U	400 U	400 U	400 U	NR	2000 U	400 U	2000 U
IPSSB04C	340 U	1700 U	340 U	1700 U	1700 U	340 U	340 U	340 U	NR	1700 U	340 U	1700 U
IPSSB05A	340 U	1700 U	340 U	1700 U	1700 U	340 U	340 U	340 U	NR	1700 U	340 U	1700 U
IPSSB05B	380 U	1800 U	380 U	1800 U	1800 U	380 U	380 U	380 U	NR	1700 U	380 U	1800 U
IPSSB05C	340 U	1600 U	340 U	1600 U	1600 U	340 U	340 U	340 U	NR	1600 U	340 U	1600 U
IPSSB06A	360 U	1800 U	360 U	1800 U	1800 U	360 U	360 U	360 U	NR	1800 U	360 U	1800 U
IPSSB06B	390 U	1900 U	390 U	1900 U	1900 U	390 U	390 U	390 U	NR	1900 U	390 U	1900 U
IPSSB06C	340 U	1700 U	340 U	1700 U	1700 U	340 U	340 U	340 U	NR	1700 U	340 U	1700 U
IPSSB07A	820 U	4000 U	820 U	4000 U	4000 U	820 U	820 U	210 J	NR	4000 U	130 J	4000 U
IPSSB08A	370 U	1800 U	370 U	1800 U	1800 U	370 U	370 U	370 U	NR	1800 U	71 J	1800 U
IPSSB08B	380 U	1900 U	380 U	1900 U	1900 U	380 U	380 U	170 J	NR	1900 U	130 J	1900 U
IPSSB08C	350 U	1700 U	350 U	1700 U	1700 U	350 U	350 U	350 U	NR	1700 U	350 U	1700 U
IPSSB08D	340 U	1700 U	340 U	1700 U	1700 U	340 U	340 U	340 U	NR	1700 U	340 U	1700 U
IPSSB08E	350 U	1700 U	350 U	1700 U	1700 U	350 U	350 U	350 U	NR	1700 U	350 U	1700 U
IPSSB10A	370 U	1800 U	370 U	1800 U	1800 U	370 U	370 U	370 U	NR	1800 U	43 J	1800 U
IPSSB10C	340 U	1600 U	340 U	1600 U	1600 U	340 U	340 U	340 U	NR	1600 U	340 U	1600 U
IPSSB11A	380 U	1800 U	380 U	1800 U	1800 U	380 U	380 U	380 U	NR	1800 U	380 U	1800 U
IPSSB11B	420 U	48 J	420 U	2000 U	2000 U	420 U	420 U	110 J	NR	2000 U	190 J	2000 U
IPSSB11C	340 U	1600 U	340 U	1600 U	1600 U	340 U	340 U	340 U	NR	1600 U	340 U	1600 U
IPSSB12A	420 U	2000 U	420 U	2000 U	2000 U	420 U	420 U	420 U	NR	2000 U	77 J	2000 U

SAMPLE NUMBER	2,4,6-TRI CHLORO-PHENOL	4-CHLORO-3-METHYL-PHENOL	2-CHLORO-PHENOL	2-4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	2-NITRO-PHENOL	4-NITRO-PHENOL	2,4-DI-NITRO-PHENOL	4,6-DI-NITRO-2-METHYL-PHENOL	PENTA-CHLORO-PHENOL	PHENOL	ACENAPH-THENE
1PSSB02C	340 U	340 U	340 U	340 U	340 U	340 U	1600 U	1600 U	1600 U	1600 U	340 U	340 U
1PSSGWR	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPSS000	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 UJ	10 U	10 U
IPSS099	17 U	17 U	17 U	17 U	17 U	17 U	84 U	84 U	84 U	84 U	17 U	17 U
IPSS101	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPSS5A	200 U	200 U	200 U	200 U	200 U	200 U	1000 U	1000 U	1000 U	11000 E	200 U	200 U
IPSS5AR	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	5000 U	5000 U	5000 U	6800	1000 U	1000 U
IPSSAA	830 U	830 U	830 U	830 U	830 U	830 U	4000 U	4000 U	4000 U	4000 U	830 U	830 U
IPSSAB	880 U	880 U	880 U	880 U	880 U	880 U	4300 U	4300 U	4300 U	4300 U	880 U	880 U
IPSSAC	920 U	920 U	920 U	920 U	920 U	920 U	4500 U	4500 U	4500 U	4500 U	920 U	920 U
IPSSB01B	380 U	380 U	380 U	380 U	380 U	380 U	1900 U	1900 U	1900 U	1900 U	380 U	380 U
IPSSB01C	340 U	340 U	340 U	340 U	340 U	340 U	1600 U	1600 U	1600 U	1600 U	340 U	340 U
IPSSB01D	340 U	340 U	340 U	340 U	340 U	340 U	1700 U	1700 U	1700 U	1700 U	340 U	340 U
IPSSB02A	370 U	370 U	370 U	370 U	370 U	370 U	1800 U	1800 U	1800 U	1800 U	370 U	370 U
IPSSB02B	380 U	380 U	380 U	380 U	380 U	380 U	1800 U	1800 U	1800 U	1800 U	380 U	380 U
IPSSB03A	380 U	380 U	380 U	380 U	380 U	380 U	1900 U	1900 U	1900 U	73 J	380 U	380 U
IPSSB03B	1200 U	1200 U	1200 U	1200 U	1200 U	1200 U	5800 U	5800 U	5800 U	5800 U	1200 U	150 J
IPSSB03C	340 U	340 U	340 U	340 U	340 U	340 U	1600 U	1600 U	1600 U	1600 U	340 U	340 U
IPSSB04A	380 U	380 U	380 U	380 U	380 U	380 U	1800 U	1800 U	1800 U	1800 U	380 U	380 U
IPSSB04B	400 U	400 U	400 U	400 U	400 U	400 U	2000 U	2000 U	2000 U	2000 U	400 U	400 U
IPSSB04C	340 U	340 U	340 U	340 U	340 U	340 U	1700 U	1700 U	1700 U	680 U	340 U	340 U
IPSSB05A	340 U	340 U	340 U	340 U	340 U	340 U	340 U	1700 U	1700 U	1700 U	340 U	340 U
IPSSB05B	380 U	380 U	380 U	380 U	380 U	380 U	1800 U	1800 U	1800 U	1800 U	380 U	380 U
IPSSB05C	340 U	340 U	340 U	340 U	340 U	340 U	1600 U	1600 U	1600 U	1600 U	340 U	340 U
IPSSB06A	360 U	360 U	360 U	360 U	360 U	360 U	1800 U	1800 U	1800 U	1800 U	360 U	360 U
IPSSB06B	390 U	390 U	390 U	390 U	390 U	390 U	1900 U	1900 U	1900 U	1900 U	390 U	390 U
IPSSB06C	340 U	340 U	340 U	340 U	340 U	340 U	1700 U	1700 U	1700 U	1700 U	340 U	340 U
IPSSB07A	820 U	820 U	820 U	820 U	820 U	820 U	4000 U	4000 U	4000 U	650 J	820 U	130 J
IPSSB08A	370 U	370 U	370 U	370 U	370 U	370 U	1800 U	1800 U	1800 U	430 J	370 U	370 U
IPSSB08B	380 U	380 U	380 U	380 U	380 U	380 U	1900 U	1900 U	1900 U	300 J	380 U	380 U
IPSSB08C	350 U	350 U	350 U	350 U	350 U	350 U	1700 U	1700 U	1700 U	1700 U	350 U	350 U
IPSSB08D	340 U	340 U	340 U	340 U	340 U	340 U	1700 U	1700 U	1700 U	1700 U	340 U	340 U
IPSSB08E	350 U	350 U	350 U	350 U	350 U	350 U	1700 U	1700 U	1700 U	1700 U	350 U	350 U
IPSSB10A	370 U	370 U	370 U	370 U	370 U	370 U	1800 U	1800 U	1800 U	150 J	370 U	44 J
IPSSB10C	340 U	340 U	340 U	340 U	340 U	340 U	1600 U	1600 U	1600 U	1600 U	340 U	340 U
IPSSB11A	380 U	380 U	380 U	380 U	380 U	380 U	1800 U	1800 U	1800 U	180 J	380 U	380 U
IPSSB11B	420 U	420 U	420 U	420 U	420 U	420 U	2000 U	2000 U	2000 U	2000 U	420 U	420 U
IPSSB11C	340 U	340 U	340 U	340 U	340 U	340 U	1600 U	1600 U	1600 U	1600 U	340 U	340 U
IPSSB12A	420 U	420 U	420 U	420 U	420 U	420	2000 U	2000 U	2000 U	2000 U	420 U	420

SAMPLE NUMBER	BENZIDINE	1,2,4-TRI-CHLORO-BENZENE	HEXA-CHLORO-BENZENE	HEXA-CHLORO-ETHANE	BIS(2-CHLORO-ETHYL)-ETHER	2-CHLORO-NAPHTHA-LENE	1,2-DI-CHLORO-BENZENE	1,3-DI-CHLORO-BENZENE	1,4-DI-CHLORO-BENZENE	3,3'-DI-CHLORO-BENZIDINE	2,4-DI-NITRO-TOLUENE	2,6-DI NITRO-TOLUENE
1PSSB02C	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	680 U	340 U	340 U
1PSSGWR	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPSS000	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPSS099	NR	17 U	17 U	17 U	17 U	17 U	17 U	17 U	17 U	33 U	17 U	17 U
IPSS101	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPSS5A	NR	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	400 U	200 U	200 U
IPSS5AR	NR	1000 U	1000 U	1000 U	1000 U	3400	1000 U	1000 U	1000 U	2000 U	1000 U	1000 U
IPSSAA	NR	830 U	830 U	830 U	830 U	830 U	830 U	830 U	830 U	1700 U	830 U	830 U
IPSSAB	NR	880 U	880 U	880 U	880 U	880 U	880 U	880 U	880 U	1800 U	880 U	880 U
IPSSAC	NR	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U	1800 U	920 U	920 U
IPSSB01B	NR	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	770 U	380 U	380 U
IPSSB01C	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	670 U	340 U	340 U
IPSSB01D	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	690 U	340 U	340 U
IPSSB02A	NR	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	750 U	370 U	370 U
IPSSB02B	NR	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	760 U	380 U	380 U
IPSSB03A	NR	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	770 U	380 U	380 U
IPSSB03B	NR	1200 U	1200 U	1200 U	1200 U	1200 U	1200 U	1200 U	1200 U	2400 U	1200 U	1200 U
IPSSB03C	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	670 U	340 U	340 U
IPSSB04A	NR	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	760 U	380 U	380 U
IPSSB04B	NR	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	810 U	400 U	400 U
IPSSB04C	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U
IPSSB05A	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	680 U	340 U	340 U
IPSSB05B	NR	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	760 U	380 U	380 U
IPSSB05C	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	680 U	340 U	340 U
IPSSB06A	NR	360 U	360 U	360 U	360 U	360 U	360 U	360 U	360 U	730 U	360 U	360 U
IPSSB06B	NR	390 U	390 U	390 U	390 U	390 U	390 U	390 U	390 U	780 U	390 U	390 U
IPSSB06C	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	690 U	340 U	340 U
IPSSB07A	NR	820 U	820 U	820 U	820 U	820 U	820 U	820 U	820 U	1600 U	820 U	820 U
IPSSB08A	NR	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	740 U	370 U	370 U
IPSSB08B	NR	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	760 U	380 U	380 U
IPSSB08C	NR	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	690 U	350 U	350 U
IPSSB08D	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	690 U	340 U	340 U
IPSSB08E	NR	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	690 U	350 U	350 U
IPSSB10A	NR	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	730 U	370 U	370 U
IPSSB10C	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	680 U	340 U	340 U
IPSSB11A	NR	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	760 U	380 U	380 U
IPSSB11B	NR	420 U	420 U	420 U	420 U	420 U	420 U	420 U	420 U	840 U	420 U	420 U
IPSSB11C	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	680 U	340 U	340 U
IPSSB12A	NR	420 U	420 U	420 U	420 U	420 U	420 U	420 U	420 U	840 U	420 U	420 U

SAMPLE NUMBER	1,2-DI-PHENYL-HYDRAZINE	FLUORAN-THENE	4-CHLORO-PHENYL-PHENYL-ETHER	4-BROMO-PHENYL-PHENYL-ETHER	BIS(2-CHLOROISO-PROPYL)-ETHER	BIS(2-CHLORO-ETHOXY)-METHANE	HEXA-CHLORO-BUTADIENE	HEXA-CHLORO-CYCLO-PENTADIENE	ISO-PHORONE	NAPH-THALENE	NITRO-BENZENE	N-NITROSO-DIMETHYL-AMINE
IPSSB02C	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR
IPSSGWR	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPSS000	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPSS099	NR	17 U	17 U	17 U	17 U	17 U	17 U	17 U	17 U	17 U	17 U	NR
IPSS101	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPSS5A	NR	860	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	NR
IPSS5AR	NR	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U	NR
IPSSAA	NR	830 U	830 U	830 U	830 U	830 U	830 U	830 U	830 U	830 U	830 U	NR
IPSSAB	NR	880 U	880 U	880 U	880 U	880 U	880 U	880 U	880 U	880 U	880 U	NR
IPSSAC	NR	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U	NR
IPSSB01B	NR	210 J	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	NR
IPSSB01C	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR
IPSSB01D	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR
IPSSB02A	NR	99 J	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	NR
IPSSB02B	NR	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	NR
IPSSB03A	NR	560	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	NR
IPSSB03B	NR	9200	1200 U	1200 U	1200 U	1200 U	1200 U	1200 U	1200 U	180 J	1200 U	NR
IPSSB03C	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR
IPSSB04A	NR	340 J	380 U	380 U	380 U	380 U	380 U	380 U	380 U	67 J	380 U	NR
IPSSB04B	NR	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	NR
IPSSB04C	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR
IPSSB05A	NR	83 J	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR
IPSSB05B	NR	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	NR
IPSSB05C	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR
IPSSB06A	NR	400	360 U	360 U	360 U	360 U	360 U	360 U	360 U	360 U	360 U	NR
IPSSB06B	NR	310 J	390 U	390 U	390 U	390 U	390 U	390 U	390 U	390 U	390 U	NR
IPSSB06C	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR
IPSSB07A	NR	5300	820 U	820 U	820 U	820 U	820 U	820 U	820 U	110 J	820 U	NR
IPSSB08A	NR	480	370 U	370 U	370 U	370 U	370 U	370 U	370 U	46 J	370 U	NR
IPSSB08B	NR	2000	380 U	380 U	380 U	380 U	380 U	380 U	380 U	190 J	380 U	NR
IPSSB08C	NR	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	NR
IPSSB08D	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR
IPSSB08E	NR	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	NR
IPSSB10A	NR	1100	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	NR
IPSSB10C	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR
IPSSB11A	NR	130 J	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	NR
IPSSB11B	NR	340 J	420 U	420 U	420 U	420 U	420 U	420 U	420 U	89 J	420 U	NR
IPSSB11C	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR
IPSSB12A	NR	240 J	420 U	420 U	420 U	420 U	420 U	420 U	420 U	420 U	420 U	NR

SAMPLE NUMBER	N-NITROSO-DIPHENYL-AMINE	N-NITRO-DI-N-PROPYL-AMINE	BIS(2-ETHYL-HEXYL)-PHTHALATE	BUTYL-BENZYL-PHTHALATE	DI-N-BUTYL-PHTHALATE	DI-N-OCTYL-PHTHALATE	DIETHYL-PHTHALATE	DIMETHYL-PHTHALATE	BENZO(A)-ANTH-RACENE	BENZO(A) PYRENE	BENZO(B)-FLUORAN-THENE	BENZO(K)-FLUORAN-THENE
1PSSB02C	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U
1PSSGWR	10 U	10 U	7 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPSS000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPSS099	17 U	17 U	17 U	17 U	17 U	17 U	17 U	17 U	17 U	17 U	17 U	17 U
IPSS101	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPSS5A	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	260	300 U	700	200 U
IPSS5AR	1400	1000 U	1000 U	990 J	1000 U	1000 U	1000 U	1000 U	380 J	200 J	1000 U	420 J
IPSSAA	830 U	830 U	130 J	830 U	3400 B	830 U	830 U	830 U	830 U	830 U	830 U	830 U
IPSSAB	880 U	880 U	880 U	880 U	880 U	880 U	880 U	880 U	880 U	880 U	880 U	880 U
IPSSAC	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U
IPSSB01B	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	93 J	66 J	170 J	170 J
IPSSB01C	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U
IPSSB01D	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U
IPSSB02A	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	94 J	85 J	120 JX	120 JX
IPSSB02B	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U
IPSSB03A	380 U	380 U	39 J	380 U	380 U	380 U	380 U	380 U	460	390	530 X	530 X
IPSSB03B	1200 U	1200 U	1200 U	1200 U	1200 U	1200 U	1200 U	1200 U	5900	5000	3100	3300
IPSSB03C	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U
IPSSB04A	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	230 J	180 J	210 J	100 J
IPSSB04B	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U
IPSSB04C	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U
IPSSB05A	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	63 J	60 J	120 J	120 J
IPSSB05B	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U
IPSSB05C	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U
IPSSB06A	360 U	360 U	360 U	360 U	360 U	360 U	360 U	360 U	250 J	220 J	450	450
IPSSB06B	390 U	390 U	390 U	390 U	390 U	390 U	390 U	390 U	170 J	110 J	220 J	220 J
IPSSB06C	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U
IPSSB07A	820 U	820 U	120 J	820 U	820 U	820 U	820 U	820 U	5700	4800	6700	6700
IPSSB08A	370 U	370 U	54 J	370 U	370 U	370 J	370 U	370 U	340 J	280 J	520 X	520 X
IPSSB08B	380 U	380 U	41 J	380 U	380 U	380 U	380 U	380 U	1100	1000	1600 X	1600 X
IPSSB08C	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U
IPSSB08D	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U
IPSSB08E	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U
IPSSB10A	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	1200	870	1800	1800
IPSSB10C	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U
IPSSB11A	380 U	380 U	93 J	380 U	380 U	380 U	380 U	380 U	61 J	44 J	74 J	68 J
IPSSB11B	420 U	420 U	420 U	420 U	43 J	420 U	420 U	420 U	130 J	140 J	300 JX	300 JX
IPSSB11C	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U
IPSSB12A	420 U	420 U	420 U	420 U	420 U	420 U	420 U	420 U	160 J	160 J	230 JX	320 JX

SAMPLE NUMBER	CHRYSENE	ACENAPH-THENE	ANTHRA-CENE	BENZO-(G,H,I)-PERYLENE	FLUORENE	PHENAN-THRENE	DIBENZ-(A,H)AN-THRACENE	INDENO-(1,2,3-CD)-PYRENE	PYRENE	BENZO-QUINONE	2-BENZYL-4-CHLORO-PHENOL	N,N-DI-METHYL-BENZENAMINE
1PSSB02C	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR	NR	NR
1PSSGWR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPSS000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPSS099	17 U	17 U	17 U	17 U	17 U	17 U	17 U	17 U	17 U	NR	NR	NR
IPSS101	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPSS5A	450	850	260	200 U	700	1500	200 U	200 U	860	NR	NR	NR
IPSS5AR	550 J	980 J	1000 U	1000 U	870 J	2000	1000 U	1000 U	1100	NR	NR	NR
IPSSAA	830 U	830 U	830 U	830 U	830 U	830 U	830 U	830 U	830 U	NR	NR	NR
IPSSAB	880 U	880 U	880 U	880 U	880 U	880 U	880 U	880 U	880 U	NR	NR	NR
IPSSAC	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U	NR	NR	NR
IPSSB01B	110 J	380 U	380 U	380 U	380 U	220 J	380 U	380 U	200 J	NR	NR	NR
IPSSB01C	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR	NR	NR
IPSSB01D	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR	NR	NR
IPSSB02A	110 J	370 U	370 U	48 J	370 U	64 J	370 U	41 J	150 J	NR	NR	NR
IPSSB02B	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	NR	NR	NR
IPSSB03A	480	60 J	110 J	230 J	55 J	450	75 J	200 J	800	NR	NR	NR
IPSSB03B	6100	990 J	1700	2100	790 J	10000	850 J	1700	12000	NR	NR	NR
IPSSB03C	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR	NR	NR
IPSSB04A	260 J	380 U	380 U	71 J	380 U	200 J	380 U	55 J	390	NR	NR	NR
IPSSB04B	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	NR	NR	NR
IPSSB04C	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR	NR	NR
IPSSB05A	75 U	340 U	340 U	340 U	340 U	66 J	340 U	340 U	120 J	NR	NR	NR
IPSSB05B	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	380 U	NR	NR	NR
IPSSB05C	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR	NR	NR
IPSSB06A	290 J	360 U	48 J	95 J	360 U	230 J	360 U	70 J	500	NR	NR	NR
IPSSB06B	190 J	390 U	91 J	390 U	390 U	420	390 U	390 U	410	NR	NR	NR
IPSSB06C	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR	NR	NR
IPSSB07A	5900	460 J	1500	1700	480 J	6500	870	1500	8500	NR	NR	NR
IPSSB08A	370 J	370 U	77 J	150 J	370 U	380	58 J	140 J	500	NR	NR	NR
IPSSB08B	1100	330 J	510	460	300 J	2400	160 J	390	2200	NR	NR	NR
IPSSB08C	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	NR	NR	NR
IPSSB08D	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR	NR	NR
IPSSB08E	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	NR	NR	NR
IPSSB10A	1200	63 J	190 J	460	56 J	1100	190 J	370	1800	NR	NR	NR
IPSSB10C	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR	NR	NR
IPSSB11A	88 J	380 U	380 U	380 U	380 U	58 J	380 U	380 U	130 J	NR	NR	NR
IPSSB11B	220 J	66 J	420 U	76 J	420 U	380 J	420 U	420 U	220 J	NR	NR	NR
IPSSB11C	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR	NR	NR
IPSSB12A	210 J	420 U	420 U	78 J	420 U	200	420 U	55 J	310 J	NR	NR	NR

SAMPLE NUMBER	2,3,4,6-TETRA-CHLORO-PHENOL	P-TERT-BUTYL-PHENOL	DIOXIN	2,3,4,5-TETRA-CHLORO-PHENOL
1PSSB02C	NR	NR	NR	NR
1PSSGWR	NR	NR	NR	NR
IPSS000	NR	NR	NR	NR
IPSS099	NR	NR	NR	NR
IPSS101	NR	NR	NR	NR
IPSS5A	NR	NR	NR	NR
IPSS5AR	NR	NR	NR	NR
IPSSAA	NR	NR	NR	NR
IPSSAB	NR	NR	NR	NR
IPSSAC	NR	NR	NR	NR
IPSSB01B	NR	NR	NR	NR
IPSSB01C	NR	NR	NR	NR
IPSSB01D	NR	NR	NR	NR
IPSSB02A	NR	NR	NR	NR
IPSSB02B	NR	NR	NR	NR
IPSSB03A	NR	NR	NR	NR
IPSSB03B	NR	NR	NR	NR
IPSSB03C	NR	NR	NR	NR
IPSSB04A	NR	NR	NR	NR
IPSSB04B	NR	NR	NR	NR
IPSSB04C	NR	NR	NR	NR
IPSSB05A	NR	NR	NR	NR
IPSSB05B	NR	NR	NR	NR
IPSSB05C	NR	NR	NR	NR
IPSSB06A	NR	NR	NR	NR
IPSSB06B	NR	NR	NR	NR
IPSSB06C	NR	NR	NR	NR
IPSSB07A	NR	NR	NR	NR
IPSSB08A	NR	NR	NR	NR
IPSSB08B	NR	NR	NR	NR
IPSSB08C	NR	NR	NR	NR
IPSSB08D	NR	NR	NR	NR
IPSSB08E	NR	NR	NR	NR
IPSSB10A	NR	NR	NR	NR
IPSSB10C	NR	NR	NR	NR
IPSSB11A	NR	NR	NR	NR
IPSSB11B	NR	NR	NR	NR
IPSSB11C	NR	NR	NR	NR
IPSSB12A	NR	NR	NR	NR

SAMPLE NUMBER	4-METHYL-PHENOL	BENZOIC ACID	2-METHYL-PHENOL	2,4,5-TRI-CHLORO-PHENOL	4-NITRO-ANALINE	BENZYL ALCOHOL	4-CHLORO-ANILINE	DIBENZO-FURAN	ANILINE	2-NITRO-ANILINE	2-METHYL-NAPH-THALENE	3-NITRO-ANILINE
IPSSB12B	410 U	2000 U	410 U	2000 U	2000 U	410 U	410 U	410 U	NR	2000 U	53 J	2000 U
IPSSB12C	340 U	1700 U	340 U	1700 U	1700 U	340 U	340 U	340 U	NR	1700 U	340 U	1700 U
IPSSB12D	340 U	1700 U	340 U	1700 U	1700 U	340 U	340 U	340 U	NR	1700 U	340 U	1700 U
IPSSB9A	360 U	1800 U	360 U	1800 U	1800 U	360 U	360 U	81 J	NR	1800 U	63 J	1800 U
IPSSB9AD	730 U	3500 U	730 U	3500 U	3500 U	730 U	730 U	730 U	NR	3500 U	730 U	3500 U
IPSSB9B	350 U	1700 U	350 U	1700 U	1700 U	350 U	350 U	350 U	NR	1700 U	350 U	1700 U
IPSSB9C	350 U	1700 U	350 U	1700 U	1700 U	350 U	350 U	350 U	NR	1700 U	350 U	1700 U
IPSSBA	910 U	4400 U	910 U	4400 U	4400 U	910 U	910 U	910 U	NR	4400 U	910 U	4400 U
IPSSBB	920 U	4500 U	920 U	4500 U	4500 U	920 U	920 U	920 U	NR	4500 U	920 U	4500 U
IPSSBC	970 U	4700 U	970 U	4700 U	4700 U	970 U	970 U	970 U	NR	4700 U	970 U	4700 U
IPSSC1	460 U	2200 U	460 U	200 U	2200 U	460 U	460 U	460 U	NR	2200 U	460 U	200 U
IPSSC1A	400 U	1900 U	400 U	1900 U	1900 U	400 U	400 U	400 U	NR	1900 U	400 U	1900 U
IPSSC2A	370 U	1800 U	370 U	1800 U	370 U	370 U	370 U	370 U	NR	1800 U	370 U	1800 U
IPSSC2B	400 U	2000 U	400 U	2000 U	2000 U	400 U	400 U	400 U	NR	2000 U	400 U	2000 U
IPSSC2C	440 U	2100 U	440 U	2100 U	2100 U	440 U	440 U	440 U	NR	2100 U	440 U	2100 U
IPSSCMC	340 U	54 J	340 U	1600 J	1600 U	304 U	340 U	2500	NR	1600 U	3700	1600 U
IPSSD5	2800	3600 U	730 U	3600 U	3600 U	730 U	730 U	730 U	NR	3600 U	730 U	3600 U
IPSSD6	3000 U	15000 U	3000 U	15000 U	15000 U	3000 U	3000 U	3000 U	NR	15000 U	3000 U	15000 U
IPSSD6D	12000 U	58000 U	12000 U	58000 U	58000 U	12000 U	12000 U	12000 U	NR	58000 U	12000 U	58000 U
IPSSGWB	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPSSGWBR	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPSSM1	940 U	4600 U	940 U	4600 U	4600 U	940 U	940 U	940 U	NR	4600 U	940 U	4600 U
IPSSMJB	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPSSP1AR	1400 U	6800 U	1400 U	6800 U	6800 U	1400 U	1400 U	1400 U	NR	6800 U	1400 U	6800 U
IPSSPP1A	1800 U	8700 U	1800 U	8700 U	8700 U	1800 U	1800 U	1800 U	NR	8700 U	1800 U	8700 U
IPSSPP1B	390 U	1900 U	390 U	1900 U	1900 U	390 U	390 U	390 U	NR	1900 U	390 U	1900 U
IPSSPP1C	860 U	4200 U	860 U	4200 U	4200 U	860 U	860 U	810 J	NR	4200 U	6600	4200 U
IPSSR7	440 U	2100 U	440 U	2100 U	2100 U	440 U	440 U	440 U	NR	2100 U	440 U	2100 U
IPSSR8	1600	2400 U	490 U	2400 U	2400 U	490 U	490 U	490 U	NR	2400 U	490 U	2400 U
IPSSR8B	1200	2500 U	510 U	2500 U	2500 U	510 U	510 U	510 U	NR	510 U	510 U	2500 U
IPSSR8C	920	2400 U	490 U	2400 U	2400 U	140 J	490 U	490 U	NR	2400 U	490 U	2400 U
IPSSS1A	370 U	1800 U	370 U	1800 U	1800 U	370 U	370 U	370 U	NR	1800 U	370 U	1800 U
IPSSS1B	460 U	2200 U	460 U	2200 U	2200 U	460 U	460 U	310 J	NR	2200 U	1300	2200 U
IPSSS1BR	1400 U	6700 U	1400 U	6700 U	6700 U	1400 U	1400 U	430 DJ	NR	6700 U	1400 U	6700 U
IPSSS1C	450 U	2200 U	450 U	2200 U	2200 U	450 U	450 U	450 U	NR	2200 U	17000 E	2200 U
IPSSS1CR	2300 U	11000 U	2300 U	11000 U	11000 U	2300 U	2300 U	1900 DJ	NR	11000 U	18000 D	11000 U
IPSSS3A	700 U	3400 U	700 U	3400 U	3400 U	700 U	700 U	700 U	NR	3400 U	700 U	3400 U
IPSSS3B	400 U	2000 U	400 U	2000 U	2000 U	400 U	400 U	400 U	NR	2000 U	400 U	2000 U
IPSSS3C	490 U	2400 U	490 U	2400 U	2400 U	490 U	490 U	490 U	NR	2400 U	490 U	2400 U

SAMPLE NUMBER	2,4,6-TRI CHLORO- PHENOL	4-CHLORO- 3-METHYL- PHENOL	2-CHLORO- PHENOL	2-4-DI- CHLORO- PHENOL	2,4-DI- METHYL- PHENOL	2-NITRO- PHENOL	4-NITRO- PHENOL	2,4-DI- NITRO- PHENOL	4,6-DI- NITRO-2- METHYL- PHENOL	PENTA- CHLORO- PHENOL	PHENOL	ACENAPH- THENE
IPSSB12B	410 U	410 U	410 U	410 U	410 U	410 U	2000 U	2000 U	2000 U	2000 U	410 U	410 U
IPSSB12C	340 U	340 U	340 U	340 U	340 U	340 U	1700 U	1700 U	1700 U	1700 U	340 U	340 U
IPSSB12D	340 U	340 U	340 U	340 U	340 U	340 U	1700 U	1700 U	1700 U	1700 U	340 U	340 U
IPSSB9A	360 U	360 U	360 U	360 U	360 U	360 U	1800 U	1800 U	1800 U	150 J	360 U	100 J
IPSSB9AD	730 U	730 U	730 U	730 U	730 U	730 U	3500 U	3500 U	3500 U	3500 U	730 U	77 DJ
IPSSB9B	350 U	350 U	350 U	350 U	350 U	350 U	1700 U	1700 U	1700 U	1700 U	350 U	350 U
IPSSB9C	350 U	350 U	350 U	350 U	350 U	350 U	1700 U	1700 U	1700 U	1700 U	350 U	350 U
IPSSBA	910 U	910 U	910 U	910 U	910 U	910 U	4400 U	4400 U	4400 U	4400 U	910 U	910 U
IPSSBB	920 U	920 U	920 U	920 U	920 U	920 U	4500 U	4500 U	4500 U	4500 U	920 U	920 U
IPSSBC	970 U	970 U	970 U	970 U	970 U	970 U	4700 U	4700 U	4700 U	4700 U	970 U	970 U
IPSSC1	460 U	460 U	460 U	460 U	460 U	460 U	2200 U	2200 U	2200 U	2200 U	460 U	460 U
IPSSC1A	400 U	400 U	400 U	400 U	400 U	400 U	1900 U	1900 U	1900 U	1900 U	400 U	400 U
IPSSC2A	370 U	370 U	370 U	370 U	370 U	370 U	1800 U	1800 U	370 U	1800 U	370 U	370 U
IPSSC2B	400 U	400 U	400 U	400 U	400 U	400 U	2000 U	2000 U	2000 U	2000 U	400 U	400 U
IPSSC2C	440 U	440 U	440 U	440 U	400 U	440 U	2100 U	2100 U	2100 U	2100 U	440 U	440 U
IPSSCMC	340 U	4200	1000	340 U	340 U	340 U	1600 U	1600 U	1600 U	1100 J	580	530
IPSSD5	730 U	730 U	730 U	730 U	730 U	730 U	3600 U	3600 U	3600 U	3600 J	730 U	730 U
IPSSD6	3000 U	3000 U	3000 U	3000 U	3000 U	3000 U	15000 U	15000 U	15000 U	85000 E	3000 U	3000 U
IPSSD6D	12000 U	12000 U	12000 U	12000 U	12000 U	12000 U	58000 U	58000 U	58000 U	150000 D	12000 U	12000 U
IPSSGWB	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPSSGWBR	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPSSM1	940 U	940 U	940 U	940 U	940 U	940 U	4600 U	4600 U	4600 U	420 J	940 U	940 U
IPSSMJB	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 UJ	10 U	10 U
IPSSP1AR	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	6800 U	6800 U	6800 U	10000	1400 U	1400 U
IPSSPP1A	1800 U	1800 U	1800 U	1800 U	1800 U	1800 U	8700 U	8700 U	8700 U	7800 J	1800 U	1800 U
IPSSPP1B	390 U	390 U	390 U	390 U	390 U	390 U	1900 U	1900 U	1900 U	1900 U	390 U	390 U
IPSSPP1C	860 U	860 U	860 U	860 U	860 U	860 U	4200 U	4200 U	4200 U	2500 J	860 U	860 U
IPSSR7	440 U	440 U	440 U	440 U	440 U	440 U	2100 U	2100 U	2100 U	600 J	440 U	440 U
IPSSR8	490 U	490 U	490 U	490 U	490 U	490 U	2400 U	2400 U	2400 U	2400 J	490 U	490 U
IPSSR8B	510 U	510 U	510 U	510 U	510 U	510 U	2500 U	2500 U	2500 U	2500 J	510 U	510 U
IPSSR8C	490 U	490 U	490 U	490 U	490 U	490 U	2400 U	2400 U	2400 U	2400 J	490 U	490 U
IPSSS1A	370 U	370 U	370 U	370 U	370 U	370 U	1800 U	1800 U	1800 U	74 J	370 U	370 U
IPSSS1B	460 U	460 U	460 U	460 U	460 U	460 U	2200 U	2200 U	2200 U	15000 E	460 U	460 U
IPSSS1BR	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	6700 U	6700 U	6700 U	17000 D	1400 U	1400 U
IPSSS1C	450 U	450 U	450 U	450 U	450 U	450 U	2200 U	2200 U	2200 U	26000 E	450 U	610
IPSSS1CR	2300 U	2300 U	2300 U	2300 U	2300 U	2300 U	11000 U	11000 U	11000 U	10000 DJ	2300 U	2300 U
IPSSS3A	700 U	700 U	700 U	700 U	700 U	700 U	3400 U	3400 U	3400 U	3400 U	700 U	700 U
IPSSS3B	400 U	400 U	400 U	400 U	400 U	400 U	2000 U	2000 U	2000 U	2000 U	400 U	400 U
IPSSS3C	490 U	490 U	490 U	490 U	490 U	490 U	2400 U	2400 U	2400 U	2400 U	490 U	490 U

SAMPLE NUMBER	BENZIDINE	1,2,4-TRI-CHLORO-BENZENE	HEXA-CHLORO-BENZENE	HEXA-CHLORO-ETHANE	BIS(2-CHLORO-ETHYL)-ETHER	2-CHLORO-NAPHTHA-LENE	1,2-DI-CHLORO-BENZENE	1,3-DI-CHLORO-BENZENE	1,4-DI-CHLORO-BENZENE	3,3'-DI-CHLORO-BENZIDINE	2,4-DI-NITRO-TOLUENE	2,6-DI NITRO-TOLUENE
IPSSB12B	NR	410 U	410 U	410 U	410 U	410 U	410 U	410 U	410 U	820 U	410 U	410 U
IPSSB12C	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	690 U	340 U	340 U
IPSSB12D	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	690 U	340 U	340 U
IPSSB9A	NR	360 U	360 U	360 U	360 U	360 U	360 U	360 U	360 U	730 U	360 U	360 U
IPSSB9AD	NR	730 U	730 U	730 U	730 U	730 U	730 U	730 U	730 U	1500 U	730 U	730 U
IPSSB9B	NR	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	690 U	350 U	350 U
IPSSB9C	NR	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	690 U	350 U	350 U
IPSSBA	NR	910 U	910 U	910 U	910 U	910 U	910 U	910 U	910 U	1800 U	910 U	910 U
IPSSBB	NR	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U	1800 U	920 U	920 U
IPSSBC	NR	970 U	970 U	970 U	970 U	970 U	970 U	970 U	970 U	1900 U	970 U	970 U
IPSSC1	NR	460 U	460 U	460 U	460 U	460 U	460 U	460 U	460 U	460 U	460 U	460 U
IPSSC1A	NR	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	800 U	400 U	400 U
IPSSC2A	NR	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	750 U	370 U	370 U
IPSSC2B	NR	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	810 U	400 U	400 U
IPSSC2C	NR	440 U	440 U	440 U	440 U	440 U	440 U	440 U	440 U	880 U	440 U	440 U
IPSSCMC	NR	340 U	340 U	340 U	340 U	1300	1600	340 U	340 U	680 U	340 U	3400
IPSSD5	NR	730 U	730 U	730 U	730 U	730 U	730 U	730 U	730 U	1500 U	730 U	730 U
IPSSD6	NR	3000 U	3000 U	3000 U	3000 U	3000 U	3000 U	3000 U	3000 U	6000 U	3000 U	3000 U
IPSSD6D	NR	12000 U	12000 U	12000 U	12000 U	12000 U	12000 U	12000 U	12000 U	24000 U	12000 U	12000 U
IPSSGWB	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPSSGWBR	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPSSM1	NR	940 U	940 U	940 U	940 U	940 U	940 U	940 U	940 U	1900 U	940 U	940 U
IPSSMJB	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPSSP1AR	NR	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	2800 U	1400 U	1400 U
IPSSPP1A	NR	1800 U	1800 U	1800 U	1800 U	1800 U	1800 U	1800 U	1800 U	3600 U	1800 U	1800 U
IPSSPP1B	NR	390 U	390 U	390 U	390 U	390 U	390 U	390 U	390 U	780 U	390 U	390 U
IPSSPP1C	NR	860 U	860 U	860 U	860 U	860 U	860 U	860 U	860 U	1700 U	860 U	860 U
IPSSR7	NR	440 U	440 U	440 U	440 U	440 U	440 U	440 U	440 U	880 U	440 U	440 U
IPSSR8	NR	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U
IPSSR8B	NR	510 U	510 U	510 U	510 U	510 U	510 U	510 U	510 U	1000 U	510 U	510 U
IPSSR8C	NR	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	990 U	490 U	490 U
IPSSS1A	NR	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	740 U	370 U	370 U
IPSSS1B	NR	460 U	460 U	460 U	460 U	460 U	460 U	460 U	460 U	920 U	460 U	460 U
IPSSS1BR	NR	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	2800 U	1400 U	1400 U
IPSSS1C	NR	450 U	450 U	450 U	450 U	450 U	450 U	450 U	450 U	900 U	450 U	450 U
IPSSS1CR	NR	2300 U	2300 U	2300 U	2300 U	2300 U	2300 U	2300 U	2300 U	4500 U	2300 U	2300 U
IPSSS3A	NR	700 U	700 U	700 U	700 U	700 U	700 U	700 U	700 U	1400 U	700 U	700 U
IPSSS3B	NR	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	810 U	400 U	400 U
IPSSS3C	NR	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	990 U	490 U	490 U

SAMPLE NUMBER	1,2-DI-PHENYL-HYDRAZINE	FLUORAN-THENE	4-CHLORO-PHENYL-PHENYL-ETHER	4-BROMO-PHENYL-PHENYL-ETHER	BIS(2-CHLOROISO-PROPYL)-ETHER	BIS(2-CHLORO-ETHOXY)-METHANE	HEXA-CHLORO-BUTADIENE	HEXA-CHLORO-CYCLO-PENTADIENE	ISO-PHORONE	NAPH-THALENE	NITRO-BENZENE	N-NITROSO-DIMETHYL-AMINE
IPSSB12B	NR	47 J	410 U	410 U	410 U	410 U	410 U	410 U	410 U	410 U	410 U	NR
IPSSB12C	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR
IPSSB12D	NR	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR
IPSSB9A	NR	4300	360 U	360 U	360 U	360 U	360 U	360 U	360 U	56 J	360 U	NR
IPSSB9AD	NR	4300 D	730 U	730 U	730 U	730 U	730 U	730 U	730 U	730 U	730 U	NR
IPSSB9B	NR	53 J	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	NR
IPSSB9C	NR	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	NR
IPSSBA	NR	910 U	910 U	910 U	910 U	910 U	910 U	910 U	910 U	910 U	910 U	NR
IPSSBB	NR	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U	NR
IPSSBC	NR	970 U	970 U	970 U	970 U	970 U	970 U	970 U	970 U	970 U	970 U	NR
IPSSC1	NR	460 U	460 U	460 U	460 U	460 U	460 U	460 U	460 U	460 U	460 U	NR
IPSSC1A	NR	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	NR
IPSSC2A	NR	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	NR
IPSSC2B	NR	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	NR
IPSSC2C	NR	440 U	440 U	440 U	440 U	440 U	440 U	440 U	440 U	440 U	440 U	NR
IPSSCMC	NR	340 U	340 U	340 U	2400	340 U	340 U	340 U	340 U	340 U	340 U	NR
IPSSD5	NR	100 J	730 U	730 U	730 U	730 U	730 U	730 U	730 U	730 U	730 U	NR
IPSSD6	NR	700 J	3000 U	3000 U	3000 U	3000 U	3000 U	3000 U	3000 U	3000 U	3000 U	NR
IPSSD6D	NR	12000 U	12000 U	12000 U	12000 U	12000 U	12000 U	12000 U	12000 U	12000 U	12000 U	NR
IPSSGWB	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPSSGWBR	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPSSM1	NR	120 J	940 U	940 U	940 U	940 U	940 U	940 U	940 U	940 U	940 U	NR
IPSSMJB	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPSSP1AR	NR	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	NR
IPSSPP1A	NR	1800 U	1800 U	1800 U	1800 U	1800 U	1800 U	1800 U	1800 U	1800 U	1800 U	NR
IPSSPP1B	NR	390 U	390 U	390 U	390 U	390 U	390 U	390 U	390 U	390 U	390 U	NR
IPSSPP1C	NR	920	860 U	860 U	860 U	860 U	860 U	860 U	860 U	350 U	860 U	NR
IPSSR7	NR	94 J	440 U	440 U	440 U	440 U	440 U	440 U	440 U	440 U	440 U	NR
IPSSR8	NR	60 J	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	NR
IPSSR8B	NR	510 U	510 U	510 U	510 U	510 U	510 U	510 U	510 U	510 U	510 U	NR
IPSSR8C	NR	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	NR
IPSSS1A	NR	96 J	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	NR
IPSSS1B	NR	230 J	460 U	460 U	460 U	460 U	460 U	460 U	460 U	180 J	460 U	NR
IPSSS1BR	NR	340 DJ	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	170 DJ	1400 U	NR
IPSSS1C	NR	4500	450 U	450 U	450 U	450 U	450 U	450 U	450 U	1800	450 U	NR
IPSSS1CR	NR	2500 D	2300 U	2300 U	2300 U	2300 U	2300 U	2300 U	2300 U	1300 DJ	2300 U	NR
IPSSS3A	NR	700 U	700 U	700 U	700 U	700 U	700 U	700 U	700 U	700 U	700 U	NR
IPSSS3B	NR	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	NR
IPSSS3C	NR	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	NR

SAMPLE NUMBER	N-NITROSO-DIPHENYL-AMINE	N-NITRO-DI-N-PROPYL-AMINE	BIS(2-ETHYL-HEXYL)-PHTHALATE	BUTYL-BENZYL-PHTHALATE	DI-N-BUTYL-PHTHALATE	DI-N-OCTYL-PHTHALATE	DIETHYL-PHTHALATE	DIMETHYL-PHTHALATE	BENZO(A)-ANTH-RACENE	BENZO(A) PYRENE	BENZO(B)-FLUORAN-THENE	BENZO(K)-FLUORAN-THENE
IPSSB12B	410 U	410 U	410 U	410 U	410 U	410 U	410 U	410 U	46 J	410 U	410 U	410 U
IPSSB12C	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U
IPSSB12D	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U
IPSSB9A	360 U	360 U	360 U	360 U	360 U	360 U	360 U	360 U	3500	3000	6200 E	6200 E
IPSSB9AD	730 U	730 U	730 U	730 U	730 U	730 U	730 U	730 U	3200 D	2700 D	2100 D	1700 D
IPSSB9B	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	43 J	350 U	350 U	350 U
IPSSB9C	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U
IPSSBA	910 U	910 U	910 U	910 U	2100 B	910 U	910 U	910 U	910 U	910 U	910 U	910 U
IPSSBB	920 U	920 U	1800	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U
IPSSBC	970 U	970 U	3200	970 U	970 U	970 U	970 U	970 U	970 U	970 U	970 U	970 U
IPSSC1	460 U	460 U	460 U	460 U	460 U	460 U	460 U	460 U	460 U	460 U	460 U	460 U
IPSSC1A	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U
IPSSC2A	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U
IPSSC2B	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U
IPSSC2C	440 U	440 U	440 U	440 U	440 U	440 U	440 U	440 U	440 U	440 U	440 U	440 U
IPSSCMC	340 U	340 U	1700	110 J	49 J	340 U	340 U	340 U	340 U	340 U	340 U	340 U
IPSSD5	730 U	730 U	730 U	730 U	730 U	730 U	3100	730 U	730 U	730 U	730 U	730 U
IPSSD6	3000 U	3000 U	920 J	3000 U	3000 U	3000 U	3000 U	3000 U	3000 U	1300 J	6400 X	6400 X
IPSSD6D	12000 U	12000 U	12000 U	12000 U	12000 U	12000 U	12000 U	12000 U	12000 U	5500 DJ	12000 DJX	12000 DJX
IPSSGWB	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPSSGWBR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPSSM1	940 U	940 U	210 J	940 U	940 U	940 U	940 U	940 U	940 U	940 U	940 U	940 U
IPSSMJB	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPSSP1AR	1400 U	1400 U	1400 U	1400 U	170 J	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U
IPSSPP1A	1800 U	1800 U	1800 U	1800 U	220 J	1800 U	1800 U	1800 U	1800 U	1800 U	1800 U	1800 U
IPSSPP1B	390 U	390 U	390 U	390 U	270 J	390 U	390 U	390 U	390 U	390 U	390 U	390 U
IPSSPP1C	860 U	860 U	860 U	860 U	860 U	860 U	860 U	860 U	200 J	860 U	860 U	860 U
IPSSR7	440 U	440 U	290 J	73 J	62 J	54 J	440 U	440 U	66 J	94 J	180 JX	180 JX
IPSSR8	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U
IPSSR8B	510 U	510 U	510 U	510 U	510 U	51 J	510 U	510 U	510 U	510 U	510 U	510 U
IPSSR8C	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U
IPSSS1A	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	59 J	49 J	120 J	120 J
IPSSS1B	4600	460 U	51 J	460 U	460 U	460 U	460 U	460 U	180 J	240 J	610	610
IPSSS1BR	1800 D	1400 U	230 DJ	1400 U	1400 U	1400 U	1400 U	1400 U	300 DJ	320 DJ	680 DJ	680 DJ
IPSSS1C	13000 E	450 U	450 U	450 U	450 U	450 U	78 J	450 U	1100	580	4300	4300
IPSSS1CR	16000 U	2300 U	2300 U	2300 U	2300 U	2300 U	2300 U	2300 U	730 DJ	460 DJ	1300 DJ	1300 DJ
IPSSS3A	700 U	700 U	81 J	700 U	700 U	700 U	700 U	700 U	700 U	700 U	700 U	700 U
IPSSS3B	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U
IPSSS3C	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U

SAMPLE NUMBER	CHRYSENE	ACENAPH-THENE	ANTHRA-CENE	BENZO-(G,H,I)-PERYLENE	FLUORENE	PHENAN-THRENE	DIBENZ-(A,H)AN-THRACENE	INDENO-(1,2,3-CD)-PYRENE	PYRENE	BENZO-QUINONE	2-BENZYL-4-CHLORO-PHENOL	N,N-DI-METHYL-BENZENAMINE
IPSSB12B	68 J	410 U	410 U	410 U	410 U	87 J	410 U	410 U	54 J	NR	NR	NR
IPSSB12C	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR	NR	NR
IPSSB12D	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	NR	NR	NR
IPSSB9A	4300	200 J	1000	1200	220 J	3400	510	990	7200 E	NR	NR	NR
IPSSB9AD	3900 D	140 DJ	940 D	1500 D	190 DJ	3100 D	560 DJ	1200 D	6400 D	NR	NR	NR
IPSSB9B	44 J	350 U	350 U	350 U	350 U	38 J	350 U	350 U	81 J	NR	NR	NR
IPSSB9C	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	350 U	NR	NR	NR
IPSSBA	910 U	910 U	910 U	910 U	910 U	910 U	910 U	910 U	910 U	NR	NR	NR
IPSSBB	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U	920 U	NR	NR	NR
IPSSBC	970 U	970 U	970 U	970 U	970 U	970 U	970 U	970 U	970 U	NR	NR	NR
IPSSC1	460 U	460 U	460 U	460 U	460 U	460 U	460 U	460 U	460 U	NR	NR	NR
IPSSC1A	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	NR	NR	NR
IPSSC2A	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	370 U	NR	NR	NR
IPSSC2B	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	NR	NR	NR
IPSSC2C	440 U	440 U	440 U	440 U	440 U	440 U	440 U	440 U	440 U	NR	NR	NR
IPSSCMC	340 U	340 U	340 U	340 U	340 U	340 U	340 U	340 U	2900	NR	NR	NR
IPSSD5	730 U	730 U	730 U	730 U	730 U	90 J	730 U	730 U	77 J	NR	NR	NR
IPSSD6	2200 J	3000 U	990 J	1200 J	3000 U	3000 U	3000 U	890 J	7400	NR	NR	NR
IPSSD6D	12000 U	12000 U	12000 U	12000 U	12000 U	12000 U	12000 U	12000 U	9900 DJ	NR	NR	NR
IPSSGWB	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPSSGWBR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPSSM1	98 J	940 U	940 U	940 U	940 U	94 J	940 U	940 U	170 J	NR	NR	NR
IPSSMJB	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPSSP1AR	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	1400 U	220 J	NR	NR	NR
IPSSPP1A	190 J	1800 U	1800 U	1800 U	1800 U	1800 U	1800 U	1800 U	320 J	NR	NR	NR
IPSSPP1B	390 U	390 U	390 U	390 U	390 U	390 U	390 U	390 U	390 U	NR	NR	NR
IPSSPP1C	700 J	1000	690 J	860 U	1800	11000	860 U	860 U	1900	NR	NR	NR
IPSSR7	85 J	440 U	440 U	440 U	440 U	59 J	440 U	440 U	110 J	NR	NR	NR
IPSSR8	490 U	490 U	490 U	490 U	490 U	86 J	490 U	490 U	490 U	NR	NR	NR
IPSSR8B	58 J	510 U	510 U	510 U	510 U	65 J	510 U	510 U	510 U	NR	NR	NR
IPSSR8C	490 U	490 U	490 U	490 U	490 U	76 J	490 U	490 U	490 U	NR	NR	NR
IPSSS1A	80 J	370 U	370 U	370 U	370 U	370 U	370 U	370 U	130 J	NR	NR	NR
IPSSS1B	400 J	280 J	150 J	120 J	340 J	820	460 U	130 J	960	NR	NR	NR
IPSSS1BR	500 DJ	280 DJ	240 DJ	1400 U	400 DJ	830 DJ	1400 U	1400 U	710 DJ	NR	NR	NR
IPSSS1C	1500	3500	830	170 J	3700	8600 E	73 J	210 J	4000	NR	NR	NR
IPSSS1CR	1200 DJ	3000 D	1800 DJ	2300 U	3500 D	6600 D	2300 U	2300 U	3500 D	NR	NR	NR
IPSSS3A	700 U	700 U	700 U	700 U	700 U	700 U	700 U	700 U	700 U	NR	NR	NR
IPSSS3B	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	400 U	NR	NR	NR
IPSSS3C	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	490 U	NR	NR	NR

SAMPLE NUMBER	2,3,4,6-TETRA-CHLORO-PHENOL	P-TERT-BUTYL-PHENOL	DIOXIN	2,3,4,5-TETRA-CHLORO-PHENOL
IPSSB12B	NR	NR	NR	NR
IPSSB12C	NR	NR	NR	NR
IPSSB12D	NR	NR	NR	NR
IPSSB9A	NR	NR	NR	NR
IPSSB9AD	NR	NR	NR	NR
IPSSB9B	NR	NR	NR	NR
IPSSB9C	NR	NR	NR	NR
IPSSBA	NR	NR	NR	NR
IPSSBB	NR	NR	NR	NR
IPSSBC	NR	NR	NR	NR
IPSSC1	NR	NR	NR	NR
IPSSC1A	NR	NR	NR	NR
IPSSC2A	NR	NR	NR	NR
IPSSC2B	NR	NR	NR	NR
IPSSC2C	NR	NR	NR	NR
IPSSCMC	NR	NR	NR	NR
IPSSD5	NR	NR	NR	NR
IPSSD6	NR	NR	NR	NR
IPSSD6D	NR	NR	NR	NR
IPSSGWB	NR	NR	NR	NR
IPSSGWBR	NR	NR	NR	NR
IPSSM1	NR	NR	NR	NR
IPSSMJB	NR	NR	NR	NR
IPSSP1AR	NR	NR	NR	NR
IPSSPP1A	NR	NR	NR	NR
IPSSPP1B	NR	NR	NR	NR
IPSSPP1C	NR	NR	NR	NR
IPSSR7	NR	NR	NR	NR
IPSSR8	NR	NR	NR	NR
IPSSR8B	NR	NR	NR	NR
IPSSR8C	NR	NR	NR	NR
IPSSS1A	NR	NR	NR	NR
IPSSS1B	NR	NR	NR	NR
IPSSS1BR	NR	NR	NR	NR
IPSSS1C	NR	NR	NR	NR
IPSSS1CR	NR	NR	NR	NR
IPSSS3A	NR	NR	NR	NR
IPSSS3B	NR	NR	NR	NR
IPSSS3C	NR	NR	NR	NR

SAMPLE NUMBER	4-METHYL-PHENOL	BENZOIC ACID	2-METHYL-PHENOL	2,4,5-TRI-CHLORO-PHENOL	4-NITRO-ANALINE	BENZYL ALCOHOL	4-CHLORO-ANILINE	DIBENZO-FURAN	ANILINE	2-NITRO-ANILINE	2-METHYL-NAPH-THALENE	3-NITRO-ANILINE
IPSSTP5	1000000 U	4900000 U	1000000 U	4900000 U	4900000 U	1000000 U	1000000 U	680000 J	NR	4900000 U	450000	4900000 U
IPSSW13A	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPSSW14A	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPSSX	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U
IPSSZ	10 U	50 U	10 U	50 U	50 U	10 U	10 U	10 U	NR	50 U	10 U	50 U

SAMPLE NUMBER	2,4,6-TRI CHLOROPHENOL	4-CHLORO-3-METHYLPHENOL	2-CHLOROPHENOL	2-4-DICHLOROPHENOL	2,4-DIMETHYLPHENOL	2-NITROPHENOL	4-NITROPHENOL	2,4-DINITROPHENOL	4,6-DINITRO-2-METHYLPHENOL	PENTACHLOROPHENOL	PHENOL	ACENAPHTHENE
IPSSTP5	1000000 U	1000000 U	1000000 U	1000000 U	1000000 U	1000000 U	4900000 U	4900000 U	4900000 U	2800000 J	1000000 U	1000000 U
IPSSW13A	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPSSW14A	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPSSX	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U
IPSSZ	10 U	10 U	10 U	10 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	10 U

SAMPLE NUMBER	BENZIDINE	1,2,4-TRICHLOROBENZENE	HEXACHLOROBENZENE	HEXACHLOROETHANE	BIS(2-CHLOROETHYL)-ETHER	2-CHLORONAPHTHALENE	1,2-DICHLOROBENZENE	1,3-DICHLOROBENZENE	1,4-DICHLOROBENZENE	3,3'-DICHLOROBENZIDINE	2,4-DINITROTOLUENE	2,6-DINITROTOLUENE
IPSSTP5	NR	1000000 U	1000000 U	1000000 U	1000000 U	1000000 U	1000000 U	1000000 U	1000000 U	2000000 U	1000000 U	1000000 U
IPSSW13A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPSSW14A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPSSX	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U
IPSSZ	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	10 U

SAMPLE NUMBER	1,2-DI-PHENYL-HYDRAZINE	FLUORAN-THENE	4-CHLORO-PHENYL-PHENYL-ETHER	4-BROMO-PHENYL-PHENYL-ETHER	BIS(2-CHLOROISO-PROPYL)-ETHER	BIS(2-CHLORO-ETHOXY)-METHANE	HEXA-CHLORO-BUTADIENE	HEXA-CHLORO-CYCLO-PENTADIENE	ISO-PHORONE	NAPH-THALENE	NITRO-BENZENE	N-NITROSO-DIMETHYL-AMINE
IPSSTP5	NR	730000 J	1000000 U	1000000 U	1000000 U	1000000 U	1000000 U	1000000 U	1000000 U	360000 J	1000000 U	NR
IPSSW13A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPSSW14A	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPSSX	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
IPSSZ	NR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR

SAMPLE NUMBER	N-NITROSO-DIPHENYL-AMINE	N-NITRO-DI-N-PROPYL-AMINE	BIS(2-ETHYL-HEXYL)-PHTHALATE	BUTYL-BENZYL-PHTHALATE	DI-N-BUTYL-PHTHALATE	DI-N-OCTYL-PHTHALATE	DIETHYL-PHTHALATE	DIMETHYL-PHTHALATE	BENZO(A)-ANTH-RACENE	BENZO(A) PYRENE	BENZO(B)-FLUORAN-THENE	BENZO(K)-FLUORAN-THENE
IPSSTP5	1000000 U	1000000 U	1000000 U	1000000 U	1000000 U	1000000 U	1000000 U	1000000 U	220000 J	1000000 U	200000 J	1000000 U
IPSSW13A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPSSW14A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPSSX	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
IPSSZ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

SAMPLE NUMBER	CHRYSENE	ACENAPHTHENE	ANTHRACENE	BENZO-(G,H,I)-PERYLENE	FLUORENE	PHENANTHRENE	DIBENZ-(A,H)ANTHRACENE	INDENO-(1,2,3-CD)-PYRENE	PYRENE	BENZOQUINONE	2-BENZYL-4-CHLOROPHENOL	N,N-DIMETHYLBENZENAMINE
IPSSTP5	340000 J	1300000 U	520000 J	1000000 U	1300000 U	3200000	1000000 U	1000000 U	770000 J	NR	NR	NR
IPSSW13A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPSSW14A	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPSSX	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR
IPSSZ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR	NR	NR

SAMPLE NUMBER	2,3,4,6-TETRA-CHLORO-PHENOL	P-TERT-BUTYL-PHENOL	DIOXIN	2,3,4,5-TETRA-CHLORO-PHENOL
IPSSTP5	NR	NR	NR	NR
IPSSW13A	NR	NR	NR	NR
IPSSW14A	NR	NR	NR	NR
IPSSX	NR	NR	NR	NR
IPSSZ	NR	NR	NR	NR

VOLATILES ANALYSIS (ug/Kg)

SAMPLE NUMBER	SS	BENZENE	CARBON TETRA-CHLORIDE	CHLORO-BENZENE	1,2-DI-CHLORO-ETHANE	1,1,1-TRI-CHLORO-ETHANE	1,1-DI-CHLORO-ETHANE	1,1,2-TRI-CHLORO-ETHANE	1,1,2,2-TETRA-CHLORO-ETHANE	CHLORO-ETHANE	1,2-DI-CHLORO-ETHENE	ACETONE	CARBON DISULFIDE
IPSS00		5 U	5 U	5 U	5 U	1 J	5 U	5 U	5 U	10 U	5 U	8 BJ	5 U
IPSS000		5 U	5 U	5 U	5 U	2 J	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSS099		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSS100		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSS101		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSSAA		7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	13 U	7 U	13 U	7 U
IPSSAB		7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	14 U	7 U	14 U	7 U
IPSSAC		7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	14 U	7 U	14 U	7 U
IPSSAGI5A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSSB01B		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	12 U	6 U	18 B	6 U
IPSSB01C		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	16 B	5 U
IPSSB01C	D	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	34 B	5 U
IPSSB02A		1 J	6 U	6 U	6 U	6 U	6 U	6 U	6 U	11 U	6 U	10 BJ	6 U
IPSSB02B		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	11 U	6 U	28 B	6 U
IPSSB02C		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	14 B	5 U
IPSSB03A		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	12 U	6 U	12 U	6 U
IPSSB03B		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	12 U	6 U	10 BJ	6 U
IPSSB03C		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	53 B	5 U	5 U	5 U
IPSSB04A		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	11 U	6 U	4 BJ	6 U
IPSSB04B		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	12 U	6 U	3 BJ	6 U
IPSSB04C		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSSB05A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	22 B	5 U
IPSSB05B		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	11 U	6 U	46 B	6 U
IPSSB05C		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	60 B	5 U
IPSSB06A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	11 U	5 U	7 BJ	5 U
IPSSB06B		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	12 U	6 U	12 U	6 U
IPSSB06C		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	4 J	5 U
IPSSB07A		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	12 U	6 U	12 U	6 U
IPSSB08A		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	11 U	6 U	11 U	6 U
IPSSB08B		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	12 U	6 U	12 U	6 U
IPSSB08B		8 U	8 U	8 U	8 U	8 U	8 U	8 U	8 U	17 U	8 U	50 B	8 U
IPSSB08C	D	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	11 U	5 U	11 B	5 U
IPSSB08C		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	11 U	5 U	11 U	5 U
IPSSB08C	E	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	11 U	5 U	9 BJ	5 U
IPSSB09A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	11 U	5 U	11 U	5 U
IPSSB09B		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	11 U	5 U	20 B	5 U
IPSSB09C		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	11 U	5 U	7 BJ	5 U
IPSSB10A		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	11 U	6 U	40 B	6 U
IPSSB10C		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U

SAMPLE NUMBER	SS	2-BUTANONE	TOTAL XYLENES	CHLORO-FORM	1,1-DI-CHLORO-ETHENE	1,2-DI-CHLORO-PROPANE	TRANS-1,3-DI-CHLORO-PROPANE	CIS-1,3-DI-CHLORO-PROPANE	ETHYL-BENZENE	METHYLENE CHLORIDE	CHLORO-METHANE	BROMO-METHANE	BROMO-FORM
IPSS00		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	7 B	10 U	10 U	5 U
IPSS000		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	7 B	10 U	10 U	5 U
IPSS099		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.9 J	10 U	10 U	5 U
IPSS100		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.6 J	10 U	10 U	5 U
IPSS101		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.5 J	10 U	10 U	5 U
IPSSAA		13 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	13 U	13 U	7 U
IPSSAB		14 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	14 U	14 U	7 U
IPSSAC		14 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	4 J	14 U	14 U	7 U
IPSSAGI5A		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	3 J	10 U	10 U	5 U
IPSSB01B		12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	22 B	12 U	12 U	6 U
IPSSB01C		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	26 B	10 U	10 U	5 U
IPSSB01C	D	10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	35 B	10 U	10 U	5 U
IPSSB02A		11 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	26 B	11 U	11 U	6 U
IPSSB02B		1 BJ	6 U	6 U	6 U	6 U	6 U	6 U	6 U	36 B	11 U	11 U	6 U
IPSSB02C		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	21 B	10 U	10 U	5 U
IPSSB03A		12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	22 B	12 U	12 U	6 U
IPSSB03B		12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	140 B	12 U	12 U	6 U
IPSSB03C		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	12 B	10 U	10 U	5 U
IPSSB04A		11 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	20 B	11 U	11 U	6 U
IPSSB04B		12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	24 B	12 U	12 U	6 U
IPSSB04C		10	5 U	5 U	5 U	5 U	5 U	5 U	5 U	22 B	10 U	10 U	5 U
IPSSB05A		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	17 B	10 U	10 U	5 U
IPSSB05B		11 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	48 B	11 U	11 U	6 U
IPSSB05C		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	54 B	10 U	10 U	5 U
IPSSB06A		11 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	14 B	11 U	11 U	5 U
IPSSB06B		12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	19 B	12 U	12 U	6 U
IPSSB06C		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	64 B	10 U	10 U	5 U
IPSSB07A		12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	14 B	12 U	12 U	6 U
IPSSB08A		11 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	24 B	11 U	11 U	6 U
IPSSB08B		12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	27 B	12 U	12 U	6 U
IPSSB08B		17 U	8 U	8 U	8 U	8 U	8 U	8 U	8 U	8 BJ	17 U	17 U	8 U
IPSSB08C	D	11 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	23 B	11 U	11 U	5 U
IPSSB08C		11 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	26 B	11 U	11 U	5 U
IPSSB08C	E	11 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	12 B	11 U	11 U	5 U
IPSSB09A		11 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	13 B	11 U	11 U	5 U
IPSSB09B		11 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	14 B	11 U	11 U	5 U
IPSSB09C		11 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	11 B	11 U	11 U	5 U
IPSSB10A		11 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	65 B	11 U	11 U	6 U
IPSSB10C		[illegible]	5 U	5 U	5 U	5 U	5 U	U	5 U	9 B	10 U	10 U	5 U

SAMPLE NUMBER	SS	BROMO-DICHLORO-METHANE	DIBROMO-CHLORO-METHANE	1,1,2,2-TETRA-CHLORO-ETHANE	TOLUENE	TRICHLORO-ETHANE	VINYL CHLORIDE	STYRENE	VINYL ACETATE	METHYL-ISOBUTYL-KETONE	2-HEXANONE
IPSS00		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSS000		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSS099		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSS100		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSS101		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSAA		7 U	7 U	7 U	7 U	7 U	13 U	7 U	13 U	13 U	13 U
IPSSAB		7 U	7 U	7 U	7 U	7 U	14 U	7 U	14 U	14 U	14 U
IPSSAC		7 U	7 U	7 U	7 U	7 U	14 U	7 U	14 U	14 U	14 U
IPSSAGI5A		5 U	5 U	5 U	1 J	5 U	10 U	5 U	10 U	10 U	10 U
IPSSB01B		6 U	6 U	6 U	6 U	6 U	12 U	6 U	12 U	12 U	12 U
IPSSB01C		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSB01C	D	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSB02A		6 U	6 U	6 U	6 U	6 U	11 U	6 U	11 U	11 U	11 U
IPSSB02B		6 U	6 U	6 U	6 U	6 U	11 U	6 U	11 U	11 U	11 U
IPSSB02C		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSB03A		6 U	6 U	6 U	6 U	6 U	12 U	6 U	12 U	12 U	12 U
IPSSB03B		6 U	6 U	6 U	6 U	6 U	12 U	6 U	12 U	12 U	12 U
IPSSB03C		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSB04A		6 U	6 U	6 U	6 U	6 U	11 U	6 U	11 U	11 U	11 U
IPSSB04B		6 U	6 U	6 U	6 U	6 U	12 U	6 U	12 U	12 U	12 U
IPSSB04C		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSB05A		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSB05B		6 U	6 U	6 U	6 U	6 U	11 U	6 U	11 U	11 U	11 U
IPSSB05C		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSB06A		5 U	5 U	5 U	5 U	5 U	11 U	5 U	11 U	11 U	11 U
IPSSB06B		6 U	6 U	6 U	6 U	6 U	12 U	6 U	12 U	12 U	12 U
IPSSB06C		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSB07A		6 U	6 U	6 U	6 U	6 U	12 U	6 U	12 U	12 U	12 U
IPSSB08A		6 U	6 U	6 U	6 U	6 U	11 U	6 U	11 U	11 U	11 U
IPSSB08B		6 U	6 U	6 U	6 U	6 U	12 U	6 U	12 U	12 U	12 U
IPSSB08B		8 U	8 U	8 U	30	8 U	17 U	8 U	17 U	17 U	17 U
IPSSB08C	D	5 U	5 U	5 U	5 U	5 U	11 U	5 U	11 U	11 U	11 U
IPSSB08C		5 U	5 U	5 U	5 U	5 U	11 U	5 U	11 U	11 U	11 U
IPSSB08C	E	5 U	5 U	5 U	5 U	5 U	11 U	5 U	11 U	11 U	11 U
IPSSB09A		5 U	5 U	5 U	5 U	5 U	11 U	5 U	11 U	11 U	11 U
IPSSB09B		5 U	5 U	5 U	5 U	5 U	11 U	5 U	11 U	11 U	11 U
IPSSB09C		5 U	5 U	5 U	5 U	5 U	11 U	5 U	11 U	11 U	11 U
IPSSB10A		6 U	6 U	6 U	6 U	6 U	11 U	6 U	11 U	11 U	11 U
IPSSB10C		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U

SAMPLE NUMBER	SS	BENZENE	CARBON TETRA-CHLORIDE	CHLORO-BENZENE	1,2-DI-CHLORO-ETHANE	1,1,1-TRI-CHLORO-ETHANE	1,1-DI-CHLORO-ETHANE	1,1,2-TRI-CHLORO-ETHANE	1,1,2,2-TETRA-CHLORO-ETHANE	CHLORO-ETHANE	1,2-DI-CHLORO-ETHENE	ACETONE	CARBON DISULFIDE
IPSSB11A		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	12 U	6 U	12 U	6 U
IPSSB11B		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	13 U	6 U	14	6 U
IPSSB11C		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSSB12A		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	13 U	6 U	26	6 U
IPSSB12B		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	13 U	6 U	11 BJ	6 U
IPSSB12C		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	11 U	5 U	11 U	5 U
IPSSB12C	D	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	11 U	5 U	11 U	5 U
IPSSBA		7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	14 U	7 U	14 U	7 U
IPSSBB		7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	14 U	7 U	14 U	7 U
IPSSBC		7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	14 U	7 U	34	7 U
IPSSC01A		7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	14 U	7 U	25 B	7 U
IPSSC1		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	12 U	6 U	3 BJ	6 U
IPSSC2A		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	11 U	6 U	4 BJ	6 U
IPSSC2B		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	12 U	6 U	42 B	6 U
IPSSC2C		7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	13 U	7 U	19 B	7 U
IPSSCMC		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	5 BJ	5 U
IPSSD05		12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	24 U	12 U	68 B	12 U
IPSSD06A		16 U	16 U	16 U	16 U	16 U	16 U	16 U	16 U	31 U	16 U	75 B	16 U
IPSSGWB		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSSGWB		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSSGWR		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSSGWR		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSSM1		14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	28 U	14 U	230 B	14 U
IPSSMJB		5 U	5 U	5 U	5 U	2 J	5 U	5 U	5 U	10 U	5 U	7 BJ	5 U
IPSSPP1A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	11 U	5 U	11 U	5 U
IPSSPP1A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	11 U	5 U	9 J	5 U
IPSSPP1B		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	12 U	6 U	12 U	6 U
IPSSPP1C		7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	12 U	7 U	19 B	7 U
IPSSR07		7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	13 U	7 U	13 U	7 U
IPSSR08A		9 U	9 U	9 U	9 U	9 U	9 U	9 U	9 U	17 U	9 U	75 B	9 U
IPSSR08A	C	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	15 U	7 U	15 B	7 U
IPSSS1A		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	11 U	6 U	13 B	6 U
IPSSS1B		7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	14 U	7 U	53 B	7 U
IPSSS1C		7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	14 U	7 U	29 B	7 U
IPSSS3A		11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	21 U	11 U	17 BJ	11 U
IPSSS3B		6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	12 U	6 U	14 B	6 U
IPSSS3C		7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	27 B	7 U	7 U	7 U
IPSSTP5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSSW13A		[illegible] U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U

SAMPLE NUMBER	SS	2-BUTANONE	TOTAL XYLENES	CHLORO-FORM	1,1-DI-CHLORO-ETHENE	1,2-DI-CHLORO-PROPANE	TRANS-1,3-DI-CHLORO-PROPANE	CIS-1,3-DI-CHLORO-PROPANE	ETHYL-BENZENE	METHYLENE CHLORIDE	CHLORO-METHANE	BROMO-METHANE	BROMO-FORM
IPSSB11A		12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	13 B	12 U	12 U	6 U
IPSSB11B		13 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	12 B	13 U	13 U	6 U
IPSSB11C		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	11 B	10 U	10 U	5 U
IPSSB12A		13 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	31 B	13 U	13 U	6 U
IPSSB12B		13 U	6 U	2 J	6 U	6 U	6 U	6 U	6 U	180 B	13 U	13 U	6 U
IPSSB12C		11 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	36 B	11 U	11 U	5 U
IPSSB12C	D	11 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 B	11 U	11 U	5 U
IPSSBA		14 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	14 U	14 U	7 U
IPSSBB		14 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	4 J	14 U	14 U	7 U
IPSSBC		14 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	4 J	14 U	14 U	7 U
IPSSC01A		4 J	7 U	7 U	7 U	7 U	7 U	7 U	7 U	45 B	14 U	14 U	7 U
IPSSC1		12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	17 B	12 U	12 U	6 U
IPSSC2A		11 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	30 B	11 U	11 U	6 U
IPSSC2B		12 U	6 U	4 J	6 U	6 U	6 U	6 U	6 U	160 B	12 U	12 U	6 U
IPSSC2C		13 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	51 B	13 U	13 U	7 U
IPSSCMC		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	8 B	10 U	10 U	5 U
IPSSD05		24 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	27 B	24 U	24 U	12 U
IPSSD06A		31 U	16 U	16 U	16 U	16 U	16 U	16 U	16 U	95 B	31 U	31 U	16 U
IPSSGWB		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPSSGWB		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	4 J	10 U	10 U	5 U
IPSSGWR		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	4 J	10 U	10 U	5 U
IPSSGWR		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPSSM1		47	14 U	14 U	14 U	14 U	14 U	14 U	14 U	12 BJ	28 U	28 U	14 U
IPSSMJB		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	7 B	10 U	10 U	5 U
IPSSPP1A		11 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	11 B	11 U	11 U	5 U
IPSSPP1A		11 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	8 B	11 U	11 U	5 U
IPSSPP1B		12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 BJ	12 U	12 U	6 U
IPSSPP1C		13 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	15 B	12 U	12 U	7 U
IPSSR07		13 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	33 B	13 U	13 U	7 U
IPSSR08A		17 U	9 U	9 U	9 U	9 U	9 U	9 U	9 U	15 B	17 U	17 U	9 U
IPSSR08A	C	15 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 BJ	15 U	15 U	7 U
IPSSS1A		11 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	17 B	11 U	11 U	6 U
IPSSS1B		14 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	41 B	14 U	14 U	7 U
IPSSS1C		14 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	18 B	14 U	14 U	7 U
IPSSS3A		21 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	40 B	21 U	21 U	11 U
IPSSS3B		12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	84 B	12 U	12 U	6 U
IPSSS3C		15 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	21 B	15 U	15 U	7 U
IPSSTP5		10 U	13	5 U	5 U	5 U	5 U	5 U	6	5 U	10 U	10 U	5 U
IPSSW13A		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U

SAMPLE NUMBER	SS	BROMO-DICHLORO-METHANE	DIBROMO-CHLORO-METHANE	1,1,2,2-TETRA-CHLORO-ETHANE	TOLUENE	TRICHLORO-ETHANE	VINYL CHLORIDE	STYRENE	VINYL ACETATE	METHYL-ISOBUTYL-KETONE	2-HEXANONE
IPSSB11A		6 U	6 U	6 U	6 U	6 U	12 U	6 U	12 U	12 U	12 U
IPSSB11B		6 U	6 U	6 U	6 U	6 U	13 U	6 U	13 U	13 U	13 U
IPSSB11C		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSB12A		6 U	6 U	6 U	6 U	6 U	13 U	6 U	13 U	13 U	13 U
IPSSB12B		6 U	6 U	6 U	6 U	6 U	13 U	6 U	13 U	13 U	13 U
IPSSB12C		5 U	5 U	5 U	5 U	5 U	11 U	5 U	11 U	11 U	11 U
IPSSB12C	D	5 U	5 U	5 U	5 U	5 U	11 U	5 U	11 U	11 U	11 U
IPSSBA		7 U	7 U	7 U	7 U	7 U	14 U	7 U	14 U	14 U	14 U
IPSSBB		7 U	7 U	7 U	7 U	7 U	14 U	7 U	14 U	14 U	14 U
IPSSBC		7 U	7 U	7 U	7 U	7 U	14 U	7 U	14 U	14 U	14 U
IPSSC01A		7 U	7 U	7 U	7 U	7 U	14 U	7 U	14 U	14 U	14 U
IPSSC1		6 U	6 U	6 U	6 U	6 U	12 U	6 U	12 U	12 U	12 U
IPSSC2A		6 U	6 U	6 U	6 U	6 U	11 U	6 U	11 U	11 U	11 U
IPSSC2B		6 U	6 U	6 U	2 J	6 U	12 U	6 U	12 U	12 U	12 U
IPSSC2C		7 U	7 U	7 U	7 U	7 U	13 U	7 U	13 U	13 U	13 U
IPSSCMC		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSD05		12 U	12 U	12 U	6 J	12 U	24 U	12 U	24 U	24 U	24 U
IPSSD06A		16 U	16 U	16 U	16 U	16 U	31 U	16 U	31 U	31 U	31 U
IPSSGWB		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSGWB		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSGWR		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSGWR		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSM1		14 U	14 U	14 U	3 J	14 U	28 U	14 U	28 U	28 U	28 U
IPSSMJB		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSPP1A		5 U	5 U	5 U	5 U	5 U	11 U	5 U	11 U	11 U	11 U
IPSSPP1A		5 U	5 U	5 U	5 U	5 U	11 U	5 U	11 U	11 U	11 U
IPSSPP1B		6 U	6 U	6 U	6 U	6 U	12 U	6 U	12 U	12 U	12 U
IPSSPP1C		7 U	7 U	7 U	7 U	7 U	12 U	7 U	13 U	13 U	13 U
IPSSR07		7 U	7 U	7 U	7 U	7 U	13 U	7 U	13 U	13 U	13 U
IPSSR08A		17 U	9 U	9 U	5 J	9 U	17 U	9 U	17 U	17 U	17 U
IPSSR08A	C	7 U	7 U	7 U	4 J	7 U	15 U	7 U	15 U	15 U	15 U
IPSSS1A		6 U	6 U	6 U	6 U	6 U	11 U	6 U	11 U	11 U	11 U
IPSSS1B		7 U	7 U	7 U	7 U	7 U	14 U	7 U	14 U	14 U	14 U
IPSSS1C		7 U	7 U	7 U	7 U	7 U	14 U	7 U	14 U	14 U	14 U
IPSSS3A		11 U	11 U	11 U	11 U	11 U	21 U	11 U	21 U	21 U	21 U
IPSSS3B		6 U	6 U	6 U	6 U	6 U	12 U	6 U	12 U	12 U	12 U
IPSSS3C		7 U	7 U	7 U	7 U	7 U	15 U	7 U	15 U	15 U	15 U
IPSSTP5		5 U	5 U	2 J	1 J	5 U	10 U	5 U	10 U	10 U	10 U
IPSSW13A		5 U	5 U	5 U	5 U	5 U	[illegible] U	5 U	10 U	10 U	10 U

SAMPLE NUMBER	SS	BENZENE	CARBON TETRA-CHLORIDE	CHLORO-BENZENE	1,2-DI-CHLORO-ETHANE	1,1,1-TRI-CHLORO-ETHANE	1,1-DI-CHLORO-ETHANE	1,1,2-TRI-CHLORO-ETHANE	1,1,2,2-TETRA-CHLORO-ETHANE	CHLORO-ETHANE	1,2-DI-CHLORO-ETHENE	ACETONE	CARBON DISULFIDE
IPSSW14A		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSSX		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSSY		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U
IPSSZ		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	5 U

SAMPLE NUMBER	SS	2-BUTANONE	TOTAL XYLENES	CHLOROFORM	1,1-DICHLOROETHENE	1,2-DICHLOROPROPANE	TRANS-1,3-DICHLOROPROPANE	CIS-1,3-DICHLOROPROPANE	ETHYLBENZENE	METHYLENE CHLORIDE	CHLOROMETHANE	BROMOMETHANE	BROMOFORM
IPSSW14A		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	5 U
IPSSX		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 BJ	10 U	10 U	5 U
IPSSY		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1BJ	10 U	10 U	5 U
IPSSZ		10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2 BJ	10 U	10 U	5 U

SAMPLE NUMBER	SS	BROMO-DICHLORO-METHANE	DIBROMO-CHLORO-METHANE	1,1,2,2-TETRA-CHLORO-ETHANE	TOLUENE	TRICHLORO-ETHANE	VINYL CHLORIDE	STYRENE	VINYL ACETATE	METHYL-ISOBUTYL-KETONE	2-HEXANONE
IPSSW14A		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSX		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSY		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U
IPSSZ		5 U	5 U	5 U	5 U	5 U	10 U	5 U	10 U	10 U	10 U

TRACE METALS ANALYSIS (ug/Kg)

SAMPLE NUMBER	SS	ALUMINUM	ARSENIC	BARIUM	CADMIUM	CALCIUM	CHROMIUM	COPPER	IRON	LEAD	MAGNESIUM	MANGANESE	MERCURY	NICKEL
IPSS000		63.60 B	2.50 B	2.00 U	2.00 U	442.00 B	4.00 U	5.00 U	50.40 B	1.00 U	55.10 B	1.00 U	0.20 U	11.00 U
IPSS099		46.00 U	1.00 U	11.00 B	3.00 U	359.00 B	5.00 U	9.00 B	29.00 B	2.50 B	120.00 U	2.00 B	0.20 U	17.00 U
IPSS101		46.00 U	1.00 U	8.00 B	3.00 U	239.00 B	5.00 U	7.00 B	17.00 B	4.20	120.00 U	2.00 B	0.20 U	17.00 U
IPSSAA		31900.00	3.30	348.00	1.10 B	10200.00	52.00	28.80	32400.00	77.00 *	8590.00	466.00	0.12	36.60
IPSSAB		253.00	1.30 BW	324.00	0.78 U	22600.00	44.30	21.40	26300.00	21.10 S*	10400.00	300.00	0.09 U	29.70
IPSSAC		30300.00	2.30 B	366.00	0.87 U	21400.00	54.20	23.20	30300.00	12.30 *	11600.00	323.00	0.11 U	30.70
IPSSAG5A		1080.00	10.39	407.00	3.00 B	19700.00	3.40 U	65.60	7670.00	7.69	43200.00	5790.00	0.20 B	13.00 U
IPSSB01B		15100.00	2.9 S	230.00	0.22 U	15700.00 *	33.00	26.40	19100.00	14.30 J*	8870.00 *	333.00	0.11 U	28.40
IPSSB01C		4820.00	1.80 B	49.40	0.20 U	36500.00 *	18.60	16.00	9710.00	3.30 J*	8530.00 *	141.00	0.17	14.90
IPSSB01D		3700.00	1.20 B	60.00	0.20 U	45900.00 *	13.10 *	20.40	7450.00	4.10 UJ*	10100.00 *	146.00	0.09 *	11.70
IPSSB02A		15100.00	3.50	264.00	0.45 U	9170.00	31.80	20.20	22500.00	20.70	5600.00 *	885.00 J	0.12 U*	22.00
IPSSB02B		15000.00	2.30	179.00	0.43 U	5200.00	32.80	14.20	23700.00	8.20	5510.00 *	244.00 J	0.11 U*	20.10
IPSSB02C		3370.00	1.90 B	32.20 B	0.39 U	55800.00	12.00	9.70	6990.00	2.50	6980.00 *	174.00 J	0.08 U*	12.60
IPSSB03A		12800.00	4.20	225.00	0.44 U	12700.00	27.90	21.00	19000.00	26.00	5610.00 *	436.00 J	0.10 U*	18.30
IPSSB03B		15200.00	12.70	421.00	0.46 U	20600.00	30.70	37.40	21500.00	99.60	6310.00 *	647.00 J	0.12 U*	20.70
IPSSB03C		3990.00	0.79 B	36.80 B	0.38 U	31100.00	18.90	12.00	9750.00	3.10	10600.00 *	109.00 J	0.09 U*	17.40
IPSSB04A		15200.00	9.00	823.00	0.43 U	19100.00	24.90	40.00	21600.00	51.70	4700.00 *	217.00 J	0.11 U*	24.80
IPSSB04B		20300.00	8.70	1320.00	0.48 U	18600.00	28.40	43.90	30300.00	10.30	4390.00 *	107.00 J	0.31 *	34.50
IPSSB04C		5740.00	1.20 B	70.40	0.39 U	23200.00	26.80	13.30	11800.00	3.20	8230.00 *	307.00 J	0.10 U*	24.10
IPSSB05A		8820.00	2.00	195.00	0.20 U	26100.00 *	21.40 *	16.10	16000.00	11.40 UJ*	6850.00 *	374.00	0.12 *	17.00
IPSSB05B		7350.00	1.30 B	90.50	0.20 U	13700.00 *	24.90 *	13.00	13200.00	5.30 UJ*	7060.00 *	282.00	0.10 U*	18.50
IPSSB05C		4910.00	1.10 B	56.50	0.21 U	31800.00 *	18.70 *	12.20	9930.00	3.30 UJ*	8180.00 *	150.00	0.24 *	16.80
IPSSB06A		17700.00	4.50	270.00	0.24 U	10400.00 *	36.60 *	26.30	24300.00	33.80 UJ*	6410.00 *	450.00	0.51 *	25.60
IPSSB06B		9220.00	1.30 B	149.00	0.22 U	43500.00 *	21.80 *	12.30	12000.00	9.10 UJ*	24300.00 *	176.00	0.64 *	20.20
IPSSB06C		4650.00	0.70 B	49.10	0.20 U	26800.00 *	18.50 *	12.40	8210.00	3.90 UJ*S	6450.00 *	144.00	0.09 *	14.70
IPSSB07A		11800.00	9.70	543.00	0.26 B	28800.00 *	19.10 *	51.50	17100.00	162.00 UJ*	4890.00 *	590.00	0.15 *	14.10
IPSSB08A		13600.00	3.90	290.00	0.44 U	16300.00	27.90	26.50	18500.00	39.70	6380.00 *	383.00 J	0.10 U*	19.10
IPSSB08B		16800.00	3.60	264.00	0.47 U	29900.00	32.70	26.20	21600.00	30.60	6140.00 *	647.00 J	0.11 U*	23.40
IPSSB08C		4420.00	1.20 B	31.80 B	0.39 U	33800.00	20.90	10.00	8930.00	3.20	7100.00 *	153.00 J	0.18 *	13.50
IPSSB09A		10100.00	4.20	245.00	0.22 U	24900.00 *	29.30 *	24.30	15200.00	59.70 UJ*	6870.00 *	338.00	0.17 *	17.40
IPSSB09B		6500.00	0.96 B	78.60	0.20 U	20900.00 *	23.50 *	12.00	11600.00	4.90 UJ*	7440.00 *	137.00	0.10 U*	19.80
IPSSB09C		4500.00	0.94 B	50.40	0.21 U	20100.00 *	19.80 *	11.90	8810.00	10.20 UJ*S	7150.00 *	107.00	0.50 *	15.60
IPSSB10A		9050.00	4.30	255.00	0.23 U	17100.00 *	21.10 *	29.20	34000.00	70.50 UJ*	4840.00 *	517.00	0.12 U*	16.50
IPSSB10C		3570.00	0.68 B	45.90	0.19 U	32300.00 *	14.00 *	11.20	8670.00	2.60 UJ*	9890.00 *	153.00	0.19 *	11.30
IPSSB11A		740.00	2.20	134.00	0.44 U	11200.00	20.80	15.90	13700.00	8.60	4630.00 *	259.00 J	0.10 U*	12.20
IPSSB11B		11000.00	4.60	305.00	0.24 U	14500.00 *	13.40	66.60	11700.00	95.60 J*	3870.00 *	160.00	0.11 U	11.60
IPSSB11C		5310.00	0.98 B	57.00	0.20 U	18000.00 *	24.10	15.30	11300.00	3.50 J*	6990.00 *	161.00	0.09 U	18.20
IPSSB12A		13500.00	7.10 S	562.00	0.52 U	20500.00	19.30	54.00	16100.00	9.30	4060.00 *	376.00 J	0.11 U*	15.30
IPSSB12B		15100.00	5.40 S	269.00	0.49 U	10200.00	29.20	30.10	21000.00	45.30	5370.00 *	622.00 J	0.10 U*	22.20
IPSSB12C		3820.00	0.47 B	38.20 B	0.19 U	22200.00 *	15.90 *	6.80	7750.00	2.80 UJ*	5070.00 *	137.00	0.10 U*	12.50
IPSSB12D		4890.00	1.00 B	54.10	0.42 U	32900.00	19.90	11.60	10200.00	3.00	10400.00 *	148.00 J	1.20 *	15.60

SAMPLE NUMBER	SS	POTASSIUM	ANTIMONY	CYANIDE	SELENIUM	SILVER	SODIUM	BERYLLIUM	THALLIUM	BORON	TIN	VANADIUM	MOLYBDENUM
IPSS000		136.00 UJ	21.00 U	NR	3.00 UJW	8.00 UJ	786.00 B	1.00 U	2.00 U	NR	NR	4.00 U	NR
IPSS099		247.00 B	46.00 UJ	NR	1.00 U	5.00 U	217.00 U	1.00 U	1.80 B	NR	NR	7.00 U	NR
IPSS101		423.00 B	46.00 UJ	NR	1.00 U	5.00 U	269.00 B	1.00 U	1.00 U	NR	NR	7.00 U	NR
SSAA		4990.00	12.90 UJ	NR	0.39 B	1.40 U	104.00 B	1.40	0.33 B	NR	NR	63.80	NR
IPSSAB		2970.00	12.00 UJ	NR	0.29 B	1.30 U	347.00 B	1.00 B	0.26 U	NR	NR	45.90	NR
IPSSAC		3690.00	13.30 UJ	NR	0.37 B	1.40 U	326.00 B	1.20 B	0.48 B	NR	NR	71.00	NR
IPSSAG5A		91600.00	12.80 U	NR	3.00 U	7.00 B	48100.00	2.10 U	3.00 U	NR	NR	20.20 B	NR
IPSSB01B		2160.00W	2.70 UJ	NR	0.45 UJ	0.67 U	192.00 B	0.71 B	0.68 U	NR	NR	38.90	NR
IPSSB01C		1000.00 B	2.40 UJ	NR	0.40 UJ	0.60 U	169.00 B	0.46 B	0.60 U	NR	NR	20.60	NR
IPSSB01D		782.00 B	2.40 UJ	NR	0.61 UW	0.60 UJ	131.00 B	0.20 U	0.41 U	NR	NR	16.10	NR
IPSSB02A		3010.00	5.90 UJ	NR	0.67 UJW	1.40 UJ	296.00 B	0.59 B	0.22 U	NR	NR	41.50	NR
IPSSB02B		2520.00	5.60 UJ	NR	0.68 UJ	1.30 UJ	305.00 B	0.61 B	0.24 B	NR	NR	48.90	NR
IPSSB02C		648.00 B	5.10 UJ	NR	0.58 UJW	1.20 UJ	141.00 B	0.20 U	0.19 U	NR	NR	16.20	NR
IPSSB03A		2200.00	5.70 UJ	NR	0.63 UJW	1.30 UJ	229.00 B	0.52 B	0.21 U	NR	NR	39.60	NR
IPSSB03B		2920.00	6.00 UJ	NR	0.70 UJW	1.40 UJ	475.00	0.74 B	0.23 U	NR	NR	44.30	NR
IPSSB03C		677.00 B	5.00 UJ	NR	0.60 UJ	1.20 UJ	180.00 B	0.19 U	0.20 U	NR	NR	21.90	NR
IPSSB04A		1960.00	5.60 UJ	NR	0.69 UJW	1.30 UJ	1530.00	0.87 B	0.23 U	NR	NR	46.90	NR
IPSSB04B		2040.00	6.30 UJ	NR	0.74 UJW	1.40 UJ	2450.00	1.50	0.25 U	NR	NR	71.80	NR
IPSSB04C		1360.00	5.10 UJ	NR	0.57 UJ	1.20 UJ	201.00 B	0.19 U	0.19 U	NR	NR	30.90	NR
IPSSB05A		1330.00	2.40 UJ	NR	0.59 UW	0.59 UJ	305.00 B	0.20 U	0.39 U	NR	NR	36.40	NR
IPSSB05B		12690.00	2.40 UJ	NR	0.60 UW	0.59 UJ	162.00 B	0.45 B	0.40 U	NR	NR	28.00	NR
IPSSB05C		962.00 B	2.50 UJ	NR	0.58 UW	0.62 UJ	162.00 B	0.48 B	0.39 UW	NR	NR	20.00	NR
IPSSB06A		3680.00	2.80 UJ	NR	0.69 UW	0.71 UJ	248.00 B	0.76 B	0.46 U	NR	NR	37.70	NR
IPSSB06B		1530.00	2.60 UJ	NR	0.62 UW	0.66 UJ	165.00 B	0.40 B	0.41 U	NR	NR	24.90	NR
IPSSB06C		960.00 B	2.30 UJ	NR	0.60 UW	0.59 UJ	463.00 B	0.27 B	0.40 U	NR	NR	18.10	NR
IPSSB07A		1830.00	3.30 B	NR	0.70 UW	0.74 UJ	404.00 B	0.57 B	0.47 U	NR	NR	29.90	NR
IPSSB08A		2240.00	5.70 UJ	NR	0.64 UJW	1.30 UJ	348.00 B	0.59 B	0.21 U	NR	NR	37.50	NR
IPSSB08B		2710.00	6.10 UJ	NR	0.67 UJW	1.40 UJ	277.00 B	0.83 B	0.22 U	NR	NR	37.90	NR
IPSSB08C		863.00 B	5.10 UJ	NR	0.61 UJ	1.40 BJ	161.00 B	0.20 U	0.20 U	NR	NR	22.10	NR
IPSSB09A		1960.00	2.60 UJ	NR	0.65 U	0.66 UJ	341.00 B	0.51 B	0.44 U	NR	NR	33.30	NR
IPSSB09B		1240.00	2.40 UJ	NR	0.60 UW	0.60 UJ	119.00 B	0.46 B	0.40 U	NR	NR	25.50	NR
IPSSB09C		1010.00 B	2.50 UJ	NR	0.60 UW	0.63 UJ	120.00 B	0.21 U	0.40 UW	NR	NR	18.80	NR
IPSSB10A		1690.00	2.70 UJ	NR	0.67 UW	0.69 UJ	270.00 B	0.53 B	0.45 U	NR	NR	33.70	NR
IPSSB10C		660.00 B	2.30 UJ	NR	0.60 U	0.58 UJ	130.00 B	0.36 B	0.40 U	NR	NR	17.60	NR
IPSSB11A		1510.00	5.80 UJ	NR	0.65 UJW	1.30 UJ	250.00 B	0.27 B	0.22 U	NR	NR	33.10	NR
IPSSB11B		1240.00	2.90 UJ	NR	0.49 UJ	2.20 B	340.00 B	0.66 B	0.74 U	NR	NR	31.40	NR
IPSSB11C		1160.00	2.40 UJ	NR	0.40 UJ	0.60 U	171.00 B	0.54 B	0.60 U	NR	NR	25.00	NR
IPSSB12A		1690.00	6.70 UJ	NR	0.76 UJW	1.60 UJ	349.00 B	0.75 B	11.00	NR	NR	35.30	NR
IPSSB12B		2790.00	6.80 BJ	NR	0.74 UJW	1.50 UJ	240.00 B	0.74 B	0.25 U	NR	NR	41.70	NR
IPSSB12C		819.00 B	2.30 UJ	NR	0.60 UW	0.58 UJ	112.00 B	0.36 U	0.40 UW	NR	NR	16.00	NR

SAMPLE NUMBER	SS	ZINC	SILICON	COBALT
IPSS000		8.10 B	NR	3.00 U
IPSS099		14.00 U	NR	10.00 U
IPSS101		14.00 U	NR	10.00 U
IPSSAA		78.70	NR	6.40 B
IPSSAB		52.90	NR	4.70 B
IPSSAC		56.70	NR	4.60 B
IPSSAG5A		38.80	NR	6.40 B
IPSSB01B		52.00	NR	10.60 B
IPSSB01C		22.60	NR	5.50 B
IPSSB01D		19.00	NR	4.60 B
IPSSB02A		66.70	NR	11.20 B
IPSSB02B		45.90	NR	9.90 B
IPSSB02C		17.10	NR	5.80 B
IPSSB03A		60.00	NR	9.40 B
IPSSB03B		155.00	NR	10.80 B
IPSSB03C		24.20	NR	6.00 B
IPSSB04A		48.50	NR	10.80 B
IPSSB04B		26.20	NR	15.50
IPSSB04C		27.70	NR	8.20 B
IPSSB05A		36.40	NR	7.30 B
IPSSB05B		30.90	NR	6.70 B
IPSSB05C		21.70	NR	6.00 B
IPSSB06A		73.80	NR	11.50 B
IPSSB06B		33.50	NR	5.80 B
IPSSB06C		22.20	NR	5.20 B
IPSSB07A		254.00	NR	8.30 B
IPSSB08A		57.30	NR	8.20 B
IPSSB08B		61.20	NR	9.80 B
IPSSB08C		19.70	NR	5.80 B
IPSSB09A		70.90	NR	7.70 B
IPSSB09B		28.50	NR	6.00 B
IPSSB09C		22.60	NR	5.00 B
IPSSB10A		67.90	NR	7.40 B
IPSSB10C		18.20	NR	3.80 B
IPSSB11A		39.00	NR	7.00 B
IPSSB11B		42.40 J	NR	6.30 B
IPSSB11C		26.20 BJ	NR	5.70 B
IPSSB12A		54.90	NR	7.40 B
IPSSB12B		59.70	NR	11.00 B
IPSSB12C		18.30	NR	4.10 B
IPSSB12D		22.00	NR	5.60 B

SAMPLE NUMBER	SS	ALUMINUM	ARSENIC	BARIUM	CADMIUM	CALCIUM	CHROMIUM	COPPER	IRON	LEAD	MAGNESIUM	MANGANESE	MERCURY	NICKEL
IPSSBA		30700.00	2.60 B	345.00	1.10 B	11400.00	49.20	28.70	31600.00	21.30 S*	8010.00	658.00	0.11	39.10
IPSSBB		23700.00	1.90 B	319.00	0.80 B	10800.00	40.40	13.10	25700.00	15.80 S*	8770.00	577.00	0.11	25.40
IPSSBC		23200.00	2.90	568.00	1.10 B	17300.00	45.90	16.30	25300.00	39.20 +*	9080.00	2820.00	0.13 U	28.70
IPSSC1		9570.00	1.70 B	289.00 *	0.32 U	11900.00	20.90	12.50	14300.00	15.10 J	5620.00	202.00 J	0.15	16.70
IPSSC1A		18100.00	4.70 S	247.00	0.47 U	20900.00	38.80	29.50	22600.00	59.50	8500.00 *	432.00 J	0.12 U*	23.80
IPSSC2A		12000.00	2.40	141.00	0.46 U	16200.00	31.90	15.00	18800.00	18.50	7530.00 *	263.00 J	0.11 U*	18.60
IPSSC2B		11300.00	2.80	146.00	0.47 U	12200.00	35.70	16.40	16400.00	10.60	6680.00 *	298.00 J	0.12 U*	21.70
IPSSC2C		12300.00	2.30 B+	194.00	0.49 U	6180.00	32.20	12.10	17500.00	7.90	5510.00 *	525.00 J	0.13 U*	18.50
IPSSCMC		14200.00	14.80 +	186.00	0.39 U	12200.00	12.60	55.00	18800.00	38.50	4180.00	559.00	0.09 U*	9.30
IPSSD5		10800.00	4.20	306.00	0.70 U	19300.00	20.90	8.60 B	15600.00	13.70	6740.00	467.00	0.14 U*	17.00
IPSSD6		13900.00	6.70	400.00 *	0.35 U	12800.00	25.00	22.70	22300.00	24.30 J	6350.00	735.00 J	0.19	22.80
IPSSGWB		29.6 B	3.0 U	1.0 U	3.0 B	256.0 B	3.4 U	4.1 U	4.0	3.0 U	23.6 U	1.0 U	0.20 B	13.0 U
IPSSGWR		29.4 U	3.0 U	1.0 U	3.0 B	286.0 B	3.4 U	4.1 U	44.40	3.0 U	25.1 B	3.5 B	0.20 B	13.0 U
IPSSM1		9270.00	8.80	341.00	0.90 U	16500.00	22.40	14.30	21100.00	62.90	5150.00	740.00	0.21 U*	15.60 B
IPSSMJB		48.90 B	3.60 B	2.00 U	2.00 U	367.00 B	4.00 U	5.00 U	31.20 B	1.00 U	31.00 U	1.00 U	0.20 U	11.00 U
IPSSPP1A		10400.00	2.70 S	168.00 *	0.21 U	7830.00	16.40	28.00	18600.00	10.40 J	4810.00	396.00 J	0.11	16.10
IPSSPP1B		10900.00	3.40	236.00 *	0.23 U	8840.00	25.70	22.90	16500.00	9.00 J	5790.00	846.00 J	0.11	22.50
IPSSPP1C		11400.00	1.70 B	269.00 *	0.26 U	5590.00	25.40	20.60	14700.00	12.00 J	4260.00	410.00 J	0.28 J	22.70
IPSSR7		4960.00	2.30 B	142.00 *	0.24 U	28500.00	11.60	8.90	9010.00	30.00 J	6140.00	197.00 J	0.42 J	8.30 B
IPSSR8		10300.00	4.00	288.00	0.63 U	24900.00	20.60	10.30	14600.00	10.70 S	7790.00	313.00	0.21 *	15.60
IPSSS1A		8610.00	3.70	197.00	0.21 U	12300.00 *	21.20 *	14.80	13100.00	16.00 UJ*	4900.00 *	507.00	0.09 U*	18.00
IPSSS1B		16600.00	6.60	361.00	0.26 U	18500.00 *	35.30 *	34.90	22100.00	70.10 UJ*S	7260.00 *	487.00	0.29 *	28.40
IPSSS1C		12000.00	4.80	382.00	0.27 U	14300.00 *	25.20 *	21.20	17700.00	25.90 UJ*	5660.00 *	624.00	0.13 *	20.40
IPSSS3A		6370.00	3.40 B	117.00	0.38 U	43600.00 *	15.00 *	23.80	8190.00	9.10 UJ*	3470.00 *	419.00	0.54 *	11.10 B
IPSSS3B		9750.00	2.10 B	141.00	0.22 U	14700.00 *	27.10 *	10.00	17900.00	9.80 UJ*	7850.00 *	274.00	0.26 *	19.80
IPSSS3C		1100.00	1.70 B	216.00	0.27 U	8940.00 *	32.20 *	16.20	16300.00	12.60 UJ*	7160.00 *	213.00	0.14 U*	23.10
IPSSW13		58.40 B	2.00 U	3.50 B	2.00 U	149.00 B	5.00 U	5.00 U	53.30 B	1.00 U	85.30 B	3.10 B	0.20 UN	6.00 U
IPSSW14		39.50 B	2.00 U	2.00 U	2.00 U	95.40 B	5.00 U	5.00 U	13.70 B	1.00 UJ	38.00 U	1.20 B	0.20 UN	6.00 U
IPSSX		13.00 U	1.00 U	2.00 U	1.00 U	84.90 B	4.00 U	5.00 U	71.40 B	1.00 UJ	54.00 U	2.40 BJ	0.20	5.10 B
IPSSZ		13.00 U	1.00 U	2.00 U	1.00 U	63.60 B	4.00 U	5.00 U	17.50 B	1.00 UJ	54.00 U	1.60 BJ	0.20	5.00 U

SAMPLE NUMBER	SS	POTASSIUM	ANTIMONY	CYANIDE	SELENIUM	SILVER	SODIUM	BERYLLIUM	THALLIUM	BORON	TIN	VANADIUM	MOLYBDENUM
IPSSB12D		876.00 B	5.50 UJ	NR	0.62 UJ	1.30 UJ	194.00 B	0.21 U	0.21 U	NR	NR	22.60	NR
IPSSBA		4520.00	12.60 UJ	NR	0.55 BW	1.40 U	180.00 B	1.40	0.27 U	NR	NR	45.30	NR
IPSSBB		3040.00	12.30 UJ	NR	0.27 UW	1.30 U	256.00 B	1.10 B	0.27 U	NR	NR	41.70	NR
IPSSBC		2920.00	12.70 UJ	NR	0.27 UW	1.40 U	372.00 B	0.83 B	0.43 B	NR	NR	51.70	NR
IPSSC1		1690.00 J	3.80 UJ	NR	0.61 UW	0.95 U	237.00 BJ	0.92 B	0.31 U	NR	NR	32.20	NR
IPSSC1A		4630.00	6.10 UJ	NR	0.68 UJW	1.40 UJ	313.00 B	0.75 B	0.23 U	NR	NR	45.80	NR
IPSSC2A		2580.00	6.00 UJ	NR	0.67 UJW	1.40 UJ	337.00 B	0.40 B	0.22 U	NR	NR	39.60	NR
IPSSC2B		2570.00	6.10 UJ	NR	0.67 UJW	1.40 UJ	205.00 B	0.47 B	0.22 U	NR	NR	38.60	NR
IPSSC2C		2100.00	6.30 UJ	NR	0.77 UJW	1.50 UJ	303.00 B	0.38 B	0.26 U	NR	NR	37.30	NR
IPSSCMC		3370.00 J	4.10 U	NR	4.50 BJ	1.50 UJ	840.00 B	0.58 B	0.39 U	NR	NR	36.80	NR
IPSSD5		1320.00 BJ	7.30 UJ	NR	1.10 BJ	2.80 UJ	219.00 B	0.50 B	0.69 U	NR	NR	28.30	NR
IPSSD6		2960.00 J	4.20 UJ	NR	0.70 U	1.00 U	279.00 BJ	1.00 B	0.35 U	NR	NR	38.10	NR
IPSSGWB		522.0 U	12.8 U	NR	3.0 B	7.0 B	216 B	2.1 U	3.0 U	NR	NR	2.6 U	NR
IPSSGWR		522.0 U	12.8 U	NR	3.0 U	7.0 B	239.0 B	2.1 U	3.0 U	NR	NR	2.6 U	NR
IPSSM1		1710.00 BJ	9.40 UJ	NR	2.10 BJ+	3.60 UJ	258.00 B	0.45 U	0.87 U	NR	NR	31.30	NR
IPSSMJB		136.00 UJ	21.00 U	NR	3.00 UJ	18.10 J	781.00 B	1.00 U	2.00 U	NR	NR	4.00 U	NR
IPSSPP1A		1440.00 J	2.50 UJ	NR	0.51 BW	0.63 U	248.00 J	0.61 B	0.20 U	NR	NR	34.90	NR
IPSSPP1B		2470.00 J	2.80 UJ	NR	0.48 U	0.69 U	197.00 BJ	0.56 B	0.24 U	NR	NR	31.20	NR
IPSSPP1C		2850.00 J	3.10 UJ	NR	0.50 UW	0.77 U	151.00 BJ	0.75 B	0.25 U	NR	NR	24.00	NR
IPSSR7		1610.00 J	2.80 UJ	NR	0.48 UW	0.71 U	308.00 BJ	0.57 B	0.24 U	NR	NR	19.90	NR
IPSSR8		1330.00 BJ	6.70 UJ	NR	1.00 UJ	2.50 UJ	216.00 B	0.50 B	0.68 UW	NR	NR	28.00	NR
IPSSS1A		2010.00	2.60 UJ	NR	0.63 UW	0.64 UJ	135.00 B	0.49 B	0.42 U	NR	NR	24.50	NR
IPSSS1B		3460.00	3.10 UJ	NR	0.79 UW	0.78 UJ	232.00 B	0.96 B	0.53 U	NR	NR	40.50	NR
IPSSS1C		3270.00	3.30 UJ	NR	0.85 UW	0.82 UJ	343.00 B	0.38 B	0.57 U	NR	NR	32.40	NR
IPSSS3A		1500.00 B	4.50 UJ	NR	1.20 UW	101. UJ	95.50 B	0.87 N	0.77 U	NR	NR	22.80	NR
IPSSS3B		2220.00	2.60 UJ	NR	0.69 UW	0.66 UJ	221.00 B	0.50 B	0.46 U	NR	NR	34.20	NR
IPSSS3C		2290.00	3.30 UJ	NR	0.81 UW	0.82 UJ	194.00 B	0.63 B	0.54 U	NR	NR	32.60	NR
IPSSW13		139.00 U	26.00 U	NR	3.00 UJ	6.00 U	227.00 B	1.00 U	1.00 UN	NR	NR	6.00 U	NR
IPSSW14		139.00 U	26.00 U	NR	3.00 UJ	6.00 U	241.00 B	1.00 U	1.00 UN	NR	NR	6.00 U	NR
IPSSX		153.00 BJ	12.00 UJ	NR	2.00 BW	3.00 U	243.00 BJ	1.40 B	1.00 U	NR	NR	3.00 U	NR
IPSSZ		89.00 UJ	12.00 UJ	NR	2.00 U	3.00 U	209.00 BJ	1.00 U	1.00 U	NR	3.00 U	NR	NR

SAMPLE NUMBER	SS	ZINC	SILICON	COBALT
IPSSBA		74.60	NR	11.50 B
IPSSBB		46.90	NR	4.50 B
IPSSBC		48.60	NR	14.90
IPSSC1		45.60 EJ		6.70 B
IPSSC1A		117.00 UJ	NR	10.80 B
IPSSC2A		49.80	NR	9.10 B
IPSSC2B		49.10	NR	8.50 B
IPSSC2C		41.10	NR	8.60 B
IPSSCMC		79.00	NR	8.30 B
IPSSD5		46.10	NR	8.60 B
IPSSD6		175.00 J	NR	12.20 B
IPSSGWB		5.1 B	NR	5.8 U
IPSSGWR		4.5 B	NR	5.8 U
IPSSM1		73.80	NR	10.70 B
IPSSMJB		5.00 B	NR	3.00 U
IPSSPP1A		41.60 J	NR	9.20 B
IPSSPP1B		41.50 EJ	NR	9.50 B
IPSSPP1C		46.40 EJ	NR	9.40 B
IPSSR7		32.30 EJ	NR	4.10 B
IPSSR8		49.70	NR	8.10 B
IPSSS1A		42.00	NR	7.30 B
IPSSS1B		102.00	NR	11.00 B
IPSSS1C		59.40	NR	9.40 B
IPSSS3A		64.40	NR	5.60 B
IPSSS3B		44.00	NR	10.30 B
IPSSS3C		45.00	NR	10.80 B
IPSSW13		25.60	NR	4.00 U
IPSSW14		4.00 U	NR	4.00 U
IPSSX		13.80 BJ	NR	4.00 U
IPSSZ		5.00 UJ	NR	4.00 U

TOX (ug/Kg)

SAMPLE NUMBER	TOX
IPSSB01A	0.02 U
IPSSB07B	0.02 U
IPSSB07C	0.02 U
IPSSB10B	0.02 U
IPSSC1B	0.02 U
IPSSC1C	0.02 U
IPSSC1CR	0.02 U
IPSSS2A	0.02 U
IPSSS2B	0.02 U
IPSSS2C	0.02 U
IPSSS2D	0.02 U
IPSSY1A	0.04 U
IPSSY1B	0.048
IPSSY1C	0.02 U
IPSSY2A	0.02 U
IPSSY2B	0.02 U
IPSSY2C	0.02 U
IPSSY3A	0.02 U
IPSSY3B	0.088
IPSSY3BD	0.070
IPSSY3BR	0.088
IPSSY3BR	0.080
IPSSY3C	0.02 U
IPSSY4A	0.02 U
IPSSY4B	0.066
IPSSY4C	0.03 U
IPSSY5A	0.02 U
IPSSY5B	0.02 U
IPSSY5C	0.02 U
IPSSY6A	0.02 U
IPSSY6B	0.02 U
IPSSY6C	0.02 U
QA/QC	0.46
QA/QC	0.52
QA/QC	0.49
QA/QC	0.50

TFH (ug/Kg)

SAMPLE NUMBER	DIESEL	KEROSENE	GASOLINE
IPSSB01A	160000 U	160000 U	160000 U
IPSSB07B	160000 U	160000 U	160000 U
IPSSB07C	140000 U	140000 U	140000 U
IPSSB10B	150000 U	150000 U	150000 U
IPSSC1B	180000 U	180000 U	180000 U
IPSSC1C	230000 U	230000 U	230000 U
IPSSS2A	180000 U	180000 U	180000 U
IPSSS2B	200000 U	200000 U	200000 U
IPSSS2C	180000 U	180000 U	180000 U
IPSSS2D	200000 U	200000 U	200000 U
IPSSY1A	150000 U	150000 U	150000 U
IPSSY1B	160000 U	160000 U	160000 U
IPSSY1C	180000 U	180000 U	180000 U
IPSSY2A	230000 U	230000 U	230000 U
IPSSY2B	210000 U	210000 U	210000 U
IPSSY2C	180000 U	180000 U	180000 U
IPSSY3A	160000 U	160000 U	160000 U
IPSSY3B	170000 U	170000 U	170000 U
IPSSY3C	170000 U	170000 U	170000 U
IPSSY4A	160000 U	160000 U	160000 U
IPSSY4B	170000 U	170000 U	170000 U
IPSSY4C	180000 U	180000 U	180000 U
IPSSY5A	140000 U	140000 U	140000 U
IPSSY5B	180000 U	180000 U	180000 U
IPSSY5C	180000 U	180000 U	180000 U
IPSSY6A	170000 U	170000 U	170000 U
IPSSY6B	170000 U	170000 U	170000 U
IPSSY6C	200000 U	200000 U	200000 U
QA/QC	51000 J	180000 U	180000 U
QA/QC	130000 U	130000 U	130000 U
QA/QC	130000 U	130000 U	130000 U
QA/QC	87000 J	130000 U	130000 U
QA/QC	45000 J	140000 U	140000 U
QA/QC	49000 J	140000 U	140000 U
QA/QC	44000 J	180000 U	180000 U

APPENDIX F

DATA VALIDATION AND EVALUATION

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1.0 INTRODUCTION

This document summarizes the validation, evaluation, and interpretation of the data that were presented in Technical Memorandum #2, Technical Memorandum #2, Addendum A, Technical Memorandum #2, Addendum B, Technical Memorandum #2, Addendum C, and Technical Memorandum #2, Addendum D for the remedial investigation/feasibility study (RI/FS) at the Idaho Pole Company (IPC) Site in Bozeman, Montana. This includes all the soil and sediment data, the 1990 spring runoff-high flow, the 1990 late summer-low flow, and the 1991 mid-winter low flow surface water data, the source area (May 1990) monitoring well data, the first (August 1990), second (November 1991), third (March and June 1991) trimesterly monitoring well data, and the single deep monitoring well sample data (September 1991), and the first (August 1990), second (November 1990), third (March 1991), and (June 1991) quarterly residential well data.

The objectives of Appendix F include: summarizing the data validation process according to U.S. Environmental Protection Agency (EPA) and Region VIII EPA guidelines; evaluate the data using a precision, accuracy, representativeness, completeness, and comparability (PARCC) statement according to U.S. EPA guidelines. The guiding documents for the data validation and evaluation include the Work Plan documents that were part of the Sampling and Analysis Plan: Part I, the Quality Assurance Project Plan (QAPjP); and, Part III, the Laboratory Analytical Protocol (LAP).

2.0 DATA VALIDATION

2.1 LABORATORY REPORTING

The IPC Site RI/FS utilizes laboratories in the EPA's Contract Lab Program (CLP); the CLP accepts labs which have met rigorous testing requirements. Labs participating in the CLP comply with the CLP Statement of Work (SOW). The CLP SOW outlines reporting and deliverable requirements, analytical methods, quality assurance/quality control (QA/QC), etc. When analyzing organics, labs report data concentrations with data reporting qualifiers, if necessary (see Table 2-1). When analyzing inorganics, labs report data concentrations with result qualifiers, if necessary (see Table 2-2). When utilizing a CLP lab, the first review of data is contract compliance screening (CCS) which is performed by the EPA to determine if the contract requirements were met.

2.2 DATA REVIEWER REPORTING

The second review of data occurs at the project office where a reviewer assesses the data by using the laboratory data validation guidelines developed by the U.S. EPA. The assessment may apply limitations to the data if certain conditions outlined in the EPA guidance documents were not met. The limitations the reviewer applies (as opposed to those the lab applies) for organics and inorganics analysis are data qualifiers (Table 2-1 and 2-2). Knowing the limitations of the data assists the data user when making interpretations. Data with limitations (flags) are usable for interpretive

TABLE 2-1

ORGANICS QUALIFIERS

DATA REPORTING QUALIFIERS[1]

U - Indicates compound was analyzed for but not detected.

J - Indicates an estimated value.

B - This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. This flag must be used for a TIC as well as for a positively identified TCL compound.

E - This flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis. This flag will <u>not</u> apply to pesticides/PCBs analyzed by GC/EC methods.

C - This flag applies to pesticide results where the identification has been confirmed by GC/MS.

D - This flag identifies all compounds identified in an analysis at a secondary dilution factor. If a sample or extract is re-analyzed at a higher dilution factor, as in the "E" flag above, the "D" suffix is appended to the sample number. <u>All</u> concentration values reported are flagged with the "D" flag.

A - This flag indicates that a TIC is a suspected aldol-condensation product.

X - Other specific flags may be required to properly define the results. If used, they must be fully described and such description attached to the Sample Data Summary Package and the Case Narrative. Begin by using "X". If more than one flag is required, use "Y" and "Z", as needed. If more than five qualifiers are required for a sample result, use the "X" flag to combine several flags, as needed. For instance, the "X" flag might combine the "A", "B", and "D" for some sample.

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[1] From USEPA CLP SOW for Organics Analysis (EPA 1988).

TABLE 2-1 (cont'd)

ORGANICS QUALIFIERS

DATA QUALIFIERS[2]

U - The material was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.

J - The associated numerical value is an estimated quantity.

R - The data are unusable (compound may or may not be present). Resampling and reanalysis is necessary for verification.

N - Presumptive evidence of presence of material.

NJ - Presumptive evidence of the presence of the material at an estimated quantity.

UJ - The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.

[2] From Laboratory Data Validation Function Guidelines for Validating Organics Analyses (EPA 1988).

TABLE 2-2

INORGANICS QUALIFIERS

RESULT QUALIFIERS[1]

1) C (Concentration) qualifier -- Enter "B" if, the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL). If the analyte was analyzed for but not detected, a "U" must be entered.

2) Q qualifier

   E - The reported value is estimated because of the presence of interference.

   M - Duplicate injection precision not met.

   N - Spike sample recovery not within control limits.

   S - The reported value was determined by the Method of Standard Additions (MSA).

   W - Post-digestion spike for Furnace AA analysis is out of control limits (85-115%), while sample absorbance is less than 50% of spike absorbance.

   * - Duplicate analysis not within control limits.

   + - Correlation coefficient for the MSA is less than 0.995.

   Entering "S", "W", or "+" is mutually exclusive. No combination of these qualifiers can appear in the same field for an analyte.

3) M (Method) qualifier -- Enter:

   - "P" for ICP
   - "A" for Flame AA
   - "F" for Furnace AA
   - "CV" for Manual Cold Vapor AA
   - "AV" for Automated Cold Vapor AA
   - "AS" for Semi-Automated Spectrophotometric
   - "C" for Manual Spectrophotometric
   - "T" for Titrimetric
   - "NR" if the analyte is not required to be analyzed

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[1] USEPA CLP SOW for Inorganics Analysis (EPA 1988).

TABLE 2-2 (cont'd)

INORGANICS QUALIFIERS

DATA QUALIFIERS[2]

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

J - The associated value is an estimated quantity.

R - The data are unusable. (Note: Analyte may or may not be present.)

UJ - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

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[2] From Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA 1988).

purposes as long as the qualifications are considered. For example, the "J" flag indicates that the concentration reported is an estimate. The analysis meets the identification criteria (definitely detected) but not the quantitation criteria (estimated concentration). After validation is complete, data are assigned into data use categories including U - unrestricted, J - restricted, and R - unusable as prescribed by MDHES (MDHES 1990). The MDHES Data Management System handles all data generated at the IPC Site.

2.3 ORGANICS

Analysis of organic compounds at the IPC Site RI/FS includes volatiles as per the CLP SOW, semivolatiles as per the CLP SOW, dioxin/furans as per EPA Method 8280, phenols as per EPA Method 8040, polynuclear aromatic hydrocarbons (PAH) as per EPA Method 8310, and pentachlorophenol (PCP) as per EPA Method 515.1. These data were validated using the document, Laboratory Data Validation Functional Guidelines For Evaluating Organics Analyses (EPA 1988). The procedure for validation was performed by MSE chemists and includes an evaluation of:

- holding times;
- gas chromatograph/mass spectrometer (GC/MS) tuning;
- initial and continuing calibration;
- blanks;
- surrogate recovery;

- matrix spike/matrix spike duplicate (MS/MSD);
- field duplicates;
- internal standards performance;
- target compound list (TCL) performance;
- compound quantitation and reported detection limits;
- tentatively identified compounds (TICs);
- system performance; and
- overall assessment of data for a case.

2.3.1 Volatile and Semivolatile Data

The following summarizes the data validation of all media for volatile and semivolatile organics analysis. Included in this summary is the source area soil and water sampling and the additional sampling of groundwater from the old drainage channel. Holding times have been established only for the water matrix; using these holding times all water and soil holding time requirements were met except for nine soil samples (R8, M1, D5, and six associated QA/QC samples) which were still accepted without qualification. The Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses (EPA 1988) states that because there is limited information concerning holding times for soil samples, the data reviewer has discretion to apply water holding time criteria to soil samples. Only the MS/MSD (one of the nine samples) was beyond holding time (19 days). The other eight samples were extracted within holding times; but, the MS/MSD reflects on the whole sample delivery group. This is not significant enough to require qualification.

The criteria for GC/MS tuning were met for water and soil. Initial and continuing calibration requirements were met for water and soil. Lab contamination of lab blanks during extraction caused approximately 84% of the water and soil samples to contain methylene chloride and approximately 62% to contain acetone; approximately 17% of the water samples contained diethylphthalate. A "B" data reporting qualifier was attached by the lab to all the methylene chloride, acetone, and diethylphthalate results which were caused by lab contamination.

Approximately 1% of the water samples had low surrogate recoveries for the surrogates 2-fluorophenol and 2,4,6-tribromophenol and the data for the compounds the surrogates mimicked were qualified by the data reviewer as estimated (J flag); all soil surrogates met controls. All water MS/MSD recoveries were accepted without qualification by the data reviewer. Approximately 7% of the soil samples (M1, R8, and D5, and six associated QA/QC samples) had low pentachlorophenol MS/MSD recoveries and the pentachlorophenol data was flagged as estimated by the data reviewer (J flag). Previously in Technical Memorandum #2, MSE judged this same soil data to be unusable (R flag) because the MS/MSD recoveries were low for pentachlorophenol. However, upon reviewing the data again, the surrogate recoveries of the acid compounds corresponding to pentachlorophenol were within the range of the CLP SOW and the MS/MSD alone should not qualify an entire case according to Laboratory Data Validation Functional Guidelines (EPA 1988).

Field duplicates will be assessed in Section 3.1, Precision. Internal standards for water and soil were found acceptable. All criteria were met for water and soil TCL compound identification. All water compound quantitation and reported detection limits were accurate. Approximately 5% of the soil samples missed the quantitation limits and the following compounds were reported as estimated quantities by the reviewer: acetone, chloroform, 2-methylnaphthalene, phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, and chrysene (J flag). All guidelines for TICs in water and soil were followed. The system performance for water and soil was determined not to have degraded between QC checks based on instrument performance indicators.

2.3.2 Dioxin/Furan Data

The following summarizes the data validation of all media for dioxin/furan analysis. Included in this summary is the source area and Well 27A soil sampling, the first (August 1990), second (November 1990), and third (March and June 1991) groundwater monitor well sampling rounds and the first (August 1990), second (November 1990), third (March 1991), and fourth (June 1991) residential well sampling rounds, and the additional sampling of vegetation, NAPL, and soil. The dioxin/furan data met all holding times and all initial and continuing calibration requirements. However, approximately 16% of the soil data (N1, N2, AGI5A2, and T7C) exceeded the calibration range and the samples were not subsequently diluted to meet concentrations within the calibration range. Hence, the samples were flagged "J" by the data reviewer as possible underestimation. The lab blanks were found to be acceptable. One water surrogate had a high recovery of OCDD causing approximately 5% of the water dioxin data (GW-18C) to be flagged as estimated by the data reviewer (J). One group of soil dioxin samples (C1, D6, R6, and AGI5A) did not have an

MS/MSD performed but the data was accepted without qualification. Field duplicates will be assessed in Section 3.1, Precision. One internal standard had a high OCDD recovery causing 4% of the soil samples (C1) OCDD data to be flagged as estimated (J flag) by the data reviewer. One internal standard had a high OCDD recovery causing approximately 5% of the water (Res 02) OCDD data to be flagged as estimated (J flag) by the data reviewer. All criteria were met for TCL compound identification and all compound quantitation and reported detection limits were accurate. The lab reported interference with approximately 12% of the soil samples (N2, T7C, and AGI5A2) causing various dioxin and furan compounds to be flagged "J" by the data reviewer. The system performance was determined not to have degraded between QC checks based on instrument performance indicators.

2.3.3 Phenol and PAH Data

The following summarizes the data validation for water and soil phenols and PAH. Included in this summary is the Well 27A soil sampling, the Well 29D groundwater and soil sampling, the 1990 late summer and the 1991 mid winter low-flow surface water sampling rounds, the first, second, and third groundwater monitor well sampling rounds and the first, second, third, and fourth residential well sampling rounds, and the additional sampling results including soils, NAPL, and vegetation. The phenols data set representing the third monitor well sampling (March and June 1991) and the fourth residential well sampling (June 1991) was returned to the Sample Management Office (SMO) because the wrong analysis method was used, pentachlorophenol was not reported, holding times were missed, and the sample extracts were incorrectly prepared. The following discussion omits the phenols data because the package was returned to the lab and SMO will deny payment.

Approximately 4% of the water phenol data (August 1990 groundwater data) missed the seven day holding time by three days and results were flagged as estimated by the data reviewer (J flag). The criteria for GC/MS tuning and initial and continuing calibration requirements were met for soil and water. There was anthracene and fluorene detected in a lab blank which required the lab to flag 6% (February 1991 surface water data) of the anthracene and fluorene water data ("B"). Surrogate compounds are spiked in all samples prior to preparation. Surrogate spike recovery is evaluated by determining if the concentration falls inside the contract required recovery limits. Three problems existed for surrogates. The first was surrogates which could not be quantitated in a number of samples due to an interfering peak. This caused approximately 2% of the water samples to have pentachlorophenol data (August 1990 groundwater data) flagged as estimated quantities by the data reviewer (J flag). The second was low recovery of seven surrogates causing approximately 2% of the water phenols data, 1% of the water PAH data, and 2% of the soil PAH data (T10A and C, T11B and C, and T21B) to be flagged as estimated (J) if the value is above the CRDL or rejected (R) if the value is below the CRDL by the data reviewer. The third was high recovery of six surrogates causing approximately 5% of the water phenols data, 1% of the water PAH data, and 1% of the soil PAH data to be flagged as estimated (J) by the data reviewer. MS/MSD recoveries for pentachlorophenol and 2,4,6-trichlorophenol were out of range and approximately 15% of the detectable levels (August 1990 groundwater data and 1990 low-flow surface water data) were flagged as estimated (J) by the data reviewer. Field duplicates will be assessed in Section 3.1, Precision. Poor internal standard performance caused approximately 4% of the soil phenol and PAH data to be flagged (J) as estimated by the data reviewer. The criteria for TCL compound identification were not met for approximately 12% (November 1990 and June 1991 groundwater data) of the water PAH data and 3% of the water phenol data. Erroneous false positives were reported due to carryover from contaminated samples and a shift in the instrument window. The false positives were flagged "X" by the data reviewer because the reported quantity resulted from carryover of a previously analyzed contaminated sample or an artificially shifted window. Approximately 2% of the phenol data (November 1990 groundwater data) were determined to be over-diluted by the data reviewer and results are flagged as estimated (J flag).

One problem existed for compound quantitation and reported detection limits. Approximately 3% of the phenols (1991 low-flow surface water data) missed the detection limit causing the phenol compound to be flagged "X" by the data reviewer. All guidelines for TICs were followed. There were several problems with the QC check sample. First, the poor recovery of fluorene in approximately 4% of the PAH samples caused the data reviewer to flag the water fluorene data as estimated quantities (J flag). Second, the poor recovery of acenaphthene in approximately 17% of the water PAH samples caused the data reviewer to flag the water acenaphthene data (March 1991 groundwater data) as estimated quantities (J flag). Third, the high recovery of fluoranthene in approximately 3% of the PAH samples caused the data reviewer to flag the water fluoranthene data as estimated quantities (J flag). Fourth, the high recovery of naphthalene in approximately 3% of the PAH samples caused the data reviewer to flag the water naphthalene data as estimated quantities (J flag). Last, high recovery of phenol in approximately 5% of the phenol samples caused the data reviewer to flag the water phenol data as estimated quantities (J flag).

2.3.4 Pentachlorophenol Data

The following summarizes the data validation for PCP in water. Because the revised MCL for PCP in drinking water is 1.0 ppb, samples collected for PCP analysis in June were analyzed using EPA Method 515.1 which provides a much lower detection limit (0.031 ppb). Included in this summary are the third (March and June 1991) groundwater monitor well sampling, the September 1991 monitor well (MW-29D) sampling, and the fourth (June 1991) residential well sampling. All samples were extracted/analyzed within the holding times. The criteria for initial and continuing calibration were met and no compounds were detected in the lab blank. Surrogate compounds were spiked in all samples prior to preparation. Surrogate spike recovery is evaluated by determining if the concentration falls within the contract required recovery limits. One surrogate, 2,4-dichlorophenyl acetic acid, had a low recovery causing approximately 4% of the PCP data (Res-02) to be flagged "J" as a possible underestimation of PCP. MS/MSD recoveries were all within range as were laboratory control standards.

The overall assessment of the organics data reveals that all data except for four soil samples with compounds below the CRDL were valid (useable) with some limitations. All organics data to date are classified into the unrestricted category as defined by the MDHES Data Management System except the November

1990 and June 1991 PAH groundwater data. These data were qualified with the "X" flag because of carryover effects or an artificially shifted window and the "X" flagged data will be used for screening purposes only (restricted use). Unrestricted data are enforcement quality data without qualifiers or qualifiers reflecting laboratory matrix effects. The soil samples demonstrate interference problems reflected in the MS/MSD percent recoveries; laboratory problems contribute to blank contamination and inaccurate quantitation limits. The water data demonstrate surrogate, MS/MSD, and the QC check sample problems: laboratory conditions contribute to blank contamination and missed holding times.

2.4 INORGANICS

Analysis of inorganic elements and compounds at the IPC Site RI/FS includes trace element metals as per the CLP SOW. These data were validated using the document, Laboratory Data Validation Functional Guidelines For Evaluating Inorganics (EPA 1988). The procedure for validation was performed by MSE chemists and includes an evaluation of the following:

- holding times;
- initial and continuing calibration;
- calibration and preparation blanks;
- inductively coupled plasma (ICP) interference check sample;
- laboratory control sample (LCS);
- duplicate sample;

- matrix spike sample (MS);
- furnace atomic absorption (AA) quality assurance (QA);
- ICP serial dilution;
- sample result verification;
- field duplicates; and
- overall assessment of data for a case.

The following summarizes the data validation for all media for inorganics analysis. Included in this summary is the source area soil and water sampling and the sampling of groundwater from the old drainage channel. Holding times have been established only for the water matrix; using these holding times for soil and water all holding time requirements were met. Initial and continuing calibration requirements were met for both soil and water. The soil and water blanks had no contaminants exceeding the CRDL, hence, all requirements were met. The requirements for running and meeting the control limits for an ICP interference check sample were met for both soil and water.

LCSs which were slightly out of control limits caused approximately 13% of the soil samples (PP1A, B, C, C1, D6, and two QA/QC samples) to be flagged by the data reviewer with estimated quantities of zinc, sodium, antimony, lead, manganese, and mercury; approximately 9% of the soil samples (R8, M1, D5, and three QA/QC samples) to be flagged with estimated selenium and silver results; and approximately 22% of the soil samples (PP1A, B, C, C1, D6, R7, R8, M1, D5, and five QA/QC samples) to be flagged with estimated potassium results (all flagged J or UJ). All water LCSs were in control. The duplicate was not within relative percent difference (RPD) for concentrations >5x the CRDL for approximately 38% of the soil sample mercury results and approximately 28% of the magnesium results. The laboratory result qualifier assigned to these concentrations is "*". All water duplicate RPDs >5x the CRDL were in control. The MS recoveries were not within range for approximately 88% of the soil antimony results; approximately 59% of the silver results; approximately 28% of the manganese results; approximately 64% of the selenium results; approximately 6% of the lead results; and approximately 30% of the thallium results. The concentrations were all flagged "J" and "UJ" by the data reviewer. The MS recoveries were not within range for approximately 97% of the water selenium results; approximately 51% of the lead and thallium results; and approximately 3% of the antimony, cadmium, mercury, vanadium, and arsenic results. The concentrations were all flagged "J" or "UJ" by the data reviewer.

The furnace AA QC requirements for duplicate injections and post digestion spikes were met for both the soil and water media. The ICP serial dilution requirements for percent difference were not met for approximately 28% of the soil cobalt, potassium, selenium, sodium, and silver results. The laboratory assigned the "N" result qualifier to all of these concentrations. All water serial dilution requirements were met. Sample result verification determined soil and water quantitation results were accurate. Field duplicates will be assessed in Section 3.1, Precision.

The overall assessment of the inorganics data reveals that all data are valid (useable). Some limitations to these data (eg. estimated amounts) apply as discussed previously. All inorganics data to date are classified into the unrestricted category as defined by the MDHES Data Management System. Unrestricted data are enforcement quality data without qualifiers or qualifiers reflecting laboratory matrix effects. The soils data have more limitations than water data because interferences are more of a problem with this medium. These interferences are demonstrated by the limited problems with the LCS, the duplicate, the MS, and the serial dilution results. The water data have few limitations; reflected in only a MS problem.

MSE, Inc., believes that the soil and water organic and inorganic data meet the data quality objectives (DQO) that were outlined in the Final Quality Assurance Project Plan (QAPjP) for the IPC Site. The DQOs were met because the CLP SOW methods were used for the organics and inorganics analysis which allowed an analytical support level (Level IV) of rigorous Quality Assurance/Quality Control (QA/QC) protocols and documentation. This data is judged to be appropriate for use with site characterization, the risk assessment, the evaluation of alternatives, and the engineering design.

3.0 DATA EVALUATION

Data evaluation begins after data validation has been completed and starts with a PARCC statement using guidelines presented in the documents, Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration (EPA 1988) and Statement of Work for Inorganics Analysis (EPA 1988). The PARCC statement presents how much of the data meets the DQOs outlined in the Final RI/FS Work Plan for the IPC Site. The DQOs are qualitative and quantitative statements that specify the data quality required to support RI/FS activities. Data evaluation then allows for data interpretation.

3.1 PRECISION

Precision is the amount of scatter or variance that occurs in repeated measurements of a particular analyte. The IPC Site RI/FS uses the relative standard deviation (RSD) of the laboratory MS/MSD and of the field duplicates to generate overall precision statements of organics and the RSD of the laboratory and field duplicates to generate overall precision statements of inorganics. The following sections present precision statements for all available RI data. The statistical methods used to calculate the precision statement are found in the Final IPC Site QAPjP and Appendix A of this report. The statistical methods describe that precision acceptance and rejection is based on relative percent differences (RPD). The control limits set for precision for this project are found in the Final IPC Site QAPjP and in Tables 3-2, 3-3, 3-6, 3-7, 3-10, 3-11, 3-13, and 3-15 of this report. When discrepancies between the QAPjP and this report exist, the control limits in this report are more current. The control limits are the ranges of RPDs that are acceptable. The following tables report precision statements containing a percent precision which can be read as follows: the concentration data lie within (percent precision) of the reported value.

3.1.1 Volatile and Semivolatile Data

The analysis of volatile organics uses five compounds in the soil and water MS/MSD including 1,1-dichloroethene, trichloroethene, benzene, toluene, and chlorobenzene. Table 3-1 presents the percent precision of the five compounds based on the RSD of the MS/MSD. The table also includes the confidence interval on which calculations were based and the completeness or how many of the MS/MSD pairs had RPDs that were unacceptable.

The analysis of semivolatile organics uses 11 compounds in the soil and water MS/MSD including phenol, 2-chlorophenol, 1,4-dichlorobenzene, N-nitroso-di-n-propylamine, 1,2,4-trichlorobenzene, 4-chloro-3-methylphenol, acenaphthene, 4-nitrophenol, 2,4-dinitrotoluene, pentachlorophenol, and pyrene. Table 3-1 presents the percent precision of the 11 compounds based on the RSD of the MS/MSD. The table also includes the confidence interval with which calculations were based and the completeness or how many of the MS/MSD pairs had RPDs that were unacceptable.

The organic water MS/MSDs met the requirements outlined in the QAPjP except for one RPD each for benzene, 1,4-dichlorobenzene, 4-chloro-3-methylphenol, and pyrene (see Table 3-2). These MS/MSD RPDs outside the control limits did not cause any data to be qualified. The organic soil MS/MSDs met the requirements of the QAPjP except for one RPD each for toluene and pentachlorophenol (see Table 3-3). These MS/MSD RPDs outside the control limits did not cause any data to be qualified; except for pentachlorophenol data because this data also missed holding times(see Section 2.1). The

TABLE 3-1

PRECISION STATEMENT OF SOIL AND WATER ORGANIC DATA USING THE MS/MSD

Compound	Confidence Interval	Completeness/Number of Outliers[1]		Percent Precision	
		Soil	Water	Soil	Water
Volatiles					
1,1-Dichloroethene	90%	100%/None	100%/None	±0.0	±0.0
Trichloroethene	90%	100%/None	100%/None	±0.0	±2.88
Benzene	90%	100%/None	83%/One	±0.0	±0
Toluene	90%	80%/One	100%/None	±7.47	±2.88
Chlorobenzene	90%	100%/None	100%/None	±0.0	±2.88
Semivolatiles					
Phenol	90%	100%/None	100%/None	±4.24	±10.27
2-Chlorophenol	90%	100%/None	100%/None	±5.18	±8.02
1,4-Dichlorobenzene	90%	100%/None	83%/One	±5.86	±3.41
N-Nitroso-di-n-propylamine	90%	100%/None	100%/None	±4.05	±9.01
1,2,4-Trichlorobenzene	90%	100%/None	100%/None	±4.05	±6.94
4-Chloro-3-methylphenol	90%	100%/None	83%/One	±6.40	±3.41
Acenaphthene	90%	100%/None	100%/None	±4.05	±6.94
4-Nitrophenol	90%	100%/None	100%/None	±4.96	±17.12
2,4-Dinitrotoluene	90%	100%/None	100%/None	±4.96	±5.68
Pentachlorophenol	90%	80%/One	100%/None	±17.80	±6.94
Pyrene	90%	100%/None	83%/One	±4.96	±5.86

[1] A 10% risk of false rejection is used for assessing outliers.

TABLE 3-2

ORGANIC WATER PRECISION REQUIREMENTS (% RPD OF MSD) AND RESULTS

Volatiles	Required	Achieved
1,1-Dichloroethene	± 14%	2%, 1%, 0%, 2%, -7%, -2%
Trichloroethene	± 14%	-1%, 0%, 1%, -1%, -12%, -4%
Benzene	± 11%	-7%, 1%, -3%, 1%, -2%, -13%[1]
Toluene	± 13%	-2%, 1%, 1%, -1%, -10%, -5%
Chlorobenzene	± 13%	-2%, 1%, 2%, -1%, -10%, -5%

Semivolatiles	Required	Achieved
Phenol	± 42%	-40%, 4%, 3%, -16%, 28%, 6%
2-Chlorophenol	± 40%	-38%, 6%, 0%, 7%, 10%, 7%
1,4-Dichlorobenzene	± 28%	-32%, 13%, 0%, 2%, 7%, 6%[2]
N-Nitroso-di-n-propylamine	± 38%	-32%, 11%, 9%, 19%, 21%, 1%
1,2,4-Trichlorobenzene	± 28%	-27%, 16%, 6%, -14%, 3%, 9%
4-Chloro-3-methylphenol	± 42%	-44%, 9%, 5%, 7%, 8%, 10%[3]
Acenaphthene	± 31%	-30%, 11%, 1%, -5%, 0%, 1%
4-Nitrophenol	± 50%	-39%, -12%, 13%, -15%, 5%, -3%
2,4-Dinitrotoluene	± 38%	-27%, 4%, -3%, -9%, -2%, 6%
Pentachlorophenol	± 50%	-23%, 13%, 8%, -16%, -9%, -12%
Pyrene	± 31%	-40%, 1%, -19%,-10%, 4%, 5%[4]

[1] Benzene had one unacceptable RPD and did qualify as an outlier.

[2] 1,4-Dichlorobenzene had one unacceptable RPD and did qualify as an outlier.

[3] 4-Chloro-3-methylphenol had one unacceptable RPD and did qualify as an outlier.

[4] Pyrene had one unacceptable RPD and did qualify as an outlier.

TABLE 3-3

ORGANIC SOIL PRECISION REQUIREMENTS (% RPD OF MSD) AND RESULTS

Volatiles	Required	Achieved
1,1-Dichloroethene	± 22%	3%, 1%, -3%, 0%, 1%
Trichloroethene	± 24%	3%, -8%, -12%, -8%, 7%
Benzene	± 21%	5%, -7%, -6%, -1%, 1%
Toluene	± 21%	4%, -8%, -7%, 23%, -1%[1]
Chlorobenzene	± 21%	4%, -6%, -3%, -3%, -5%

Semivolatiles	Required	Achieved
Phenol	± 35%	-17%, 6%, 2%, 1%, 8%, 11%
2-Chlorophenol	± 50%	-8%, 13%, -2%, 7%, 21%, 5%
1,4-Dichlorobenzene	± 27%	-9%, -1%, 0%, 4%, 14%, -2%
N-Nitroso-di-n-propylamine	± 38%	-9%, -1%, 1%, 12%, 13%, -4%
1,2,4-Trichlorobenzene	± 23%	-4%, -3%, -5%, 4%, 21%, 4%
4-Chloro-3-methylphenol	± 33%	-6%, 17%, -10%, 10%, 12%, 15%
Acenaphthene	± 19%	-6%, -4%, -1%, -4%, 18%, 8%
4-Nitrophenol	± 50%	-5%, -5%, 5%, 3%, 23%, -1%
2,4-Dinitrotoluene	± 47%	-2%, -5%, -6%, 19%, 14%, 5%
Pentachlorophenol	± 47%	2%, 58%, 14%, -2%, 25%, 0% [2]
Pyrene	± 36%	-10%, 0%, 7%, -19%, 15%, 5%

[1] Toluene had one RPD outside control limits and qualified as an outlier.

[2] Pentachlorophenol had one RPD outside control limits and qualified as an outlier.

completeness requirements were not met for two compounds in soil and four compounds in water.

The analysis of duplicates for volatile and semivolatile organics in soil (two field duplicates) did not detect enough compounds to perform statistics on the field duplicates. Therefore, a volatile and semivolatile precision statement based on field duplicates cannot be generated. No duplicates for volatile and semivolatile organics in water were collected since the CLP Users Guide (EPA 1988) indicated it was not necessary.

3.1.2 Phenol and PAH Data

For the analysis of phenols, several spiking compounds were used throughout the investigation because samples were submitted to various EPA CLP labs. The August 1990 groundwater sample analysis and the late summer low flow surface water sample analysis used the same 5 compounds in the water MS/MSD, the November 1990 groundwater sample analysis used 5 compounds in the water MS/MSD, the March 1991 groundwater sample analysis used 10 compounds in the water MS/MSD, the midwinter low flow sample analysis used 5 compounds in the water MS/MSD, the June 1991 groundwater sample analysis used 5 compounds in the water MS/MSD, and the April 1991 additional sampling used 5 compounds in the soil MS/MSD. Table 3-4 presents the percent precision of 12 water compounds based on the RSD of the MS/MSD. Table 3-5 presents the percent precision of the five soil compounds based on the RSD of the MS/MSD. The tables also include the confidence interval with which calculations were based

TABLE 3-4

PRECISION STATEMENT OF WATER PHENOL AND PAH DATA USING THE MS/MSD

Compound	Confidence Interval	Completeness/Number of Outliers[1]	Percent Precision
Phenols			
2-Chlorophenol	90%	94%/One	±4.47
2,4-Dichlorophenol	90%	100%/None	±5.66
2,4,6-Trichlorophenol	90%	92%/One	±2.75
Pentachlorophenol	90%	88%/Two	±3.10
2,4-Dinitrophenol	90%	100%/None	±33.32
Phenol	90%	87%/Two	±2.97
4-Chloro-3-methylphenol	90%	100%/None	±3.11
4-Nitrophenol	90%	100%/None	±8.28
2-Methylphenol	90%	100%/None	±4.35
2,4-Dimethylphenol	90%	100%/None	±4.06
2,4,5,6-Tetrachlorophenol	90%	100%/None	±4.35
4,6-Dinitro-2-methylphenol	90%	100%/None	±4.96
PAHs			
Naphthalene	90%	100%/None	±5.73
Acenaphthylene	90%	93%/One	±2.83
Acenaphthene	90%	94%/One	±3.67
Fluoranthene	90%	85%/Two	±1.83
Chrysene	90%	92%/One	±0
Pyrene	90%	86%/Two	±1.73
Fluorene	90%	89%/One	±3.22
Phenanthrene	90%	89%/One	±3.22
Anthracene	90%	100%/None	±6.50
Benzo(a)anthracene	90%	86%/One	±2.88
Benzo(b)fluoranthene	90%	100%/None	±20.91
Benzo(k)fluoranthene	90%	88%/One	±0
Benzo(a)pyrene	90%	100%/None	±9.04
Dibenzo(a,h)anthracene	90%	100%/None	±2.29
Benzo(g,h,i)perylene	90%	100%/None	±7.16
Indeno(1,2,3-cd)pyrene	90%	88%/One	±0

[1] A 10% risk of false rejection is used for assessing outliers.

TABLE 3-5

PRECISION STATEMENT OF SOIL PHENOL AND PAH DATA USING THE MS/MSD

Compound	Compound Interval	Completeness/ Number of Outliers[1]	Percent Precision
Phenols			
Phenol	90%	100%/None	±3.85
2-Chlorophenol	90%	100%/None	±4.55
4-Chloro-3-methylphenol	90%	100%/None	±2.44
4-Nitrophenol	90%	92%/One	±0
Pentachlorophenol	90%	92%/One	±3.61
PAHs			
Acenaphthene	90%	92%/One	±1.83
Pyrene	90%	100%/None	±2.98

[1] A 10% risk of false rejection is used for assessing outliers.

and the completeness or how many of the MS/MSD pairs had RPDs that were unacceptable.

For the analysis of PAHs, several spiking compounds were used throughout the investigation because samples were submitted to various EPA CLP labs. The August 1990 groundwater sample analysis and the late-summer, low-flow surface water sample analysis used 5 compounds in the water MS/MSD, the November 1990 groundwater sample analysis used 2 compounds in the water MS/MSD, the March 1991 groundwater sample analysis used 16 compounds in the water MS/MSD, the midwinter, low-flow surface water sample analysis used 5 compounds in the water MS/MSD, the June 1991 groundwater sample analysis used compounds in the water MS/MSD, and the additional sampling used 2 compounds in the soil MS/MSD. Table 3-4 presents the percent precision of the 16 compounds based on the RSD of the MS/MSD. Table 3-5 presents the percent precision of the two soil compounds. The tables also include the confidence interval with which calculations were based and the completeness or how many of the MS/MSD pairs had RPDs that were unacceptable.

The water phenol and PAH MS/MSDs met the requirements as outlined in Test Methods for Evaluating Solid Waste (EPA 1986) except for one RPD each for acenaphthylene, fluorene, phenanthrene, chrysene, 2,4,6-trichlorophenol, anthracene, benzo(a)anthracene, benzo(k)fluoranthene, benzo(a)pyrene, and indeno(1,2,3-cd)perylene; two RPDs each for phenol, fluoranthene, benzo(b)fluoranthene, 4-nitrophenol, pyrene, and benzo(g,h,i)perylene; three RPDs for pentachlorophenol; four RPDs each for 2,4-dinitrophenol and naphthalene; five RPDs each for 2-chlorophenol and 2,4-dichlorophenol; and six

RPDs for acenaphthene (see Table 3-6). These MS/MSD RPDs outside the control limits did not cause any data to be qualified; except pentachlorophenol and 2,4,6-trichlorophenol data because this data also had high MS/MSD recoveries (see Section 2.1). The completeness requirements were not met for nine compounds.

The soil phenol and PAH MS/MSDs met the requirements as outlined in Test Methods for Evaluating Solid Waste (EPA 1986) except for one RPD each for 4-nitrophenol, pentachlorophenol, and acenaphthene (see Table 3-7). These MS/MSD RPDs outside the control limits did not cause any data to be qualified. The completeness requirements were met for all compounds.

The analysis of duplicates for phenols and PAHs in water (10 field duplicates) detected PCP in five samples and the duplicates; enough to perform statistical analyses. The % RPD for PCP in the natural samples and the duplicates were 1.23%, 6.45%, 34.46%, 99%, and 40%. A phenol and PAH precision statement for waters based on field duplicates yields a percent precision of 21.06% for PCP.

3.1.3 Inorganics Data

The analyses of inorganics data measures precision with lab duplicates. Lab duplicates are generated by the lab by either the reanalyzing of a field sample extract or splitting a field sample prior to digestion or extraction. All compounds in the target analyte list are analyzed in the lab duplicate, however, only three analytes were common to all water lab duplicates above the IDL. Sixteen analytes were common to all soil lab duplicates. Hence,

TABLE 3-6

ORGANIC WATER PHENOL AND PAH PRECISION REQUIREMENTS (% RPD OF MSD) AND RESULTS

Phenols	Required (%)	Achieved (%)
2-Chlorophenol	±20%	4%, 6%, 10%, 42.36%, 2%, 11%, 17%, 6.6%, 22.6%, 26%, 78%, 35% 6%, 6%, 20%, 15%[1]
2,4-Dichlorophenol	±20%	1%, 1.8%, 4.5%, 6.2%, 9%, 10.9%, 7.8% 22.22%, 35%, 40%, 13%, 38%, 42.1%[2]
2,4,6-Trichlorophenol	±20%	.1%, 2%, 3%, 3%, 9%, 4%, 6.6%, 12%, 0.3%, 18.67%, 88%, 14.8%[3]
Pentachlorophenol	±20%	.8%, 2%, 2.9%, 6%, 11%, 11.3%, 12.4%, 5.5%, 17%, 24%, 36%, 61%, 3%, 14%, 18%, 10.9%[4]
2,4-Dinitrophenol	±20%	200%, 29%, 0%, 12%, 110%, 85%, 11.1%, 18.6%[5]
Phenol	±42%	0%, 2.1%, 4%, 4.8%, 4.8%, 12.4%, 15%, 6.7%, 25.6%, 17%, 112.2, 1%, 9%, 11%, 60%[6]
4-Chloro-3-methylphenol	±42%	1.2%, 3%, 3.9%, 5.8%, 6.01%, 8%, 18.2%, 21.1%, 9.6%, 16%, 21%, 8%, 10%, 10%
4-Nitrophenol	±50%	2.3%, 6.5%, 12.6%, 15%, 18.3%, 22%, 4.8%, 55%, 59%, 0%, 7%, 13%, 42%, 50%, 13.4%[7]
2-Methylphenol	±20%	3.1%, 3.1%, 4.9%, 10.9%
2,4-Dimethylphenol	±20%	2.0%, 2.9%, 4.2%, 9.8%, 4.8%, 19.8%
2,3,5,6-Tetrachlorophenol	±20%	2.2%, 2.5%, 5.3%, 11.1%
4,6-Dinitro-2-methylphenol	±20%	1.2%, 6.6%, 6.6%, 10.6%, 19%, 2.1%
PAHs		
Naphthalene	±20%	0%, 0%, 1.1%, 6.9%, 17%, 22.2%, 16.3%, 16.4%, 23.9%, 31%, 32.9%[8]
Acenaphthylene	±20%	0%, 3%, 4.3%, 5.6%, 9.97%, 10%, 7.2% 5.0%, 10.1%, 12%, 17.1%, 20%, 16%, 37%[9]
Acenaphthene	±20%	3.2%, 3.4%, 5%, 6%, 13.9%, 14%,, 2.0%, 6.5%, 14.1%, 22%, 23%, 28%, 31%, 35.6%, 62.86%, 1%, 4%, 4%[10]
Fluoranthene	±20%	0%, 0%, 0%, 0%, 4%, 4.1%, 4.7%, 15%, 63.2%, 12%, 33%, 7.6%, 3.1%[11]

TABLE 3-6 (cont'd)

ORGANIC WATER PHENOL AND PAH PRECISION REQUIREMENTS (% RPD OF MSD) AND RESULTS

PAHs	Required (%)	Achieved (%)
Chrysene	±20%	0%, 0%, 3.6%, 4.8%, 5.4%, 5.4%, 6.3%, 10%, 12%, 22.22%, 9.0%, 5.4%[12]
Pyrene	±20%	0%, 1.6%, 1.9%, 3.6%, 7.2%, 12%, 20%, 30.5%, 68.55%, 8%, 9%, 10%, 6.9%, 3.4%[13]
Fluorene	±20%	0%, 4%, 4.3%, 10.8%, 14.6%, 14%, 35%, 6.1%, 4.7%[14]
Phenanthrene	±20%	2.3%, 3.3%, 3.4%, 7.8%, 12.5%, 13%, 34%, 7.3%, 1.7%[15]
Anthracene	±20%	0%, 6.1%, 9.5%, 18.2%, 25%, 10.7%, 5.1%[16]
Benzo(a)anthracene	±20%	0%, 2%, 4.9%, 6.1%, 21.5%, 9.2%, 4.2%[17]
Benzo(b)fluoranthene	±20%	1.4%, 10.7%, 0%, 5.4%, 5.4%, 7.3%, 41%, 11%, 31%[18]
Benzo(k)fluoranthene	±20%	8.3%, 5.2%, 0%, 0%, 9.5%, 9.9%, 10.5%, 45.5%[19]
Benzo(a)pyrene	±20%	6.5%, 6.6%, 3.8%, 7.7%, 8%, 19.6%, 27.5%[20]
Dibenzo(a,h)anthracene	±20%	9.3%, 3.8%, 2.2%, 2.5%, 7.1%, 7.8%, 9.7%, 14.8%
Benzo(g,h,i)perylene	±20%	9.9%, 4.9%, 2.6%, 2.7%, 3%, 3.3%, 30%, 40%[21]
Indeno(1,2,3-cd)pyrene	±20%	8.3%, 5.6%, 1.3%, 2.67%, 2.9%, 6.3%, 7.6%, 23%[22]

[1] 2-Chlorophenol had five RPDs outside control limits and one qualified as an outlier.

[2] 2,4-Dichlorophenol had five RPDs outside control limits and did not qualify as outliers.

[3] 2,4,6-Trichlorophenol had one RPD outside control limits and qualified as an outlier.

[4] Pentachlorophenol had three RPDs outside control limits and two qualified as outliers.

[5] 2,4-Dinitrophenol had four RPDs outside control limits and did not qualify as outliers.

[6] Phenol had two RPDs outside control limits and two qualified as outliers.

[7] 4-Nitrophenol had two RPDs outside control limits and did not qualify as outliers.

[8] Naphthalene had four RPDs outside control limits and did not qualify as outliers.

[9] Acenaphthylene had one RPD outside control limits and did qualify as an outlier.

[10] Acenaphthene had six RPDs outside control limits and one qualified as an outlier.

TABLE 3-6 (cont'd)

ORGANIC WATER PHENOL AND PAH PRECISION REQUIREMENTS (% RPD OF MSD) AND RESULTS

[11] Fluoranthene had two RPDs outside control limits and both qualified as outliers.
[12] Chrysene had one RPD outside control limits and qualified as an outlier.
[13] Pyrene had two RPDs outside control limits and both qualified as outliers.
[14] Fluorene had one RPD outside of control limits and qualified as an outlier.
[15] Phenanthrene had one RPD outside of control limits and qualified as an outlier.
[16] Anthracene had one RPD outside controls and did not qualify as an outlier.
[17] Benzo(a)anthracene had one RPD outside control limits and qualified as an outlier.
[18] Benzo(b)fluoranthene had two RPDs outside control limits and did not qualify as outliers.
[19] Benzo(k)fluoranthene had one RPD outside control limits and did qualify as an outlier.
[20] Benzo(a)pyrene had one RPD outside control limits and did not qualify as an outlier.
[21] Benzo(g,h,i)perylene had two RPDs outside control limits and did not qualify as outliers.
[22] Indeno(1,2,3-cd)pyrene had one RPD outside control limits and qualified as an outlier.

TABLE 3-7

ORGANIC SOIL PHENOL AND PAH PRECISION REQUIREMENTS (% RPD OF MSD) AND RESULTS

Phenols	Required (%)	Achieved
Phenol	±35	1%, 3%, 4%, 5%, 6%, 7%, 9%, 12%, 14%, 16%, 29%, 32%
2-Chlorophenol	±50	0%, 1%, 1%, 4%, 8%, 8%, 9%, 10%, 16%, 21%, 29%, 37%
4-Chloro-3-methylphenol	±33	0%, 1%, 3%, 4%, 4%, 4%, 5%, 7%, 9%, 13%, 16%, 16%
4-Nitrophenol	±50	2%, 4%, 5%, 5%, 5%, 7%, 9%, 9%, 11%, 12%, 13%, 112%[1]
Pentachlorophenol	±47	1%, 1%, 1%, 2%, 3%, 3%, 5%, 10%, 13%, 26%, 38%, 104%[2]
PAHs		
Acenaphthene	±19%	0%, 0%, 1%, 1%, 2%, 3%, 4%, 5%, 8%, 11%, 15%, 27%[3]
Pyrene	±36	0%, 1%, 1%, 2%, 3%, 7%, 7%, 8%, 13%, 13%, 15%, 25%

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[1] 4-Nitrophenol had one RPD outside control limits and did qualify as an outlier.

[2] Pentachlorophenol had one RPD outside control limits and did qualify as an outlier.

[3] Acenaphthene had one RPD outside control limits and did qualify as an outlier.

precision for water can only be calculated on three analytes including calcium, sodium, and iron and precision for soil can only be calculated on sixteen analytes. Table 3-8 presents the water percent precision of the three analytes and Table 3-9 presents the soil percent precision for soil of the sixteen analytes, both are based on the RSD of the lab duplicates. The tables also include the confidence interval with which calculations were based and the completeness or how many of the pairs (sample and duplicate) had RPDs that were unacceptable.

The laboratory water duplicate RPDs met the requirements outlined in the QAPjP except for one RPD for calcium and two RPDs for iron (see Table 3-10). These RPDs outside the control limits did not cause any data to be qualified because the concentrations were less than 5x the CRDL as per the CLP SOW (EPA 1988). The laboratory soil duplicate RPDs met the requirements outlined in the QAPjP except for one RPD each for arsenic, calcium, lead, and magnesium (see Table 3-11). Only the magnesium data was qualified because concentrations exceeded 5X the CRDL (see Section 2.2). The completeness requirements were not met for two analytes in soil and two analytes in water.

Only two soil field duplicates were collected and analyzed for inorganics. Therefore, a precision statement based on field duplicates cannot be calculated because the results would not be statistically meaningful.

TABLE 3-8

PRECISION STATEMENT OF WATER INORGANIC DATA USING THE LAB DUPLICATE

Compound	Conficence Interval	Completeness/ Number of Outliers[1]	Percent Precision
Calcium	90%	80%/One	±0.0
Sodium	90%	100%/None	±5.86
Iron	90%	80%/One	±13.59

[1] A 10% risk of false rejection is used for assessing outliers.

TABLE 3-9

PRECISION STATEMENT OF SOIL INORGANIC DATA USING THE LAB DUPLICATE

Compound	Confidence Interval	Completeness/ Number of Outliers[1]	Percent Precision
Aluminum	90%	100%/None	±6.40
Arsenic	90%	83%/One	±5.86
Barium	90%	100%/None	±9.01
Calcium	90%	83%/One	±8.21
Chromium	90%	100%/None	±6.94
Cobalt	90%	100%/None	±6.40
Copper	90%	100%/None	±6.40
Iron	90%	100%/None	±4.05
Lead	90%	100%/None	±17.12
Magnesium	90%	100%/None	±12.44
Manganese	90%	100%/None	±4.96
Potassium	90%	100%/None	±6.40
Nickel	90%	100%/None	±6.93
Sodium	90%	100%/None	±6.93
Vanadium	90%	100%/None	±6.40
Zinc	90%	100%/None	±4.96

[1] A 10% risk of false rejection is used for assessing outliers.

TABLE 3-10

INORGANIC WATER PRECISION REQUIREMENTS (% RPD OF DUPLICATE) AND RESULTS

Analyte	Required	Achieved
Calcium	± 20%	1.3%, 1.3%, 200%, 1.5%, 0.2%[1]
Sodium	± 20%	3.2%, 1.7%, 15.8%, 9.8%, 2.0%
Iron	± 20%	12.3%, 31.7%, 11.1%, 0.5%, 200%[2]

[1] Calcium had one RPD outside of control limits and qualified as an outlier.

[2] Iron had two RPDs outside of control limits and one qualified as an outlier.

TABLE 3-11

INORGANIC SOIL PRECISION REQUIREMENTS (% RPD OF DUPLICATE) AND RESULTS

Analyte	Required	Achieved
Aluminum	± 35%	10.5, 10.1%, 18%, 11.8%, 6.9%, 6.4%
Arsenic	± 35%	3.9, 1.6%, 11.8%, 39.2%, 10.1%, 15.4%[1]
Barium	± 35%	3.6%, 14.1%, 27.3%, 17.6%, 0.1%, 23.6%
Calcium	± 35%	1.9%, 25.7%, 12.8%, 50.4%, 4.7%, 8.9%[2]
Chromium	± 35%	10%, 8.2%, 11.4%, 24.8%, 6.1%, 11.7%
Cobalt	± 35%	4%, 2.8%, 22.4%, 17.2%, 10.5%, 9.8%
Copper	± 35%	21.4%, 20.9%, 15.7%, 12.8%, 21.6%, 16.3%
Iron	± 35%	7.1%, 7.4%, 9.4%, 14.7%, 5.3%, 12.5%
Lead	± 35%	19.3%, 22.3%, 14.1%, 34.3%, 67.6%, 10.7%[3]
Magnesium	± 35%	4.3%, 25.4%, 19.0%, 45.7%, 0.4%, 27.5%[4]
Manganese	± 35%	1.7%, 1.1%, 20%, 2.5%, 0.6%, 15.2%
Nickel	± 35%	5.0%, 2.5%, 24.2%, 25%, 3.6%, 16.4%
Potassium	± 35%	13.8%, 13.7%, 19.6%, 12.6%, 1.9%, 0.9%
Sodium	± 35%	10.3%, 19.9%, 11.5%, 12.9%, 4.2%, 14.5%
Vanadium	± 35%	10.3%, 15.1%, 8.2%, 15.7%, 22.3%, 1.7%
Zinc	± 35%	5.8%, 6.8%, 8.4%, 20%, 10.2%, 8.6%

[1] Arsenic had one RPD outside control limits and qualified as an outlier.

[2] Calcium had one RPD outside control limits and qualified as an outlier.

[3] Lead had one RPD outside control limits and did not qualify as an outlier.

[4] Magnesium had one RPD outside control limits and did not qualify as an outlier.

3.1.4 Dioxin/Furan Data

The analyses of samples for dioxin/furan used many different dioxin and furan compounds in the water MS/MSD because the samples were submitted to various EPA CLP labs. The compounds common throughout the investigation include 2,3,7,8-tetrachlorodibenzofuran (TCDF), total octachlorodibenzofuran (OCDF), 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), and octachlorodibenzo-p-dioxin (OCDD). Table 3-12 presents the percent precision of the four compounds which are common to the investigation. The table also includes the confidence interval with which calculations were based and the completeness or how many of the MS/MSD pairs had RPDs that were acceptable.

The dioxin/furan MS/MSDs met the requirements (see Table 3-13) as outlined in Test Methods for Evaluating Solid Waste (EPA 1986). The completeness requirements were met.

Only two water field duplicates were collected and analyzed for dioxin/furans. Therefore, a precision statement based on field duplicates cannot be calculated because the results would not be statistically meaningful. No soil field duplicates were analyzed for dioxin/furans.

3.1.5 Pentachlorophenol Data

The analyses of PCP uses PCP only in the water MS/MSD. Table 3-14 presents the percent precision of PCP based on the RSD of the MS/MSD. The table also

TABLE 3-12

PRECISION STATEMENT OF WATER DIOXIN/FURAN DATA USING THE MS/MSD

Compound	Confidence Interval	Completeness/ Number of Outliers	Percent Precision
Dioxins			
2,3,7,8-TCDD	90%	100%/None	±4.06
OCDD	90%	100%/None	±0
Furans			
2,3,7,8-TCDF	90%	100%/None	±2.88
OCDF	90%	100%/None	±4.06

TABLE 3-13

DIOXIN/FURAN WATER PRECISION REQUIREMENTS (% RPD OF MSD) AND RESULTS

Dioxins	Required	Achieved
2,3,7,8-TCDD	±50%	0%, 4.6%, 2.2%, 2.0%, 0%, 12.7%
OCDD	±50%	4%, 2.3%, 1.9%, 1%
Furans		
2,3,7,8-TCDF	±50%	5%, 2.2%, 2.0%, 1.1%, 2%, 10.2%
OCDF	±50%	2%, 2.4%, 3.3%, 4.4%, 23%, 2.1%

TABLE 3-14

PRECISION STATEMENT OF PCP DATA USING THE MS/MSD

Compound	Confidence Interval	Completeness/ Number of Outliers	Percent Precision
PCP	90%	100%/None	±17.34

includes the confidence interval with which calculations were based and the completeness or how many of the MS/MSD pairs had RPDs that were unacceptable.

The PCP water MS/MSDs met the requirements outlined in Test Methods for Evaluating Solid Waste (see Table 3-15). The completeness requirements were met.

3.2 ACCURACY

Accuracy is measured as the ability of the analytical procedure to determine the actual or known quantity of a particular substance in a sample. The IPC Site RI/FS uses the standard deviation (SD) of the laboratory MS and of the standard reference material to generate overall accuracy statements for organics and inorganics. The following sections present accuracy statements for all available RI data. The statistical methods used to calculate accuracy are found in the Final IPC Site QAPjP and in Appendix A of this report. The statistical methods describe that accuracy acceptance and rejection is based on percent recovery (%R) of the MS. The control limits set for accuracy for this project are found in the Final IPC Site QAPjP and in Tables 3-17, 3-18, 3-21, 3-22, 3-25, 3-26, 3-28, and 3-30 of this report. When discrepancies between the QAPjP and this report exist, the control limits in this report are more current. The control limits are the ranges of percent recovery that are acceptable. The following tables report accuracy statements containing a percent range of uncertainty which can be read as follows: the data lie within (percent range of uncertainty) plus or minus the percent precision of the reported value.

TABLE 3-15

PCP WATER PRECISION REQUIREMENTS (% RPD OF MSD) AND RESULTS

Compound	Required	Achieved
PCP	±30%	20%, 11%, 5.4%

3.2.1 Volatile and Semivolatile Data

The analysis of volatile organics uses five compounds in the soil and water MS including 1,1-dichloroethene, trichloroethene, benzene, toluene, and chlorobenzene. Table 3-16 presents the percent range of uncertainty of the five compounds based on the SD of the MS. The table also includes the confidence interval with which calculations were based and the completeness or how many MS recoveries were unacceptable.

The analysis of semivolatile organics uses 11 compounds in the soil and water MS including phenol, 2-chlorophenol, 1,4-dichlorobenzene, N-nitroso-di-n-propylamine, 1,2,4-trichlorobenzene, 4-chloro-3-methylphenol, acenaphthene, 4-nitrophenol, 2,4-dinitrotoluene, pentachlorophenol, and pyrene. Table 3-16 presents the percent range of uncertainty of the 11 compounds based on the SD of the MS. The table also includes the confidence interval with which calculations were based and the completeness or how many MS recoveries were unacceptable.

The organic water MS % recoveries met the requirements outlined in the QAPjP except for one % recovery each for 4-chloro-3-methylphenol and pentachlorophenol (see Table 3-17). The MS % recovery outside the control limit did not cause any data to be qualified. The organic soil MS % recoveries met the requirements outlined in the QAPjP except for one % recovery each for phenol, 4-nitrophenol, and 2,4-dinitrotoluene; and two % recoveries for pentachlorophenol (see Table 3-18). The MS % recoveries did

TABLE 3-16

ACCURACY STATEMENT OF SOIL AND WATER ORGANIC DATA USING THE MS

Compound	Confidence Interval	Completeness/Number of Outliers		Percent Range of Uncertainty	
Volatiles		Soil	Water	Soil	Water
1,1-Dichloroethene	90%	100%/None	100%/None	13.06±0	12.65±0
Trichloroethene	90%	100%/None	100%/None	7.46±0	5.52±2.88
Benzene	90%	100%/None	100%/None	7.95±0	2.49±0
Toluene	90%	100%/None	100%/None	14.31±7.47	3.66±2.88
Chlorobenzene	90%	100%/None	100%/None	5.54 ± 0	4.27±2.88
Semivolatiles					
Phenol	90%	100%/None	100%/None	11.47±4.24	8.53±10.27
2-Chlorophenol	90%	100%/None	100%/None	7.62±5.18	12.02±8.02
1,4-Dichlorobenzene	90%	100%/None	100%/None	8.23±5.86	10.92±3.41
N-Nitroso-di-n-proplyamine	90%	100%/None	100%/None	11.62±4.05	13.80±9.01
1,2,4-Trichlorobenzene	90%	100%/None	100%/None	8.44±4.05	11.08±6.94
4-Chloro-3-methylphenol	90%	100%/None	100%/None	10.63±6.40	11.98±3.41
Acenaphthene	90%	100%/None	100%/None	10.46±4.05	11.32±6.94
4-Nitrophenol	90%	100%/None	100%/None	23.59±4.96	6.15±17.12
2,4-Dinitrotoluene	90%	100%/None	100%/None	20.31±4.96	11.39±5.68
Pentachlorophenol	90%	100%/None	100%/None	28.55±17.80	29.86±6.94
Pyrene	90%	100%/None	100%/None	16.70±4.96	18.20±5.86

TABLE 3-17

ORGANIC WATER ACCURACY REQUIREMENTS (% RECOVERY OF MS) AND RESULTS

Volatiles	Required	Achieved
1,1-Dichloroethene	61-145%	84%, 89%, 112%, 98%, 114%, 123%
Trichloroethene	71-120%	84%, 92%, 98%, 100%, 99%, 102%
Benzene	75-130%	102%, 98%, 97%, 104%, 102%, 97%
Toluene	76-125%	98%, 98%, 107%, 105%, 108%, 101%
Chlorobenzene	76-127%	93%, 100%, 102%, 109%, 102%, 99%

Semivolatiles	Required	Achieved
Phenol	12-89%	34%, 57%, 56%, 34%, 40%, 41%
2-Chlorophenol	27-123%	58%, 88%, 64%, 86%, 56%, 82%
1,4-Dichlorobenzene	36-97%	67%, 76%, 53%, 64%, 43%, 77%
N-nitroso-di-n-propylamine	41-116%	76%, 98%, 57%, 90%, 58%, 83%
1,2,4-Trichlorobenzene	39-98%	71%, 79%, 55%, 80%, 48%, 76%
4-Chloro-3-methylphenol	23-97%	66%, 98%, 62%, 82%, 60%, 78%[1]
Acenaphthene	46-118%	73%, 95%, 68%, 79%, 55%, 64%
4-Nitrophenol	10-80%	31%, 49%, 50%, 42%, 36%, 38%
2-4-Dinitrotoluene	24-96%	68%, 84%, 70%, 89%, 54%, 88%
Pentachlorophenol	9-103%	49%, 41%, 58%, 130%, 29%, 44%[2]
Pyrene	26-127%	61%, 121%, 77%, 98%, 68%, 77%

[1] 4-Chloro-3-methylphenol had one % recovery out of control limits but did not qualify as an outlier.

[2] Pentachlorophenol had one % recovery out of control limits but did not qualify as an outlier.

TABLE 3-18

ORGANIC SOIL ACCURACY REQUIREMENTS (% RECOVERY OF MS) AND RESULTS

Volatiles	Required	Achieved
1,1-Dichloroethene	59-172%	89%, 84%, 107%, 98%, 118%
Trichloroethene	71-120%	100%, 116%, 103%, 98%, 112%
Benzene	75-130%	118%, 95%, 103%, 103%, 106%
Toluene	76-125%	112%, 98%, 98%, 125%, 86%
Chlorobenzene	76-127%	104%, 113%, 99%, 99%, 106%

Semivolatiles	Required	Achieved
Phenol	26-90%	96%, 62%, 76%, 64%, 79%, 59%[1]
2-Chlorophenol	25-102%	84%, 62%, 85%, 74%, 82%, 69%
1,4-Dichlorobenzene	28-104%	79%, 60%, 82%, 67%, 80%, 61%
N-nitroso-di-n-propylamine	41-126%	76%, 68%, 100%, 66%, 88%, 65%
1,2,4-Trichlorobenzene	38-107%	87%, 64%, 87%, 89%, 76%, 71%
4-Chloro-3-methylphenol	26-103%	96%, 73%, 103%, 90%, 84%, 70%
Acenaphthene	31-137%	84%, 68%, 98%, 85%, 66%, 69%
4-Nitrophenol	11-114%	124%, 76%, 107%, 106%, 95%, 43%[2]
2-4-Dinitrotoluene	28-89%	81%, 65%, 122%, 76%, 60%, 53%[3]
Pentachlorophenol	17-109%	78%, 52%, 89%, 117%, 1%, 42%[4]
Pyrene	35-142%	117%, 70%, 107%, 112%, 86%, 74%

[1] Phenol had one % recovery out of control limits but did not qualify as an outlier

[2] 4-Nitrophenol had one % recovery out of control limits but did not qualify as an outlier.

[3] 2-4-Dinitrotoluene had one % recovery out of control limits but did not qualify as an outlier.

[4] Pentachlorophenol had two % recoveries out of control limits but did not qualify as outliers.

not cause any data to be qualified. The completeness requirements were met for soil and water. Only one water standard reference material (quality control standard) and one soil standard reference material were collected and analyzed for volatile and semivolatile organics. Therefore, an accuracy statement based on standard reference materials cannot be calculated.

3.2.2 Phenol and PAH Data

For the analysis of phenols, several spiking compounds were used throughout the investigation because the samples were submitted to various EPA CLP laboratories. The August 1990 groundwater sample analysis and the late summer low flow surface water sample analysis used 5 compounds in the water MS, the November 1990 groundwater sample analysis used 5 compounds in the water MS, the March 1991 groundwater sample analysis used 10 compounds in the water MS, the mid winter low flow sample analysis used 5 compounds in the water MS, the June 1991 groundwater sample analysis used 5 compounds in the water MS, the September 1991 deep well sample analysis used 11 compounds in the water MS, and the April 1991 additional sampling used 5 compounds in the soil MS.

Table 3-19 presents the percent range of uncertainty of the 12 water compounds based on the recovery of the MS. Table 3-20 presents the percent range of uncertainty of the five soil compounds based on the recovery of the MS. The tables also include the confidence interval with which calculations were based and the completeness or how many MS recoveries were unacceptable.

TABLE 3-19

ACCURACY STATEMENT OF WATER PHENOL AND PAH DATA USING THE MS

Compound	Confidence Interval	Completeness/Number of Outliers	Percent Range of Uncertainty
Phenols			
2-Chlorophenol	90%	100%/None	6.93±4.47
2,4-Dichlorophenol	90%	100%/None	14.85±5.66
2,4,6-Trichlorophenol	90%	100%/None	66.10±2.75
Pentachlorophenol	90%	75%/Four	16.31±3.10
2,4-Dinitrophenol	90%	100%/None	34.98±33.32
Phenol	90%	100%/None	15.54±2.97
4-Chloro-3-methylphenol	90%	93%/One	12.99±3.11
4-Nitrophenol	90%	93%/One	16.37±8.28
2-Methylphenol	90%	100%/None	2.35±4.35
2,4-Dimethylphenol	90%	100%/None	22.84±4.06
2,3,5,6-Tetrachlorophenol	90%	100%/None	6.33±4.35
4,6-Dinitro-2-methylphenol	90%	100%/None	26.68±4.96
PAHs			
Naphthalene	90%	91%/One	11.12±5.73
Acenaphthylene	90%	93%/One	10.34±2.83
Acenaphthene	90%	100%/None	17.25±3.67
Fluoranthene	90%	100%/None	8.79±1.83
Chrysene	90%	100%/None	7.19±0
Pyrene	90%	100%/None	7.15±1.73
Fluorene	90%	100%/None	9.88±3.22
Phenanthrene	90%	100%/None	8.43±3.22
Anthracene	90%	100%/None	11.06±6.50
Benzo(a)anthracene	90%	100%/None	7.89±2.88
Benzo(b)fluoranthene	90%	100%/None	8.67±20.91
Benzo(k)fluoranthene	90%	100%/None	10.84±0
Benzo(a)pyrene	90%	100%/None	2.87±9.04
Dibenzo(a,h)anthracene	90%	100%/None	10.55±2.29
Benzo(g,h,i)perylene	90%	100%/None	15.75±7.16
Indeno(1,2,3-cd)pyrene	90%	100%/None	7.23±0

TABLE 3-20

ACCURACY STATEMENT OF SOIL PHENOL AND PAH DATA USING THE MS

Compound	Confidence Interval	Completeness/Number of Outliers	Percent Range of Uncertainty
Phenols			
Phenol	90%	100%/None	4.41±3.85
2-Chlorophenol	90%	100%/None	3.68±4.55
4-Chloro-3-methyl-phenol	90%	100%/None	5.84±2.44
4-Nitrophenol	90%	100%/None	5.14±0
Pentachlorophenol	90%	83%/Two	9.43±3.61
PAH			
Acenaphthene	90%	100%/None	3.81±1.83
Pyrene	90%	100%/None	5.51±2.98

For the analysis of PAHs, several spiking compounds were used throughout the investigation because the samples were submitted to various EPA CLP labs. The August 1990 groundwater sample analysis and the late summer low flow surface water sample analysis used 5 compounds in the water MS, the November 1990 groundwater sample analysis used 2 compounds in the water MS, groundwater sample analysis used 16 compounds in the water MS, the mid winter low flow surface water sample analysis used 8 compounds in the water MS, the June 1991 groundwater sample analysis used 5 compounds in the water MS, the September 1991 deep well sample analysis used 16 compounds in the water MS, and the April 1991 additional sampling used 2 compounds in the soil MS. Table 3-19 presents the percent range of uncertainty of the 16 water compounds based on the SD of the MS. Table 3-20 presents the percent range of uncertainty of the two soil compounds based on the SD of the MS. The tables also include the confidence interval with which calculations were based and the completeness or how many MS recoveries were unacceptable.

The phenol and PAH % recovery of the water MS met the requirements as outlined in Test Methods for Evaluating Solid Waste (EPA 1986) except for one % recovery each for 2,4-dinitrophenol, phenol, 2,4-dimethylphenol, naphthalene, acenaphthylene, and dibenzo(a,h)anthracene; two % recoveries for benzo(g,h,i)perylene; four % recoveries each for 2,4-dichlorophenol, 2,4,6-trichlorophenol, and 4-chloro-3-methylphenol; five % recoveries for 4-nitrophenol; six % recoveries for acenaphthene; and seven % recoveries for pentachlorophenol (see Table 3-21). The five above mentioned % recoveries of the MS which were outside the control limits did not cause any data to be qualified except the compounds pentachlorophenol and 2,4,6-trichlorophenol

TABLE 3-21

ORGANIC WATER PHENOL AND PAH ACCURACY REQUIREMENTS (% RECOVERY OF MS) AND RESULTS

Phenols	Required	Achieved
2-Chlorophenol	27-123%	86%, 100%, 89%, 47%, 77%, 45%, 84%, 65%, 65%, 56%, 54%, 62%, 74%, 80%, 81.8%, 76.6%
2,4-Dichlorophenol	44-119%	130%, 100%, 120%, 64%, 91.4%, 77.8%, 90.1%, 87.6%, 80%, 45%, 40%, 142,5%, 83.2%[1]
2,4,6-Trichlorophenol	53-119%	280%, 340%, 420%, 220%, 85%, 105.9%, 9.86%, 101%, 100.4%, 102.9%, 80%[2]
Pentachlorophenol	9-103%	90.8%, 99%, 103.5%, 280%, 360%, 510%, 913%, 50%, 26%, 62%, 121%, 27%, 71%, 91%, 90.6%, 110.5%[3]
2,4-Dinitrophenol	12-145%	41%, 87%, 0%, 18%, 105%, 110%, 39.4%, 128.6%[4]
Phenol	12-110%	66%, 46%, 75%, 72%, 85.6%, 58%, 95.6%, 81.6%, 37.4%, 24%, 19%, 25%, 96.2%, 125.7%[5]
4-Chloro-3-methylphenol	23-97%	114%, 45%, 80%, 69%, 96%, 84.8%, 91.4%, 87.8%, 113%, 59%, 47%, 58%, 128%, 184.8%[6]
4-Nitrophenol	10-80%	1295%, 40%, 47%, 67%, 80.4%, 67%, 121%, 98.4%, 74.6%, 30%, 40%, 16%, 11%, 30%, 98%[7]
2-Methylphenol	50-150%	91.6%, 77.2%, 87.2%, 87.6%
2-4 Dimethylphenol	24-118%	79.6%, 75.2%, 63.8%, 78%, 110.8%, 137.6%[8]
2,3,5,6-Tetrachlorophenol	50-150%	103.8%, 92.4%, 101%, 103.7%
4,6-Dinitro-2-methylphenol	30-136%	90%, 96.5%, 106%, 90.5%, 34.3%, 133.3%

PAHs	Required	Achieved
Naphthalene	D-122%	76%, 72%, 68%, 87%, 95.5%, 32.9%, 65.3%, 63.1%, 151.1%, 80.1%, 41.4%[9]
Acenaphthylene	D-139%	108%, 96%, 92%, 90%, 105%, 45.2%, 80%, 82.3%, 367%, 54%, 81%, 54%, 100%, 76.9%, 50.4%[10]
Acenaphthene	46-118%	81%, 16.5%, 35.5%, 33.5%, 48%, 12%, 144%, 128%, 116%, 92%, 66%, 78%, 63%, 53%, 64%, 59%, 79.1%, 51%[11]
Fluoranthene	14-123%	112%, 96%, 96%, 100%, 75%, 80%, 105%, 110%, 106%, 71%, 54%, 77.4%, 79%
Chrysene	D-199%	84%, 76%, 72%, 86%, 108.3%, 112%, 103.3%, 108%, 100%, 93.3%, 81.8%, 80.2%
Pyrene	26-127%	67%, 77%, 54%, 105%, 81.5%, 96.5%, 100%, 93.5%, 63.33%, 81%, 77%, 69%, 78.5%, 77.2%

TABLE 3-21 (cont'd)

ORGANIC WATER PHENOL AND PAH ACCURACY REQUIREMENTS (% RECOVERY OF MS) AND RESULTS

PAHs	Required	Achieved
Fluorene	D-142%	90%, 45%, 88%, 80%, 88.5%, 87%, 68%, 85.4%, 59%
Phenanthrene	D-155%	95%, 57%, 92.5%, 93%, 87%, 92%, 72%, 75.2%, 68.4%
Anthracene	D-126%	80%, 60%, 70%, 80%, 36%, 62.5%, 60.8%
Benzo(a)anthracene	12-126%	98%, 100%, 87%, 100%, 98%, 75.8%, 77.4%
Benzo(b)fluoranthene	6-150%	80%, 100%, 90%, 90%, 120%, 86%, 66%, 86.9%, 84.8%
Benzo(k)fluoranthene	D-159%	80%, 120%, 100%, 110%, 90%, 88.33% 77.2%, 75.2%
Benzo(a)pyrene	D-128%	62.5%, 65%, 55%, 65%, 62.5%, 64.8%, 67%
Dibenzo(a,h)anthracene	D-110	83%, 87%, 90%, 92.5%, 62.5%, 118.33%, 82.8%, 78%[12]
Benzo(g,h,i)perylene	D-116	143.5%, 100%, 95.8%, 104%, 67.3%, 121.67%, 87%, 84.6%[13]
Indeno(1,2,3-cd)pyrene	D-116	99%, 98%, 89%, 105%, 77%, 76%, 87.1%, 81.2%

D = Detected; results must be greater than zero.

[1] 2,4-Dichlorophenol had four % recoveries outside of control limits but did not qualify as outliers.

[2] 2,4,6-Trichlorophenol had four % recoveries outside of control limits but did not qualify as outliers.

[3] Pentachlorophenol had seven % recoveries outside of control limits and four qualified as outliers.

[4] 2,4-Dinitrophenol had one % recovery outside of control limits but did not qualify as an outlier.

[5] Phenol had one % recovery outside control limits but did not qualify as an outlier.

[6] 4-Chloro-3-methylphenol had four % recoveries outside of control limits and one qualified as an outlier.

[7] 4-Nitrophenol had five % recoveries outside of control limits and one qualified as an outlier.

[8] 2,4-Dimethylphenol had one % recovery outside control limits but did not qualify as an outlier.

[9] Naphthalene had one % recovery outside of control limits and qualified as an outlier.

[10] Acenaphthylene had one % recovery outside of control limits and qualified as an outlier.

[11] Acenaphthene had six % recoveries outside of control limits and did not qualify as outliers.

[12] Dibenzo(a,h)anthracene had one % recovery outside of control limits and did not qualify as an outlier.

[13] Benzo(g,h,i)perylene had two % recoveries outside of control limits and did not qualify as outliers.

were qualified because many of the pentachlorophenol and 2,4,6-trichlorophenol MS % recoveries were out of control limits (see Section 2.1). The completeness requirements were not met for pentachlorophenol.

The phenol and PAH % recovery of the soil MS met the requirements as outlined in Test Methods for Evaluating Solid Waste (EPA 1986) except for two % recoveries for pentachlorophenol (see Table 3-22) which did not cause any pentachlorophenol data to be qualified. The completeness requirements were met except for pentachlorophenol.

Four water standard reference material samples (quality control standard) were collected and analyzed for phenols and PAHs. The analysis of the standard reference material (SRM) had three compounds common throughout the investigation. The accuracy statement of water phenol and PAH data using the SRM is PCP 55.23 ± 33.32; phenol 56.80 ± 2.97; and naphthalene 39.03 ± 5.73.

3.2.3 Inorganics Data

The inorganics analyses accuracy is measured with lab spikes. All the target analyte list compounds were spiked except for Al, Ca, Fe, Mg, K, and Na in soil and Ca, Mg, K, and Na in water. Even though almost all analytes are spiked, accuracy statements can only be calculated on the same analytes used in the inorganic precision statements because both statements require common analytes. Table 3-23 presents the water percent range of uncertainty of one analyte (Iron) which is common to precision and accuracy based on the SD of the MS. The high uncertainty calculated for iron does not seriously impact

TABLE 3-22

ORGANIC SOIL PHENOL AND PAH ACCURACY REQUIREMENTS (% RECOVERY OF MS) AND RESULTS

Phenols	Required	Achieved
Phenol	26-90%	62%, 64%, 58%, 58%, 60%, 54%, 70%, 59%, 57%, 78%, 43%, 57%
2-Chlorophenol	25-102%	69%, 59%, 64%, 55%, 61%, 58%, 72%, 60%, 55%, 55%, 45%, 56%
4-Chloro-3-methylphenol	26-103%	68%, 90%, 68%, 67%, 64%, 86%, 75%, 71%, 67%, 87%, 52%, 62%
4-Nitrophenol	11-114%	68%, 80%, 77%, 75%, 69%, 74%, 94%, 92%, 81%, 93%, 67%, 70%
Pentachlorophenol	17-109%	76%, 68%, 68%, 29%, 72%, 50%, 86%, 51%, 68%, 170%, 71%, 128%[1]
PAHs		
Acenaphthene	31-137%	66%, 66%, 75%, 72%, 75%, 63%, 82%, 69%, 74%, 87%, 77%, 57%
Pyrene	35-142%	72%, 77%, 79%, 71%, 59%, 71%, 80%, 71%, 64%, 97%, 57%, 68%

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[1] Pentachlorophenol had two % recoveries outside control limits and both qualified as outliers.

TABLE 3-23

ACCURACY STATEMENT OF WATER INORGANIC DATA USING THE MS

Compound	Confidence Interval	Completeness/ Number of Outliers	Percent Range of Uncertainty
Iron	90%	100%/None	434.26±13.59

data interpretation. Table 3-24 presents the soil percentage of uncertainty of the 10 analytes which are common to precision and accuracy based on the SD of the MS. The table also include the confidence interval with which calculations were based and the completeness or how many MS recoveries were unacceptable.

One of the inorganic water MS% recoveries for iron did not meet the requirements outlined in the QAPjP (see Table 3-25). The data were not qualified because the sample had four times the concentration of iron than the concentration of the MS. The inorganics soil MS% recoveries met the requirements in the QAPjP except for two % recoveries for manganese and four % recoveries for lead (see Table 3-26). The % recoveries outside the control limits caused the manganese and lead data to be qualified (see Section 2.2). The completeness requirements were met for soil and water.

Only one water standard reference material (quality control standard) and one soil standard reference material were collected and analyzed for inorganics. Therefore, an accuracy statement based on standard reference materials cannot be calculated.

3.2.4 Dioxin/Furan Data

The analysis of samples for dioxin/furan used many different dioxin and furan compounds in the water MS because the samples were sent to various EPA labs. The compounds common throughout the investigation include 2,3,7,8-TCDF, OCDF (total), 2,3,7,8-TCDD, and OCDD (total). Table 3-27 presents the percent

TABLE 3-24

ACCURACY STATEMENT OF SOIL INORGANIC DATA USING THE MS

Compound	Confidence Interval	Completeness/ Number of Outliers	Percent Range Of Uncertainity
Arsenic	90%	100%/None	14.16 ± 5.86
Barium	90%	100%/None	5.96 ± 9.01
Chromium	90%	100%/None	6.55 ± 6.94
Cobalt	90%	100%/None	4.53 ± 6.40
Copper	90%	100%/None	4.44 ± 6.40
Lead	90%	100%/None	28.87 ± 17.12
Manganese	90%	100%/None	5.80 ± 4.96
Nickel	90%	100%/None	3.46 ± 6.93
Vanadium	90%	100%/None	3.76 ± 6.40
Zinc	90%	100%/None	2.29 ± 4.96

TABLE 3-25

INORGANIC WATER ACCURACY REQUIREMENTS (% RECOVERY OF MS) AND RESULTS

Analyte	Required	Achieved
Iron	75-125%	96.9%, 95.7%, 82.6%, 99.5%, 1,112%[1]

[1] Iron had one % recovery outside of control limits but did not qualify as an outlier.

TABLE 3-26

INORGANIC SOIL ACCURACY REQUIREMENTS (% RECOVERY OF MS) AND RESULTS

Analyte	Required	Achieved
Arsenic	75-125%	88%, 94.4%, 97.4%, 80.6%, 88.8%, 89,6%
Barium	75-125%	101.4%, 84.5%, 96.4%, 88.3%, 94.4%, 103.3%
Chromium	75-125%	99%, 88%, 90.3%, 79.9%, 102.1%, 92.4%
Cobalt	75-125%	105.1%, 89.6%, 93.3%, 92.4%, 92.9%, 91.7%
Copper	75-125%	92.6%, 91.4%, 91.4%, 81.7%, 87.2%, 97.7%
Lead	75-125%	74.4%, 73.0%, 102.6%, 162.4%, 70%, 102.7%[1]
Manganese	75-125%	79.8%, 74.1%, 81.5%, 83.4%, 78.1%, 64.9%[2]
Nickel	75-125%	99.7%, 88.5%, 90.3%, 90.2%, 95.8%, 93.7%
Vanadium	75-125%	97.6%, 87.8%, 90.9%, 87.3%, 97.7%, 92%
Zinc	75-125%	87.2%, 86.5%, 90%, 89.8%, 93.7%, 93.8%

[1] Lead had four % recoveries outside the control limits and did not qualify as outliers.

[2] Manganese had two % recoveries outside the control limits and did not qualify as outliers.

TABLE 3-27

ACCURACY STATEMENT OF WATER DIOXIN/FURAN DATA USING THE MS

COMPOUND	CONFIDENCE INTERVAL	COMPLETENESS/ NUMBER OF OUTLIERS	PERCENT RANGE OF UNCERTAINTY
Dioxins			
2,3,7,8-TCDD	90%	100%/None	8.54±4.06
OCDD	90%	100%/None	6.46±0
Furans			
2,3,7,8-TCDF	90%	100%/None	22.76±2.88
OCDF	90%	86%/One	7.35±4.06

range of uncertainty of the four compounds based on the recovery of the MS. The table also includes the confidence interval with which calculations were based and the completeness or how many MS recoveries were unacceptable.

The dioxin/furan % recovery of the MS met the requirements (see Table 3-28) as outlined in Test Methods for Evaluating Solid Waste (EPA 1986) except for one % recovery each for 2,3,7,8-TCDF and OCDF. The completeness requirements were met except for OCDF.

A standard reference material (quality control standard) for dioxin/furan analysis was not collected. Therefore, an accuracy statement based on standard reference materials cannot be calculated.

3.2.5 Pentachlorophenol Data

The analysis of PCP uses PCP only in the water MS. Table 3-29 presents the percent range of uncertainty of PCP based on the recovery of the MS. The table also includes the confidence interval with which calculations were based and the completeness or how many MS recoveries were unacceptable.

The PCP % recovery of the MS met the requirements (see Table 3-30) as outlined in Test Methods for Evaluating Solid Wastes (EPA, 1986). The completeness requirements were met.

TABLE 3-28

DIOXIN/FURAN WATER ACCURACY REQUIREMENTS (% RECOVERY OF MS) AND RESULTS

DIOXINS	REQUIRED	ACHIEVED
2,3,7,8-TCDD	60-140%	88.6%, 89.0%, 112%, 112%, 109%, 89%, 109%
OCDD	60-140%	84.8%, 84.4%, 95%, 99%, 96%
FURANS		
2,3,7,8-TCDF	60-140%	89.0%, 89.8%, 98%, 94%, 175%, 92%, 99%[1]
OCDF	60-140%	82.4%, 79.6%, 89%, 95%, 159%, 103%, 83%[2]

[1] 2,3,7,8-TCDF had one % recovery out of control limits but did not qualify as an outlier.

[2] OCDF had one % recovery out of control limits and did qualify as an outlier.

TABLE 3-29

ACCURACY STATEMENT OF WATER PCP DATA USING THE MS

Compound	Confidence Interval	Completeness/ Number of Outliers	Percent Range of Uncertainty
PCP	90%	100%/None	10.25±17.34

TABLE 3-30

PCP WATER ACCURACY REQUIREMENTS (% RECOVERY OF MS) AND RESULTS

Compound	Required	Achieved
PCP	50-150%	100%, 99%, 110%

3.3 REPRESENTATIVENESS

The objective in addressing representativeness is to assess whether information obtained during the investigation accurately represents the site conditions. The IPC Site RI/FS uses laboratory blanks, equipment rinsate samples, and field blanks to assess representativeness. Field duplicates are assessed in Section 3.1, Precision.

3.3.1 Laboratory Blanks

Laboratory blanks are addressed in Section 2.0, Data Validation; all contamination problems due to a lab blank have associated data flagged with a "B".

3.3.2 Equipment Rinsates

Thirty-one equipment rinsate samples have been collected in the investigation: 7 for the TCL, 6 for dioxin/furan, 1 for the TCL and dioxin, and 17 for phenols and PAH. All rinsate samples were of the water medium, however, they were collected after rinsing either soil or water sampling equipment. Two volatile organic compounds were detected in the equipment rinsate samples above the instrument detection limit (IDL) including methylene chloride in four samples and 1,1,1-trichloroethane in one sample. The methylene chloride contamination in the equipment rinsate samples is also in the lab blank and associated samples are qualified with a "B" flag. The 1,1,1-trichloroethane is not in the lab blank but is flagged "J" because the concentration is below the contract required detection limit (2 ppb). The concentrations of 1,1,1-trichloroethane may be significant, however, no 1,1,1-trichloroethane was detected in any natural field samples (as opposed to QA/QC samples) in the investigation.

One semivolatile compound, bis(2-ethylhexyl)phthalate, was detected above the IDL in one equipment rinsate sample and is flagged "J" because concentrations are below the contract required detection limit (CRDL) at 7 ppb. Phthalate esters are common lab contaminants and because there is a low concentration in the rinsate sample it may not have been detected in the lab blank.

Two phenolic compounds, phenol (.5 ppb) and 4-chloro-3-methylphenol (3 ppb), were detected in one equipment rinsate sample; and PAH compounds were found in three equipment rinsate samples. These compounds were flagged "X" as compounds which were carryover from a previously analyzed contaminated sample.

One dioxin compound was detected in the equipment rinsate samples. Total OCDD was detected at 3.1 ppb in one sample.

Eighteen trace element metals were detected in the various rinsate samples above the IDL because an organics-free water was used to prepare the QA/QC samples rather than a metals-free water. Trace element metals will not be considered contaminants of concern in the future sampling because they were not found in significant quantities in source areas. Four metals were detected above the CRDL; these metals include iron (44.4 ppb), mercury (0.2

ppb), lead (4.2 ppb), and zinc (25.6 and 76.3 ppb) and must be considered as contaminants from the rinsate water.

3.3.3 Field Blanks

Thirty-three field blank samples were collected in the investigation; 5 for the TCL, 6 for dioxin only, 1 for the TCL and dioxin, and 21 for phenols and PAH. Three volatile organic compounds were detected in the field blank samples including methylene chloride in four samples, acetone in one sample, and 1,1,1-trichloroethane in one sample. The methylene chloride and acetone contamination in the field blank samples is also in the lab blank and associated samples are qualified with a "B" flag. The 1,1,1-trichloroethane is not in the lab blank but is flagged "J" because concentrations are below the contract required detection limit (2 ppb); the concentrations of 1,1,1-trichloroethane may be significant, however, no 1,1,1-trichloroethane was detected in any natural field samples (as opposed to QA/QC samples) in the investigation.

No semivolatile compounds were detected in the field blank samples. Three phenolic compounds, 4-chloro-3-methylphenol (2.57 ppb) and 2,4,6-trichlorophenol (.70 ppb), and 2,4-dinitrophenol (0.74J ppb) were detected in two field blank samples. Four PAH compounds, benzo(a)anthracene (0.84X ppb), chrysene (3.6X ppb), benzo(k)fluoranthene (8.6X ppb), and anthracene (0.097B ppb) were detected in two field blanks. The chrysene and benzo(k)fluoranthene were flagged "X" as compounds which were carryover from a previously analyzed contaminated sample; the anthracene was flagged "B" as a compound which was also found in the lab blank; and the benzo(a)anthracene was flagged "X" because it was identified when the chromatography retention time window on the GC was inappropriately adjusted.

Two dioxin compounds, total OCDD (5.5ppb) and total HxCDD (.89ppb), were detected in one equipment rinsate. Three furan compounds, total HxCDF (2.4ppb), total HpCDF (.87ppb), and total OCDF (1.7ppb), were detected in one field blank sample.

Sixteen metals were detected in the various rinsate samples above the IDL because an organics-free water was used to prepare the QA/QC samples rather than a metals-free water. Two metals were detected above the contract required detection limit (CRDL); these metals include mercury (0.2 ppb) and lead (4.0 ppb) and must be considered significant lab contaminants.

3.3.4 Summary

In summary, the lab blank, equipment rinsate, and field blank samples indicated that no significant organic contamination entered the investigation derived samples from decontamination of equipment or from the sample bottles; the slight contamination was from the lab. However, metals did enter the investigation samples from decontamination and while the data are not qualified with flags, the four compounds (iron, lead, mercury, and zinc) observed should be considered when evaluating data. MSE believes these quality control data indicate the samples are representative.

3.4 COMPLETENESS

The objective in addressing completeness is to assess whether enough data have been collected and enough data are valid to meet the investigation needs. Completeness for this project was assessed by comparing the number of valid sample results to the number of samples collected and to the number of samples planned, except for soil. The valid soil sample results can only be compared to the number of samples collected because the number of planned soil samples was unknown in the Final RI/FS Work Plan; a field screening method was used to determine sample analysis.

Tables 3-31 through 3-37 present the inorganics and organics completeness forms for soil and water. For soil inorganics, 57 samples were determined to be valid. This is 100% of the collected samples (Table 3-31). For water inorganics, 31 samples were determined to be valid. This is 100% of the collected samples (Table 3-32). For soil organics, 57 samples were determined to be valid. This is 100% of the collected samples (Table 3-33). For dioxin soils, 27 of the samples were determined to be valid. This is 100% of the collected samples (Table 3-34). For water organics, 31 samples were determined to be valid. This is 100% of the collected samples (Table 3-35). For dioxin waters, 27 samples were determined to be valid. This is 100% of the collected samples (Table 3-36). For phenol and PAH water, 217 samples were determined to be valid. This is 100% of the collected samples (Table 3-37). For phenol and PAH soil, 146 samples were determined to be valid. This is 97% of the collected samples (Table 3-37). Thus, the tables indicate that enough data are valid to meet the investigation needs.

TABLE 3-31

INORGANICS SOIL COMPLETENESS FORM[A]

	Natural Samples	Field Replicates	Equipment Rinsates	Field Blanks	Standard Reference Materials	Total
Number of Samples Proposed	See B below	1 per 20 (3)	1 per 20 (3)	1 per 20 (3)	1 per 50 (2)	B
Number of Samples Collected	57	2	6	4	1	70
Number of Valid[C] Samples	57	2	6	4	1	70
% Valid/Proposed	B	100%	100%	100%	100%	--
% Valid/Collected	100%	100%	100%	100%	100%	100%

[A] Includes the following elements: antimony, arsenic, barium, beryllium, cadmium, calcium, chromium cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

[B] The number of soil samples proposed was not known in the Final Work Plan because a field screening determined sample numbers.

[C] Valid samples include any concentration value not flagged R (unusable).

TABLE 3-32

INORGANICS WATER COMPLETENESS FORM[A]

	Natural Samples	Equipment Rinsates	Field Blanks	Standard Reference Materials	Total
Number of Samples Proposed	33	1 per 20 (2)	1 per 20 (2)	1 per 50 (1)	38
Number of Samples Collected	31	2	2	1	36
Number of Valid[B] Samples	31	2	2	1	36
% Valid/Proposed	94%	100%	100%	100%	99%
% Valid/Collected	100%	100%	100%	100%	100%

[A] Includes the following elements: aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

[B] Valid samples include any concentration value not flagged R (unusable).

TABLE 3-33

ORGANICS SOIL COMPLETENESS FORM[A]

	Natural Samples	Field Replicates	Equipment Rinsates	Field Blanks	Standard Reference Materials	Total
Number of Samples Proposed	see B below	1 per 20 (3)	1 per 20 (3)	1 per 20 (3)	1 per 50 (2)	B
Number of Samples Collected	57	2	6	4	1	70
Number of Valid[C] Samples	57	2	6	4	1	70
% Valid/Proposed	B	100%	100%	100%	100%	--
% Valid/Collected	100%	100%	100%	100%	100%	100%

[A] Includes 99 compounds (volatiles and semivolatiles) in the Target Compound List presented in the CLP SOW for organics.

[B] The number of soil samples proposed was not known in the Final Work Plan because a field screening determined sample numbers.

[C] Valid samples include any concentration value not flagged R (unusable).

TABLE 3-34

DIOXIN SOIL COMPLETENESS FORM[A]

	Natural Samples	Equipment Rinsates	Field Blanks	Total
Number of Samples Proposed	27	1 in 20(2)	1 in 20(2)	31
Number of Samples Collected	27	3	3	33
Number of Valid Samples[B]	27	3	3	33
% Valid/Proposed	100%	100%	100%	100%
% Valid/Collected	100%	100%	100%	100%

[A] Includes all dioxin and furan congeners

[B] Valid samples include any concentration value not flagged R (unusable).

TABLE 3-35

ORGANICS WATER COMPLETENESS FORM[A]

	Natural Samples	Equipment Rinsates	Field Blanks	Standard Reference Materials	Total
Number of Samples Proposed	33	1 per 20 (2)	1 per 20 (2)	1 per 50 (1)	38
Number of Samples Collected	31	2	2	1	36
Number of Valid Samples	31	2	2	1	36
% Valid/Proposed	94%	100%	100%	100%	99%
% Valid/Collected	100%	100%	100%	100%	100%

[A] Includes the 99 compounds (volatiles and semivolatiles) in the Target Compound List presented in the CLP SOW for organics.

TABLE 3-36

DIOXIN WATER COMPLETENESS FORM[A]

	Natural Samples	Equipment Rinsate	Field Blank	Field Duplicate	Total
Number of Samples Proposed	27	1 in 20(2)	1 in 20(2)	1 in 20(2)	33
Number of Samples Collected	27	3	3	2	35
Number of Valid Samples	27	3	3	2	35
% Valid/Proposed	100%	100%	100%	100%	100%
% Valid/Collected	100%	100%	100%	100%	100%

[A] Includes all dioxin and furan congeners.

TABLE 3-37

PHENOL AND PAH WATER COMPLETENESS FORM[A]

	Natural Samples	Equipment Rinsates	Quality Control Standard	Field Blanks	Duplicates	Total
Number of Samples Proposed	217	1 in 20(11)	1 in 50(5)	1 in 20(11)	1 in 20(11)	255
Number of Samples Collected	217	9	4	12	10	252
Number of Valid Samples	217	9	4	12	10	252
% Valid/Proposed	100%	100%	100%	100%	100%	100%
% Valid/Collected	100%	100%	100%	100%	100%	100%

PHENOL AND PAH SOIL COMPLETENESS FORM[A]

	Natural Samples	Equipment Rinsates	Field Blanks	Total
Number of Samples Proposed	151	1 in 20(8)	1 in 20(8)	167
Number of Samples Collected	151	8	9	168
Number of Valid[B] Samples	146	8	9	163
% Valid/Proposed	97%	100%	100%	99%
% Valid/Collected	97%	100%	100%	99%

[A] Includes 11 phenol compounds in Method 8040 SW-846 and 16 PAH compounds in Method 8310 SW-846.

[B] Valid samples include any concentration value not flagged "R" (unusable); does not include phenols data package that did not meet requirements.

3.5 COMPARABILITY

The objective in addressing comparability is to assess whether one set of data can be compared to another set of data. Comparability is assessed by determining if an EPA-approved analysis method was used, if the concentration values and units reported are sufficient for the database and models, if specific sampling points can be established and documented, and if field collection methods were similar.

The field investigation and laboratory analysis followed QA/QC practices as outlined in the QAPjP, Work Plan, and Field Sampling Plan for all media and all analytical methods with the following exceptions. First, the soil matrix was analyzed for total organic halogens (TOX) and total fuel hydrocarbons (TFH) by EPA SW 846 methods 9020 and 8015, respectively; the CLP SOW does not include methods for these parameters (Analytical Support Level V). Second, method 8015 is a method used to determine various concentrations of nonhalogenated volatile organics. Modifications to the method are performed in order to characterize contaminants as diesel, kerosene, or gasoline. Third, head space analysis was performed with an HNu rather than an OVA. The Hnu was chosen because it does not respond to methane which is a common organic decomposition product and does not necessarily indicate the presence of potentially toxic materials that were being screened.

Fourth, the water matrix was analyzed for phenols (compound- specific contaminant group determined to be compounds of concern from the TCL analysis) by EPA SW-846 method 8040; the CLP SOW does not include a method for phenols

(Analytical Support Level V). Fifth, polynuclear aromatic hydrocarbons (PAH), the second compound-specific contaminant group was analyzed with EPA SW-846 method 8310 (Analytical Support Level V). Sixth, water dioxin samples were analyzed through EPA SW-846 method 8280 rather than the CLP SOW. The latter analytical service was no longer available through the CLP as a routine analytical service (Analytical Support Level V). Seventh, alkalinity testing for groundwater and surface water was performed in the field with a Hach kit rather than in the lab. The Hach Kit is a more accurate indicator of alkalinity because it is performed immediately in the field which prevents atmospheric carbon dioxide from equilibrating with the sample. Eighth, total solids testing for surface water was not performed. All field screening tests and lab tests are included in the MDHES data management system.

The concentration values reported by the CLP labs all meet the requests except the soil phenol and PAH data flagged "R" because of poor surrogate recovery and water phenol and PAH flagged "X" by the MSE data reviewer as samples which missed detection limits and data which had false positives because of carryover from a contaminated sample or because of an artificially shifted window. The data missing detection limits includes the phenol data in the 1991 mid-winter low flow sampling episode. Although the data missed the requested detection limit, the laboratory instrument detection limit for phenol was 0.2 ug/l which is still acceptable for all uses. All sampling points are established in the field logbooks and incorporated into the topographic map for the IPC Site. All field collection methods followed the Field Sampling Plan.

4.0 CONCLUSIONS

The overall assessment of the organics data reveals that all data except for four soil samples with compounds below the CRDL (flagged "R") were valid with minor qualification. All organics data were classified into the unrestricted category as defined by the MDHES Data Management System, except for some groundwater data flagged "X" which were used as screening level only (restricted use).

The overall assessment of the inorganics data reveals that all the data were valid with minor limitations. All inorganics data were classified into the unrestricted category as defined by the MDHES Data Management System.

MSE believes that the soil and water organic and inorganic data meet the data quality objectives (DQOs) that were outlined in the Final Quality Assurance Project Plan (QAPjP) for the IPC Site. The DQOs were met since the CLP Statement of Work (SOW) methods were used for all analyses which allowed an analytical support level (Level IV) of rigorous QA/QC protocols and documentation.

APPENDIX G

SUMMARY OF RISK ASSESSMENT METHODS

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SUMMARY OF RISK ASSESSMENT METHODS

This appendix briefly describes the major tasks and subtasks required for completion of the baseline human health and ecological risk assessments for Superfund (CERCLA) sites on the National Priorities List (NPL). Risk assessments (human health and ecological) are conducted at Superfund sites with the following objectives in mind:

- provide an analysis of baseline risk (i.e., potential risks if no remedial action occurs) and help determine the need for action;
- provide a basis for determining cleanup levels (concentrations) that are adequately protective of human health and the environment;
- provide a basis to compare potential health impacts of various remedial alternatives; and to
- provide a consistent process to evaluate and document potential public health and environmental threats arising from Superfund sites.

The text below represents task-specific summaries taken from Risk Assessment Guidance for Superfund (RAGS), Volumes I (i.e., the Human Health Evaluation Manual; EPA, 1989a) and II (i.e., the Environmental Evaluation Manual; EPA, 1989b).

The Baseline Human Health Risk Assessment (BRA) is divided into four major tasks: information gathering, exposure assessment, toxicity assessment, and risk characterization. An overview of each of these tasks in completing the BRA report is presented below.

The first task of the BRA, information gathering, can be divided into data collection and data evaluation phases. Data collection involves the following:

- acquisition of existing data on site history, including known or suspected uncontrolled releases of hazardous substances into the environment and documentation regarding any administrative/regulatory actions taken at the site; and
- preliminary identification of human populations (e.g., young children) who may be exposed to the hazardous substances via some environmental pathway and route (e.g., drinking contaminated groundwater from a well).

This information is used to prepare a preliminary conceptual model that links potential sources of contaminant release with environmental pathways (e.g., groundwater) and then to potentially exposed individuals (e.g., children drinking well water). Such a model is then used to prepare the Remedial Investigation (RI) Work Plan regarding numbers and locations of samples needed for each environmental medium (e.g., soils); the physical and chemical parameters that need to be characterized/quantified (e.g., benzene levels in groundwater); appropriately sensitive analytical methods needed to make these determinations; and quality assurance/quality control measures required to generate data of acceptable quality for use in risk assessment.

The second phase, data evaluation, involves the following assessments of the site characterization data:

- review of analytical quantitation limits, qualifications (if any) attached to individual data points, and comparison of site data (e.g., benzene levels in groundwater) to similar information gathered from background ("clean") sites; and then

- identifying those chemicals of potential concern, given their respective concentrations, mobility, environmental persistence and toxicity to humans.

The second task of the BRA, exposure assessment, includes the following sequence of activities:

- characterization of exposure setting, particularly with respect to the general physical characteristics of the site and the characteristics of the populations on and near the site;
- identify exposure pathways, including evaluation of contaminant source/release mechanisms (e.g., volatilization of benzene during bathing), identify points of exposure (e.g., a nearby residence) and exposure route (e.g., inhalation of volatilized benzene).

In essence, this step utilizes validated site data, contaminant fate and transport models, and knowledge of (at least potentially) exposed populations to estimate exposure point concentrations and consequent estimation of route-specific intake (e.g., via inhalation) of each contaminant of concern (CoC). These intakes are expressed in units of mg/kg of body weight per day for noncarcinogenic chemicals and mg/kg of body weight per day, averaged over a lifetime, for carcinogenic chemicals (e.g., benzene).

The third task of the BRA, toxicity assessment, involves two phases: hazard identification and dose-response evaluation. Hazard identification is the process of determining whether exposure to a chemical can cause an increase in the incidence of a particular adverse health effect (e.g., leukemia, pancytopenia following inhalation of benzene), and whether the adverse effect is known or likely to occur in humans. Finally, this step characterizes the nature and weight-of-the-evidence (i.e., likelihood) regarding the chemical's ability to produce the particular adverse health effect(s). The second step, dose-response evaluation, is the process of quantitatively evaluating the available toxicity information generated by laboratory test animal and human epidemiological studies; such data is evaluated using statistical (e.g., linearized multistage) models or biologically-based (e.g., two stage) models to characterize the relationship between contaminant dose administered or received and the incidence of adverse health effects (i.e., toxicological endpoints) in the exposed population(s). From this quantitative dose-response relationship, reference doses (for noncarcinogens) are derived; these values are used to estimate the incidence, or potential, for occurrence of the adverse effect on the basis of route-specific intake of the chemical by humans. These values are used in the risk characterization step to estimate the likelihood of adverse systemic or excess cancer incidence occurring in humans at given/or differing levels of exposure.

The final task of the BRA process is termed risk characterization. Completion of this task is accomplished as follows:

- review and summarization of the findings/output from toxicity and exposure assessments;
- characterization of potential noncarcinogenic health threats via comparison of compound- and route-specific intake to respective reference doses; and
- characterization of compound- and route-specific probabilities that an exposed individual will develop cancer over a lifetime of exposure (to the given chemical).

The consequent estimates of "risk" posed by individual contaminants are then extended -- if appropriate -- across exposure pathways and combined -- if appropriate -- also with risks posed from exposure to other chemicals. This effort generates an overall estimate of potential noncarcinogenic health hazard and excess cancer risk to the exposed individuals. Of particular importance to this task is the inclusion of text that interprets and qualifies the resulting risk estimates. Such discussion identifies the sources and likely magnitude of uncertainty associated with each of the various components (e.g., $\mu g/m^3$.d intake of benzene via inhalation) that were involved (and culminated) in the risk characterization estimates.

The evaluation of ecological risk requires the qualitative and/or quantitative appraisal of the actual or potential effects of a hazardous waste site on plants and animals other than people and domesticated species. These evaluations are not intended to provide absolute proof of damage resulting from uncontrolled releases of site contaminants. Rather, the ecological evaluation is intended to reduce the (inevitable) uncertainty associated with understanding the environmental contaminant effects on a site, determining consequent need for site remediation, and establishing (as best possible) the degree of uncertainty associated with both of these determinations.

The health of humans and domesticated species is inextricably linked to the quality of the environment shared with other species. Thus, although the BRA and Ecological Risk Assessment (ERA) evaluations are different processes, they share certain information needs; consequently, they generally share site (RI) characterization data. The major tasks in preparing the ERA are presented below.

The first task of the ERA involves determination of the objectives and level of effort required to document actual or potential threat of damage of the environment, and to evaluate the need for and type of remedial action required to mitigate the apparent ecological damage. This task culminates in a clear definition of ecological receptors (i.e., potentially effected populations or communities of organisms) and ecological endpoints of concern (e.g., lowered reproduction rates, liver disorders) for each of the "indicator" species.

The second task of the ERA involves determination of the nature and extent of the contaminated area; as alluded to above, this step relies heavily upon site characterization data generated in the RI and used in preparing the BRA. Of particular interest is the identification of sensitive environments (e.g., wetlands) that are -- or may be -- adversely affected by uncontrolled release of hazardous substances from the given site.

The third task of the ERA, contaminant evaluation, involves the review of the chemical database in terms of their known or suspected potential to cause ecological harm. This effort includes review of their respective chemical fate and transport characteristics; if contaminants are suspected of bioaccumulation or are considered fairly persistent, then further evaluation of potential for transfer from organism to organism through the food chain (or food web). Generally, site-specific monitoring data and toxicity testing of contaminated media are preferable to information derived from literature review. However, the latter approach is usually sufficient for preliminary assessment of ecological risk and to determine the need for more intensive, site-specific investigations.

Once the applicable toxicological endpoint and other pertinent-data (e.g., ambient water quality criteria) have been identified for each contaminant of concern, such information is compared to estimated (or known) exposure point concentrations. This process if accomplished in a manner similar to the toxicological and exposure assessment tasks discussed for the human health risk assessment.

The fourth task of the ERA process is characterization of ecological risk or threat and provides at least qualitative answers to the following issues:

- the likelihood of adverse effect occurring to the target (indicator) organism, population, or community;
- the magnitude of each adverse effect (e.g., the likelihood of target species population reduction/loss due to reproductive failure);
- the assessment of duration of the adverse effect (e.g., whether transient, reversible over time or essentially permanent); and
- determination of those receptor populations or habitats likely affected by the contaminants of concern.

The risk characterization step of an ERA must also present and evaluate the uncertainty(ies) associated with answering each of the above issues of concern. Such discussion presents the evidence that supports or refutes each major conclusion, as well as describing the factors that limited (or prevented) development of a definitive conclusion. Thus, this text could include discussion of such limitations as:

- the degree of statistical confidence in the media-specific levels of the contaminants of concern, as well as professional judgement regarding adequate characterization of the (potentially) affected environment;

- the consequent selection of indicator species which portray some representative response between the CoCs and affected environment; as well as

- uncertainties associated with the toxicological database utilized, particularly dose-response information for the given test organism and applicability of this data to the indicator species (e.g., laboratory mouse - deer mouse dose-response extrapolations).

References Cited

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TITLE Remedial Investigation Report for
Idaho Pole Site Bozeman, Montana
Attachment A
Topographic Map

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Attachment B

Sample Location Map

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