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Hazardous Waste Ground-Water
Task Force

***Evaluation of
Envirosafe Services, Inc. Site B
Grandview, Idaho***

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 10

and

THE HAZARDOUS WASTE GROUND WATER TASK FORCE

GROUND WATER MONITORING EVALUATION

Envirosafe Services of Idaho, Inc., Site B
Grand View, Idaho

May 1987

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EXECUTIVE SUMMARY

BACKGROUND

This report describes the comprehensive ground water monitoring inspection conducted at EnviroSAFE Services of Idaho, Inc., Site B (ESII-B), a commercial, off-site hazardous waste land disposal facility located near Grand View, Idaho. The inspection was conducted in June 1986 by Region 10 of the United States Environmental Protection Agency (EPA) and the Idaho Department of Health and Welfare, in conjunction with the EPA Hazardous Waste Ground Water Task Force.

ESII-B is an operating treatment, storage and disposal facility which is subject to the Resource Conservation and Recovery Act (RCRA), to the interim status and permit application standards promulgated pursuant to RCRA, and to applicable state of Idaho rules governing hazardous waste management activities. The ESII-B site covers approximately 118 acres and is located at the end of Missile Base Road approximately 10 miles west of Grand View, Idaho, in Owyhee County.

The facility has been owned and operated by EnviroSAFE Services of Idaho, Inc. since 1981. The site was formerly a United States Air Force Titan missile defense facility, constructed in the late 1950s and early 1960s. Wes Con, Inc., an Idaho corporation, subsequently purchased the site and operated the facility beginning August 1, 1973. Hazardous waste was accepted and disposed at the site both prior to and after November 19, 1980.

There are three missile launch silos in addition to other underground structures at the facility which were constructed by the U.S. Department of Defense while the site was a Titan missile base. After acquisition of the property and silo complex by Wes Con, and prior to November 19, 1980, many of these underground structures were filled with liquid and solid hazardous wastes and PCB wastes.

ESII-B accepts a variety of wastes for land disposal, including RCRA-regulated hazardous waste, wastes from Superfund sites, and PCB wastes which are regulated pursuant to the Toxic Substances and Control Act (TSCA). A Part B permit application has been submitted to EPA by ESII-B to continue its hazardous waste management activities, including land disposal.

Objectives of the evaluation of ESII-B include determination of compliance with the requirements of 40 CFR Part 265, Subpart F (interim status ground water monitoring); 40 CFR § 270.14(c) (information required to be submitted with the facility's Part B permit application); and potential compliance with the requirements of 40 CFR Part 264 Subpart F. In addition to wells designated by ESII-B as RCRA monitoring wells, the following ground water monitoring wells were also subject to this inspection: wells installed at the facility pursuant to a RCRA § 3013 investigative order; wells installed pursuant to TSCA PCB-approval authorities; and test/observation wells and piezometers at the facility.

The investigation team consisted of personnel from EPA Region 10; the Idaho Department of Health and Welfare; EPA Headquarters; and contract

personnel provided by the Task Force for obtaining ground water samples. To accomplish the objectives, the investigation team reviewed records, inspected the ground water monitoring system, reviewed on-site laboratory procedures, conducted interviews with appropriate facility representatives, and collected samples from 18 ground water monitoring wells for extensive chemical analyses.

FINDINGS

Interim Status Ground Water Monitoring Program

ESII-B operates as an interim status land disposal facility and as such is subject to the ground water monitoring requirements of 40 CFR Part 265 Subpart F. The facility operates a detection monitoring system to fulfill its interim status ground water monitoring obligations. While the present monitoring network affords a fair degree of assurance of protection of ground water, several steps were identified which ESII-B should take to improve its interim status ground water monitoring system and to secure more reliable ground water samples. These steps are specifically delineated and discussed in the text. They include recommendations which include or address the following: (1) to incorporate an existing well into the monitoring network to monitor downgradient of Trench 10; (2) to abandon or rehabilitate wells which bridge the upper and lower aquifers; (3) to discontinue use of submersible pumps for sampling purposes; (4) to purge at least three volumes of water, including that calculated to reside in the filter pack, from each well prior to purging, unless well yields prohibit this; (5) to obtain samples as soon as feasible from wells purged to dryness; (6) to perform student's t-tests on current indicator parameter data; (7) to comply with applicable EPA reporting

requirements regarding ground water information; and (8) to increase the scope of the facility's ground water quality assessment outline.

Hydrogeologic Characterization Efforts

Extensive work has been carried out by ESII-B in its efforts to characterize the subsurface hydrogeology of the site, including saturated and unsaturated zones. Such efforts have been sufficient to allow the design of an adequate ground water monitoring system. There remain a few differences between ESII-B and EPA in the interpretation of certain hydrogeologic factors at the site, including ground water flow directions and rates in the middle of the site. EPA recommends that water table elevations in this area and along the northern boundary of the site be measured on a routine basis to provide continual information on flow directions.

Monitoring of Silos

EPA and ESII-B entered into an Agreed Order in November 1983, requiring an investigation of soils and ground-water contamination in the area of the silos. ESII-B's subsequent sampling and analysis efforts at or near the silos demonstrated contamination in the form of volatile organic compounds in both ground water and soils.

In October 1985, EPA issued a RCRA section 3008(h) order to ESII-B, addressing remedial measures to be taken in the silo areas, should contamination reach a specific concentration. In response, ESII-B initiated a

silo well data assessment program to evaluate the presence of the contamination. The assessment program included pumping three ground water wells installed in the silo area for 15 days, subsequent to which concentrations of the hazardous constituents in the silo wells decreased to near or below detection limits.

In a report describing the results of the assessment program, ESII-B offered its view that activities such as well drilling, well construction, well development, sampling errors and/or analytical procedures could have been responsible for the appearance of hazardous constituents in ground water samples from the silo wells, as opposed to an actual release from the silo complex. The analytical data support this conclusion. However, as detailed in the report, EPA does not believe that the silo well data assessment program adequately demonstrated that no release has occurred from the silo complex. The data which were presented do not eliminate the possibility that the volatile organics which have been detected are due to leakage from the silo complex and that such contamination has migrated vertically through the sediments to ground water.

Sampling and analysis of the silo wells and selected RCRA interim status wells for volatile organic compounds is being required on a quarterly basis. Should new evidence confirm that hazardous constituents have been released to ground water, EPA would seek an accelerated investigation to fully characterize the nature and extent of the contamination, in order to facilitate any remedial action determined to be necessary.

Proposed Ground Water Monitoring Program

As part of its permit application, ESII-B has proposed a ground water detection program which would monitor regulated units and which also includes three wells to monitor the silos. ESII-B has proposed that each of the two aquifers would have four upgradient wells. Sixteen downgradient wells are proposed for the upper aquifer and eight for the lower aquifer. Proposed construction designs and methods for the new upper and lower aquifer wells appear to be appropriate for a detection monitoring system at this site. ESII-B's rationale for horizontal spacing between wells is being evaluated and independently studied by EPA.

Several comments regarding ESII-B's proposal for a ground water monitoring system are made in the text. They address topics including the following: (1) the continued use of original silo wells in the monitoring network; (2) a discussion of the appropriate use of statistical methodologies; (3) identification of appropriate indicator parameters; (4) the need to identify specific concentrations (or trends) for individual parameters and constituents which would act as triggers to address the possible existence of ground-water contamination; (5) the importance of maintaining wells or piezometers sufficient to evaluate ground water flow directions in the upper aquifer; and (6) appropriate methods of purging wells prior to obtaining samples.

Waste Tracking Records

Specific comments are made in the text regarding aspects of ESII-B's current and historical waste analysis plans and tracking records. Based on

such records, as well as on the degree of uncertainty in being able to identify wastes which were disposed prior to ESII-B's ownership of the site, it is concluded that monitoring of ground water potentially affected by each waste management unit cannot be limited to those constituents identified by ESII-B's operating records as having been disposed in the unit.

Results of Ground Water Sample Analyses

The sample analysis data generated from this inspection are for the most part unremarkable. Low levels of chloroform were detected in silo wells SW-1 and SW-3, consistent with the results ESII-B has obtained recently for those wells. An unidentifiable semivolatile compound was reported in SW-3 at 17 ug/l, although it was not reported in the duplicate sample obtained from that well. Low levels of phthalate compounds were reported in wells MW-11, MW-13, PCB-1, PCB-2, PCB-3, MW-16 and MW-21, and in a field blank. Phthalates were not detected in the stainless steel silo wells, reinforcing the belief that phthalates are released from the polyvinyl chloride well casings. N-butylbenzenesulfonamide was tentatively identified in Well D-19 at an estimated concentration of 9 ug/l. The same compound was tentatively identified in MW-3 at an estimated concentration of 17 ug/l. An unidentifiable semi-volatile compound was identified at an estimated 215 ug/l in MW-5.

Low levels of organic constituents (in addition to phthalates and other compounds which apparently originated from equipment or laboratory contamination) infrequently have been identified in ground-water samples obtained by ESII-B from its interim status well network over the past three

years. Such findings have not been substantiated in location or over time, either in ESII-B's frequent sampling efforts or in the comprehensive sample analyses conducted as part of this inspection.

There does not appear to be any reliable evidence of ground-water contamination at the site boundary of ESII-B in either of the two monitored aquifers. As delineated in the text, ESII-B's techniques for purging and sampling wells should be improved in order to be able to place more confidence in the quality of the data generated from the samples it collects. From a regulatory standpoint, ESII-B must fulfill its interim status obligations to carry out required statistical analyses in order to obtain a RCRA permit allowing it to operate in a detection monitoring mode. Long-term sampling of wells in the silo complex area will be necessary to definitively determine whether ground water contamination exists from past practices in that area.

INTRODUCTION

The United States Environmental Protection Agency (EPA) is charged with administration of the Resource Conservation and Recovery Act (RCRA), which regulates operations at hazardous waste treatment, storage and disposal facilities. Such facilities are subject to RCRA (as amended) and to regulations promulgated thereunder, found at 40 CFR Parts 260 through 268, and implemented through the hazardous waste permit program of 40 CFR Part 270. These facilities are also subject to applicable state regulations, and in some cases, state hazardous waste management programs may be in effect in lieu of federal rules and regulations. In all instances, the regulations are intended to address hazardous waste management operations to ensure that hazardous waste is properly and safely managed. Ground water monitoring requirements for land disposal facilities are included as part of these regulations, and are intended to ensure that releases from hazardous waste management units will be immediately detected, and that when such a release is known or detected, that the nature and extent of the contamination will be fully characterized, to enable prediction of contaminant movement and to facilitate corrective action.

Commercial facilities which engage in land disposal of hazardous waste, and in particular those which accept waste from off-site generators for this purpose, are being evaluated throughout the United States to determine compliance with ground water monitoring requirements and to evaluate the degree to which such facilities are protecting the ground water beneath their sites. The inspections are being conducted in conjunction with the EPA Hazardous Waste Ground Water Task Force (Task Force). The Task Force was

established by the EPA Administrator to address rising concerns regarding discoveries across the nation of incidents of serious ground-water contamination. Hazardous waste land disposal facilities are a potential source of contamination which occurs when pollutants such as toxic chemicals seep through the soil into underlying aquifers. Depending on the nature of both the aquifer and the contaminant, such contamination may move off-site with the ground water and cause serious consequences for downgradient users of the aquifer water and other environmental receptors.

The Task Force effort has two major goals: to determine whether regulated hazardous waste disposal facilities are meeting RCRA requirements to protect ground water from contamination by hazardous materials, including wastes taken from clean-up efforts at Superfund sites; and to identify and evaluate causes of any deficiencies in compliance and recommend measures to amend such deficiencies.

This report describes the Task Force inspection at Envirosafe Services of Idaho, Inc., Site B (ESII-B), a commercial, off-site hazardous waste land disposal facility located near Grand View, Idaho. ESII-B accepts a variety of wastes for land disposal, including RCRA-regulated hazardous waste, wastes from Superfund sites (which may or may not be RCRA-regulated), and PCB (polychlorinated biphenyl) wastes which are regulated pursuant to the Toxic Substances and Control Act (TSCA).

Objectives of the evaluation of ESII-B include determination of compliance with the requirements of 40 CFR Part 265, Subpart F (interim status ground water monitoring); 40 CFR § 270.14(c) (information required to be submitted with the facility's Part B permit application); and potential

compliance with the requirements of 40 CFR Part 264 Subpart F. In addition to wells designated by ESII-B as RCRA monitoring wells, the following ground water monitoring wells were also subject to this inspection: wells installed at the facility pursuant to a RCRA § 3013 investigative order; wells installed pursuant to TSCA PCB-approval authorities; and test/observation wells and piezometers at the facility. Specific objectives of the evaluation at ESII-B included determining if:

- (1) The ground water monitoring system is capable of immediately detecting any statistically significant amounts of hazardous waste or hazardous waste constituents that may migrate from the waste management units to the aquifer which is uppermost in the vicinity of each waste management unit;
- (2) Designated RCRA monitoring wells are properly located and constructed;
- (3) ESII-B has developed and is following an adequate plan for ground water sampling and analysis, and if well purging and sampling are appropriately conducted;
- (4) Required analyses have been conducted on samples from the designated RCRA monitoring wells;
- (5) The ground water quality assessment program outline is adequate;
- (6) Ground water contamination currently exists;

(7) The hydrogeology of the site and the geochemistry of the ground water have been appropriately characterized; and

(8) Incoming hazardous waste is appropriately characterized by generators and/or the facility, and adequately tracked by the facility.

The investigation team consisted of personnel from EPA Region 10; the Idaho Department of Health and Welfare; EPA Headquarters; and contract personnel provided by EPA Headquarters for obtaining ground water samples. To accomplish the objectives, the investigation team reviewed records, inspected the ground water monitoring system, reviewed on-site laboratory procedures, conducted interviews with appropriate facility representatives, and collected samples from selected ground water monitoring wells for extensive chemical analyses.

THE INSPECTION

The inspection of the ESII-B facility consisted of the following activities:

Review and evaluation of records and documents from the Region 10 office, the Idaho Department of Health and Welfare (IDHW), and ESII-B;

Physical inspection of the facility from June 16 through June 25, 1986, which included further review of records and obtaining ground-water samples; and

Analysis of ground water samples and subsequent evaluation of all available ground water sampling data.

Participants in the inspection team consisted of the following: Marcia Bailey and Andrew Boyd, EPA Region 10; Mark Torf, Katie Sewell, David Eighmey and Al Ogden, IDHW; Robert Farrell, hydrogeology consultant to Region 10; Brian Lewis, EPA Headquarters; and Richard Roat, David Billo and Julianne Howe, GCA sample team.

REVIEW OF RECORDS AND DOCUMENTS

Records and documents from the EPA Region 10 and IDHW offices, compiled by an EPA contractor, were reviewed prior to and during the on-site inspection. Prior to the inspection, company personnel were requested to make

available specific, additional records during the inspection, including all ground water monitoring data not previously submitted to EPA. Requests for other records were requested during the inspection. A few records were located and mailed to EPA subsequent to the inspection. Some records, discovered to exist in ESII-B files, were not made available until March 1987.

During the inspection, a review of selected facility records was conducted to determine the nature, extent, and reliability of waste analyses and waste location records prepared by ESII-B since it obtained the facility in 1981. Facility representatives were interviewed to aid in identifying documents of interest and to discuss the contents of documents, and to discuss facility operations. A special session was held during the first week of the inspection in which the hydrogeologic characterization of the site was discussed among EPA, IDHW and facility representatives.

Records selected for review were copied. They included all waste analysis plans used by ESII-B at the site, and a selection of the following records prepared from 1982 to the time of the inspection: waste analysis records for waste generated on-site and off-site, manifests, waste location records, inspection logs, training records for those conducting waste sampling and analyses, and laboratory audit records. Also copied for review were the facility's ground water assessment outline, ground water statistical evaluations, and analytical results from ground water sampling.

Company personnel [specifically, corporate personnel located at Envirosafe Services, Inc. (ESI) corporate offices in Pennsylvania] were called upon during the preparation of this report to discuss and clarify various issues and to provide additional information and data, as needed.

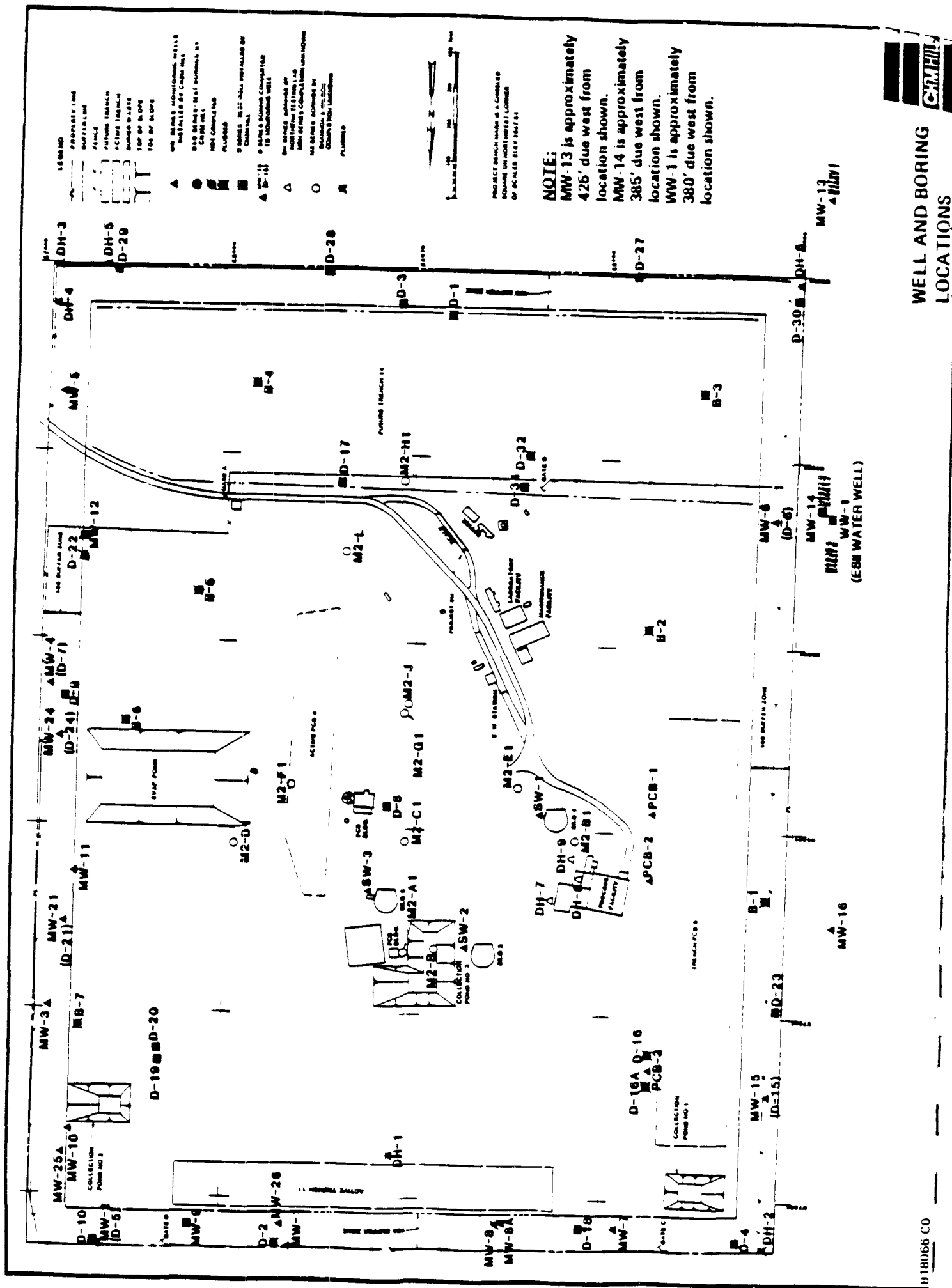
Many of the records collected during the inspection were claimed by ESII-B as Confidential Business Information (CBI). This claim covered such documents as waste analysis plans, internal control forms, sampling and analysis plans, and the ground water monitoring assessment outline. At EPA's request, ESII-B qualified the CBI claim, making it possible to distribute this document.

EPA inadvertently discovered very late during the report preparation that records containing the results of monthly ground water sample analyses existed and were in the possession of the company, but had not been provided to or shared with EPA either during the inspection or in any other forum, including the Part B permit development process. These data include analytical parameters beyond those minimally required by applicable regulations, including Priority Pollutant volatile and base/neutral extractable compounds. Attempts to obtain these data from EnviroSAFE personnel were successful. The analytical data that were provided are discussed in this report, in the section on ground water sample data results.

LABORATORY EVALUATIONS

The off-site laboratory which has generated most of ESII-B's ground-water data is ETC of Edison, New Jersey. This laboratory was evaluated in July 1985 for its ability to produce quality data for required analyses, as part of another Ground Water Task Force inspection. The August 1986 Ground Water Task Force report for Chem-Security Systems, Inc. includes a discussion of the laboratory evaluation. The problems noted with TOC analyses reportedly have been corrected.

Figure 1



At ESII-B's on-site laboratory, waste analyses are performed on a portion of the wastes accepted from off-site facilities. This laboratory was visited during the inspection to confirm the availability of equipment necessary to implement the current waste analysis plan. Record-keeping procedures were also observed.

FIELD ACTIVITIES

Field activities included identifying current waste management units and surface drainage routes, verifying monitoring well locations, obtaining ground water elevation and well depth measurements, collecting samples from 18 ground water monitoring wells, and observing ESII-B contractors purge and sample two monitoring wells.

Field Team Sampling Activities

On the first day of the inspection, organic vapor readings (using an Hnu meter) and depth-to-water measurements were made by the field team at 34 of the 46 piezometers and ground water monitoring wells at ESII-B. In all cases attempts were made to identify and use the same measuring point on the well that the facility utilizes for such measurements. On subsequent days of the inspection, additional water level measurements were made at each well to be sampled. Based on the measurements obtained by the field team, water level contour maps were constructed to compare with those submitted by the facility. Locations of wells are shown in Figure 1.

Table 1. EPA Sample Collection Locations and Descriptions

Well	Date and Time Purged	Purge Method	Purge Volume	Casing Volume	Date & Time Sampled	Sample Method	Notes
PCB-3	6/17 1022	Teflon baller	28g	9.6g	6/17 1200	Baller	Continuous purge to sample
MW-11	6/17 1510	Submersible pump	90g	30g	6/17 1730	Submersible pump	Water drawn to top of pump; allowed to recover 0.5 hours
MW-10	6/18 0840	Submersible pump	100g	30g	6/18 1002	Submersible pump	Continuous purge to sample
MW-25	6/18 1140	Submersible pump	210g	69g	6/18 1420	Submersible Pump	Continuous purge to sample
MW-13	6/19 0835 6/20 1230	Submersible pump	55g 10g	42g	6/20 1400	Submersible pump	Water drawn down to top of pump during first purge; left to recover overnight
MW-16	6/19 0930	Teflon baller	31g	10.3g	6/19 1500	Teflon baller	Allowed to recover 2.5 hours before sampling
PCB-1	6/20 0845	Teflon baller	14.5g	5g	6/20 0950	Teflon baller	Continuous purge to sample
MW-21	6/19 1335 6/20 0830 6/21 1445	Submersible pump	52g 52g 22g	52g	6/21 1510	Submersible pump	Purged to top of pump twice. Strong sulfide odor in water; water petillant; air in all samples.
SW-2	6/23 0950	Teflon baller	23g	7.6g	6/23 1202	Teflon baller	Continuous purge to sample
SW-1	6/23 0930 6/24 0645	Bladder pump	55g	18.6	6/24 1045	Bladder pump	Pump turned off at night.
SW-2	6/23 0930 6/24	Bladder pump	34g 55g	11.3g	6/24 1325	Bladder pump	Pump turned off at night.

Table 1. (cont.) Task Force Sample Collection Locations and Descriptions

Well	Date Purged and Time	Purge Method	Purge Volume	Casing Volume	Date & Time Sampled	Sample Method	Notes
SW-3	6/23 0930	Bladder pump	37g	12.3g	6/23 1630	Bladder pump	Continuous purge to sample
MW-5	6/24 0840 6/25 0815	Stainless steel baller	55g 50g	34g	6/25 1500	teflon baller	Purged till nearly dry both times. Second recovery = 5.5 hours before sampled
D-18	6/24 1345	Stainless Steel baller	134g	26.8g	6/24 1515	teflon baller	Water very murky until middle of sampling
MW-9	6/24 1015 6/25 1640	Stainless Steel baller	34g 110g	32g	6/25 1830	teflon baller	SS baller dropped into well during 1st purge. 2nd day continuous purge to sample.
MW-5	6/25 0820 6/25 1800	Submersible pump	20g 5g	18.4g	6/25 1800	Submersible pump	1st purge drawn down to pump intake. Volume sufficient only for VOAs, organic extractables, and total metals.
PCB-2	6/25 0954	Teflon baller	24g	8.1g	6/25 1145	teflon baller	Continuous purge to sample
D-19	6/25 1017	Stainless Steel baller	96g	32g	6/25 1200	teflon baller	Continuous purge to sample

To verify well-construction records, well-depth measurements were made by the field team at 11 wells, and depths to the top of the permanently-installed submersible pumps were determined at three others. These measurements are presented in this report in the section on ESII-B's interim status ground water monitoring program.

Samples from 18 ground water monitoring wells were obtained by the field team during the inspection. Upgradient and downgradient wells representing both upper and lower aquifers were selected for sampling. For the most part, downgradient wells were selected on the basis of being most likely to be affected by current or past hazardous waste management practices at the facility. Duplicates or replicates of samples from each well and of blank samples (trip, equipment and field) were provided to ESII-B representatives.

A summary description of the sampling activities of the field team at each well is given in Table 1. Wells were purged using either permanently-installed submersible pumps, dedicated bladder-type pumps, three-foot Teflon bailers provided by GCA, or a 20-foot stainless steel bailer attached to a truck rig, which was kindly provided by ESII-B for wells which would have proved formidable to purge otherwise. Samples were obtained with the pumps, where in place; and with Teflon bailers in all other locations. Submersible pumps were temporarily removed by ESII-B from four wells at EPA's request, to avoid using the pumps for sampling purposes during this inspection.

Typically, samples were collected by the field team pursuant to the following procedures at each well:

- A depth-to-water measurement was made using an electrical tape designed for this purpose. The probe was cleaned subsequent to each use.
- Depth to the bottom of each well was measured where possible. (This was not possible when either a submersible pump was present in the well, or when the well depth exceeded 250 feet, which was the length of the measuring device provided by GCA. The GCA interface probe was also not of use due to its short length relative to the water table elevations at this site.) The height of the water column was calculated from the measured depth to water and the depth to the bottom of the well (if not measured, using the value reported in ESII-B well-construction records).
- The volume of standing water in the casing was calculated.
- The well was purged of the volume of water indicated in Table 1. Purging activities at some wells required time lapses between subsequent purges and/or sampling events, depending upon individual well yields and casing volumes.
- Sample aliquots were collected three or more times during purging. Field measurements (water temperature, pH and specific conductance) were obtained from these aliquots (and are reported in Appendix A).
- Samples were obtained as soon as practicable after purging was completed. Containers were filled in the order shown in Table 2.

Table 2
ORDER OF SAMPLE COLLECTION;
CONTAINERS AND PRESERVATIVES

Parameter	Bottle	Preservative* (Concentration)
1. Volatile organic analysis (VOA)		
Purge and trap	2 40-ml VOA vials	
Direct inject	2 40-ml VOA vials	
2. Purgeable organic carbon (POC)	1 40-ml VOA vials	
3. Purgeable organic halogens (POX)	1 40-ml VOA vials	
4. Extractable organics	4 1-qt. amber glass	
5. Dioxin	2 1-qt. amber glass	
6. Total metals	1 1-qt. plastic	HNO ₃ (95-98%)
7. Total organic carbon (TOC)	1 4-oz. glass	H ₂ SO ₄ (95-98%)
8. Total organic halogens (TOX)	1 1-qt. amber glass	
9. Phenols	1 1-qt. amber glass	H ₂ SO ₄ (95-98%)
10. Cyanide	1 1-qt. plastic	NaOH (12N)
11. Nitrate/ammonia	1 1-qt. plastic	H ₂ SO ₄ (95-98%)
12. Sulfate/chloride	1 1-qt. plastic	
13. Carbonate/Bicarbonate	1 1-qt. plastic	

* Volume added to each sample was 5 ml except for TOC, where about 1 ml was added.

- Sample containers were filled directly from the Teflon bailer or pump discharge line.
- Samples were placed in an ice chest and returned to the GCA staging area for shipment preparation. Samples obtained for the analysis of metals, TOC, total phenols, cyanide, nitrate and ammonia were preserved (Table 2). Split samples for ESII-B were similarly prepared and turned over to facility personnel at the end of each day.
- Each day, samples which had been obtained that day (and/or the afternoon of the previous day) were packaged and shipped, under chain-of-custody, to the EPA contract laboratories. Shipping procedures were according to applicable U.S. Department of Transportation regulations (40 CFR Parts 171-177). Monitoring well samples were considered "environmental" for shipping purposes.

Samples were analyzed by the EPA contract laboratories for the parameter groups shown in Table 2. Specific parameters and detection limits are listed in Appendix B. At well MW-5, samples for only volatile organics, extractable organics and total metals were obtained due to insufficient volume and time. Duplicate samples were obtained at wells SW-1 and SW-3. Field blanks were obtained near wells MW-25, MW-16, and SW-3. Equipment blanks were made for a Teflon bailer and a stainless steel pump (which was not used during the inspection). A trip blank which accompanied the GCA personnel to the site was also submitted for analysis. The trip blank was composed of high purity water subjected to high performance liquid chromatography.

SITE HISTORY AND OPERATIONS

OVERVIEW

The ESII Site B facility (ESII-B) is an operating treatment, storage and disposal facility which is subject to RCRA, to the interim status and permit application standards promulgated pursuant to RCRA, and to applicable state of Idaho rules governing hazardous waste management activities. The facility is seeking a final RCRA permit for those activities. The ESII-B site covers approximately 118 acres and is located at the end of Missile Base Road approximately 10 miles west of Grand View, Idaho, in Owyhee County. Owyhee County, encompassing 7000 square miles, is an area of agricultural activity and ranges, and contains a birds-of-prey sanctuary adjacent to the facility boundary. The county is sparsely populated, with an average of approximately one person per square mile. The site location is shown in Figure 2, and the current site plan is shown in Figure 3. Approximately 30 people are employed by and work at the facility.

The facility has been owned and operated by EnviroSAFE Services of Idaho, Inc. (ESII) since 1981. The site was formerly a United States Air Force Titan missile defense facility, constructed in the late 1950s and early 1960s. Wes Con, Inc., an Idaho corporation, subsequently purchased the site and operated the facility beginning August 1, 1973. Wes Con received a Conditional Use Permit in June 1973, issued by IDHW for disposal of pesticide wastes. Wes Con submitted a Notification of Hazardous Waste Activity and a Part A application to EPA in 1980 and qualified for Interim Status for hazardous waste storage and disposal activities. The facility accepted and disposed of hazardous waste both prior to and after November 19, 1980.

Figure 2

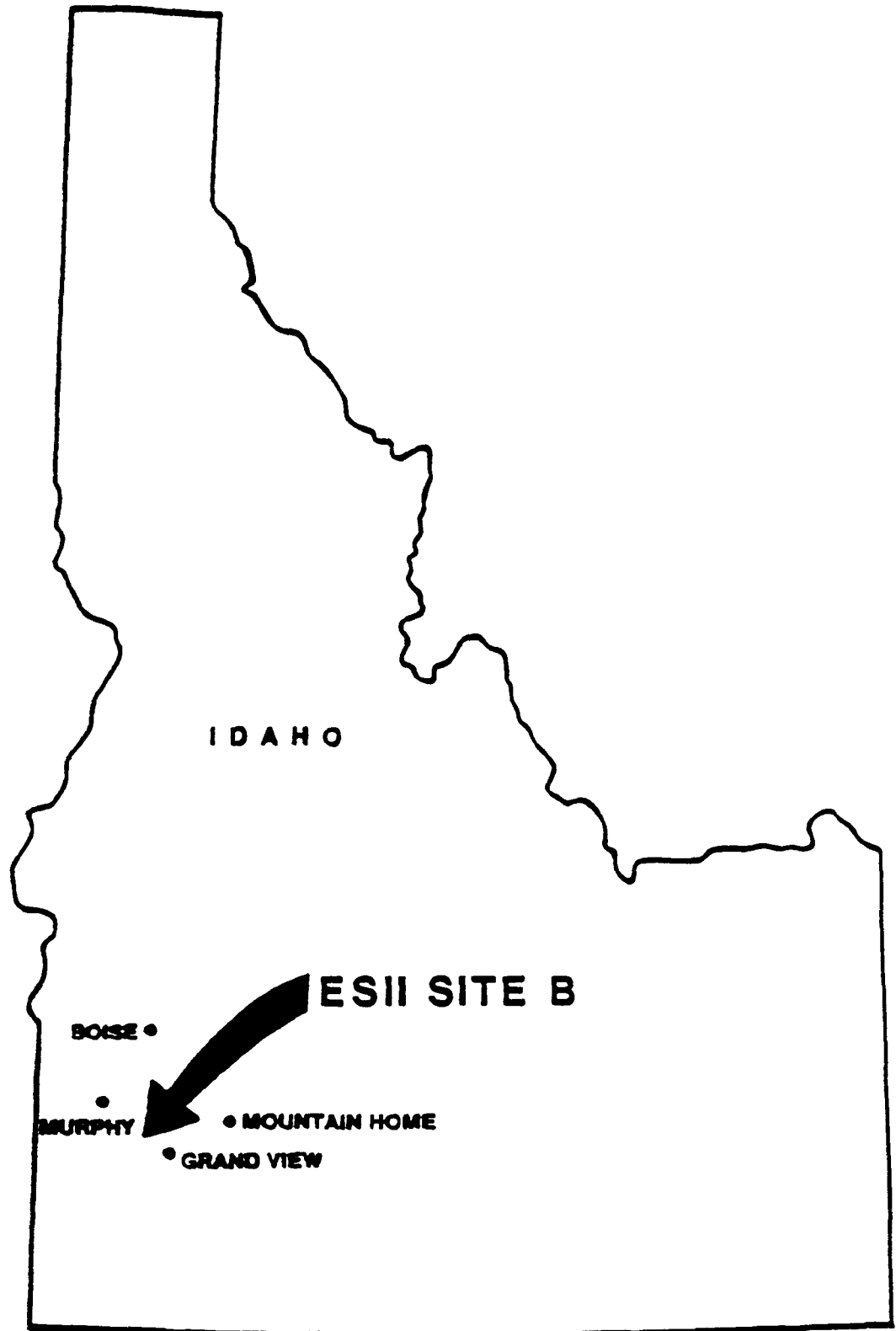
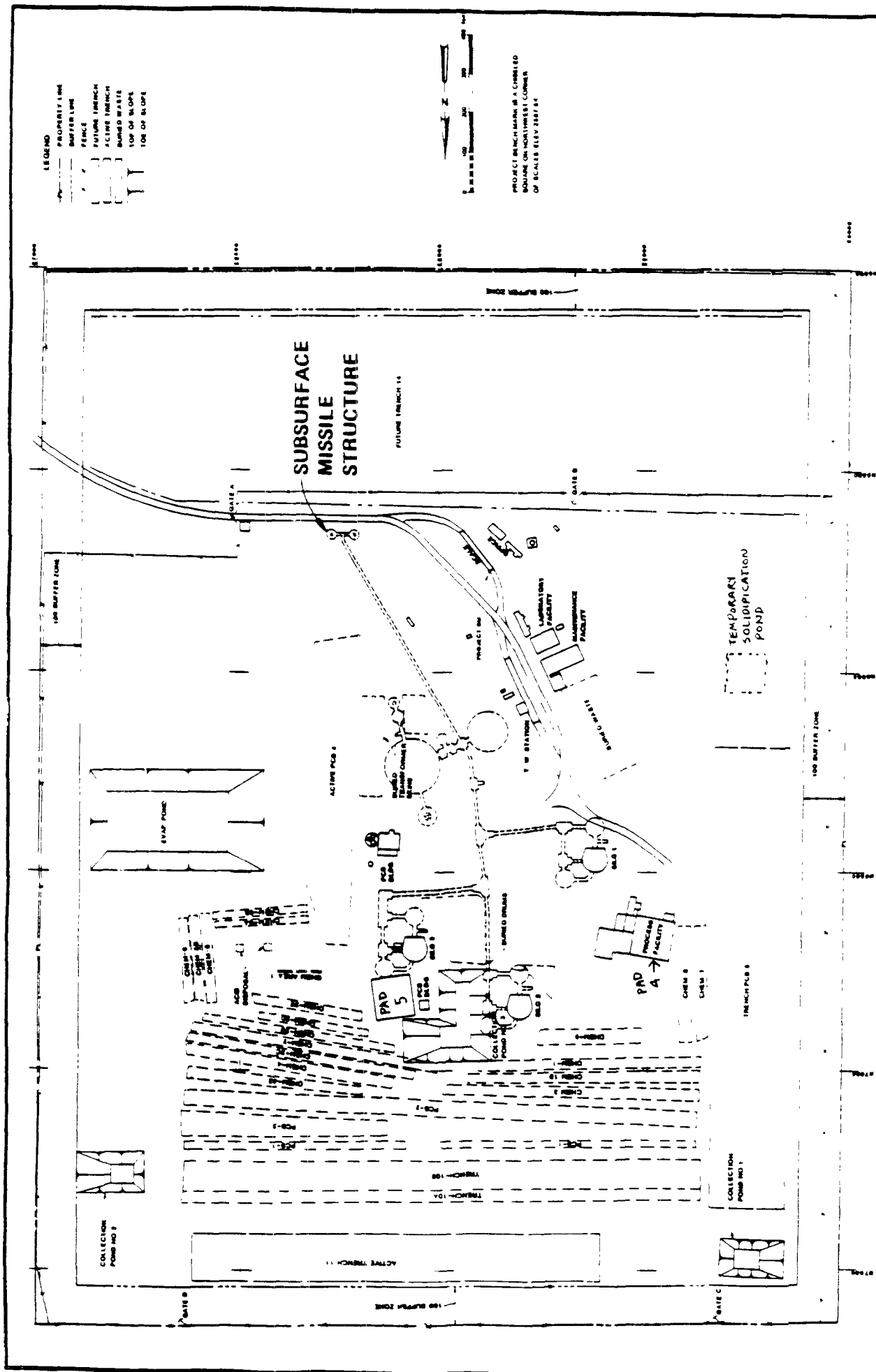


Figure 3.



Locations of Solid Waste Management Units

There are three missile launch silos and other underground structures at the facility which were constructed by the U.S. Department of Defense while the site was used as a Titan missile base. The silos are each approximately 60 feet in diameter, and extend to depths of 160 feet below the surface. Underground structures associated with the silos include smaller side silos, a power house, control center, antenna silos, elevator and exhaust shafts, and a tunnel system. After acquisition of the property and silo complex by Wes Con, and prior to November 19, 1980, many of these underground structures were filled with liquid and solid hazardous waste and PCB wastes. The integrity of the underground missile base structures at this time is unknown.

In August 1981, the site was acquired by ESII, which is a wholly owned subsidiary of IU Conversion Systems, Inc., a Delaware corporation. The site is now known as ESII-B. Hazardous waste operations at the site were continued under the new ownership. A revised Part A permit application was submitted to EPA by the facility requesting approval to add treatment as a hazardous waste management activity to be conducted at the facility. This was approved by EPA in February 1982.

Initial waste management activities at the site involved disposal of mostly pesticide wastes in the three main silos and other underground structures associated with the silos. As capacity in these structures diminished, a number of disposal trenches were excavated and used for waste disposal. In addition, drums of hazardous waste were stored in many locations at the site. In 1978, the site received certification to dispose PCB wastes in the missile silos. In 1979, the state approved disposal of PCB wastes in trenches near the silos.

Current and/or recent hazardous waste management activities at the facility include the following:

- Storage of bulk and/or containerized hazardous waste.
- Solidification of hazardous waste in containers (and bulk solidification prior to May 8, 1985).
- Management of recyclable hazardous waste for reclamation or incineration at other hazardous waste management facilities.
- Disposal of hazardous waste by landfill burial.

Wastes not regulated by RCRA or TSCA are also managed at ESII-B. Specific units and hazardous waste management activities are described in further detail later in this report.

Many of the waste disposal units have reached capacity and no longer receive waste. The regulatory status of each land disposal unit no longer in operation is determined by the date hazardous waste was last placed in it. In addition to old units and currently-active units, specific new units have been proposed in ESII-B's Part B permit application. Active units as well as many which are no longer active are shown in Figure 3.

REGULATORY INFORMATIONPermits History

In June 1973, Wes-Con (then the owner/operator of the site) was granted a Conditional Use Permit for pesticide-waste disposal by IDHW. It was stated then that the disposal of hazardous waste other than pesticides would require specific state approval, to be granted on a case-by-case basis.

In March 1977, subsequent to the occurrence of fires in the silos, Wes-Con received a revised Conditional Use Permit that required Wes-Con to lower drums into the silos rather than drop them, as previously had been done.

In 1978, Wes-Con received approval from the state of Idaho and EPA for the disposal of PCBs in the on-site missile silos. In 1979, Wes-Con received approval for disposal of PCB wastes in trenches adjacent to the silos and was issued a revised Conditional Use Permit by IDHW for non-liquid disposal of PCBs. This Conditional Use Permit, which is broad in scope and encompasses management and disposal of both PCB and RCRA wastes, is currently in effect.

In 1983, EPA modified the site's PCB disposal approval by increasing ground water monitoring requirements. Also in 1983, EPA called for the submittal of the facility's RCRA Part B permit application for hazardous waste management activities. The application was submitted on December 15, 1983. EPA sent Notice of Deficiency letters regarding the application to ESII-B in February 1984 and in January 1985. Revised Part B applications were submitted in May 1984, May 1985 and April 1987. Updated information regarding site

characterization for ground water program designs (Section E of the permit application) were submitted in January 1985 and in February 1986. Revised proposals for the ground water detection monitoring program (Section E-6 of the permit application) were submitted in December 1986 and April 1987.

While Idaho is not yet authorized to implement a hazardous waste regulatory program in lieu of the federal government, the state has promulgated environmental statutes and regulations to which ESII-B is subject. The Idaho legislature passed the Hazardous Waste Management Act (HWMA) in 1983 giving the Board of Health and Welfare the authority to develop regulations. The Idaho Rules, Regulations and Standards for Hazardous Wastes were adopted in January 1985 and are consistent with the RCRA regulations. The Idaho legislature added a new section to the HWMA in 1986 which adopted the "California list" of land disposal restrictions. This ban affects the types of wastes which ESII-B can accept for disposal. For example, hazardous waste containing halogenated compounds in total concentration greater than, or equal to, 1000 ppm may not be landfilled. In addition to these regulations specific to hazardous waste, ESII-B is also subject to the Idaho Solid Waste Management Act. The Conditional Use Permits which have been granted to ESII-B were done so pursuant to this act.

ESII-B also operates pursuant to federal PCB-approval authorities under TSCA, which regulates the disposal of PCB-containing materials. In 1982, a Letter of Approval was issued covering disposal into silos and trench 4. Trench 4 is now full, and a closure plan has been submitted for it. ESII-B currently disposes PCB-containing wastes pursuant to a temporary Letter of Approval, which allows for such disposal in one-third of the newly-constructed

trench 5. It is anticipated that a final Letter of Approval will be issued concurrently with the final determination of the RCRA permit, and that it will address the entirety of trench 5, closure of past units which were approved for PCB disposal, and ground water monitoring requirements (including how such requirements will be carried out as part of the RCRA ground water monitoring program).

Compliance History

In the early years of the site's operations, compliance actions taken against the facility typically took the form of enforcement correspondence between EPA and/or IDHW and the facility. These enforcement actions usually resulted in the issuance of a revised state Conditional Use Permit. For example, in 1977, the Conditional Use Permit was revised to require lowering of the drums into silos, and in 1978 it was revised to allow PCB disposal in trenches and silos. In a criminal trial in 1981, Wes Con was convicted of illegal disposal of PCBs.

In March 1981, IDHW assessed a penalty against Wes Con, then the site owner/operator, for improper management of containers, in violation of the Conditional Use Permit. The penalty was paid by the new owner, ESII-B.

Subsequent to inspections of the facility, EPA issued an administrative order to ESII-B in November 1983. The order, issued pursuant to sections 3008(a) and 3013 of RCRA, required ESII-B to institute changes in the physical condition of the site and site operations; to implement a plan that would ensure that free liquids would not be placed in trench 11; to come into compliance with 40 CFR Part 265 Subpart F ground water monitoring

requirements; and to implement a sampling, analysis, and monitoring plan to determine whether hazardous waste or hazardous waste constituents had leaked from the silos or other underground structures at the site.

In August 1984, another administrative order was issued by EPA to ESII-B pursuant to RCRA § 3008(a). Site inspections by IDHW and EPA had revealed a number of violations regarding drum storage ranging from improper manifesting, to the presence of leaking and improperly-closed drums. Violations concerning the storage and disposal of incompatible wastes were also noted. A pond where hazardous waste solidification activities were being carried out was ordered to be removed from service, as it was being utilized as an unpermitted hazardous waste management unit. ESII-B was assessed punitive damages and ordered to come into compliance with applicable regulations, as well as to investigate and remove soil contamination which may have occurred as a result of improper drum storage and hazardous waste solidification practices. An Agreed Order between EPA and ESII-B was signed in October 1984 in resolution of this action.

A RCRA § 3008(a) Complaint and Compliance Order was issued to ESII-B in August 1985, citing further violations of RCRA. Inspections conducted by EPA and IDHW in 1985 revealed that ESII-B had improperly manifested hazardous waste shipments. The order required that this situation be corrected, and also required ESII-B to amend its closure plan, revise its contingency plan, and implement a plan to decontaminate the exterior surfaces of vehicles leaving certain waste management areas of the site.

Another RCRA § 3008(a) Complaint and Compliance Order was issued to ESII-B in February 1986, primarily concerned with record-keeping violations

observed by IDHW and EPA inspectors. The order was not contested by ESII-B, which was required to pay a penalty and institute measures to come into compliance.

IDHW assessed a penalty to ESII-B in October 1986, for violations of Conditional Use Permit requirements regarding cover material at trench 11.

EPA issued a corrective action order pursuant to RCRA § 3008(h) to ESII-B in October 1985. This order addressed the presence of hazardous constituents in ground water near the silos, discovered as a result of the investigation undertaken in compliance with the § 3013 order issued in 1983. A consent agreement was executed on February 12, 1986, which requires ESII-B to conduct regular sampling of the silo wells and four downgradient, RCRA perimeter wells, and to remove ground water in the event that the concentration of any volatile organic compound exceeds 1 ppm. ESII-B has reserved its right to obtain a hearing on the order; and EPA has reserved its right to demand an answer to or compliance with all other outstanding terms of the original order.

ESII-B has contended that the presence of constituents found in the ground water from the silo wells were caused by carry-down from contaminated soils during well-drilling activities, from lab error, or from improper sampling procedures. To investigate this, the facility instituted a pumping program in which the three original silo wells were continuously pumped and intermittently sampled over a period of about 15 days, immediately preceding this inspection. The results of that effort, which showed diminished concentrations of contamination, are discussed in the section on silo well

monitoring. EPA considers the continued monitoring of the silo wells to be necessary.

SOLID WASTE MANAGEMENT UNITS (SWMUs)

ESII-B includes units which fall into several categories:

(1) Units which received or stored hazardous waste before, but not after, November 19, 1980: These units are not subject to the 40 CFR Part 265 interim status standards or to the 40 CFR Part 264 permitting standards of RCRA. They are, however, subject to other applicable statutory and regulatory requirements of RCRA, pursuant to the RCRA Hazardous and Solid Waste Amendments of 1984. Such units are generally referred to as "not regulated," despite the fact that, as described here, they are regulated under distinct statutory provisions. These units are being addressed as part of the RCRA permitting process, as required by section 3004(u) of RCRA;

(2) Units which received or stored hazardous waste after November 19, 1980: These units are subject to all applicable RCRA statutory and regulatory requirements and are generally referred to as "regulated units," as distinguished from the units described in paragraph (1), above;

(3) Units which have been permitted to receive PCB wastes and which are subject to TSCA requirements; and

(4) Units which were not in existence on November 19, 1980, which have not qualified for interim status, and which are not permitted to receive hazardous waste: this category includes an evaporation pond and three run-off collection ponds constructed in 1984 in response to an EPA compliance action; the temporary solidification pond which was operated without regulatory status or other approval; and any other units (existing or future) which may be included in the Part B permit application but which do not qualify to be utilized for interim status hazardous waste management activities.

Physical descriptions of units which have received hazardous and/or PCB wastes and which are included in categories (1) through (3), above, are given in Table 3. Their locations can be found in Figure 3. Trench 5, which was under construction during this inspection, is the only existing trench which is lined. It is operated under RCRA interim status and in the past year received TSCA approval to receive PCB wastes in an area comprising one-third of its surface area. Figures 4 and 5 are illustrations of SWMUs associated with the missile silo complex.

ESII-B's application for final permitted status includes storage and treatment in tanks; treatment and storage in containers; disposal in landfills; storage, treatment and disposal in surface impoundments; operation of the existing vehicle wash station; and closure of numerous temporary storage areas.

Table 3. DESCRIPTION OF SOLID WASTE MANAGEMENT UNITS

Unit	Horizontal Dimensions, Feet	Vertical Dimensions, Feet	Volume (ft ³)	Location
<u>Received Hazardous Waste Prior to November 19, 1980</u>				
PCB #1	650 x20	40	520,000	North side of site
PCB #2	1,300 x40	30	1,560,000	North side
PCB #3	500 x50	30	750,000	Northeast (NE) side
PCB #4	710 x110	55	4,295,000	Middle of site near power station
Cnem #1	620 x35	20	434,000	NW quadrant of site
Cnem #1B	590 x30	20	354,000	NW quadrant
Cnem #2	610 x20	20	244,000	NE quadrant
Cnem #2B	470 x20	20	188,000	NE quadrant
Cnem #2C	570 x20	20	228,000	NE quadrant
Cnem #2D	280 x20	20	112,000	NE quadrant
Cnem #2E	270 x20	20	108,000	NE quadrant
Cnem #3	640 x30	20	384,000	NW quadrant
Cnem #4	520 x25	20	260,000	NE quadrant
Cnem #4B	430 x25	20	215,000	NE quadrant
Cnem #5	230 x20	20	92,000	NE quadrant parallel to east side
Cnem #5B	230 x20	20	92,000	NE quadrant parallel to east side

(continued)

Table 3. (continued)

Unit	Horizontal Dimensions, Feet	Vertical Dimensions, Feet	Volume (ft ³)	Location
<u>Received Hazardous Waste Prior to November 19, 1980 (cont.)</u>				
Cnem #6	210 x20	20	84,000	NE quadrant parallel to east side
Cnem #6A	180 x20	20	72,000	NE quadrant
Cnem #6B	180 x20	20	72,000	NE quadrant
Cnem #7	220 x15	20	66,000	NW quadrant parallel to west edge
Cnem #8	240 x20	20	96,000	NW quadrant parallel to west edge
Cnem #9	240 x40	20	192,000	NW quadrant near silo 2
Silo #1	40 dia.	160	201,062	Middle of site on western side
Silo #1 (propellant room)	40 dia.	35	43,982	Middle of site on western side
Silo #1 (equipment terminals)	42 dia.	68	94,210	Middle of site on western side
Silo #2	40 dia.	160	201,062	Middle of site, to the NW
Silo #2 (propellant room)	40 dia.	35	43,982	Middle of site on western side
Silo #2 (equipment terminals)	42 dia.	68	94,210	Middle of site on western side

(continued)

Table 3. (continued)

Unit	Horizontal Dimensions, Feet	Vertical Dimensions, Feet	Volume (ft ³)	Location
<u>Received Hazardous Waste Prior to November 19, 1980 (cont.)</u>				
Silo #3	40 dia.	160	201,062	Middle of northerly portion of site
Silo #3 (propellant room)	40 dia	35	43,982	Middle of northerly portion of site
Silo #3 (equipment terminals)	42 dia	68	94,210	Middle of northerly portion of site
Antenna Silo #1	38 dia.	67	76,000	SE quadrant
Antenna Silo #2	38 dia.	67	76,000	SE quadrant
Control Center	100 dia	40		Near powerhouse
Elevator Shaft	30 dia	70	9,480	Middle of site
Exhaust Shaft	27 dia	40	23,720	Middle of site
Buried Drum Area 1	Right triangle sides 100', 70', 75'	20	52,500	NW corner near silo #2
Buried Drum Area 2	Trapezoid sides 180', 140', 80', 120'	20	374,000	Middle of site near silo #3
Acid Disposal Pit #1	20 x 20	10	4,000	NE quadrant near chemical trenches

(continued)

Table 3. (continued)

Unit	Horizontal Dimensions, Feet	Vertical Dimensions, Feet	Volume (ft ³)	Location
<u>RCRA-Regulated Units (cont.)</u>				
Pad #5 (Container storage; originally solidification pad)	100 x100	--	--	North of Silo #3
Drum/Container Storage Areas	--	--	--	Open areas all around site; bounded by PCB 4, Chem Trench 10 and Trench 5
Temporary Solidification Pond	40 x50	unknown	--	South of Trench 5
Container Storage Area Near Silo #3	unknown	--	--	Old solidification area next to Silo3
Storage Tanks 1, 2, 3	--	--	16,000 gallons each	Process facility
Temporary Storage Tanks (2)			20,000 gallons ea.	Pad 4 when in use, since disposed in Trench 11

Figure 4.

Solid Waste Management Units Associated with the Missile Silo Complex

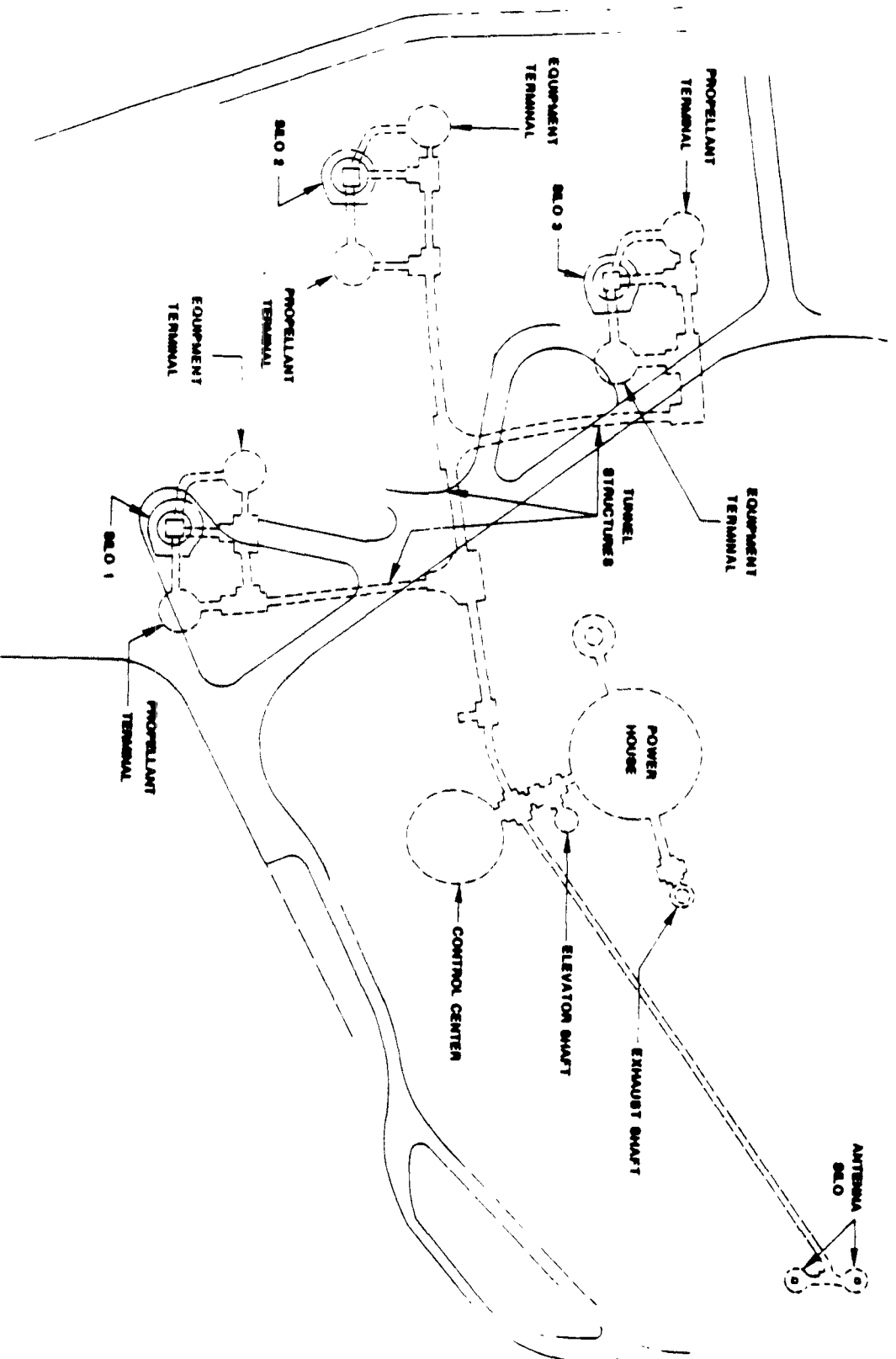
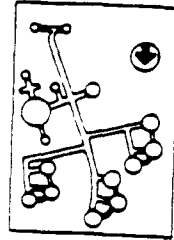
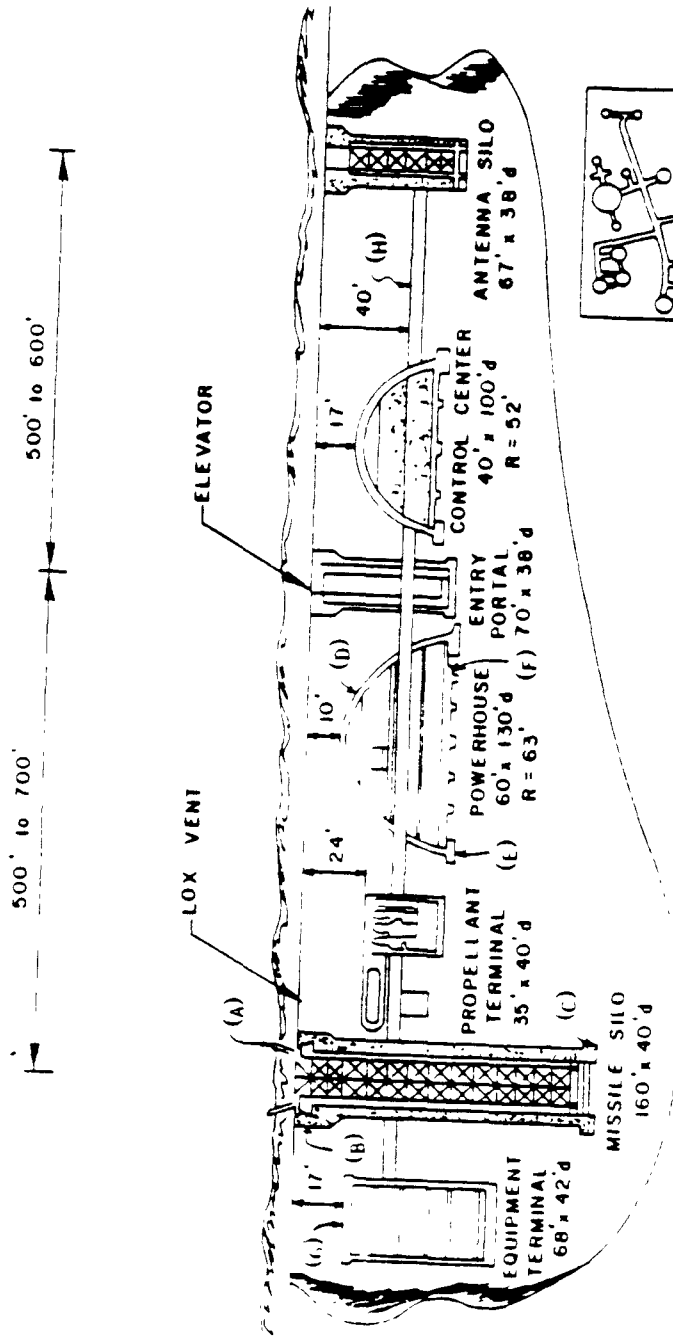


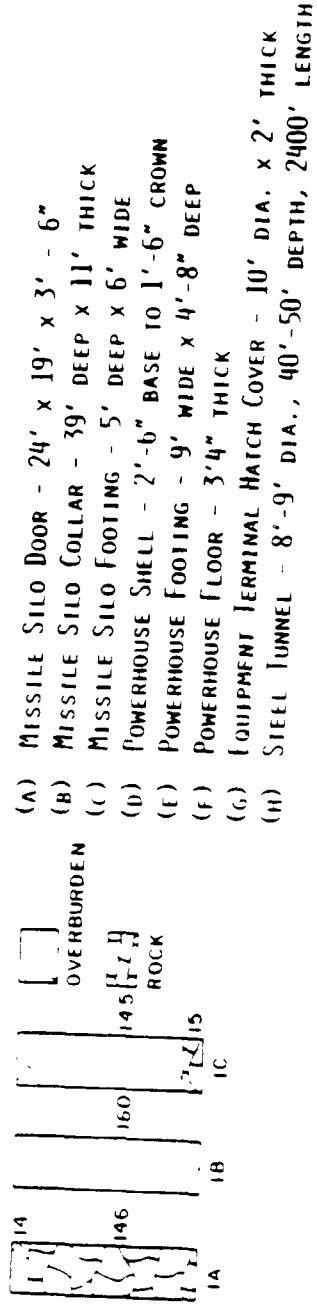
Figure 5.

Missile Silo Complex Components



KEY PLAN

UNDERGROUND TITAN ICBM COMPLEX PROFILE SKETCH



Missile Silos 1, 2, and 3

The missile silos were the first disposal units at the facility to receive hazardous waste. None of the silos reportedly received waste after November 19, 1980. The main silos are approximately 60 feet wide and 160 feet deep with walls up to six feet thick and floors 13 feet thick. The main silos and the side silos are interconnected by tunnels. Silo 2 has a 100-ton reinforced concrete door which has been sealed. In addition, Silo 2 is fitted with a vent pipe and a pressure relief valve intended to vent the silos should extreme pressure excursions occur. Silos 1 and 3 are capped with compacted soil.

Antenna Silos, Control Center, Equipment Terminals, Elevator Shafts,
Tunnels and Propellant Rooms

Most of the structures associated with the missile silos reportedly were used for disposal of hazardous waste. However, they are not RCRA-regulated units, as they ceased receiving hazardous waste prior to November 19, 1980. According to facility personnel interviewed, the tunnels associated with the silos have blast doors at every joint, and the doors are believed to be sealed. Disposal has occurred in the silos and side silos and in portions of the tunnels. The power house associated with the silos reportedly was not used as a site of waste disposal.

PCB Trenches

Disposal of PCB wastes began in 1978 with the authorization to dispose of PCBs in the silos. In 1979, Wes-Con received authorization to dispose of PCB wastes in trenches. Since then, five trenches have been excavated and used for PCB disposal. Trench 5 is the only PCB disposal location which is active and which is also regulated under RCRA interim status and permitting standards. The other PCB units are not RCRA-regulated, as they did not receive hazardous waste (as defined under RCRA) after November 19, 1980. All of the units are regulated under TSCA.

Chemical Trenches 1-9

Disposal in chemical trenches was initiated after the capacities of the silos were reached. The chemical trenches are located in the northern portion of the facility. The trenches range from 180 to 1300 feet in length. For purposes of volume estimation, all chemical trenches are assumed to have a depth of 20 feet. These trenches are not regulated under RCRA interim status, as it has been reported that wastes were not placed in them subsequent to November 19, 1980.

Buried Drum Areas 1 and 2

Two areas are identified on Figure 3 as containing drums of hazardous waste. These buried-drum areas are assumed to be unlined pits approximately 10-20 feet deep. These areas ceased receiving hazardous waste before November 19, 1980 and hence are not regulated units.

Acid Disposal Pits

Two small areas are identified on Figure 3 as containing acid wastes. These areas are assumed to be unlined pits approximately 20 feet deep. It is possible that acid wastes were dumped into these pits in bulk liquid form for several years during operation of these units. These areas did not receive hazardous waste after November 19, 1980 and are not regulated units.

Buried Transformer Skin Areas

Two areas are identified on Figure 3 as containing buried transformer skins. These areas are assumed to be unlined pits approximately 10-20 feet deep. They did not receive hazardous waste after November 19, 1980 and are not regulated units. During the inspection, facility personnel indicated that there is some doubt that these units actually exist. They were initially identified based on employee interviews, but have not been substantiated in a review of facility records by ESII-B.

Burial Waste Area and Chemical Area #1

These areas are identified on Figure 3 as containing buried chemical wastes. Like the other buried waste areas, these areas are assumed to be unlined pits approximately 20 feet deep. They also are not regulated units, since they did not receive hazardous waste after November 19, 1980. The existence of the unit identified as "buried waste," adjacent to the maintenance facility, has not been substantiated in a review of facility records by ESII-B. It was initially identified based on employee interviews.

Trench 11

Trench 11 is an active, RCRA-regulated unit located along the north edge of the site. It was created by ESII-B after its purchase of the site. The trench is unlined and is filled nearly to grade. ESII-B intends to place waste in trench 11 to above-grade levels. The unit is reported to have an approximate depth of 50 feet. Many drums were exhumed from trench 11 in 1984 due to reports that drums containing free liquid hazardous waste and improperly solidified, liquid hazardous waste had been disposed in it. Exhumation efforts were ceased before all of the drums were removed, based on personnel safety considerations, the amount of free liquids being found in the exhumed drums, and estimation of the fluid retention capacity of the trench. A leachate detection system, consisting of two standpipes placed in low areas of the trench, was instituted subsequent to this activity.

Trench 5

Trench 5 is a new, double-lined trench that reportedly began receiving PCB wastes in November 1986 and RCRA wastes in December 1986. It is the only land disposal unit that may qualify to receive federally-directed CERCLA wastes, since no other trench at ESII-B is lined, and since no special demonstration was made showing that disposal in any unlined units is adequately protective of human health and the environment.

Trenches 10a and 10b

Trenches 10a and 10b are located adjacent to trench 11. They are RCRA-regulated units, having received hazardous waste after November 19,

1980. The trenches are assumed to be 40 feet deep. They have not been closed, but are presently covered with native soil from the site. It is anticipated that they will be closed subsequent to the final RCRA permit determination and along with closure activities for trench 11.

Pads 4 and 5

These areas, used as solidification pads until sometime during 1984, are identified on Figure 3. Pad 5 is now used for container storage and handling. Pad 4 is next to the process facility and is used as a staging area for drums. Although some decontamination activities have taken place, it has not yet been demonstrated that land disposal of hazardous waste or hazardous waste constituents did not occur as a result of the operation of these units for solidification activities. ESII-B is obligated to address these units in its closure plan unless removal to background levels is demonstrated prior to facility closure.

Collection Ponds 1,2 and 3 and the Evaporation Pond

These ponds, constructed in 1984 pursuant to an EPA administrative order to better manage and control on-site run-off, are located in the northwest and northeast corners of the site, near the center of the site, and in the middle of the eastern edge of the site, respectively. In a letter from Lee Cleveland of Envirosafe Services, Inc. to EPA Region 10, dated February 11, 1986, it is stated that "the units are not regulated units and do not contain hazardous liquids." They are not considered to have qualified for interim status, and therefore may not receive hazardous waste. Leaks have been detected in the

primary liners of the evaporation pond and collection pond 3. Repairs have been made, and monitoring is being continued to determine if all leaks have been repaired.

Drum/Container Storage Areas

Drums are currently stored near silo 3 (pad 5) and on a concrete slab (pad 4) in the processing plant. The earlier uses of pads 4 and 5 for solidification are discussed above.

For a period after November 19, 1980, many drums and containers were stored on ground surface (with no secondary containment) in the area roughly bounded by trench PCB 4, trench 10, and trench 5. Poor container management practices occurred in these areas, with leaking drums and improperly closed drums identified by EPA and IDHW inspectors. An administrative order issued by EPA in 1984 required sampling of the soils in the affected areas. However, sampling and analytical efforts by ESII-B following soil excavation in these regulated storage areas have failed to demonstrate complete decontamination to background levels. Unless such demonstration is made prior to facility closure, ESII-B is obligated to address these areas in its closure plan.

Temporary Solidification Pond

This area is located south of trench 5 on the western side of the site. The lower aquifer is the uppermost aquifer at this unit. The unit was a lined pit in the ground, used for hazardous waste solidification during 1984. Cessation of use of this unpermitted unit, and soil contamination studies of

this area, were required by the 1984 EPA administrative order; however, analytical data from soil sampling has not yet been submitted. The liners and some soil have been removed from the area, and ESII-B has stated its intention to excavate additional soil from the area and resample prior to submitting analytical data confirming clean-up. ESII-B is obligated to address this unit in its closure plan unless removal to background levels is demonstrated prior to facility closure.

FACILITY DISCUSSION OF OPERATIONS

Facility representatives were questioned regarding operations at the site. The following is a summary of their responses. It was indicated that bulk stabilization of liquids has not been conducted at the facility.

Solid Waste Management Units

When asked if information contained in recent submittals to EPA (made upon request pursuant to § 3004(u) of RCRA) regarding past waste disposal practices at the site was complete, facility representatives indicated that an underground concrete tank, believed to be an old electrical vault, had been discovered east of the operations trailer following soil subsidence above it. This finding was not included in the subject documents. The tank is located on the side of the site road opposite the laboratory and the administrative trailer. The facility also has discovered a corrugated drainage pipe which is part of an old military drainage structure. It was discovered in a magnetometer survey southeast of trench PCB-4, and is said not to contain any waste.

The company's original submittal to EPA on past disposal practices identified buried waste northwest of the maintenance trailer, and buried transformer skins (two locations) west of trench PCB 4, but these were not confirmed in a review of facility records, according to ESII-B.

Facility representatives indicated that land disposal conducted by the prior owner of the site was generally shallow, on the order of 10-20 feet deep. Information available concerning the nature of the covers on the units is limited, according to ESII-B, but the trenches are believed to be covered with three feet of soil. The horizontal locations of past disposal units are believed to be within 10 feet of the locations identified in the 3004(u) submittal. The units were surveyed pursuant to the state's conditional use permits. Survey information was submitted to EPA by letters, dated May 30, 1986 and March 17, 1987.

Facility representatives indicated that the silos are gunnite-sealed both inside and out, have walls which are eight feet thick, and were constructed without calcium-treated concrete to avoid drying and cracking.

Trench 5

The facility engineer described the installation of trench 5. The original lining was installed in 1984. It is now double-lined with 40 and 60 mil HDPE liners. Following the original excavation of native soils, the area was hand-raked, and all aggregate larger than 1/2-inch was removed along with any remaining sharp particles. The liners were installed in the south one-third of the trench. A double connection was used on all seams. All seams were pressure-tested and where greater than a 5% loss in pressure was

observed the seams were patched. Twelve inches of sand have been placed over the primary liner in the bottom of the trench along with a four-inch HDPE perforated pipe wrapped with geotextile, which was installed in the sand as a leachate detection system. A hole was found in the primary liner. A third liner was placed over the top of the primary liner in the bottom southern third of the trench to plug the hole. Between the primary and secondary liners is a sand layer of about 18 inches. A drainage net and a french drain with 4-inch HDPE pipe has been installed between the liners for leak detection.

The final two-thirds of the trench have three feet of compacted clay under the two liners. The liners are 60 and 80 mil HDPE, respectively.

Leachate Observation

According to facility records, leachate observation standpipes are installed in trenches PCB 1, PCB 2, PCB 3, PCB 4, Chem 1, Chem 1B, Chem 6, Chem 6B, RCRA 10b, and RCRA 11 (two standpipes). These pipes are checked monthly for the presence of liquid. In trench 11 a french drain of gravel, two feet deep, with a PVC riser-pipe which has a 10-foot screen and a 4 foot silt-sump, has been installed in the lowest part of the trench, according to the facility. There is a gravel trench between the two leachate detection pipes.

Inspection logs for these standpipes from June 1983 through May 1986 were reviewed. The pipes are checked monthly for liquid with an electrical conductivity meter or weighted sponge. On the following occasions liquid or dampness in the pipe(s) was noted, as recorded in the logs:

- liquid detected on 2/28/86 in trench 11 (11 B).
- dampness noted on 8/30/85 in trench PCB 4.
- dampness noted in trench 11 (11 A) on 8/30/85.
- liquid found on 7/26/85 in trench PCB 4 (300 milliliters was removed).
- dampness noted in PCB 4 on 11/9/84.
- dampness noted in all standpipes in 12/83 and 1/84.
- dampness noted in PCB 1, PCB 2, Chem 1, Chem 2B, Chem 6, and Chem 6B on 9/16/83.
- dampness noted in Chem 2B in 8/83.

Samples were withdrawn from the leachate pipes in PCB 4 on 8/7/85, and from pipe 11 B on 3/3/86. The sample from the PCB trench was analyzed for pH, TOC and PCBs. Recorded results indicate less than 1 ppm PCB, 7.37 pH, and 18 ppb TOC. The sample from trench 11 was analyzed for pH (6.88), PCBs (less than 1 ppm), TOC (62 ppb), conductivity (800), chloride (57.5), and hardness (56.1) (units for conductivity, chloride and hardness were not identified in the report). Metals and organic analyses were not conducted.

According to facility representatives, disposal at the site since ESII-B obtained the facility, until the time of this inspection, had been in trenches PCB 4, PCB 3, 11, and 10b. Trench 11 was excavated to 50 feet, and trench PCB 4 to 40 feet. Both of these trenches are said to have bottoms that slope to a low point. Leachate observation standpipes have been installed in the trenches. Synthetic liners do not exist in any of the trenches, except trench 5, which began receiving waste in November 1986. Some unlined trenches reportedly have a charcoal base.

Stabilization and Solidification

The locations on site where solidification of waste occurred were identified by facility representatives. They are pad 5, pad 4, a temporary pond south of trench 5, the concrete pads near silos 1 and 2, and the bulk solidification plant. Concrete pads exist in all these areas except the temporary area, where a double synthetic/soil liner (described previously) was said to have been used to cover the depression where the solidification occurred. Solidification of bulk loads occurred on pads 4 and 5 and in the temporary solidification pond, but ceased in 1984, pursuant to an administrative order issued by EPA. Solidification was also said to have been conducted in the silos by the prior owner of the facility.

Surface Impoundments

The evaporation pond and three run-off collection ponds, which are not interim status hazardous waste management units, were constructed in the same manner as the first 1/3 of trench 5, according to the facility. They have a 60 mil HDPE primary liner overlaying a leak collection zone. The secondary liner is 40 mil HDPE placed over base geotextile on compacted, native soil. The leak collection system between the liners consists of 12-18 inches of free-draining, granular materials with a geotextile-wrapped HDPE drain pipe. The ponds do not, however, have a leachate detection system above the primary liner since liquids are placed in these impoundments. Above the primary liner is an 18-inch bed of sand and cobbles to protect the liner. Construction of the surface impoundments was completed and all were put into operation in October and November 1984.

According to facility inspection logs, liquid was detected in the leak detection systems in collection pond 3 and the evaporation pond on August 30, 1985. Memos to the file indicate that approximately 2300 gallons were pumped from between the liners in the evaporation pond in October 1985, and more than 20,000 gallons during the period February through March 1986. Approximately 4000 gallons of liquid were pumped from collection pond 3 during September, October and November of 1985. Another 2000 (approximately) gallons were pumped out between February 25, 1986 and April 24, 1986. Samples drawn from the leak detection systems were analyzed for pH and TOC, and in some cases for conductivity, total hardness, and chloride. Values for pH ranged from 9.69 (evaporation pond) to 6.81 (pond # 3).

Disposal records indicate that the following materials have been placed in the evaporation pond: liquid waste from the truck wash sump; liquid waste from the lab sump; liquid pumped from the trench 5 primary leachate detection system (prior to the time the trench began receiving waste); liquid from collection ponds 1, 2 and 3; liquids from containment at the power dome; drilling water; water collected from silo pad 3 and pads 4 and 5; plant sump liquid; silo pump test water; water from the RCRA and PCB tank containment areas; rain water collected at the PCB building and from puddles around the site; bulk receiving dock sump water; and PCB building filtered water.

Analyses of lab sump waste were conducted from January to June 1985, for pH, TOC, PCBs, arsenic, silver, barium, cadmium, chromium, lead, mercury and selenium. Analyses for EP toxicity pesticides were also conducted for samples drawn on April 29, 1985; May 6, 1985; and May 13, 1985. The results of these limited analyses did not indicate that the materials were characteristic

hazardous waste. During the same period, analyses for pH, TOC, and, in some cases, PCBs, chloride, hardness, and/or conductivity were conducted on rain water collected from puddles, storage areas, the bulk receiving sump, the drum unloading sump and bay area, the plant sump, decant sump, pad 4, T-4 tank sump, PCB tank sump, PCB tank containment area, RCRA tank sump (T-5 & T-6), pad 5, PCB capacitor building, Pad 3, PCB drain and flush area; and on other liquids including filtered water from the PCB area. The results are limited for purposes of hazardous waste characterization, but do not indicate that any of the materials tested is a hazardous waste. In general, the following values were recorded: TOC less than 100 ppb; pH between 6 and 11; and PCB less than 2 ppm, although there were instances of higher values for PCBs and TOC.

Disposal records indicate that the following materials have been placed in the following collection ponds: pond 1 - rain water from trench 11, water from trench 5 (up to 11/8/85); pond 2 - rain water from trench 11; rain water from pad 4, trench 5 rain water and water from leak detection systems (until 11/22/85), decant sump rain water, bulk receiving and decant sump rain water; collection pond 3 - truck wash overflow. Samples drawn from the impoundments were analyzed in most cases for pH, conductivity, total hardness, TOC and chloride. Reported values for pH ranged from 10.95 (pond 1) to 7.07 (pond 3).

The inspection log for January 31, 1986 shows damp soils reported in the leak detection system for collection pond 2. The log for November 30, 1985 indicates water in the leak detection system in collection pond 1. No records were provided to indicate that any pumping had been conducted at these two ponds. Dye tests were conducted in the three collection ponds and in the

evaporation pond. Magnesium chloride was also used in the collection ponds as a tracer for purposes of leak detection. According to the facility, leaks were suspected in collection pond 3 and the evaporation pond. Leaks which were located were repaired, and the facility is continuing to monitor for evidence of any remaining leaks.

The facility has conducted daily inspections of the surface impoundments (collection ponds 1, 2, and 3, and the evaporation pond) on site since July 1, 1985 for problems, including damage, maintenance of freeboard, and dike integrity. Problems were noted on reports of inspections conducted from 5/21/86 to 6/3/86. A hole in the primary liner above the water mark was noted for collection pond 1 on logs from 5/22/86 to 6/2/86. Duct tape was used to provide a temporary patch and was checked daily. On the 6/3/86 log it was noted that the run-on pipe for collection pond 1 had washed out, and the down pipe was clogged. It was noted that corrective action needed to be taken but that the pond could continue to operate.

Implementation of the Facility Contingency Plan

Reports provided indicated the following:

- On May 31, 1983, on pad 4, a fire occurred on the pond solidification area involving approximately 12,000 gallons of waste ink, paint sludge, degreaser solvents (non-halogenated), grease, oil, and halogenated solvents. The fire was brought under control with bulldozers, foam and water-fogging after approximately 200 gallons of the waste were consumed.

- On April 25, 1984, while solidifying waste containing methylene chloride, methyl alcohol, and a proprietary chemical Naprone, an odor was detected and said to be from methyl mercaptan. The material was landfilled and backfilled with clean fill to control the odor after solidification.

- On January 18, 1984, vapor releases were detected from two drums of organophosphate pesticide waste. The drums were overpacked and landfilled.

- On June 5, 1984, there was a release of organic vapors when solidified waste containing sulfamic acid was placed in trench 11. Ten to 15 cubic yards of activated carbon and clean fill were used to control the vapors and cover the area. The specific cause of the release was not determined.

- On November 16-18, 1984, 30 gallons of liquid leaked from incoming trucks containing PCB and solvent wastes. Liquids leaked on-site were said to have been contained and cleaned up. The liquids were solidified and placed in overpack drums. Soil removed as part of the clean-up was disposed in trench PCB 4.

Conclusions

The primary liners for the evaporation pond and collection pond 3 have leaked. The ability of these units to prevent liquid releases to the soil, particularly with regard to past activities, is not assured. However,

disposal records indicate that these units are not used for hazardous waste shipped to the site. Limited analytical data for purposes of hazardous waste characterization do not indicate that the materials disposed in the surface impoundments are characteristic hazardous waste. The generation of a vapor cloud in trench 11 on June 5, 1984, and the facility's inability to identify the cause of the incident, indicate a likely failure of waste analysis and/or tracking procedures.

EVALUATION OF FACILITY OPERATIONS

Laboratory Evaluation

Off-site contractor laboratories conduct the analyses of ESII-B's ground-water samples. The facility has an on-site laboratory which is used primarily for analysis of waste samples. A tour of that laboratory was conducted with the facility's laboratory manager to confirm that equipment necessary to implement the waste analysis plan was available. The equipment in the facility lab included a gas chromatograph (the lab manger indicated that the facility hopes to add columns to provide for PCB analysis at the parts per billion level), pH meters, EP extraction equipment, a TOC analyzer, an atomic absorption spectrophotometer, a hood, a refrigerator, an oven, and a dishwasher.

The lab manager explained that the laboratory technicians usually obtain the samples. Sampling information is recorded in a field notebook and on the facility internal control form (ICF). The lab logbook is used to assign numbers to samples of waste without ICF numbers, such as samples of rain water

and lab sump waste. The numbers are assigned by year and in sequence - e.g., 86-199 would be the 199th sample taken in 1986. Laboratory data for ICF loads are kept in lab notebooks, and are also transferred to ICF forms. Waste product questionnaires are also kept on file in the laboratory.

Hexane is used to decontaminate glassware by hand for the gas chromatograph. Waste from RCRA and PCB samples are handled as RCRA and PCB waste, according to the lab manager. Other wastes go to the lab sump, which is a double-lined, 1,000-gallon tank. These wastes are eventually disposed in the evaporation pond.

The site laboratory participates in EPA's water pollution laboratory performance evaluation studies. Records of participation between February 1985 and April 1985 indicate that the laboratory's performance was outside the range of acceptable values for analyses of arsenic, chromium, iron, mercury, and selenium. In a letter to EPA, ESII-B attributed the incorrect values for chromium and iron to calculation errors. The other discrepancies were attributed to outdated analytical standards, dirty equipment, and inappropriate analytical procedures (for selenium). The study conducted between August 1985 and October 1985 indicated that the ESII-B lab-generated results were outside of acceptable ranges for analytical results for zinc, pH, arsenic and selenium. Performance evaluation results for tests conducted between February and April 1986 were not provided.

Waste Analysis Plans

Before the facility treats, stores or disposes hazardous waste, it is obligated [40 CFR §265.13(a)] to obtain a detailed chemical and physical analysis of a representative sample of the waste sufficient to ensure proper treatment, storage, and/or disposal. Off-site facilities such as ESII-B are also required to inspect and, as necessary, analyze waste received to determine if it matches the identity of the waste described in the records submitted by the generator. ESII-B's waste identification procedures are described in the facility's waste analysis plans. Major revisions of the facility waste analysis plans occurred in 1983, 1984 and 1985.

In general, ESII-B's waste analysis plans require the generators to provide the necessary waste characterization data. On occasion, ESII-B may request a pre-shipment sample and conduct the necessary analyses for the generator. The plans also identify procedures for checking wastes upon receipt at the facility to verify the information supplied by the generator. The waste analysis plans used at the facility were reviewed to evaluate the ability of the facility to reliably identify and locate hazardous constituents managed at the facility, using operating records.

Facility personnel indicated that laboratory procedures for cyanide and sulfide analyses are not contained in the waste analysis plans, but did present written lab procedures used for confirming the absence of free cyanides and sulfides. The facility also has a series of standard operating procedure (SOP) documents which supplement the waste analysis plan:

RCRA Hazardous Waste Sampling - 3/1/84
ESII Classification Procedure - 11/23/84
Classification Procedure - Table 3 - 11/7/83
Quality Assurance Testing - 9/14/81
Quality Control Testing - 3/1/84
PCB Sampling Procedure - no date
Section 7 - Environmental Services - SOPs

According to facility representatives, the waste analysis plan and procedures in use from 1981 until December 1983 are contained in three documents: the Waste Analysis Plan (four pages, not dated), Sampling of Hazardous Waste Standard Operating Procedure (dated 8/28/80), and Quality Testing Standard Operating Procedure (dated 9/14/81). These plans and procedures fail to provide necessary technical detail. Specific deficiencies identified are as follows:

- A description of the parameters to be analyzed and an explanation of how selected parameters will provide information needed to properly treat, store and/or dispose of wastes received, are not included.
- The plan does not indicate test methods to be used.
- The plan does not include the sampling methods generators are to use in obtaining representative samples, although sampling methods to be used by ESII-B for incoming wastes are included.

- The plan does not address the frequency of analyses to be conducted by generators for specific waste streams to ensure that the analyses are accurate and up to date.

- The plan does not describe how waste analyses are to be conducted for different waste management processes at the site to assure compatability (e.g., at solidification units and landfills).

- The plan does not contain procedures to be followed if inspections show that a waste is unacceptable to the facility.

- The ESII-B document "Sampling of Hazardous Waste Standard Operating Procedure" describes sampling procedures for incoming waste loads, but it does not provide sampling methods for solids in both open and closed bed trucks, as called for in "Test Methods for Evaluating Solid Waste, SW-846, Second Edition" (SW-846). The plan calls for use of tubes for sampling, which is not among those devices recommended for sampling in SW-846. In addition, the sampling method provided does not address the need to obtain representative samples.

- The plans do not indicate that personnel involved in sampling will be trained and evaluated.

In 1983, a second waste analysis plan was developed. It became effective in December of that year. It was revised in June 1984. These plans improved upon the earlier plan, but the following deficiencies were identified:

- The plan does not describe the manner in which thin or viscous liquids will be homogenized to obtain a representative sample. The plan calls for using tubes for sampling and provides a method, but does not indicate how representative samples will be obtained.
- The plan indicates that a coliwasa sampler may be used for liquids, powders and some cakes. Coliwasa is not among those devices recommended in SW-846 for sampling of powders and cakes. Similarly, the plan indicates that a scoop may be used to sample liquids, when a scoop is not among the devices recommended by SW-846 for sampling liquids.
- The plan provides a sampling method for trucks, but it does not provide sampling methods for solids in both open and closed bed trucks, as called for in "Test Methods for Evaluating Solid Waste, SW-846, Second Edition" (SW-846).
- The facility classification procedure indicates that volatile, toxic liquids are not safe to handle. The waste analysis plan does not state that such wastes will not be accepted at the facility.
- The plan indicates that the facility will use special techniques to obtain very deep soil samples. A soil sampling plan to obtain such samples should be included.
- The plan and procedures do not provide for the periodic maintenance and servicing of laboratory equipment (standard operating procedures were later developed for equipment maintenance, dated 11/25/85).

- The plan calls for sampling 10% of containers received from off-site facilities; however, the plans and procedures do not describe a procedure for randomly selecting 10% of such containers for sampling.

- Although the plan and procedures include chain-of-custody procedures, they do not provide procedures to determine the disposition of remaining samples after analysis, and to document and record test results.

The waste analysis plan in use at the time of the inspection was implemented on 5/31/85. It also improved upon the earlier plans; however, potential deficiencies were identified, as follows:

- The plan calls for screening by composite sampling of up to 10 drums. Analysis of the individual container samples without compositing (so as not to mask the presence of material that does not fit the description) would be a more reliable screening procedure.

- Compatability testing/determinations should be performed for all stabilized or solidified waste designated for land disposal. The plan indicates that this is not routinely done. It is stated in the plan that "...incompatible materials when solidified/stabilized properly become compatible." The plan should also identify how landfill and storage cells are designated so as to assure adequate separation of incompatible materials.

- The stated sample holding time in the plan for mercury analysis is 38 days. The EPA recommended holding time is 28 days (SW-846). In

addition, the plan indicates that no preservation is required for samples requiring determinations of settleable matter. This is contrary to EPA methods which call for maintaining such samples at 4 degrees centigrade.

- The plan provides for the use of tubing, spatulas, and vacuum samplers as sampling devices. These are not included in SW-846. The plan describes the equipment and how it is used, but does not indicate how representative samples are to be obtained using this equipment.
- The plan does not describe procedures that the laboratory will follow to record the disposition of remaining samples after analysis and to document and forward test results for filing.
- The waste product questionnaire instructions for generators calls only for providing percent ranges of constituents in the waste, but does not call for providing concentrations to the ppm level for hazardous constituents at less than 0.1%, as required in the prior waste analysis plan.

Waste Analysis and Tracking Records

Any hazardous waste load received at ESII-B is assigned a unique tracking number. Each container in that load is marked with that number. Records for that load reference the tracking number, referred to as the internal control form (ICF) number. Storage locations are recorded on the ICF. Disposal locations are recorded on field disposal forms, on the ICF, and

on a three-dimensional map of the disposal trench. The 3-D disposal maps were examined for several of the waste loads received. The disposal trench in use at the time of the inspection (trench 11) is divided into cells approximately 70 feet wide by 5 feet long by 15 feet high for purposes of recording disposal location. The records reviewed indicate the cells in which the wastes are buried.

The facility records for a number of loads received in 1982, 1983, 1984, 1985 and 1986 were copied for review. The results of that review indicate the following: in several cases, waste analysis records for loads received prior to 1983 were not complete, including in some cases, the absence of ESII-B fingerprint results, and in others, incomplete waste characterization data; generator laboratory analysis data sheets were not available for most wastes received, although waste product questionnaires were submitted; and many of the completed waste product questionnaire forms provide broad percentage ranges rather than the specific concentrations. Information on sampling methods used for each waste was not provided.

Training

The waste analysis plans in use after 1983 indicate that personnel involved in sampling incoming waste loads will be trained. Records provided on the training of employees who perform sampling and analytical work were requested and reviewed. Resumes and employment applications that described relevant training and education obtained outside of employment at ESII-B were not examined.

Records provided on training of samplers indicate that a single two-hour course on sampling was offered on May 21, 1986. A memo to the file indicates that the laboratory technician who assumed that position in August 1985 received on-the-job training from the previous lab technician. No other records were presented to document sampling training for that individual. The facility provided no records indicating that training had been provided to personnel who perform analytical techniques; however, training for such personnel may have been obtained prior to or apart from their employment by ESII-B.

Conclusions

Sampling and analytical information available for several of the waste loads reviewed, particularly for the years before 1984, were incomplete. Deficiencies were also identified in the current and past facility waste analysis plans.

Problems were identified in laboratory performance and sampling methods. Classroom training of samplers has been deficient. A two-hour sampling training course is unlikely to provide sufficient time to present and make understandable all necessary information regarding sampling procedures and techniques.

Consequent to these findings, it must be concluded that monitoring of ground water potentially affected by each unit cannot be limited to constituents identified in the operating record as being handled in that unit. Should there come a time when assessment or compliance ground water

monitoring is required at the facility, a more thorough analysis of the ground water would be necessary than might otherwise be required if the identities of constituents disposed were more completely known. However, this situation is also attributable to the nature of the disposal activities which occurred at the site before it was owned by EnviroSAFE Services.

SITE HYDROGEOLOGY

Site Characterization Efforts

Investigations into the hydrogeology of the ESII-B site have been reported in the original Part B permit application, December 1983; revised Part B application, January 1985; ESII Site B Hydrogeology and Ground Water Monitoring supplement, March 1985 (appendix K); Supplemental Analysis of Hydrochemical Conditions at ESII Site B, November 1985; Interim Progress Report - Site Characterization - Proposed Trench 14 Area, ESII Site B, November 1985; and ESII Site B Site Characterization and Ground Water Monitoring Program, February 1986. The content of this section draws extensively on the information included in the February 1986 report.

The site characterization has been accompanied with mapping of the local geology [Benfer, J.A., 1984, Geology in the Vicinity of the EnviroSAFE Hazardous Waste Site (Site B) near Grand View, Idaho] in the vicinity of the facility and with demonstrations of how the site fits into the local geology. The site itself was studied with 52 test borings, of which 13 were continuously cored, 30 were geophysically logged, 34 were completed as test wells and five were completed as piezometer clusters. Fourteen slug or pump tests were done to determine the aquifer properties. The mineralogy of the sediments were studied using X-ray diffraction, and geochemical water analyses were done to explain the distribution of inorganic parameters and to support the hydrogeologic evaluation.

Physiographically, the site is located on the Snake River Plain that extends from Asotin, Idaho to Ontario, Oregon. The site's elevation varies from 2525 to 2635 feet above mean sea level and is 250 feet above the Snake River flood plain. The Owyhee Mountains are 25 miles to the south of the site, and the Snake River is approximately 2.5 miles east and north of the site. Castle Creek is a perennial stream about one mile west of the site, and Cloud Burst Wash is an intermittent stream about two miles east of the site.

The Snake River Plain is underlain by 5000 feet of sedimentary and interspersed basaltic flows over a basement complex of silicic volcanics. The sedimentary deposits are assigned to the Idaho Group of Miocene to Pleistocene age. Figure 6 represents the generalized stratigraphic column for the area. The Idaho Group was deposited under three distinct episodes of lava damming of the ancestral Snake River. These episodes resulted in the formation of large lakes across the region. Lacustrine deposits predominate and form the most contiguous sedimentary beds. The Snake River Basalts are regionally the youngest formation but are absent from the vicinity of ESII-B.

ESII-B and the Snake River are located in a down-faulted block bounded by normal faulting. The dip of the sedimentary units is gentle to the northeast at about two to four degrees. Faulting has been observed on a regional scale in the Idaho Group, but has not been observed locally near ESII-B.

The Bruneau and Glens Ferry Formations of the Idaho Group are of prime importance in the characterization of ESII-B. The Bruneau Formation comprises the surficial sediments of the ESII-B site to a depth of up to 110 feet. The

Figure 6.

AGE	FORMATION	
PLEISTOCENE	SNAKE RIVER BASALT	
	BRUNEAU FORMATION	IDAHO GROUP
PLIOCENE	GLENN'S FERRY FORMATION	
	CHALK HILLS FORMATION	
MIOCENE	BANBURY BASALT	
	POISON CREEK FORMATION	
	IDA VADA VOLCANICS	

STRATIGRAPHY OF THE WESTERN
SNAKE RIVER PLAIN
(MODIFIED AFTER MALDE AND POWERS, 1962)

Glenns Ferry Formation contains the two aquifers that are monitored at the facility. The deeper formations of the Idaho Group contain the regional, deep, artesian aquifers at depths of 2000 to 3000 feet. The artesian head in the regional aquifer is usually above the ground surface throughout the area. One well (not part of the monitoring network), which previously existed at the facility, tapped the regional aquifer. The well had a head 160 feet above the ground surface or about 300 feet higher than the potentiometric surface in the shallower aquifers in the Glenns Ferry Formation. That well was permanently sealed in March 1986.

The Bruneau Formation is an unconsolidated lake deposit made up of deep and shallow facies. Only the near-shore beach facies of rounded pebbles and cobbles with coarse sand are present at the site. These coarse sediments vary from zero to about 110 feet thick, but in general are about 50 feet thick over most of the site.

The Glenns Ferry Formation occurs below the Bruneau Formation and is about 1550 feet thick at the site. The formation is made up of lacustrine, fluvial, and flood-plain depositional facies. The upper fluvial sequence contains many thick-bedded fine sands and silts containing a few clay seams. These sediments are representative of lake-margin environments. This section persists to approximately 130 feet in the center of the site. The bottom contact of the fluvial facies overlies the lacustrine facies.

The lacustrine facies consists of thick-bedded clays and silts with minor beds and lamina of sand and silt-sand. The sequence expresses cyclic sedimentation with depth. This sequential, cyclic appearance reflects the

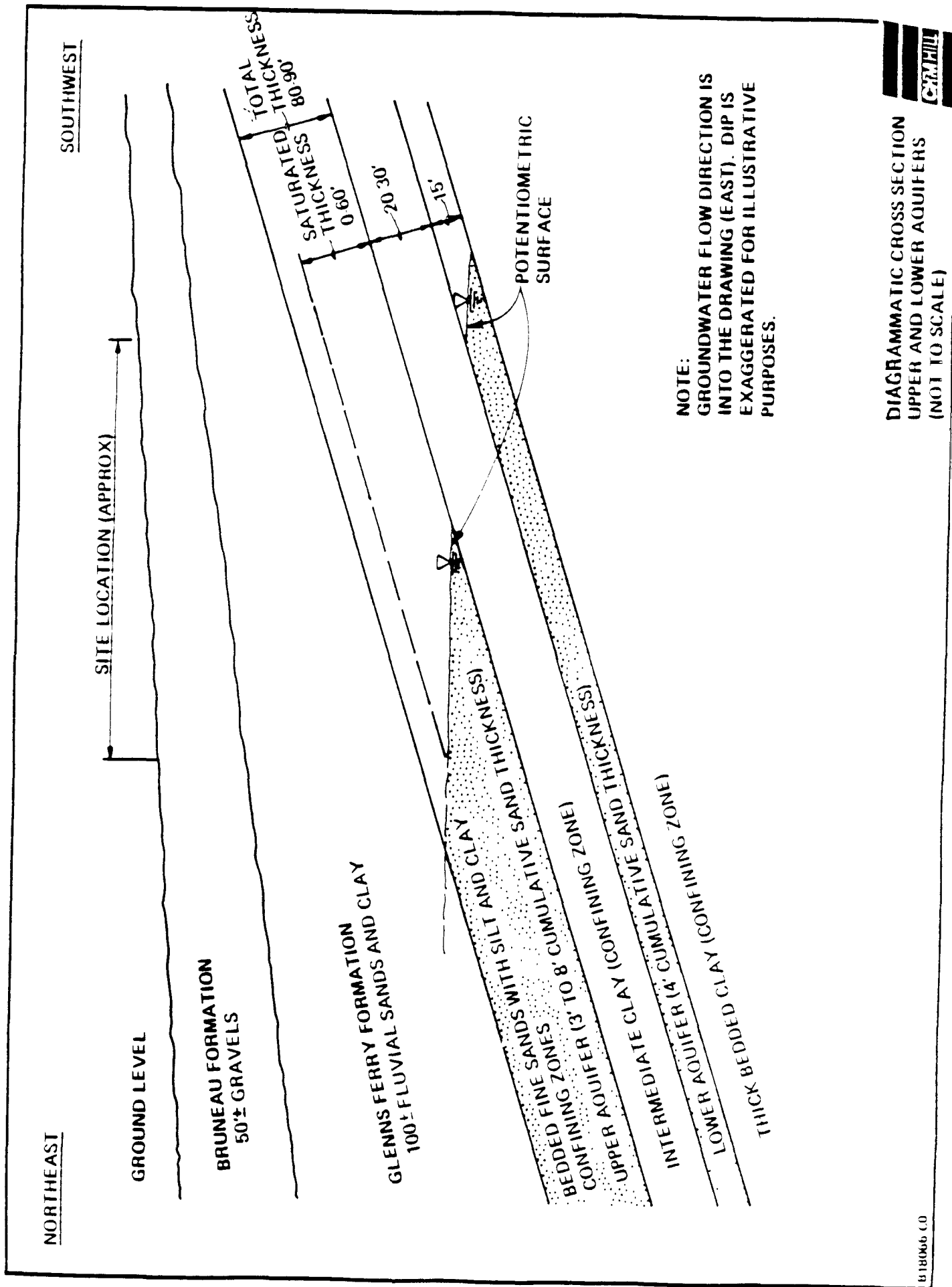
changes in deposition as the lake levels rose and fell. The first sequence of near-shore deposits underlying the fluvial facies occurs at approximately 160 feet. In the northwest portion of the site, the sequence contains numerous thin beds and lamina of silty sand separated by thin to thick bedded silts and clays. These sand beds appear to pinch and thin toward the south and east. Although a continuous zone of thin beds exists across the site, individual sand beds appear to be discontinuous. It is this zone of thin, discontinuous and laterally variable sand and silts that represents the upper aquifer.

The near-shore facies grades vertically downward into a deep lake deposit of thickly bedded, plastic clay. This clay unit, which is 20 to 30 feet thick and extends to a depth of 230 feet, is the confining bed separating the upper and lower aquifers. The clay unit grades vertically into another near-shore deposit of thick-bedded silt and thin-bedded clay containing thin-bedded sand and sand lamina.

The lower, near-shore sequence is the lower aquifer, extending to a depth of approximately 250 feet. This unit grades vertically into another off-shore facies that provides the basal confinement of the lower aquifer. Deep drilling activities on and near the site indicate strata below the lower aquifer to be predominantly blue clay and shale to at least 1770 feet.

As noted above, two water-bearing zones have been identified within the Glenns Ferry Formation. These two zones have been denoted as the upper and lower aquifers, illustrated in Figure 7 in diagrammatic cross-section. The upper aquifer consists of three to eight cumulative feet of thinly bedded sand within 80 to 90 feet of silt and clay. As a result of the northeasterly dip

Figure 7



of the strata, the upper aquifer gradually emerges above the potentiometric surface about half-way between the north and south ends of the facility. Individual sand seams above the zone of saturation along the southern limits of the aquifer intercept the potentiometric surface and become saturated along the northern side of the site. The potentiometric surface of the upper aquifer, shown in Figure 8, varies from 140 to about 200 feet below ground level. The ground water flow directions in the upper aquifer are generally west to east. Highest well yields occur in the northwest corner of the site, with decreasing well yields to the east and south.

The lower aquifer is saturated beneath the entire site. It consists of up to four feet of cumulative sand within 30 to 40 feet of bedded silts and clays. Figure 9 shows the potentiometric surface in the lower aquifer. The ground water flow direction in the lower aquifer is to the northeast. Well yields in the lower aquifer are less than one gallon per minute.

The upper and lower aquifers are separated by 20 to 30 feet of deep water facies clay. Three lines of evidence lead to the conclusion that the upper and lower aquifers are not interconnected: (1) the intervening clay beds are only partially saturated; (2) the two aquifers have different flow directions; and (3) there are significant differences in water chemistry between the two aquifers, as illustrated in Figure 10.

Table 4, taken from ESII-B's permit application, contains the principal hydraulic properties for the upper and lower aquifers that were used to determine the velocity of the ground water. The value given in the last column is ESII-B's calculated velocity of ground water in the sand seams and

figure 8

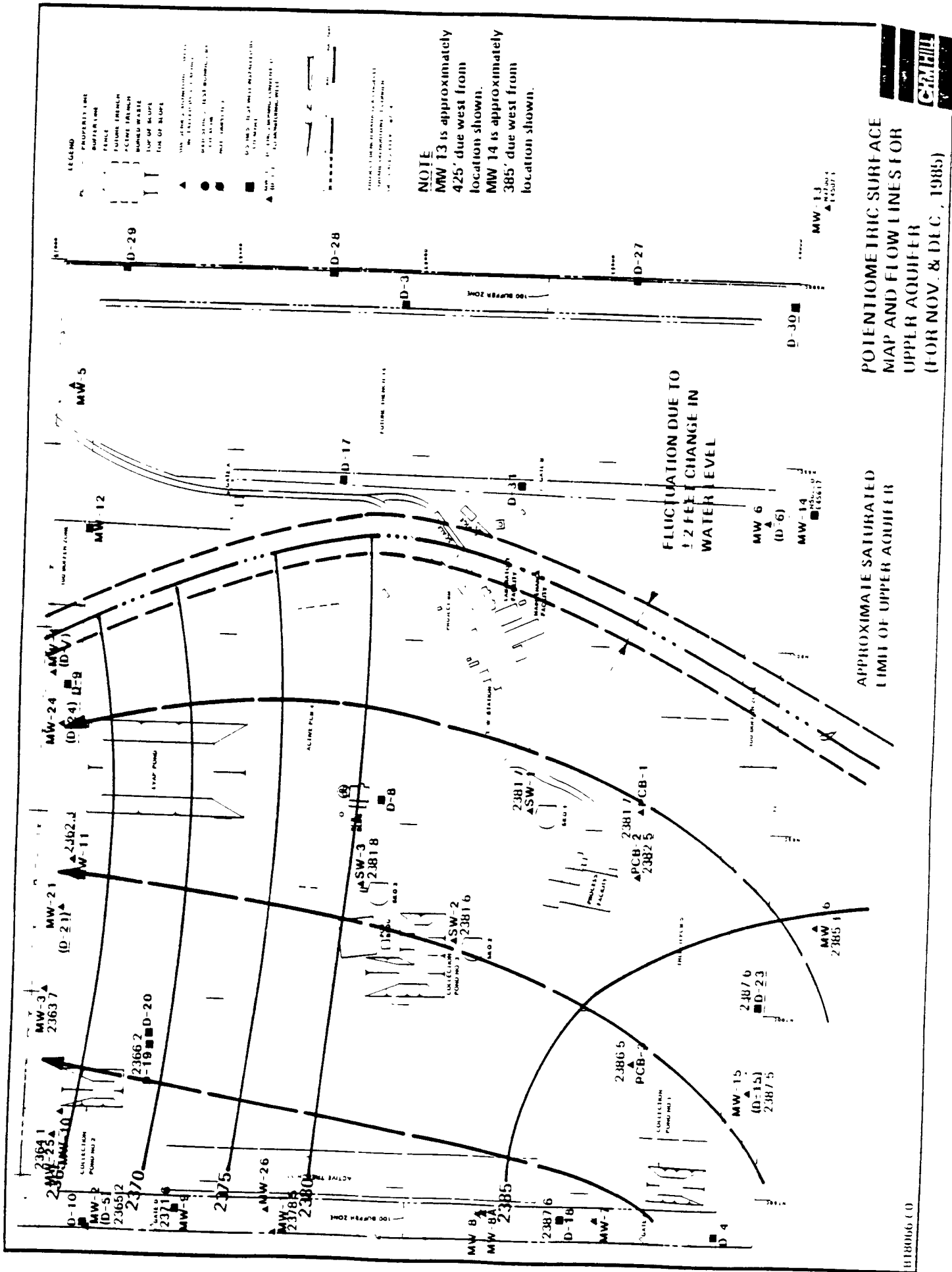
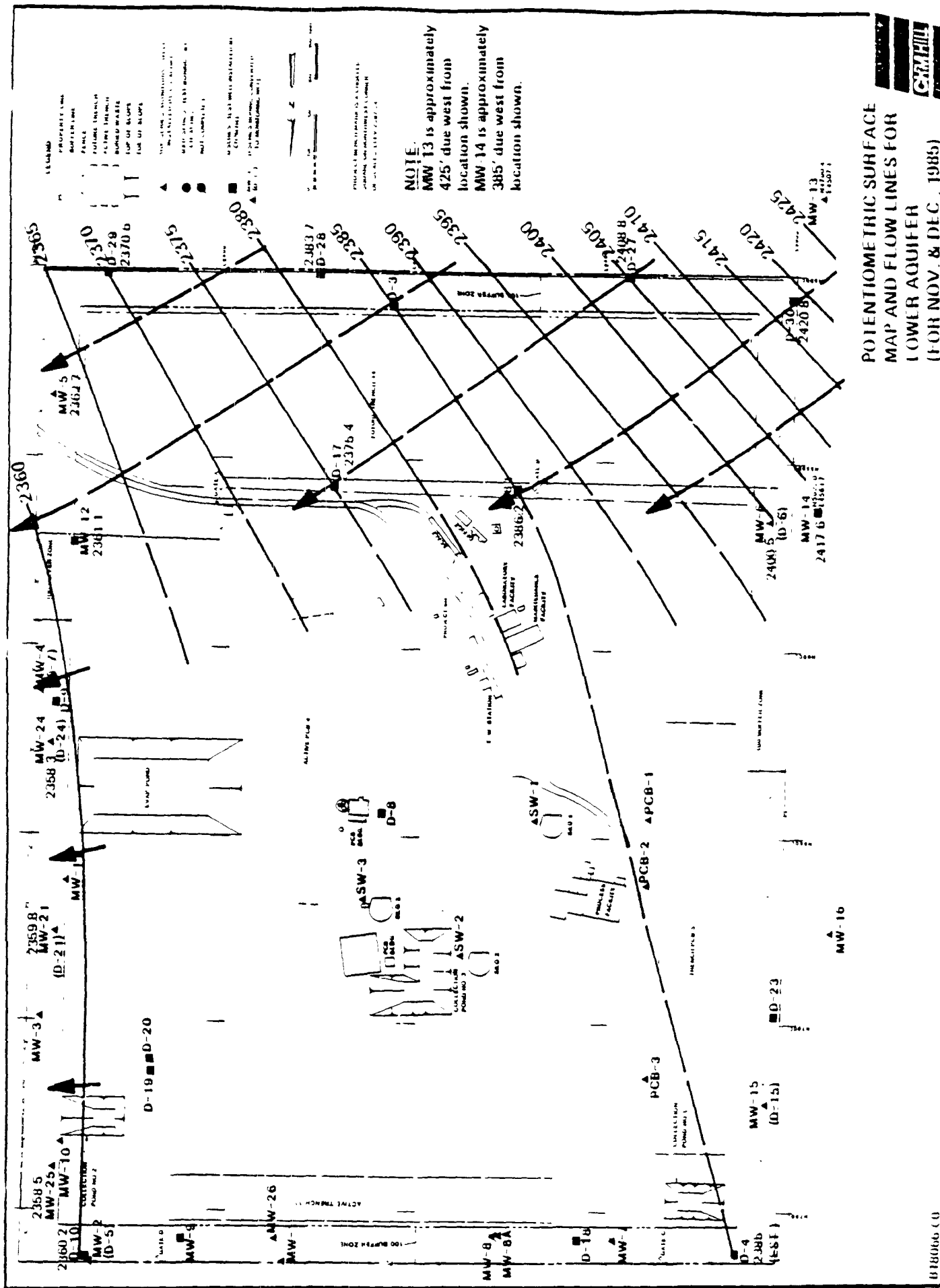


Figure 9



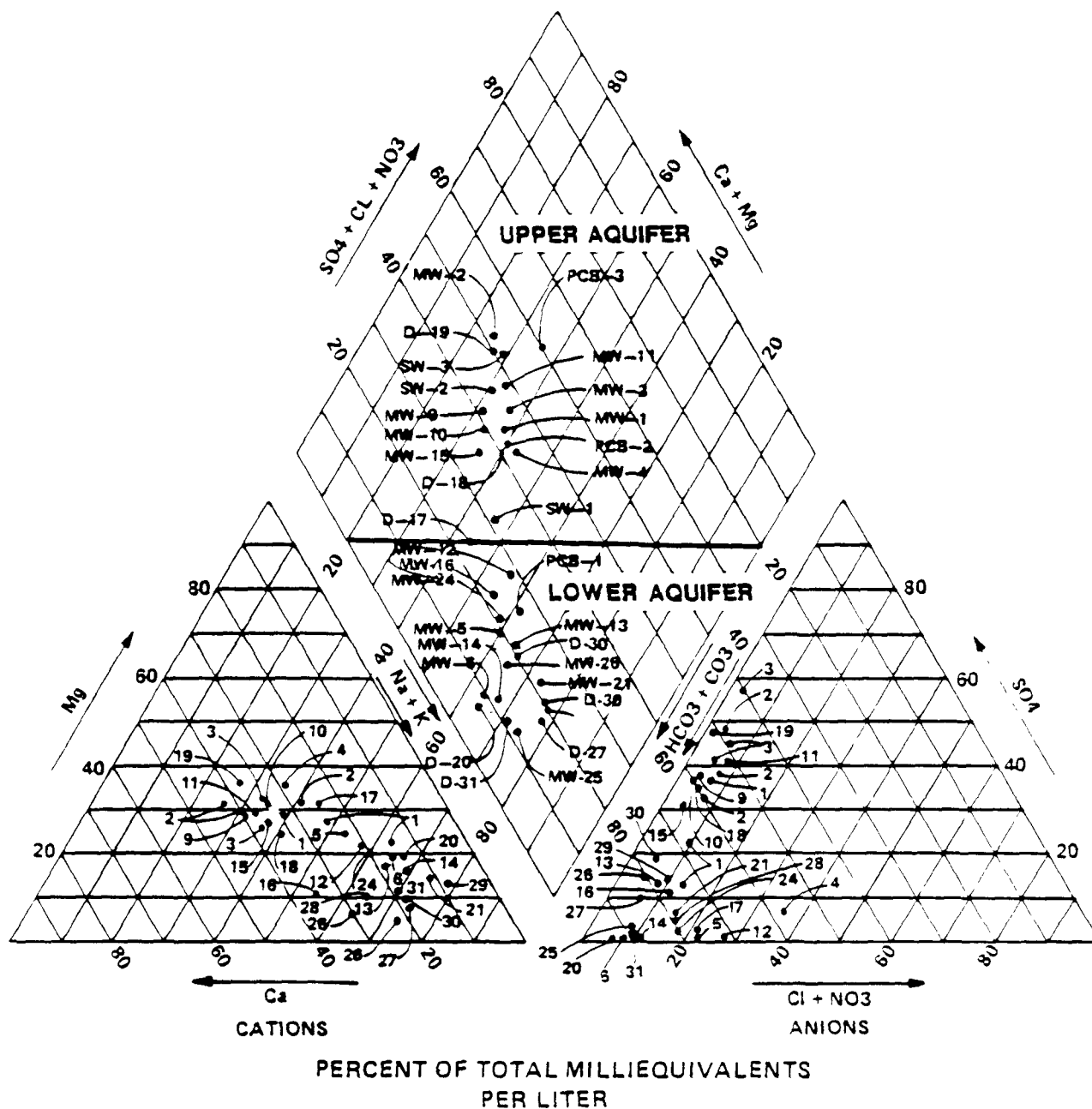


Figure 10
A Demonstration of the Geochemical
Differences between the Upper and Lower
Aquifers (Piper Diagram)

Table 4

SUMMARY OF PRINCIPAL AQUIFER DATA

Well	Aquifer	Test ^a Type	Transmissivity ft ² /day	Aquifer Test Section (ft)	Cumulative Sandbed Thickness (ft)	Measured Hydraulic Conductivity ft/day	cm/sec	Hydraulic Gradient ^b ft/ft	Groundwater ^c Velocity ft/day	ft/year
MW-1	Upper	R	21.0	22	5	4.20	1.5×10^{-3}	0.023	0.23	82
MW-3	Upper	R	14.0	22	4	3.50	1.2×10^{-3}	0.020	0.16	59
MW-10	Upper	P	14.0	47	5	2.80	9.9×10^{-4}	0.020	0.13	47
MW-11	Upper	P	2.1	46	3	0.76	2.5×10^{-4}	0.020	0.03	12
D-18	Upper	P	33.0	38	8	4.13	1.5×10^{-3}	0.010	0.09	33
AVERAGES			16.8	35	5	3.07	1.1×10^{-3}	0.019	0.13	47
MW-5	Lower	R	3.3	23	4	0.83	2.9×10^{-4}	0.019	0.04	13
MW-6	Lower	R	0.4	22	4	0.10	3.5×10^{-5}	0.038	0.01	3
MW-12	Lower	R	2.5	46	4	0.63	2.2×10^{-4}	0.019	0.03	10
U-17	Lower	R	No Fit, <0.1							
D-27	Lower		0.1	25	1	0.10	3.5×10^{-5}	0.038	0.01	2
AVERAGES			1.6	29	3	0.41	1.4×10^{-4}		0.02	7
MW-2	Span	R	4.5	26	5	0.90	3.2×10^{-4}	0.028	0.06	21
MW-4	Span	R	0.9	24	7	0.13	4.5×10^{-5}	0.019	0.01	2
MW-15	Span	P	3.3	60	8	0.41	1.5×10^{-4}	0.006	0.01	2
D-2	Span	P	10.0	50	7	1.43	5.0×10^{-4}	0.021	0.07	26
AVERAGES			4.7	40	7	0.72	2.5×10^{-4}	0.020	0.04	13

^aTest Types: P = Constant rate pumping and recovery
R = Evacuation and recovery

^bHydraulic gradients were based on the April 1985 potentiometric map
^cWith porosity, $n = .43$

beds within each aquifer. According to those calculations, which include an assumed value for porosity of 0.43, the velocities in the upper aquifer range from 12 to 82 feet per year, while the lower aquifer velocities range from less than two to 13 feet per year.

Recharge to the regional aquifer is at the Owyhee Mountains, 25 miles south of the site. The two shallow aquifers appear to be recharged by local sources. The probable source of both aquifers is Castle Creek to the west of the site and local areas of irrigation northwest of the site. Limited age dating of the shallow ground water has suggested that the ground water is more than 45 years old. This age is consistent with the time that would be required to move ground water from Castle Creek to the site, estimated to be from at least 64 years up to 2640 years, given the range of ground-water velocities (Table 3).

The data taken together present a picture of low to very low yielding aquifers that occur along a limited number of sand stringers over an 80 to 90 foot section for the upper aquifer and a 30 to 40 foot section for the lower aquifer. Because of the high upward gradient between the deep regional aquifer and the relatively shallow upper two aquifers, there is limited potential for migration of contaminants from the site into the regional aquifer. Because of the apparent lack of interconnection between the first and second aquifers, the ground water flow in these aquifers must be parallel to the bedding. The best means for monitoring the ground water, given this hydrogeologic scheme, is in the upper aquifer down-gradient of hazardous waste management units, in the second aquifer where the upper aquifer is not present, and in both aquifers at or near the estimated zone of transition where the upper aquifer becomes unsaturated.

GROUND WATER FLOW DIRECTIONS AND RATES

Water table contour maps for the upper aquifer and the lower aquifer were submitted by ESII-B in its Part B application and are shown in Figures 4 and 5. These maps are based on water level data obtained in November and December 1985. The water level elevations obtained by the field team during this inspection were in agreement with the general shape of the water contours for the two aquifers as presented by ESII-B.

In constructing its upper aquifer contour maps, ESII-B did not include data from three important wells, D-4, D-8, and D-10. Water level data for SW-1-2 and SW-3-2 became available after December 1985 and were therefore not included in the construction of the maps. In addition, ESII-B's map for the upper aquifer includes data from wells MW-2, MW-4 and MW-15, which span the upper and lower aquifers and which therefore should not have been included in the data base from which the maps were constructed. Because of these shortcomings, EPA independently contoured the water table of the upper aquifer. The resulting maps, constructed from data representing July and December of 1986, are shown in Figures 11 and 12, respectively.

As noted previously, it is believed that horizontal flow dominates beneath the facility due to the thick clay layers bounding both the upper and lower aquifers. Evidence that hydraulic separation of the upper and lower aquifers exists was also discussed. The direction of ground-water flow can be interpreted as being approximately orthogonal to the equipotential lines on the ground water contour maps.

North

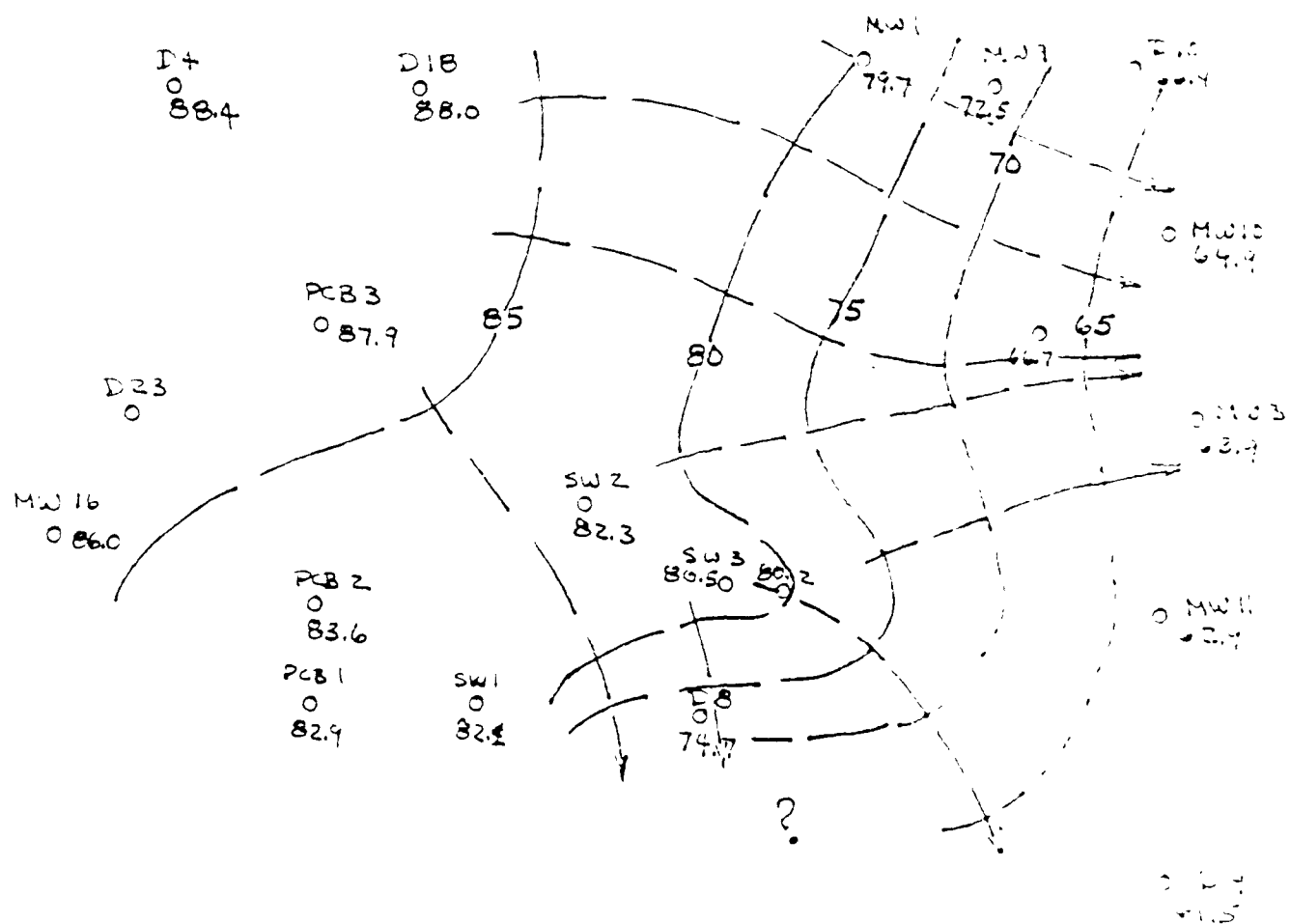


Figure 11
Upper Aquifer Equipotential
Contour Map for July, 1986

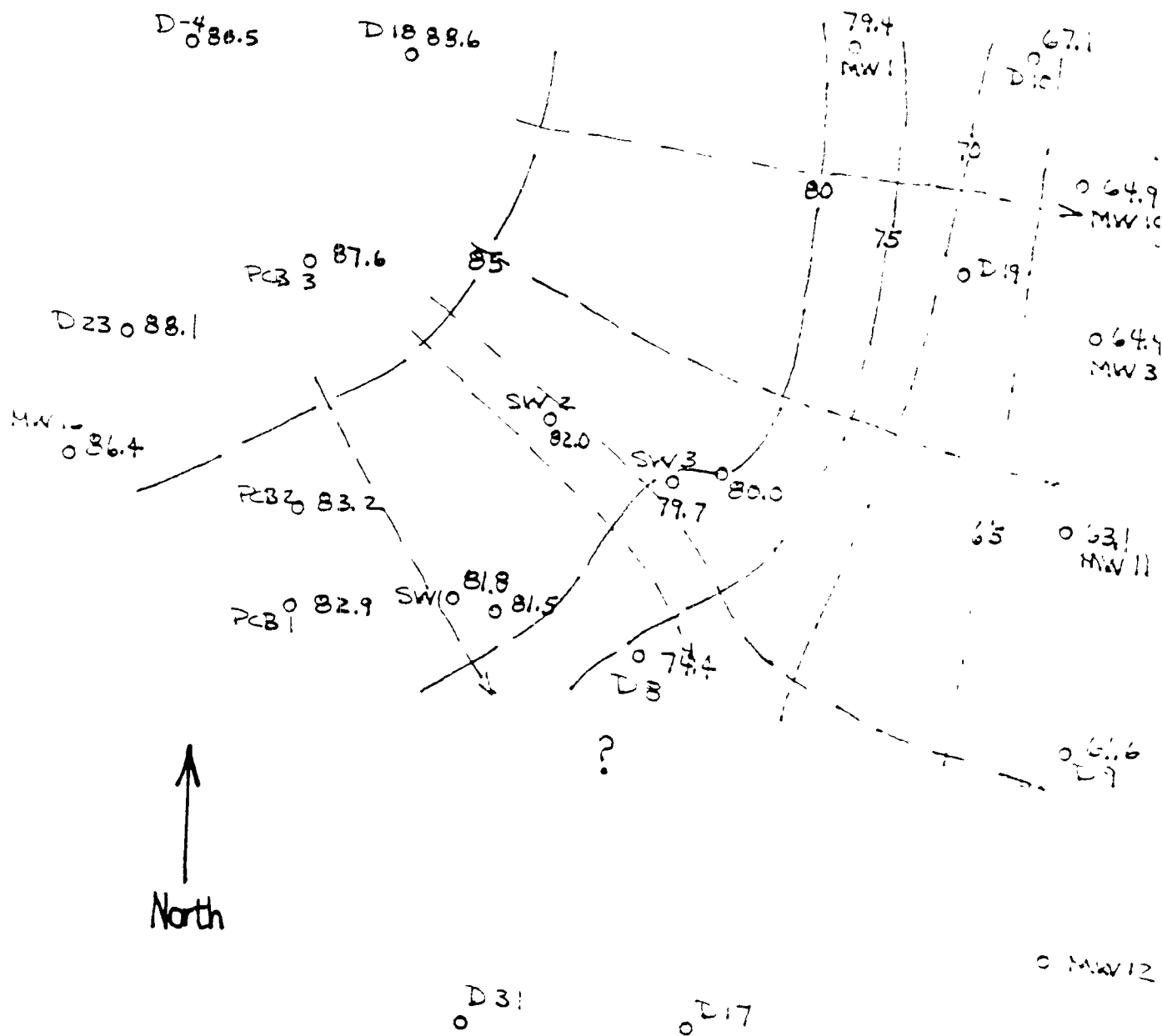


Figure 12
Upper Aquifer Equipotential
Contour Map for December, 1986

The ground water flow directions in the lower aquifer are generally from the southwest to the northeast, becoming more easterly toward the eastern boundary of the facility. The hydraulic conductivity of the lower aquifer has been measured in in-situ slug tests to range from $2.0\text{E-}5$ to $2.6\text{E-}4$ centimeters/second. These hydraulic conductivities, combined with the gradients from Figure 9 (and assuming an effective porosity of 0.2), result in ground-water velocities ranging from approximately 4 to 51 feet/year (as compared with 2 to 13 feet/year estimated by ESII-B).

The flow directions in the upper aquifer are more variable and are subject to some interpretation. The equipotential lines shown in Figure 8 indicate ground water entering the site in the northwest corner and emerging along the eastern boundary of the site along smooth curves. The more extensive data used in the July and December 1986 contour maps (Figures 11 and 12) indicate the existence of a more complex pattern of flow, internal to the facility around the silo complex (reference wells SW-3 and D-8 on each map). The data in this area suggest ground-water flow to the south and southeast rather than to the east as suggested in Figure 8. Whether the ground-water flow continues to the south is not known, because the next well to the south is D-17, for which the observation during drilling indicated the upper aquifer zone to be unsaturated. At this point, ground water flow in the upper aquifer has either turned to the east or entered the clay layer separating the upper and lower aquifers. Because of the higher hydraulic conductivity of the upper aquifer compared with that of the clay, the majority of the flow in the upper aquifer in this area may be assumed to be channeled parallel to the southern boundary of the upper aquifer. The increase in gradient near D-8 suggests an increase in velocity to move the converging ground-water flow in this area.

Such an interpretation of flow in this part of the facility would have ground water flowing east and exiting the site near well MW-4 (Figure 3).

The hydraulic conductivity in the upper aquifer measured for slug tests ranges from $1.5E-3$ to $5.4E-5$ centimeters/second. The highest values of hydraulic conductivity were measured in the northwest corner of the site. The hydraulic conductivity decreases toward the southern boundary of the upper aquifer. This decrease in hydraulic conductivity also may explain the bending of the equipotential lines toward the south in the area of the silos. If this is the case, then it is possible that ground-water flow from the upper aquifer continues into the intervening clay layer separating the upper and lower aquifers, as the upper aquifer sediments take on the characteristic of the clay (i.e., lower hydraulic conductivity).

The velocity of ground water in the upper aquifer is highly variable. EPA has calculated velocities in certain areas of the site which are significantly higher than those estimated by ESII-B (Table 4). The highest rates of travel occur in the northeast portions of the site, where the combination of high gradients, high hydraulic conductivity and an effective porosity value estimated to be 0.20, yield effective velocities that range from approximately 85 to 200 feet/year. Near the silos and toward the southern edge of the upper aquifer, the velocities are calculated to range from approximately 10.6 to 96 feet/year.

POSSIBLE VERTICAL RECHARGE

Four lines of evidence suggest that there may be vertical recharge to the upper aquifer under the ESII-B facility: (1) the distribution of the major ions in the ground water suggests vertical recharge; (2) the greater variability of the hydrographs in the upper aquifer suggests vertical recharge; (3) the presence of volatile organic chemicals detected in the monitoring wells downgradient of the silos (if verified as representing ground-water contamination) suggests vertical migration through the sediments above the upper aquifer; and (4) the equipotential lines of the upper aquifer contour maps bend around the silo area, as discussed in the previous section.

Two geochemical models have been proposed to explain the major ion distribution in the upper aquifer at ESII-B. The first, proposed by ESII-B, explains the distribution of major ions by the oxidation of pyrite, releasing iron and sulfate with a decrease in pH. The decrease in pH dissolves carbonate with the release of bicarbonate. The second model requires the breakdown of gypsum in the sediments overlying the upper aquifer as it is recharged vertically under the facility. The latter is favored by EPA, because the ratios of calcium and sulfate in the upper aquifer are consistent with those expected for the breakdown of gypsum, but not of pyrite.

The variability of the hydrographs for ground water levels is greater in the upper aquifer than in the lower aquifer. Changes in water levels in the upper aquifer at times have been nearly five feet. The variation in water levels is attributed by ESII-B to barometric effects and to errors in measurements. However, careful examination of the hydrographs and

precipitation records reveals a correlation of high rainfall with later higher ground water elevations. Furthermore, these same events are not observed in the lower aquifer.

At least the first three of these four phenomena have been individually and independently explained by ESII-B in some manner that would not require recharge vertically into the upper aquifer beneath the facility. However, taken together, they suggest that there are areas of preferred vertical recharge at the facility. Such areas are likely to have been caused by human activity, such as the installation of the silos and associated structures and former on-site waste water disposal activities which occurred when the facility was a missile base.

INTERIM STATUS GROUND WATER MONITORING PROGRAM

BACKGROUND

ESII-B operates as an interim status land disposal facility and as such is subject to the ground water monitoring requirements of 40 CFR Part 265 Subpart F. Prior to September 1983, ESII-B (and its previous owner, Wes-Con) believed that the shallowest, monitorable ground water beneath the site was contained in the regional, artesian aquifer located at more than 3000 feet below ground surface. Based on this assumption, Wes-Con had prepared a Ground Water Monitoring Waiver in 1981, just prior to selling the site to EnviroSAFE Services. EPA found the waiver to be inadequate in a September 1983 Notice of Deficiency, subsequent to which ESII-B instituted a drilling program to gather more information regarding the hydrogeology of the site. Those efforts demonstrated the presence of ground water at 182 feet beneath the ground surface on the northern edge of the site. At this point, it was apparent that a waiver demonstration was not feasible, and ESII-B chose to institute an interim status ground water program which would monitor the uppermost aquifer.

ESII-B proposed a system of six perimeter wells in October 1983, which EPA accepted as "a method of initially determining whether gross contamination is leaving the site." EPA also stated that "additional wells may be necessary." An administrative order issued by EPA to ESII-B on November 23, 1983, required the implementation of the proposal. The six wells (MW-1 through MW-6) were installed by the end of December 1983.

The initial ground water sampling event was conducted in January 1984, with EPA and IDHW obtaining split samples. A few organic hazardous constituents at very low concentrations were detected in the samples. On February 29, 1984, EPA issued ESII-B a Notice of Deficiency and Warning which, among other things, required ESII-B to "continue sampling and analysis of all existing and new wells on a monthly basis for all parameters required under 40 CFR 265 and for all priority pollutants and 40 CFR 261, Appendix VIII constituents detected by ESII, EPA or the state of Idaho. This monthly monitoring must be continued until permit issuance." In February 1985, after contamination was found in the silo wells, EPA required that a specific list of volatile organic compounds be added to the analytical parameter lists of upper aquifer, downgradient wells.

In May 1985, ESII-B submitted a revised site characterization/ground water monitoring program document to EPA as part of the facility's Part B permit application. This document included the finding that two aquifers, instead of one, exist beneath the site (both above the deep, regional aquifer). Wells MW-6, an upgradient well, and MW-5 were found to be located in the lower aquifer. An additional monitoring well (MW-15) was installed as an upper aquifer, upgradient well.

In order to better monitor both aquifers, seven additional wells were added to the interim status detection monitoring network in September 1985. One of these (MW-26) was later dropped from the network, as ESII-B claimed that it was screened at the wrong depth. Thus in September 1985, the 14 wells that comprise the current interim status ground water monitoring system were in place and being sampled monthly for the groups of parameters cited above.

In May 1986, ESII-B requested that the required frequency of sampling and the list of required analytical parameters be decreased. EPA responded in June 1986, with concurrence that the facility could implement quarterly, instead of monthly, sampling, but that the parameter list must remain the same until a new one had been developed by EPA for the facility. However, ESII-B apparently had already made the decision to discontinue the more extensive parameter list; as of May 1986, the facility has, by its own report, obtained samples for only those parameters required by 40 CFR § 265.92(c), with the following frequency: ground-water quality parameters, semi-annually; ground-water indicator parameters, quarterly. (Wells MW-3, MW-4, MW-10 and MW-11 are also sampled quarterly for Priority Pollutant volatile organic compounds, as part of the silo well monitoring program.)

LOCATIONS OF WELLS

The facility instituted a detection monitoring program in which wells at the perimeter of the site have been utilized collectively as downgradient wells for all of the regulated units. Figure 1 shows the locations of ground water monitoring wells at ESII-B. Wells designated by the facility as forming the RCRA detection monitoring program (at the time of this inspection) are listed in Table 5. Six upper aquifer and four lower aquifer wells are located near the facility boundary to monitor downgradient of the facility (although ESII-B claims that only four of the six upper aquifer wells are actually downgradient of present or past waste management areas). There are two upgradient wells monitoring each aquifer. According to water level contour maps, the locations of upgradient wells are appropriate.

Table 5

RCRA GROUND WATER MONITORING WELLS
FOR INTERIM STATUS DETECTION MONITORING PROGRAM
ESII-B

Lower Aquifer

upgradient wells

MW-13

MW-6

downgradient wells

MW-5

MW-21

MW-24

MW-25

Upper Aquifer

upgradient wells

MW-15

MW-16

downgradient wells

MW-1

MW-2

MW-3

MW-4

MW-10

MW-11

Units at ESII-B which are subject to interim status ground water monitoring requirements are trenches 5, 10 and 11; and areas on-site where disposal of hazardous waste or hazardous waste constituents occurred since November 19, 1980 and which have not been demonstrated to have been cleaned up such that no hazardous waste or hazardous waste constituents remain. The history and locations of these areas are discussed earlier in this report in the section on solid waste management units.

The ground-water monitoring requirements to which the facility is subject pursuant to TSCA are met by the three PCB wells (PCB-1, -2 and -3) immediately east of trench 5, and by certain upgradient and downgradient wells in the RCRA monitoring network. Thus the two systems are integrated to some extent and historically have had overlapping functions, which is the choice of ESII-B. The three designated PCB wells are immediately downgradient of trench 5. Disposal of RCRA-regulated hazardous waste in trench 5 is authorized pursuant to interim status, and the southern third of the trench has received approval for disposal of PCBs. Disposal of hazardous waste has occurred in the southern third of the trench since December 1986. Trench 5 is double-lined and is the only land disposal unit on-site that may qualify to receive federally-directed Superfund wastes. The facility's analytical schedule, obtained by EPA during a facility inspection in March 1987, indicates that the three PCB wells were to be incorporated into the RCRA interim status monitoring well network in March 1987. Until recently, ESII-B sampled its PCB well network monthly, analyzing for specific Aroclors, chloride, pH, specific conductance and total organics (electronegative). It recently received approval to sample quarterly, and to substitute total organic halides (TOX) for total organics. The results generated for

PCB-approval purposes historically have not been included with ESII-B's RCRA ground water data submittals to EPA, but have been submitted to EPA separately.

CONSTRUCTION OF WELLS

Specific information on well construction materials and techniques delineated below is derived from ESII-B's Part B application, February 1986. A summary of well construction data is provided in Table 6. Silo wells SW-1-2 and SW-3-2 (installed later) are not included. The three original silo wells and the three PCB wells, while not included in the interim status monitoring network at the time of this inspection, are included in the following discussions regarding well construction and sampling.

Most of the wells in the RCRA monitoring network were installed by air rotary drilling methods. One well (MW-21) was installed using hollow stem auger and wash rotary core methods. Air rotary methods for all wells installed prior to July 19, 1985, involved foam and water injection to aid in the removal of cuttings. This includes all RCRA monitoring wells except MW-16 and MW-25. Other wells installed using this method include PCB-1, PCB-2, and five D-series (test) wells. A sample of the foam ("Quik Foam") reportedly was collected for chemical analysis to determine if organic compounds could be detected in the foam.

Dry air rotary techniques were used on wells installed after July 1985, which include current RCRA monitoring wells MW-16 and MW-25; MW-26 (no longer in the RCRA network); and PCB-3. Silo well 1 was constructed during the period from July to October 1984 using a modified cable tool. Silo wells 2

Table 6.

WELL CONSTRUCTION SUMMARY

Well No.	GL Elev. (ft MSL)	Top of Casing Elev. (ft MSL)	Total Depth Drilled (ft)	Steel Surface Casing		Well Casing				Open Interval				Dedicated ^g Sampling Equipment	
				Depth (ft BGL) ^a	Diam. (in)	Type ^b	Depth (ft BGL)	SC/OH ^c	Diam. (in)	Type ^b	Screen Interval (ft)	Slot Size (in)	Sand Pack Interval (ft)		Static Water Level (ft BGL) ^d
MW-1	2558	2559.57	235	138	4	PVC	214	SC	4	PVC	174-194	.010	154-216	180	SP
MW-2	2558	2559.97	300	158	3	PVC	231	SC	3	PVC	191-211	.010	166-291	193	PB
MW-3	2548	2549.95	240	118	4	PVC	219	SC	4	PVC	179-199	.010	154-232	185	SP
MW-4	2559	2560.02	280	139	3	PVC	235	SC	3	PVC	195-215	.010	167-255	200	PB
MW-5	2568	2569.56	250	118	4	PVC	232	SC	4	PVC	200-220	.010	176-237	205	SP
MW-6	2597	2598.10	280	119	3	PVC	230	SC	3	PVC	190-210	.010	160-256	196	PB
MW-7	2560	2562.70	260	137	8	-	-	OH	-	-	-	-	Sloughed	-	-
MW-8	2565	2566.59	260	158	8	ST	218	OH	6	-	-	-	Sloughed	-	-
MW-8A	2563	2566.59	165	117	8	-	-	OH	-	-	-	-	Sloughed	-	-
MW-9	2565	2565.27	260	139	4	PVC	250	SC	4	PVC	190-230	.010	174-250	196	-
MW-10	2539	2541.51	250	117	4	PVC	225	SC	4	PVC	175-215	.010	160-230	175	SP
MW-11	2555	2556.85	265	118	4	PVC	240	SC	4	PVC	190-230	.010	178-247	192	SP
MW-12	2563	2565.30	265	118	4	PVC	250	SC	4	PVC	200-240	.010	189-250	202	-
MW-13	2632	2633.72	300	158	4	PVC	265	SC	4	PVC	215-255	.010	193-265	189	SP
MW-14	2606	2606.92	290	159	4	PVC	235	SC	4	PVC	210-230	.010	205-235	187	-
MW-15	2545	2547.24	270	158	4	PVC	220	SC	4	PVC	170-210	.010	160-250	157	SP
MW-16	2566	2568.15	200	118	4	PVC	195	SC	4	PVC	180-190	.010	178-196	183	SP
MW-21	2552	2555.17	300	118	4	PVC	265	SC	4	PVC	255-265	.010	245-262	192	SP
MW-24	2557	2559.52	280	118	4	PVC	274	SC	4	PVC	245-255	.010	236-274	198	SP
MW-25	2542	2543.56	290	118	4	PVC	278	SC	4	PVC	263-273	.010	255-283	185	SP
MW-26	2567	2569.49	290	157	4	PVC	277	SC	4	PVC	262-272	.010	255-280	199	SP
D-38 ^e	2603	2605.54	407	97	3/4	PVC	225	SC	3/4	PVC	195-215	.010	176-230	209	-
D-3d ^e	2603	2605.52	407	98	3/4	PVC	315	SC	3/4	PVC	285-305	.010	273-308	213	-

Table 6 (cont.)

WELL CONSTRUCTION SUMMARY

Well No.	GL Elev. (ft MSL)	Top of Casing Elev. (ft MSL)	Total Depth Drilled (ft)	Steel Surface Casing		Well Casing				Open Interval				Dedicated ^g Sampling Equipment	
				Depth (ft BGL) ^a	Diam. (in)	Type ^b	Depth (ft BGL)	SC/OC ^c	Diam. (in)	Type ^b	Screen Interval (ft)	Slot Size (in)	Sand Pack Interval (ft)		Static ^d Water Level (ft BGL)
D-4s ^e	2528	2530.09	400	118	3/4	PVC	215	SC	3/4	PVC	185-205	.010	175-215	140	
D-4d ^e	2528	2530.06	400	118	3/4	PVC	300	SC	3/4	PVC	270-290	.010	260-300	143	
D-8s ^e	2566	2568.66	400	138	3/4	PVC	240	SC	3/4	PVC	210-230	.010	200.5-240	191	
D-8d ^e	2566	2568.65	400	138	3/4	PVC	320	SC	3/4	PVC	290-310	.010	280-315	190	
D-9s ^e	2559	2561.18	401.5	118	3/4	PVC	230	SC	3/4	PVC	185-205	.010	189-231	197	
D-9d ^e	2559	2561.22	401.5	118	3/4	PVC	320	SC	3/4	PVC	290-310	.010	280-321	198	
D-10s ^e	2556	2558.34	401.5	138	3/4	PVC	230	SC	3/4	PVC	200-220	.010	190-230	191	
D-10d ^e	2556	2558.34	401.5	138	3/4	PVC	310	SC	3/4	PVC	280-300	.010	270-310	196	
D-16	2561	-	300	100	-	-	-	-	-	-	Plugged	-	-	-	
D-16A	2561	2562.95	260	118	-	-	-	-	-	-	Plugged	-	-	-	
D-17	2585	2586.84	300	118	4	PVC	250	SC	4	PVC	190-230	.010	180-290	209	
D-18	2563	2564.61	260	138	4	PVC	215	SC	4	PVC	165-205	.010	160-260	175	
D-19	2558	2560.14	250	118	4	PVC	240	SC	4	PVC	190-230	.010	180-250	192	
D-20	2558	2560.53	390	137	4	PVC	360	SC	4	PVC	310-350	.010	293-360	196	
D-21s ^f	2552	2555.17	300	118	3/4	PVC	220	SC	3/4	PVC	205-215	.010	189-220	192	
D-22	2563	-	300	-	-	-	-	-	-	-	Plugged	-	-	-	
D-23	2552	2552.93	315	4	3/4	PVC	177	SC	3/4	PVC	167-177	.010	165-177	165	
D-24s ^f	2557	2559.52	280	118	3/4	PVC	192	SC	3/4	PVC	175-185	.010	163-192	Dry	
D-27	2613	2614.27	300	99	4	PVC	237	SC	4	PVC	222-232	.010	218-247	205	
D-28	2603	2604.76	300	98	4	PVC	239	SC	4	PVC	224-234	.010	219-249	221	
D-29	2579	2580.51	300	97	4	PVC	227	SC	4	PVC	212-222	.010	207-238	210	
D-30	2613	2615.07	300	98	4	PVC	223	SC	4	PVC	208-218	.010	203-233	194	
D-31	2594	2596.38	253	98	4	PVC	248	SC	4	PVC	233-243	.010	228-253	210	
D-32	2596	-	299	-	-	-	-	-	-	-	Plugged	-	-	-	

Table 6. (cont.)

WELL CONSTRUCTION SUMMARY

Well No.	GL Elev. (ft MSL)	Top of Casing Elev. (ft MSL)	Total Depth Drilled (ft)	Steel Surface Casing		Well Casing				Open Interval				Dedicated ^g Sampling Equipment	
				Depth (ft BGL) ^a	Diam. (in)	Type ^b	Depth (ft BGL)	SC/OH ^c	Diam. (in)	Type ^b	Screen Interval (ft)	Slot Size (in)	Sand Pack Interval (ft)		Static Water Level (ft BGL) ^d
WW-1	2605	2606.92	800	460	-	-	-	-	-	Plugged	-	-	-	-	-
SW-1	2571	2573.19	220	8	4	ST	220	SC	4	SST	187.5-197.5	.020	-	191	SP
SW-2	2566	2567.11	204	20	4	ST	200	SC	4	SST	185-195	.010	180-204	185	SP
SW-3	2564	2565.89	202.5	20	4	ST	202.5	SC	4	SST	187-197	.010	182-202.5	187	SP
PCB-1	2568	2569.56	197	138	4	PVC	181	SC	4	PVC	181-191	.010	179-191	187	PB
PCB-2	2566	2567.69	200.5	138	4	PVC	184	SC	4	PVC	184-194	.010	181-197	186	PB
PCB-3	2561	2562.93	195	138	4	PVC	190	SC	4	PVC	175-185	.010	173-187	176	SP

^a Feet below ground level.^b ST = steel, PVC = polyvinyl chloride, SST = stainless steel.^c SC = screen, OH = open hole.^d Typical water levels.^e High/low piezometers set in the same borehole.^f 3/4-inch PVC piezometer installed in same borehole as 4-inch PVC.^g SP = Stainless steel pump, PB = PVC bailer.

All pumps are set at the bottom of the well screen.

B07420/D.113

and 3, constructed between February and May 1985, were drilled using a combination of air rotary and modified bucket auger methods.

For wells drilled using dry air rotary, a booster air compressor, augmenting that of the rig, was used to clear the well of cuttings. Water and foam injection were used to clear cuttings from the holes after the first saturated sands were encountered.

Most of the air rotary holes were drilled with a 7-7/8-inch tricone roller bit. Steel surface casing (8-inch ID) was driven downward as the hole was advanced. Wells MW-2, MW-4 and MW-6 were drilled with a 5-7/8-inch tricone roller bit, and a 6-inch ID steel casing was driven. For all air rotary-drilled wells, the steel casing was seated in clayey strata, 120 to 160 feet below ground level. The annulus outside of the steel casing was filled with dry, granulated bentonite as the casing was driven. The open hole was drilled from the bottom of the casing to the total depth of the well borehole. The final well screen and casing were installed in the open hole and extended up through the steel casing to the surface.

Most of the RCRA and PCB wells consist of 4-inch ID, Schedule 40 PVC joined with threaded flush joints and 4-inch ID PVC slotted well screens. The exception is MW-6, which is 3-inch ID. Screen slots are .010 inch (except SW-1, with a slot size of .020 inch), and 16-mesh, clean mesh silica sand was used for the filter pack. Silo wells 1, 2 and 3 have 4-inch ID stainless steel screens and steel well casings. Silo well SW-1 has no filter pack. Filter packs in the other wells range in length from 10 feet to 90 feet. Screen lengths range from 10 feet to 40 feet. There are no multiple

completion wells or well clusters to monitor multiple, discrete aquifer intervals. Wells are screened at the top of the aquifers. Since the lower aquifer is partially confined, the head rises considerably above the top of the aquifer and the screened zone (Table 6).

The primary PVC well casing was installed through the outer steel casing. In most wells the steel surface casing extended down from 120 to 160 feet and was left in place. In silo wells 1, 2 and 3, the surface casing was retracted as the primary well casing, screen, sand pack, and annular seals were placed. The annulus between the borehole and well casing, and the well casing and steel surface casing were sealed with dry bentonite or bentonite and cement grout. The top 10 feet of the annulus between the PVC and the steel casing were filled with cement grout. Above-water annular seals were placed from the surface. Annular seals beneath the water were tremied into place with one-inch ID steel pipe. The amount of annular fill was determined by periodically sounding the annulus as the seal material was being placed.

During the inspection, depths to the bottoms of 11 wells were measured, and depths to the tops of installed, submersible pumps were measured in two others. The measurements, and their corresponding values as reported in ESII-B construction logs, are given in Table 7. Eight of the 11 wells were measured to be approximately two feet greater in depth than reported. In well D-3 (shallow), which is reported to be 225 feet deep, soil was encountered at 216 feet. Well MW-9 was initially measured to be approximately six feet shallower than as reported in construction diagrams. During the purging process, ESII-B's 20-foot stainless steel bailer was accidentally released from the truck rig, plunging into the well. After the bailer was retrieved,

Table 7
 DEPTHS OF WELLS MEASURED BY EPA
 COMPARED WITH DEPTHS REPORTED IN ESII-B CONSTRUCTION LOGS

Well	Reported Depth, *Ft.	Measured Depth, Ft.
PCB-3	190	191.84
SW3-2	195	197.69
D-18	215	217.45
MW-9	250	243.81 246.14**
MW-3	219	219.37
D-3 Shallow	225	216.00
SW-2	200	202.76
SW-3	202.5	204.76
PCB-2	194	196.62
PCB-1	191	194.36
D-19	240	242.90
MW-25 (top of pump)	273	273.00
MW-11 (top of pump)	230	229.44

* as reported in well construction data in ESII-B Part B permit application

** after stainless steel bailer fell into well

Table B. Water Remaining in Wells With Submersible Pumps
In Which The Wells Are Pumped "Dry" Prior to Sampling

ES 11-B Purge Techniques	Casing Volume	Volume of Water Below Pump Intake gallons*	Volume In Discharge Line, gallons*	Total Volume In Well When Pump Suction Breaks, g	Volume Remaining In Well as Percentage of Total Casing Volume
MW-5 Pump "dry" 20g. Same 15g then sample	17.6	1.0	5	6	34%
MW-11 Pump "dry" 35g. Next day pump 20g then sample.	31.3	5.5	5.3	10.8	34%
MW-13 Pump "dry" 70g. Same day pump 15g then sample.	49.6	5.5	5.9	11.4	23%
MW-16 Pump "dry" 8-10g. Same day pump 6g then sample.	7.2	2.3	4.4	6.7	93%
MW-21 Pump "dry" 50g. Next day pump 25g then sample.	51.0	5.5	6.1	11.6	23%
MW-24 Pump "dry" 40g. Next day pump "dry" 33g. Later pump 7g then sample.	47.7	11.4	5.9	17.3	36%

*These quantities remain in the well when the pump is turned off, or when suction is broken, even when the well is pumped "dry". The water in the discharge line cascades back into well due to lack of check valves. Water below the pump intake cannot be removed.

the well was left for more than 24 hours before the field team returned to resume the purging activity. At that time, the depth measurement indicated that the well had increased in depth by more than two feet.

Measurements made to the tops of two submersible pumps were virtually the same as the corresponding depths reported in construction diagrams. For wells which were measured to be significantly deeper in total depth than as reported in construction logs, errors in initial measurements during drilling are suspected. Where depths appear to have decreased, both construction record errors and sediments moving into the casing are suspected.

Eleven of the 14 RCRA monitoring network wells and one PCB well are equipped with permanently-installed submersible pumps. The pump in each well is placed near the bottom of the screen. Below the screen, typically, is a ten to 20-foot sump. The discharge line of each pump holds approximately five gallons of water and has no check valve. The combined effect of sumps beneath the level of the pump intake and the lack of check valves is to make it impossible to purge such wells dry. In its "Sampling Procedures" document (provided during the inspection), ESII-B claims to purge "dry" six such wells prior to sampling, but, for these wells, "dry" perforce means only until no additional water can be extracted, given the existing equipment. Table 8 illustrates the relative effects that water which cannot be removed from a well is calculated to have on the volume actually evacuated from that well, expressed as a percentage of the total casing volume. Unless the wells with such equipment were purged "dry" several times prior to sampling (with the necessary purge quantity dependent upon how many well volumes it is possible to extract prior to breaking suction), one could not be certain to have

removed the stagnant water prior to obtaining samples. ESII-B's written sampling procedures indicate that, following the initial purge to "dryness," a quantity representing less than one casing volume is purged the next day immediately before samples are obtained from these wells.

As noted above, the lack of check valves in the submersible pumps causes the water in the discharge lines to cascade back down into the wells when either the pumps are turned off or when suction breaks by purging to "dryness." If the pump is still running, the water will hit the moving impellers. In any case, the water is subject to aeration that is unacceptable for samples that may be analyzed for volatile substances or other labile parameters.

As documented in Table 6, extremely long filter packs exist in most of the 14 detection monitoring system wells. The lengths of effective filter packs, that is, the length that is calculated to be saturated at each well, ranges from 12 feet in MW-16 to 98 feet in MW-2. Eight of the wells have effective filter packs greater than 45 feet in length. Filter packs serve to increase the effective screen lengths of the wells. In at least three upper aquifer wells, MW-2, MW-4 and MW-15, the combination of the screen and filter pack lengths cause the wells to effectively bridge the two aquifers. Such an interconnection is not acceptable for two reasons: (1) water table measurements are not valid, since they reflect influences from more than one aquifer; and (2) should contamination occur in one aquifer, the interconnection caused by the filter packs could cause the otherwise unaffected aquifer to become contaminated. For that reason, ESII-B should take steps to appropriately abandon or rehabilitate such wells as soon as

practicable. Water level information obtained from these wells should not be utilized in constructing water contour maps. Replacement wells should be installed where necessary to maintain an adequate detection monitoring program.

Another effect of a filter pack which is much longer than the well screen, is to greatly increase the amount of stagnant water that must be removed from wells prior to sampling, to ensure that fresh formation water is being sampled. This is true unless a well is purged virtually dry, in which case formation water should enter the well casing at once. However, as discussed above, ESII-B is not generally able to accomplish this, either due to well yields, well design or the nature of the equipment in the wells. The quantities of water which exist in the filter packs of the interim status wells, the PCB wells and four silo wells have been calculated and are presented in Table 9. (Volumes residing in filter packs were estimated assuming a porosity of 0.20.) The calculated, total volume of the casing plus the filter pack is shown for each well, along with the number of casing volumes and the number of effective volumes (i.e., filter pack plus casing) which are purged by ESII-B prior to obtaining samples from each well (obtained from ESII-B's "Sampling Procedures" document).

Wells MW-6 and MW-4 are bailed dry prior to obtaining samples. Wells which are bailed to dryness do not have the problem of inaccessible water remaining in the well casing as do wells with permanently installed submersible pumps. For these wells, samples could properly be obtained as soon as possible subsequent to bailing dry, regardless of the number of volumes purged. Wells MW-5, MW-11, MW-13, MW-16, MW-21, and MW-24 have submersible pumps and are bailed as dry as is possible, given the presence of

the equipment. The balance of the wells, including PCB and silo wells, are continuously purged (bailed or pumped) and then sampled. It is apparent from Table 9 that insufficient volumes of water are being removed from many wells prior to sampling, even when filter packs are not considered. When the impact of the filter packs is taken into consideration, the calculations indicate that, in some wells (aside from those bailed to virtual dryness), not even a full volume of water is removed prior to sampling.

ESII-B SAMPLE COLLECTION PROCEDURES

Field Activities

As requested prior to the inspection, ESII-B had arranged for its contractors to conduct "mock" purging and sampling activities at two wells. EPA had requested to observe an example of these activities at a bailed well and at a pumped well. ESII-B chose wells PCB-2 and MW-1 as the demonstration wells. The purging and sampling procedures which were observed were generally acceptable; however, in hindsight, it was determined that this was not an adequate way to evaluate the practices that would be involved in an actual purging and sampling event. This is due in part to the fact that essentially every well in the monitoring network is unique, given the variety of equipment used for purging and sampling and the wide range of yields of the wells, even within aquifers. These factors force decisions at each well as to purge rates, purge volumes and extent of recovery periods prior to sample collection. In addition, 14 wells (or more if PCB wells and silo wells are sampled during the same event) must be purged and sampled according to a timetable, during an actual sampling event. All of these variables

contributed to the conclusion that the two-well mock sampling event was insufficient for the type of evaluation needed. Therefore, an assessment of this portion of ESII-B's ground water monitoring effort has been deferred until September 1987, when a routine comprehensive ground water monitoring evaluation will be conducted by EPA and IDHW, during which ESII-B's ground water sampling team will be observed during a scheduled sampling event, and split samples will be obtained.

Records Review

During the inspection, two documents were provided by ESII-B pertaining to its interim status ground water monitoring program. One is entitled "Interim Status Groundwater Monitoring Program for the Hazardous Waste Management Facility Located 10 Miles West of Grand View, Idaho (Site B) Operated by Envirosafe Services of Idaho, Inc. Boise, Idaho IDD073114655. June, 1986." A November 1985 version of this document had been obtained from ESII-B prior to the inspection. The 1986 document includes a description of the site hydrogeologic characterization efforts and the history of ground water monitoring events; well locations and specifications; sampling and analysis plan; ground water quality assessment outline; and sections on statistical analyses, reassessment of monitoring well locations, and recordkeeping and reporting. The second document is "Sampling Procedures, ESII Site B, RCRA, TSCA, and Silo Test Wells," dated June 1986. This document, which apparently was prepared by and for ESII-B's ground water sampling contractors, describes the routine that is to be followed for the interim status, silo and PCB wells during a sampling event. It specifies such things as the order in which wells are to be purged and sampled; the volumes

to be purged; the number of times to which each well is returned for purging prior to sample collection; the rate at which water should be pumped during purging at wells with submersible pumps; how long a well is to be left to recover prior to further purging and/or sampling (specified as either later during the same day or the next day, for wells which are not sampled directly after an initial purge); the location of the water level measuring point on each well head; and the level of personal safety protection required at each well location. It also describes sampling techniques that are to be followed, and includes a copy of a letter to ETC, the testing laboratory utilized by ESII-B, delineating the analytical testing schedule from May through December 1986.

These two documents make it possible to evaluate the technical adequacy and the appropriateness of ESII-B's sampling collection procedures as they relate to the facility's regulatory obligations pursuant to the interim status ground water monitoring requirements. As silo wells and PCB wells are included in the documents, they are also included in this evaluation.

As demonstrated previously in the section on well construction, the extensive filter packs in most of ESII-B's wells have the effect of increasing the amount of water that should be purged prior to sampling for all wells except those which are bailed to dryness. Because of the sumps beneath the pump intakes and the lack of check valves, the wells which have submersible pumps installed cannot be purged to dryness. An evaluation of ESII-B's purging and sampling routines, as found in the sampling procedures document, best can be made by categorizing the types of wells and equipment as follows:

(1) Wells which are purged dry prior to sampling:

According to ESII-B's sampling procedures document, two wells, MW-4 and MW-6, are bailed dry during purging. The casing volume of MW-4 is approximately 13 gallons. The procedures provided for purging this well are to bail to dryness, approximately 17 gallons; return later the next day, bail three more gallons and then collect samples. For MW-6, the casing volume of which is approximately 12.5 gallons, the instructions are to purge the well 15 gallons to dryness; return later the same day, purge five additional gallons and then sample.

The preferable method for purging any well is to continuously purge a sufficient volume (at least three volumes including filter pack) and then immediately collect samples. Purging to dryness is less preferable due to the aeration of the water which occurs when the water level is drawn below the top of the screen. However, wells located in certain formations may not yield volumes sufficient to accomplish this, even when purged very slowly. In such a case, the appropriate procedure would be to purge to dryness; then wait only until the well has recovered sufficiently to collect at least part of the required sample volume, obtaining samples for labile parameters such as volatiles and pH as soon as possible. If necessary, the well may be left to recover further, after the initial samples have been obtained. However, the well should not be purged further prior to sampling once it has been purged dry, unless it is again purged to dryness. The benefit derived from purging a few additional gallons from a well already purged to dryness is outweighed by the aeration of the water in the casing which would be created by the additional bailing action.

(2) Wells with submersible pumps which are purged until no additional water enters the pump intake (i.e., when pump suction breaks), but which cannot be purged to virtual dryness due to the nature of the equipment in the wells:

These wells were described in the section on well construction and are summarized in Table 8. They are MW-5, MW-13, MW-24, MW-21 and MW-11. While the purging instructions for these wells vary somewhat, each is purged until suction breaks, is allowed to recover until later in the day or until the next day, at which time it is purged of a specific amount of additional water, and then is sampled. It would be difficult to ascertain what a sufficient purge volume would be for wells which retain a significant portion of their casing volumes at a point where no further water can be removed from them. Such a judgment is made more difficult by the existence of the submersible pumps lacking check valves, which cause the aeration of significant volumes of water that cascade back into the well when suction is broken or the submersible pump turned off.

Given the relatively small volumes that ESII-B purges from these wells prior to sampling (Table 9), it is unlikely that the samples obtained represent close to 100% fresh formation water. In addition to the drawbacks inherent in this sampling scheme, the discharge outlets from submersible pumps serve as a poor method for obtaining ground-water samples, especially those for analysis of volatile compounds, pH, or other parameters which might be affected by aeration or heat. High flow-rates delivered by submersible pumps cause turbulence and aeration in the water; throttling back the flow in an attempt to control this may

cause the water to gain heat (ESII-B's sampling instructions do not address the flow rate to be used while obtaining samples). For these reasons, it is recommended that the submersible pumps be removed from these wells and that they be bailed for both purging and sampling purposes. A continuous purge-to-sample routine would be preferable, but if yields in these wells prohibit this, they should be bailed to virtual dryness prior to sampling.

(3) Wells which are purged and then sampled with no intervening time:

This category includes wells which have submersible pumps installed (MW-15, MW-16, MW-1, MW-3, MW-25, MW-10, and PCB-3); wells which have bladder-type pumps installed (SW-1, SW-2, and SW-3); and wells which are bailed for both purging and sampling (MW-2, PCB-1 and SW-3-2). In all of these wells, it is necessary to consider the effective volume of the filter packs in determining the appropriate amount of water to be purged prior to sample collection. It is apparent from Table 9 that none of these wells is purged sufficiently. It is recommended that ESII-B increase the quantity of water purged from these wells so that at least three volumes (casing plus filter pack) are removed prior to sampling. In addition, since obtaining samples using a submersible pump is not acceptable for the reasons specified in (2), above, ESII-B should either find another means for both purging and sampling such wells, or continue to use a submersible pump for purging, but remove it prior to obtaining samples with a bailer. Bladder-type pumps and bailers (made of relatively inert materials) are acceptable for both purging and sampling.

SAMPLING AND ANALYSIS PLAN

The sampling and analysis plan is contained within the interim status ground water monitoring document, cited above, which is a lengthy document that covers virtually all aspects of the ground water monitoring program. Sample collection, sample preservation and handling, chain-of-custody, analytical procedures and quality assurance and quality control measures are appropriately presented. EPA-approved analytical methods are cited for ground water sample analyses.

It is impossible to determine from the sampling and analysis plan the schedule for analytical parameters that are to be obtained during particular sampling events, since the regulatory requirements for first-year samples and subsequent-year samples are simply cited from the regulations, without identifying which wells fall into which category. However, a copy of a letter from Envirosafe Services, Inc. to the testing laboratory, delineates the analytical needs for samples from specific wells for May through December 1986. This letter is included in the sampling procedures document prepared by ESII-B's sampling contractor, dated June 1986.

OUTLINE OF GROUND WATER QUALITY ASSESSMENT PROGRAM

Pursuant to 40 CFR § 265.93(a), the owner/operator must prepare an outline of a ground-water quality assessment program that describes a ground-water monitoring program that is more comprehensive than its detection monitoring system and which is capable of determining:

- (1) Whether hazardous waste or hazardous waste constituents have entered the ground water;
- (2) The rate and extent of migration of hazardous waste or hazardous waste constituents in the ground water; and
- (3) The concentrations of hazardous waste or hazardous waste constituents in the ground water.

ESII-B's outline of such a program is quite brief and vague. The introduction to the assessment outline states that the "outline will be expanded into a plan" if dictated by ground-water quality. All items discussed in the outline need clarification and qualification. Specifics may be limited in such an outline, but some should be included. The following deficiencies are noted in the assessment outline:

- The outline states that for the determination of the identity of hazardous waste or hazardous waste constituents that have been released to ground water, samples would be obtained for the parameters required in 40 CFR §§ 265.92(b)(1), (2) and (3); and other parameters "specified by the Regional Administrator." A method that ESII-B would follow to determine appropriate analytical parameters should be included. A time frame and frequency for sampling and analysis are not specified, but should be. The outline should also state if analytical results would be submitted to regulatory authorities and if so, the time frame for reporting.
- The outline should specify if initial sampling activities would include all interim status monitoring wells, other wells, or how well selection would otherwise occur.

- The outline states that the determination of the rate and extent of migration of hazardous waste or hazardous waste constituents in the ground water would entail the following:
 - (1) Documentation of aquifer characteristics based on existing site-specific and published data;
 - (2) Sample and analysis of "supplemental wells in the vicinity of site;"
 - (3) Drilling, sampling and analysis of "additional wells as needed."

It is not specified or explained what site-specific data would be available to be used in the assessment or what published data would be used as a source of information. It is also not stated what "in the vicinity" refers to in terms of wells, e.g., if they are private or public wells, where they may be located, or whether they have already been identified.

- The outline states that to determine the concentrations of hazardous waste or hazardous waste constituents in the ground water, water-quality data developed as a result of the activities described above will be "evaluated." The outline should make reference to a time frame for such a determination and describe what protocols would be used to evaluate the data. It should also state whether reports would be submitted to the regulatory authorities and if so, the time frame for submittals.

STATISTICAL ANALYSES

Records regarding the statistical analyses of ground-water data were requested and provided during the inspection. ESII-B's interim status ground water monitoring program document (June 1986) contains a section on statistics. Also supplied was evidence of limited statistical tests of ESII-B's ground-water data, performed and submitted to ESII-B by a statistical consultant.

In the documents provided, ESII-B states that, when sufficient data are available, the Student's t-test and covariate analysis will be used to analyze ground-water data. According to 40 CFR § 265.93(b), only the t-test is an acceptable statistical method that an interim status facility may employ to determine whether it should remain in a detection monitoring mode. Limited results of covariate analyses conducted by the facility's statistician were presented. T-tests apparently had not been conducted to compare data from individual downgradient wells with background values. The results of the analyses of covariance for indicator parameter values in the upper aquifer and the lower aquifer, pertaining only to the January 1986 sampling event, were presented. It is stated that no statistical "hits" were found. No other evidence that statistical analyses had been performed was presented. In March 1987, ESII-B confirmed to EPA during a site inspection that no t-tests had been performed on ground-water data, because "a year's worth of background data was not available until the end of 1986." Statistical evaluations are reportedly planned for 1987.

Despite the absence of a year's worth of data for an upgradient, upper aquifer well, ample data has been available for some time for ESII-B to perform t-tests on the indicator parameter data from its interim status wells. ESII-B was put into an accelerated (monthly) and expanded ground water sampling schedule in 1984, because the site was behind in providing the ground water monitoring information that existing facilities subject to RCRA were required to have generated by November 1983; i.e., at least one year of quarterly upgradient and downgradient data, including indicator parameters. Information sufficient to conduct statistical analyses was not available in a timely manner at ESII-B due to (1) the initial belief that a waiver from ground water monitoring requirements would be feasible at this site (prior to the discovery that water-bearing zones existed above the deep, regional aquifer); and (2) the placement of the sole background well in an aquifer other than the one monitored by the majority of the downgradient wells (prior to the realization that two aquifers existed and must be monitored).

The fact that ESII-B had a technically inadequate detection monitoring system in place until September 1985, should not be considered by the facility as a basis to postpone determining whether statistically significant indications of ground-water contamination exist at the site. It is recommended that the statistics required by the interim status regulations be performed by ESII-B and that the results be presented to EPA and IDHW as soon as feasible.

RECORDKEEPING AND REPORTING

In its interim status ground water monitoring program document (June 1986), ESII-B explains how it will comply with the record-keeping and reporting requirements regarding ground water, as required by 40 CFR § 265.94. The document basically reiterates the regulations as written, except for the reporting requirements specified at § 265.94(a)(2)(iii). That section requires the owner/operator to submit to the Regional Administrator annually, no later than March 1 of the following year, results of the evaluations of ground-water surface elevations made pursuant to § 265.93(f), and a description of the response to that evaluation, where applicable. ESII-B's plan states that such information will be submitted to the Regional Administrator "as part of the annual report required under 265.75." However, § 265.75 requires the submittal of a biennial, not an annual, report. ESII-B's plan also states that it will comply with § 265.94(a)(2)(iii), which requires that the owner/operator annually submit the following information to the Regional Administrator no later than March 1 following each calendar year: concentrations or values of the parameters listed in § 265.92(b)(3) (indicator parameters) for each ground-water monitoring well, along with the statistical evaluations required by § 265.93(b) for such parameters.

EPA records indicate that routine submittals from ESII-B to the Regional Administrator of interim status ground water monitoring data or statistical analyses have not been made. On one occasion, a submittal of ESII-B's analytical data and ground water elevation measurements was made to the Regional Administrator, for ground water monitoring data collected from January through June 1984. This document, dated August 16, 1984, included a

statement that its submittal was intended to comply with interim status recordkeeping and reporting requirements. In general, however, analytical ground water monitoring data have been submitted by ESII-B as part of its Part B application submittals. Laboratory data from 1986 sampling events had to be specifically requested from ESII-B in mid-March 1987 in order to be evaluated for this report, as it had not been submitted. No statistical analyses were provided when that data was subsequently provided.

The facility should follow its written plan, where it is consistent with regulatory requirements, for routine submittals of required information. The reference to data being submitted with an annual report should be deleted, and the facility should not tie its obligations to submit specific interim status ground water monitoring data to submittals required under other provisions; although it is certainly acceptable to submit information at the same time.

CONCLUSIONS

Considering the plethora of past and present land disposal activities at the ESII-B site, the present monitoring network is thought to afford a fairly high degree of assurance of protection of ground water, in that contamination migrating from any point of origin on the site would likely have a discernible effect on the ground water quality in one or more of the monitoring wells in the interim status network. For this potential to be realized, however, it is necessary to be able to place more confidence in the integrity of the analytical samples collected from the wells.

Because trench 11 is virtually aligned with the flow lines of the upper aquifer, it likely would be necessary to install wells within the disposal trench in order to create a system that offers better monitoring characteristics for contamination that may be released from the unit. Since installing wells within the trench would not be environmentally sound, monitoring the eastern edge of it along the flow lines is an acceptable alternative, and one which should assure that contamination released from the trench would be detected prior to migrating off-site. This explicitly depends, of course, on the degree to which flow lines have been correctly drawn; for this reason, it is imperative that ESII-B maintain wells and/or piezometers which may not be in the monitoring network but which can provide valuable water table elevation data on a regular basis.

The three PCB wells should provide adequate coverage immediately downgradient of trench 5. During the next ground water monitoring inspection, it will be verified formally whether they were incorporated into the interim status ground water monitoring network since the trench began receiving RCRA hazardous waste in December 1986.

Since ESII-B is proposing to install new wells for its detection monitoring system for purposes of a final RCRA permit (discussed later in this report), it is not deemed necessary for the interim status network to be independently upgraded by the installation of new wells, for the purpose of improving on the construction of current wells. Nevertheless, there are several steps ESII-B should take at once to improve its interim status ground water monitoring system and to secure more reliable ground water samples:

(1) Well D-19, which is located in the upper aquifer approximately downgradient of trench 10, should be incorporated into the interim status ground water monitoring network to provide an immediate detection well for that trench, which is a regulated unit despite the fact that it no longer receives waste.

(2) Wells with screens or filter packs which span the two aquifers monitored beneath the facility should be appropriately abandoned or rehabilitated, and replaced where necessary to maintain an adequate detection monitoring network. All other wells, regardless of whether they are included in the interim status network, should be maintained for purposes of obtaining periodic water level data and updating water table contour maps accordingly.

(3) Submersible pumps should not be used for obtaining ground water samples. If they are used for purging, check valves must be installed.

(4) All wells should be purged of at least three volumes of water, including that calculated to reside in the filter pack, immediately prior to sampling. Wells with yields that are so low that this cannot be accomplished, should be purged to virtual dryness and then sampled for labile parameters as soon as the well has recovered sufficiently to obtain the required sample volumes.

(5) Student's t-tests can and should be performed for indicator parameter data generated from ESII-B's interim status monitoring wells.

(6) Ground water monitoring data generated from the interim status well network, water level measurement data and evaluations, and demonstrations of required statistical analyses should be submitted annually to the Regional Administrator, as required by 40 CFR § 265.94(a).

(7) The scope of ESII-B's ground water quality assessment outline should be broadened, to reflect more specifically what a ground water assessment plan would entail.

(8) The three PCB wells (PCB-1, PCB-2 and PCB-3) downgradient of trench 5 should be verified formally as having been brought into the RCRA interim status network, since the unit reportedly receives RCRA-regulated hazardous waste (including Superfund wastes) in addition to PCB wastes.

GROUND WATER MONITORING OF SILOS

As described previously in this report, the ESII-B site was used in the early 1960s as a Titan missile base. Massive concrete structures were constructed within huge excavations, each of which extended to 160 feet in depth at the locations of the three missile silos. Tunnels were installed between silos at a depth of approximately 60 feet. Other underground structures were constructed at various locations on the site at approximately the same depth. Upon completion of the construction of each silo and its underground support facilities, the excavations were backfilled with soil to original grade. Each of the silos and many of the associated structures were used for the disposal of hazardous and PCB wastes after the site ceased being utilized as a missile base. Subsequent drilling activities at the site have identified a variety of hazardous constituents in the soil at a depth of approximately 60 feet in the vicinity of these structures.

EPA and ESII-B entered into an Agreed Order on November 23, 1983, requiring an investigation of soils and ground water contamination in the area of the silos. Pursuant to that order, a plan was implemented for sampling and analysis of ground water downgradient of each of the three silos, and for determining whether hazardous waste or hazardous constituents had leaked or were leaking from the silos and ancillary underground structures. ESII-B's subsequent sampling and analysis efforts at or near the silos detected contamination in both ground water and soils, as shown in Table 10.

On October 31, 1985, EPA issued a RCRA section 3008(h) order to ESII-B, addressing remedial measures to be taken in the silo areas where contamination

Table 10. Ground Water and Soil Contamination
Reported in the Area of the Silos

SIL0 1

SOIL

Sampling dates: 7/31/84 - 10/15/84

<u>Depth</u>	<u>Constituent</u>	<u>Concentration, ppb</u>
56-58 ft. (unsaturated)	chloroform	166,000
	2-chlorophenol	137,000
	2,4-dichlorophenol	993,000
	2,4,5-trichlorophenol	1,010,000
	1,2,4-trichlorobenzene	80,000
192-193 ft.	carbon tetrachloride	115
	chlorobenzene	115
	chloroform	143
	methyl bromide	862
	methylen chloride	201

GROUND WATER

Sampling date: 6/28/85

<u>Constituent</u>	<u>Concentration, ppb</u>
carbon tetrachloride	15.3
chloroform	86.9
methyl chloride	54.5
methylen chloride	38.8

SIL0 2

SOIL

Sampling dates: 2/24/85 to 3/14/85

<u>Depth</u>	<u>Constituent</u>	<u>Concentration, ppb</u>
62.5- 63.5 ft. (unsaturated)	chloroform	32
	methylen chloride	46
179.5 ft.	chloroform	26
	methylen chloride	109

Table 10, cont.

SIL0 2 (cont.)

GROUND WATER

Sampling date: 4/29/85

<u>Constituent</u>	<u>Concentration, ppb</u>
cnloroform	108.4
methylene cnloride	35.0
methnl chloride	107.1
carbon tetracnloride	4.5
trichloroethylene	3.6

Sampling date: 6/28/85

cnloroform	3.4
methylene cnloride	21.4

SIL0 3

SOIL

sampling dates: 4/25/85 to 5/22/85

<u>Depth</u>	<u>Constituent</u>	<u>Concentration, ppb</u>
60-65 ft. (unsaturated)	methylene chloride	5,000
	cnloromethane	28,209
	tetracnloroethylene	6,657
	cnlorobenzene	39,487
	PCB (aroclor 1260)	27,000
	2,4,6 trichlorophenol	20,019
	2,4 dichlorophenol	27,102
202 ft.	cnloroform	18
	methylene cnloride	347

GROUND WATER

Sampling date: 6/28/85

<u>Constituent</u>	<u>Concentration, ppb</u>
cnloroform	293
metnvl cnloride	27.3
methylene cnloride	118
trichloroethylene	3.8

had been discovered. In response, ESII-B submitted a remedial investigation work plan in April 1986, and as part of that plan initiated a silo well data assessment program to evaluate the presence of the contamination. The assessment program was designed to determine if hazardous constituents might be present in the upper aquifer as a result of a release from the silos or if contaminants were present due to other causes.

The results of the silo well data assessment program were submitted by ESII-B in December 1986. Included in the program report are explanations of how activities such as well drilling, well construction, well development, sampling errors and/or analytical procedures could have been responsible for the appearance of hazardous constituents in ground water samples from the silo wells, as opposed to an actual release from the silo complex.

As part of the assessment program, silo wells SW-1, SW-2 and SW-3 were continuously pumped and intermittently sampled for a period of 15 days, immediately prior to this inspection. This was done, in part, in an attempt to flush clean the intake portion of the wells including the screens, filter pack materials, void areas and collapsed formation materials immediately outside the well screen, which could have been contaminated by previous well drilling and/or installation procedures.

A synopsis of analytical results of ground water samples for carbon tetrachloride, chloroform, methyl chloride, and trichloroethylene from wells SW-1, SW-2, SW-3, SW-3-2, MW-3, MW-4, MW-10, MW-11, PCB-1, PCB-2, PCB-3 and various field and trip blanks was recently submitted by EnviroSAFE Services, Inc. These data cover sampling dates from December 1984 through December 1986

and are presented, as received from the company, in Appendix D. Concentrations of the four hazardous constituents in the silo wells decreased to near or below detection limits after the pumping activities of June 1986.

ESII-B has suggested that the volatile organic chemicals that have been found in the ground water downgradient of the silos may have been the result of drag-down of contamination from soil at higher levels into the upper aquifer during well-drilling activities. However, as demonstrated in Table 10, not all of the constituents found in the ground water were also found in the unsaturated soil at each respective silo. For example, carbon tetrachloride, methyl chloride and methylene chloride were found in the ground water at silo 1 but not in unsaturated soil samples at depths of 56-58 feet; methyl chloride, carbon tetrachloride and trichloroethylene were found in ground water at silo 2 but not in unsaturated soils at depths of 62.5-63.5 feet; and methyl chloride, trichloroethylene and chloroform were found in ground water at silo 3 but not in unsaturated soils at depths of 60-65 feet.

EPA does not believe that the silo well data assessment program adequately demonstrated that no release has occurred from the silo complex. The nature of ESII-B's 15-day pump test, conducted in a low-yielding aquifer, could have caused a masking of the contamination due to dilution by ground water drawn from other parts of the aquifer. The data which were presented do not eliminate the possibility that the volatile organics which have been detected are due to leakage from the silo complex and that such contamination has migrated vertically through the sediments to ground water. If ESII-B's assessment that a release has not occurred is correct, the ground-water contamination will not return over time. Therefore, sampling and analysis of

the silo wells and selected RCRA interim status wells for volatile organic compounds is being required on a quarterly basis. Should new evidence confirm that hazardous constituents have been released to ground water, EPA would seek an accelerated investigation to fully characterize the nature and extent of the contamination, in order to facilitate any remedial action determined to be necessary.

PROPOSED GROUND WATER MONITORING PROGRAM

In addition to existing regulated land disposal units, ESII-B has proposed new surface impoundments and a new trench, shown on Figure 13, as part of its Part B permit application. Other land disposal units may be proposed for a later permit determination. As part of its application, ESII-B has proposed a ground water detection program to monitor regulated units that have received hazardous waste subsequent to November 19, 1980, or which will receive hazardous waste if approved in the permit determination. The proposed program is supplemented by three wells to monitor the silos, which are pre-RCRA solid waste management units.

In addition to earlier proposals made as part of its Part B permit application, ESII-B submitted revised proposals for a ground water monitoring program in December 1986 and April 1987. Several discussions between EPA and EnviroSAFE Services, Inc. personnel were held regarding the content of the December submittal, leading to the recent submittal of the April document.

ESII-B's proposed ground water monitoring program is different in many aspects from the interim status program. Those aspects, as presented in the December 1986 and April 1987 submittals, are described here briefly.

WELL LOCATIONS

ESII-B has proposed that each of the two aquifers would have four upgradient wells. Sixteen downgradient wells are proposed for the upper aquifer and eight for the lower aquifer. Maps showing proposed well locations

Figure 13.

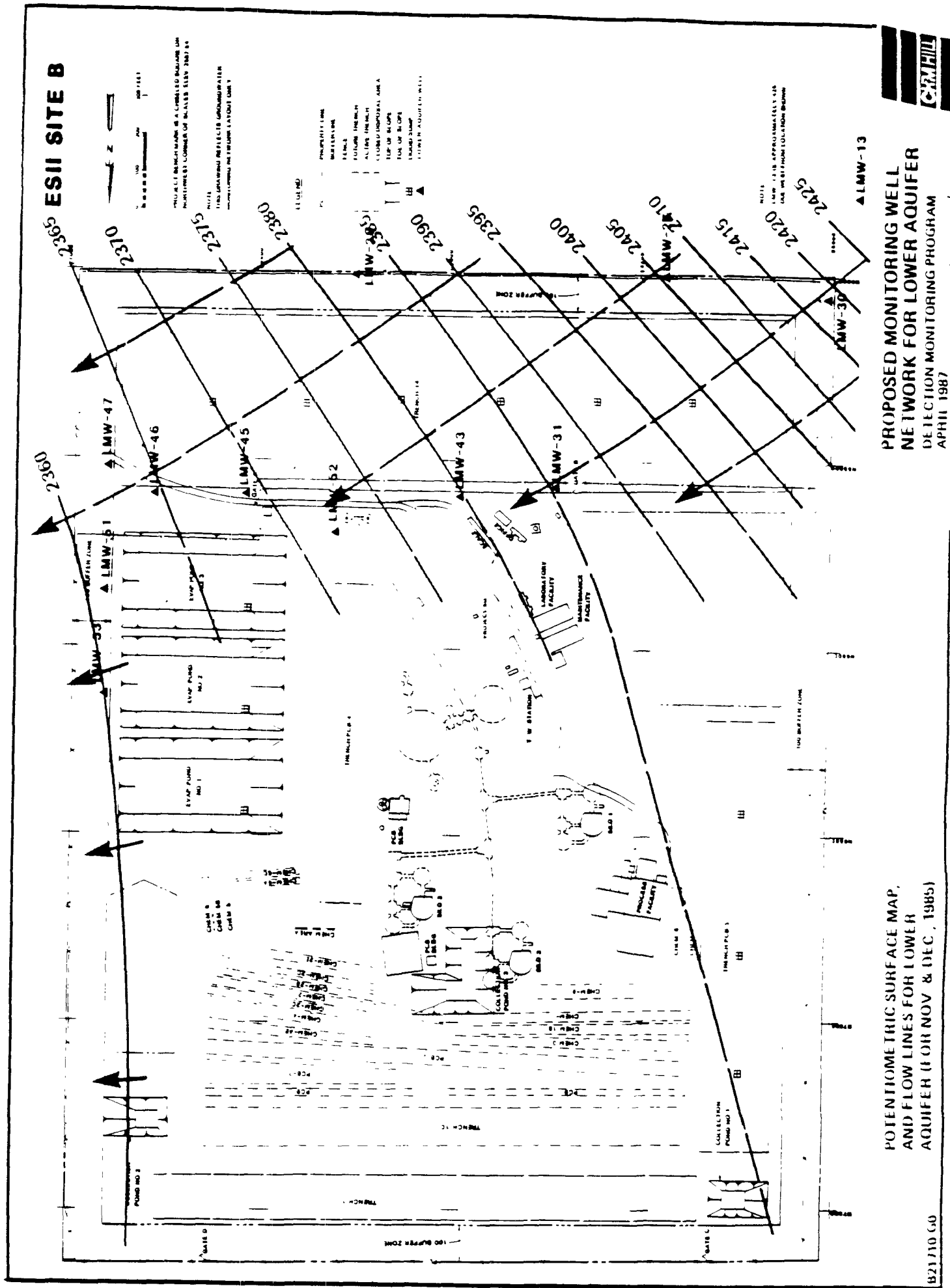
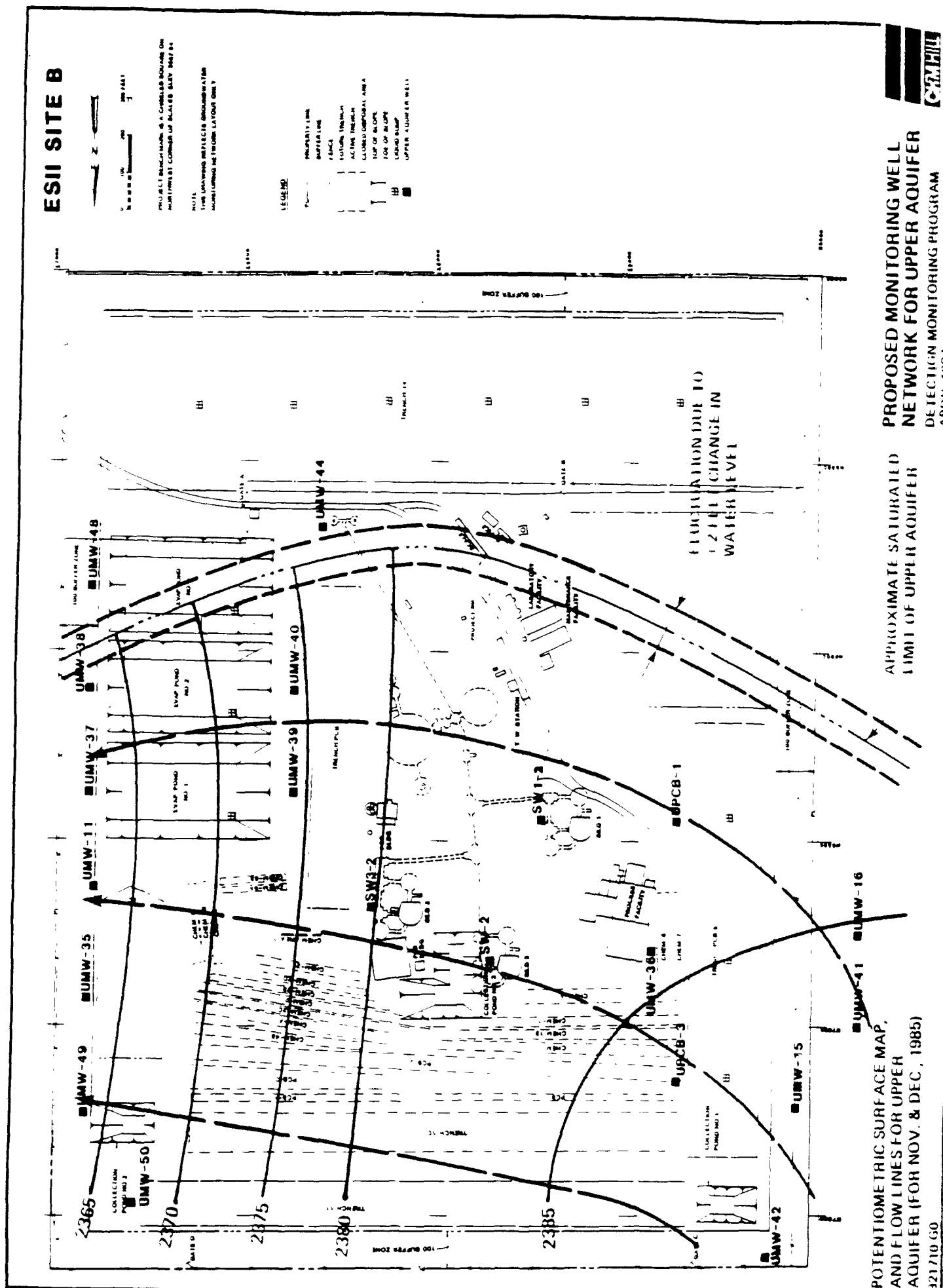


Figure 14.



and equipotential contour lines for the upper and lower aquifers are shown in Figures 14 and 15. At EPA's request, ESII-B included a proposal for the installation of two wells at downgradient locations which are at or near the estimated area of transition of the upper aquifer. At such locations, an upper aquifer well and a lower aquifer well would be installed. The rationale given by ESII-B for the choice of monitoring locations is that they are "based on groundwater flow directions, aquifer properties determined during the site characterization study...and the location and orientation of existing and proposed regulated units." Horizontal distances between proposed well locations, as measured perpendicular to flow lines, average 145 feet in the lower aquifer and 285 feet in the upper aquifer. Regarding horizontal spacing of monitoring wells, ESII-B states that computer modeling efforts of the vadose zone "have shown [that] significant spreading of hypothetical leachate plumes occurs in the vadose zone at Site B and [that] hypothetical leachate volumes of reasonable size released into the vadose zone will not reach the uppermost aquifer during the closure-post closure period of the site."

WELL CONSTRUCTION

ESII-B has proposed the use of a combination of new, existing and redrilled wells for its monitoring network, as indicated in Figure 13. Redrilled wells would take advantage of the previous drilling efforts but would include well design and construction details identical to those of new wells. In the lower aquifer, existing wells which are proposed to be included in the new well network are the four background wells (LMW-13, LMW-27, LMW-28 and LMW-30). Existing wells proposed for the upper aquifer are UMW-16, PCB-1, SW-1-2, SW-2 and SW-3-2. The general construction of existing wells is

described previously in this report, in the section on the interim status ground water monitoring program. Silo wells SW-1-2 and SW-3-2 are located near silo wells 1 and 3, respectively, and are approximately 100 feet more distant from the silos than are wells SW-1 and SW-3.

The proposed construction of new wells (illustrated in Figures 16 and 17) includes the following features:

- (1) Well screens would span the entire saturated thickness of the aquifer at each well location. This would entail screen lengths ranging from 10 feet to 60 feet.
- (2) The drilling method proposed is air rotary with water and Quik-Foam injection to set driven steel surface casing to approximately 140 feet. From 140 feet to 20 feet above the top of the aquifer, dry air rotary is proposed. It is also stated that if removal with dry air is not possible below 140 feet, water/foam injection would be used to about 20 feet above the aquifer.
- (3) Existing site characterization data would be used to guide well construction activities. From 20 feet above the anticipated top of the aquifer to the first saturated sand, and for an additional 20 feet (if possible), the bucket auger method or a combination of dry air rotary drilling and split spoon sampling would be used, in order to identify the first saturated sand encountered. From the bottom of the bucket auger section to the anticipated bottom of the aquifer, air rotary with water and foam injection would be used.

Figure 15.

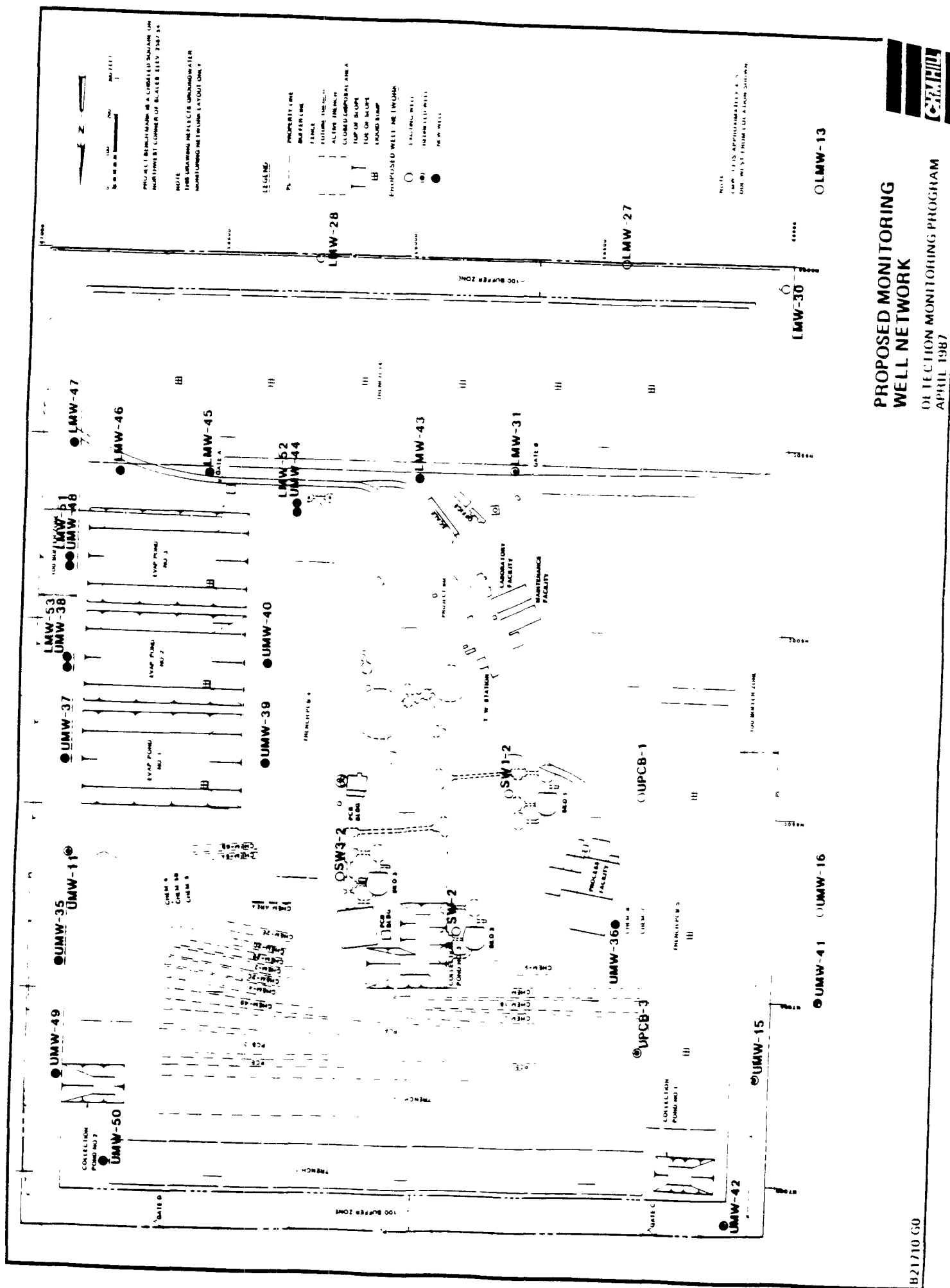
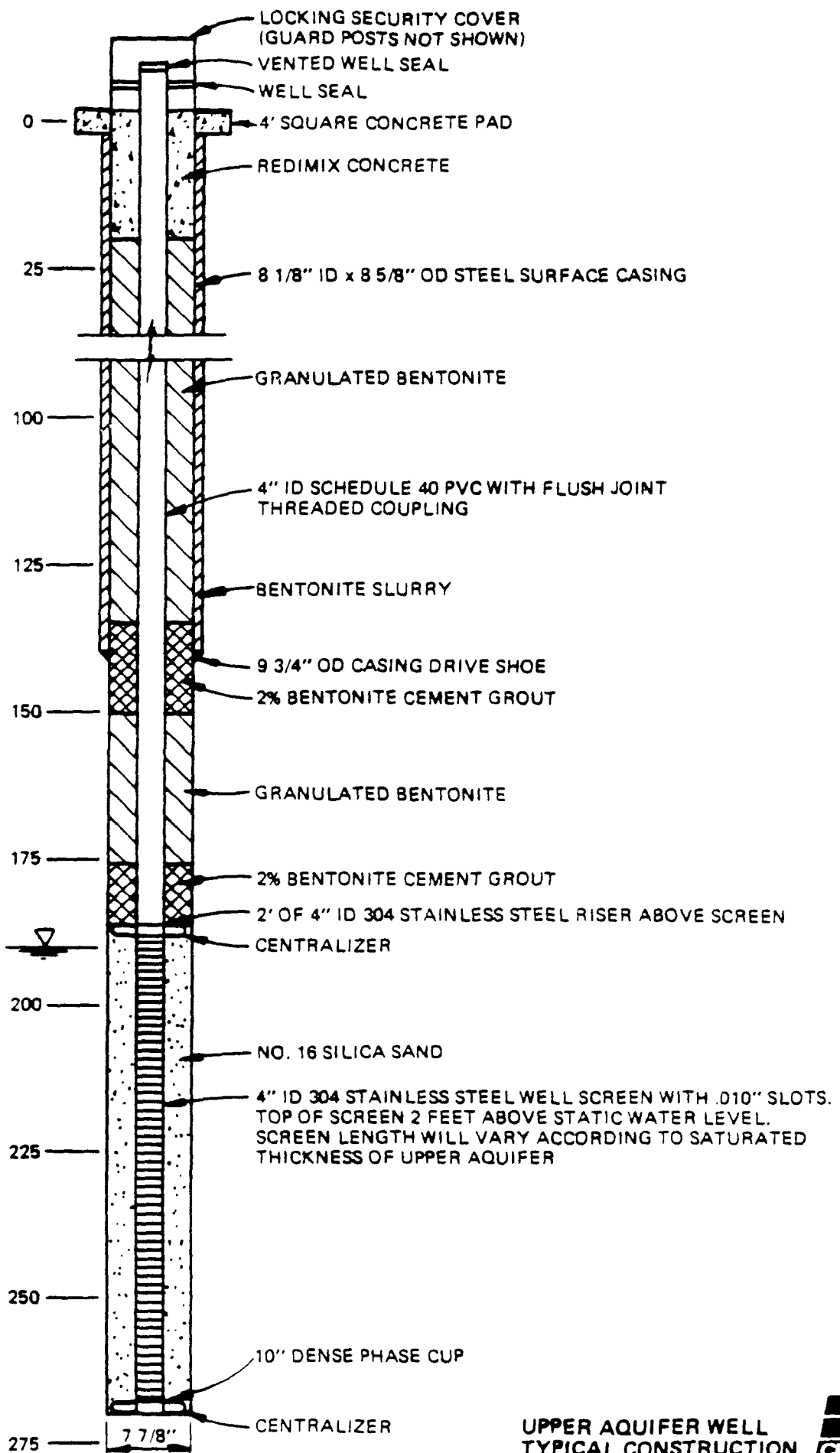
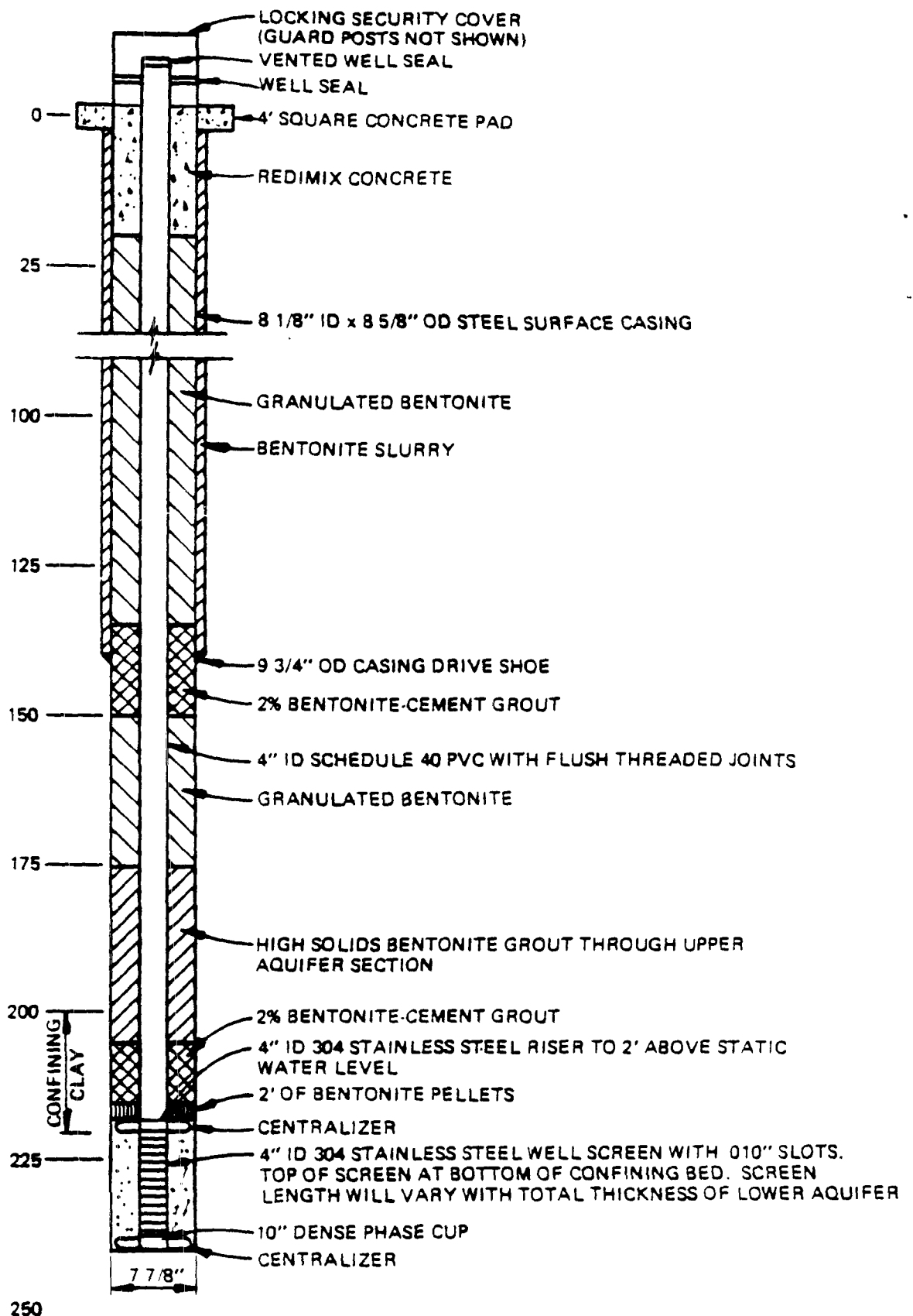


Figure 1.



UPPER AQUIFER WELL
TYPICAL CONSTRUCTION





LOWER AQUIFER WELL
TYPICAL CONSTRUCTION



(4) Each well would have a surface casing of 8-5/8-inch OD (8-1/8-inch ID) Schedule 40 steel with welded joints, which would be driven to approximately 140 feet in a 7-7/8-inch diameter borehole.

(5) All new wells would have a nominal inside diameter of four inches. A 10-inch dense phase cup is proposed for each well. The dense phase cup, well screen and bottom end plate would be 304 stainless steel.

(6) Well screens, which would span the aquifer thickness at each location, would extend 10 feet above the encountered static water level in the upper aquifer wells. A five-foot stainless steel riser would be placed above the screen. In the lower aquifer, screens would be positioned at the bottoms of the inner confining bed, and a stainless steel riser would be placed above the screen to five feet above the static water level. Water levels in the lower aquifer would extend up to 20 feet above the top of the screen due to the confined head of the lower aquifer.

(7) From the top of the stainless steel to two feet above ground level, 4-inch Schedule 40 PVC with threaded flush joint couplings would be used. Stainless steel centralizers would be located at the bottom and top of the well screen assembly.

(8) Slot sizes of all screens would be .010-inch. No. 16 silica sand would be used for the filter pack. In its proposal, ESII-B states that the screen slot and filter pack sand were sized for the screen slot size and aquifer sands, and further, that the use of the specified

combination of slot size and filter pack material is supported by textbook sizing calculations as well as prior experience at the site.

(9) For new wells, it is stated that the filter pack would extend from the bottom of the dense phase cup to above the top of the screen not less than two feet but not more than 10 percent of the total length of the filter pack.

(10) Because the top of the filter pack would be below the potentiometric surface in the lower aquifer wells, the requirements for sealing the annulus of a well in the lower aquifer are different from those in the upper aquifer. The seals in the upper aquifer wells would have 10 feet of two percent bentonite-cement grout on top of the filter pack. From the top of the cement to 10 feet below the steel surface casing, dry granulated bentonite would be placed. Another plug of two percent bentonite-cement would be tremied on top of the granulated bentonite and would extend five feet up into the bottom of the steel surface casing. Dry granulated bentonite would then be used to fill the inside of the steel surface casing to 20 feet below ground level. Concrete would be used to fill the upper 20 feet of annulus and to form a four-foot-square pad approximately four inches thick around the base of the well head.

In lower aquifer wells, ten feet of two percent bentonite-cement grout would be tremied on top of bentonite pellets placed on top of the filter pack. From the top of the grout to 10 feet below the surface casing, a bentonite grout with a high, unhydrated solids content would

be tremied into place. Bentonite-cement would be tremied on top of the bentonite grout and would extend five feet into the surface casing. Dry bentonite would then be used to fill the annulus to 20 feet below ground level. Concrete would fill the upper 20 feet of annulus and create a pad similar to those in upper aquifer wells.

(11) After completion of well construction, wells would be treated with a disinfectant such as calcium hypochlorite to retard the growth of iron and or sulfur bacteria. Wells would then be developed using, in the following order: stainless steel bailer, air lift surging, stainless steel bailer, and final development by stainless steel submersible pump. Water removed during the development process would be monitored periodically for specific conductivity, temperature, pH and turbidity. The total volume of water removed from each well would be recorded.

ANALYTICAL PARAMETERS

ESII-B has proposed a schedule for ground water sampling and analysis as follows:

(1) Indicator parameters (TOX, TOC, pH and specific conductance) quarterly for the first year and semi-annually thereafter;

(2) Volatile organic compounds from EPA's Priority Pollutant list and total phenolic compounds, semi-annually;

(3) Aroclors, chloride and TOX quarterly, to satisfy TSCA requirements for ground water monitoring of PCB disposal units; and

(4) Major anions and cations, annually.

ESII-B proposes that wells SW-1-2, SW-2 and SW-3-2 would be included for the purpose of monitoring only non-regulated units, i.e., those that had not received hazardous waste after November 19, 1980, and that these wells would be sampled only once per year. Samples would be analyzed for the parameters listed above, but the results would not be included in any statistical analyses performed on the sample data obtained from the other wells.

MONITORING FOR HEAVY AND LIGHT IMMISCIBLES

ESII-B's current (interim status) ground water monitoring program does not include checking for the presence of immiscible substances that may collect at the tops or bottoms of water columns, depending upon their density relative to water. ESII-B's proposal states the intention to check for the presence of light and heavy immiscibles each time a well is sampled. Light and heavy immiscible phases are proposed to be monitored using an interface probe. If the presence of either were detected, a sample would be collected to submit for laboratory analysis. ESII-B also states that, regardless of the indications from the water-level probe, a sample of the top 0.5 foot of the static water column in the well and the bottom liquids and sediments would be collected twice per year, as part of the well maintenance program. A discrete-interval sampler (Kemerer-type) or double-check-valve sampler would be used to collect the samples, which would be submitted for laboratory analysis.

PURGING AND SAMPLING TECHNIQUES

ESII-B proposes that, depending upon field conditions encountered subsequent to well installation, wells would be purged using stainless steel submersible pumps (to be removed prior to obtaining samples) where well yields are greater than one gallon per minute, and using stainless steel bailers in other locations. ESII-B has agreed not to utilize submersible pumps for obtaining ground water samples, and to install check valves where they are used for purging purposes. All samples are proposed to be obtained using dedicated Teflon bailers.

Three well volumes, including the quantity calculated to reside in the filter pack, are proposed to be purged from wells prior to obtaining samples, unless the wells can be evacuated to dryness. In that case, one volume would be removed. ESII-B has not indicated that it would attempt to purge wells continuously of three volumes instead of bailing to dryness, when yields (and controlled purging rates) would permit. The proposal does include a provision that samples would be collected as soon as the well had sufficiently recovered, in low-yielding wells purged with a bailer. For wells purged with a submersible pump, samples would be obtained immediately after the pump had been removed from the well.

STATISTICAL ANALYSES

ESII-B has proposed to subject only indicator parameter data to statistical analyses. ESII-B states in its proposal that "statistical analyses...cannot be performed on the VOAs or total phenols because none are

present in background analyses; therefore, any comparison of these parameters between upgradient and downgradient wells, or within each well over time, would be done using a non-statistical methodology, such as trend-line analysis or other graphical techniques." While this argument may be valid for volatile organic compounds, total phenolics in fact have been detected in certain upgradient and downgradient wells at ESII-B, as discussed in this report in the section on ground water sample data.

ESII-B has proposed to utilize two separate parametric statistical tests, both of which would have to indicate the presence of a significant difference before an investigative action would be taken to verify or prove erroneous the subject data. In accordance with 40 CFR § 264.97(h)(1)(ii), the owner/operator must use either the Cochran's Approximation to the Behrens-Fisher Student's t-test or an equivalent statistical procedure to determine whether a statistically significant change has occurred in water quality at the point of compliance as compared with background data. Such a determination must be made semi-annually, pursuant to 40 CFR § 264.98(d).

ESII-B has proposed to use the averaged replicate (AR) t-test and the analysis of covariance (ANCOVA). ESII-B states that ANCOVA eliminates several biases that are built into the t-test because "it does not assume that ground water data should be homogeneous over time and at all locations." ANCOVA does eliminate seasonal effects that could alter the values of certain parameters in some hydrogeologic regimes where such seasonal effects are significant; but it also requires that, for a significant difference to be found, the differences in values for a given parameter among downgradient wells must be less than the difference between the value obtained for a particular

Table 9. (cont.)

Screen Length, ft.	Total Length of Filter Pack, ft.	Saturated Length of Filter Pack, ft.	Typical Length of Water Column, ft. ^a	Well Volume, Casing Only, g	Effective Volume, Filter Pack, g	Total Volume, Casing + Filter Pack	Total Volume Purged by ES11-B, g ^b	Number of Volumes (Casing Only) Purged by ES11-B	Total Number of Volumes (Casing + Filter Pack) Purged by ES11-B
Downgradient Wells									
MW-1	20	62	36	34	22.2	21.5	44	75	3.4 1.7
MW-2	20	75	98	38	14	39	53	21	1.5 0.4
MW-3	20	78	47	34	22.2	30	52.2	75	3.4 1.4
MW-4	20	88	55	35	13	20	33	20	1.5 0.6
MW-10	40	70	55	50	32.6	33.3	60	105	3.2 1.6
MW-11	40	69	55	50	31.3	34	65	55	1.8 0.8
PCB-1	10	12	6	6	4	3.5	7.5	6	1.5 1.2
PCB-2	10	16	12	9	6	7.6	13.6	9	1.5 1.2
PCB-3	10	14	11	14	9	6	15	35	3.9 2.3
SW-1	10	none		32	21	21	21	33	1.6 1.6
SW-2	10	24	19	35	10	12	22	16	1.6 0.7
SW-3	10	21	16	16	10.4	7.5	24	17	1.6 0.7
SW-3-2	10	12.5	4	9	6	3	9	10	1.7 1.1

^a Using ES11-B reported values for well depths and (typical) depths to standing water^b From ES11-B's Sampling and Analysis Plan, dated June 1986^c Using ES11-B's estimated depth of well (actual depth incorrectly reported in construction diagrams)

Table 9. Quantities of Stagnant Water in Interim Status, PCB, and Silo Wells Before Purging Compared With Quantities Purged by ES11-B Prior To Obtaining Samples

Screen Length, ft.	Total Length of Filter Pack, ft.	Saturated Length of Filter, ft.	Typical Length of Water Column, ft. ^a	Well Volume, Casing Only, g	Effective Volume, Filter Pack, g	Total Volume, Casing + Filter Pack, g	Total Volume Purged by ES11-B, g ^b	Number of Volumes (Casing Only) Purged by ES11-B	Total Number of Volumes (Casing + Filter Pack) Purged by ES11-B
LOWER AQUIFER									
Upgradient Wells									
MW-13	40	72	76	49.6	42.3	91.9	85	1.7	0.9
MW-6	20	96	34	12.5	23	35.5	20	1.6	0.6
Downgradient Wells									
MW-5	20	61	32	17.6	20	27.6	35	2	1.3
MW-21	10	17	17	51.5	10	61.5	75	1.7	1.4
MW-24	10	38	38	48	15	78	80	1.7	1.0
MW-25	10	28	28	60	58	118	100	1.7	0.8
UPPER AQUIFER									
Upgradient Wells									
MW-15	40	90	93	41.1	60.5	102	130	3.2	1.3
MW-16	10	18	12	7.2	7.2	14.4	16	2.2	1.1

downgradient well and the background value with which it is compared. This effectively assumes that differences in the values of indicator parameters would nearly uniformly change in the downgradient wells should a release occur to ground water. However, at a large site such as ESII-B, a release would be unlikely to affect all of the downgradient wells in either aquifer uniformly. It is more likely that a narrow plume would initially affect the water quality in one or two wells. This consideration is particularly important in a detection monitoring system, where the goal is to detect a release before it is allowed to disperse in any direction.

In its proposal, ESII-B states that if a statistically significant difference is confirmed by both the AR and the ANCOVA procedures, the steps described at 40 CFR § 264.97(h)(1) to certify the statistically significant variance would be implemented. It goes on to state that if a confirmation were made, the conditions described at 40 CFR § 264.98(h) would be implemented with two exceptions: "only the well(s) in which the variance occurred will be resampled, and background values will be established for an applicable list of parameters to thoroughly characterize the nature and extent of any contaminants present." No description of what such an applicable list would entail is provided.

NON-STATISTICAL EVALUATIONS

ESII-B proposes to use an unspecified trend line analysis to evaluate all ground-water data other than those generated for indicator parameters. The only explanation offered as to how such an evaluation would be conducted and interpreted is that "[i]f trends are identified, a program will be

developed to determine the cause and significance of the trend." Trend line analyses, appropriately conducted, would be a suitable way to follow and evaluate values of pH, specific conductance, total dissolved solids (if monitored), total phenolics and major ions. Trend lines for volatile organic compounds would be inappropriate in a detection monitoring system. The detection of such a compound in a downgradient well should be considered a "hit" under specified circumstances, such as: (1) the compound was not also found in blank samples; (2) other volatile organic compounds were concomitantly reported; and/or (3) the concentration of the compound exceeds previously established threshold values, such as the method detection limit. A program that would specifically address such occurrences should be outlined in detail.

WELL MAINTENANCE

ESII-B has described a well maintenance program to be conducted as part of the ground water monitoring program for the site. It would entail well-head inspection prior to sampling; semi-annual sounding to determine total depth of each well; periodic re-development and disinfection; and determination of specific capacity (gallons/minute/foot of drawdown after a specified period of pumping) at the time of installation and before and after any maintenance is performed, or bi-annually if no maintenance is scheduled.

DETERMINATION OF WATER TABLE ELEVATIONS

In its most recent proposal, ESII-B has stated its intention to retain 15 existing test and monitoring wells that would not be incorporated into the

detection monitoring program, but which would be retained for the purpose of periodically determining water levels. It is also proposed that 11 existing wells and piezometers be abandoned, reportedly because they either connect the upper and lower aquifers or have sand packs that come within 10 feet of bridging the confining bed between the aquifers.

EPA agrees that wells or piezometers which bridge the two aquifers do not provide useful water level data and may present pathways for contaminant transport from one aquifer to another, and therefore should be appropriately abandoned or rehabilitated. For example, EPA concurs that wells MW-2 and MW-4 should be abandoned, as stated in this report in the section on the interim status ground water monitoring program. Well MW-15, which bridges the aquifers, is an upgradient well which ESII-B has proposed to redrill as an upgradient well for the permitted monitoring network.

It is important that ESII-B maintain an adequate system that will allow an accurate, routine evaluation of the ground water flow directions in the aquifers. Such information is crucial in the upper aquifer along the northern border of the site, where no wells have been proposed to be included in the detection monitoring network. The decision to exclude placement of such wells is based on ground water contour maps which indicate that flow lines parallel trench 11. Such a conclusion is dependent upon water level data, which are not fixed in time, and which must be verified periodically so that an adequate degree of confidence can be placed in the locations of the wells in the monitoring network. It is also important to procure such information in the central areas of the site, where ground water flow direction in the upper aquifer is in question, particularly as it relates to the area of the silo

complex. ESII-B has proposed to abandon well D-8, which is centrally placed, but which does not appear from well boring logs to breach the two aquifers. It should not be abandoned unless it is replaced with an appropriate substitute. Similarly, the construction of the remaining wells which ESII-B has proposed to abandon should be scrutinized closely prior to doing so, as it may be more appropriate to maintain some of them for informational purposes.

COMMENTS

Since EPA and ESII-B are still conducting dialogues concerning the appropriate ground water monitoring program for the RCRA permit determination, conclusions regarding ESII-B's permit application are not made here. Following are a few comments regarding the facility's submittal.

(1) Proposed construction designs and methods for the new upper and lower aquifer wells appear to be appropriate for a detection monitoring system at this site. Where lower aquifer wells are to be placed in locations where the upper aquifer is saturated, ESII-B should describe the construction techniques to be used to prevent interconnection of the aquifers and to preclude vertical migration of contamination, should it be present at any time.

(2) Silo wells SW-1-2 and SW-3-2 may not be downgradient from their respective silos. Silo wells SW-1 and SW-3 are more appropriately located and should be utilized in ESII-B's ground water monitoring network.

(3) ESII-B's rationale for horizontal spacing between wells is being evaluated and independently studied by EPA.

(4) EPA concurs that volatile organic compounds are appropriate to use as indicators of contamination at this site. The volatile organic compounds included in the Hazardous Substance List (as referenced in EPA's contract laboratory program and in the Federal Register, Vol. 51, No. 188) would be a more appropriate list than the Priority Pollutant list, since the Hazardous Substance List of volatile organic compounds includes all of those on the Priority Pollutant list, plus a few additional compounds which could be important indicators of ground-water contamination at a hazardous waste site.

(5) EPA agrees that statistical analyses should not be applied to values obtained for volatile organic compounds at this site, at this time. EPA is still considering what, if any, statistical methodologies would be appropriate for ESII-B's indicator parameter data. However, analysis of covariance, as proposed by ESII-B, is not an acceptable statistical methodology to be used in conjunction with or instead of other statistical tests for such data generated at this site.

(6) A description of the procedures to be followed by ESII-B, should a statistically significant change in indicator parameter values be detected and verified, needs to be more detailed in a permit than ESII-B has offered in its submittal.

(7) ESII-B proposes to deviate from 40 CFR § 264.98(g), which requires that statistical analyses be conducted for all parameters and constituents which are required by the permit to be monitored. However, for parameter and constituents not proposed to be statistically analyzed, ESII-B has provided no method for determining what value or values would be considered indicative of ground water contamination, and no reference is made to any actions that would be taken in response to such a finding. Where application of statistical methods to data generated at this site is deemed inappropriate by EPA, it would be appropriate to specify concentrations (or trends) for individual parameters and constituents which would act as triggers to set into motion procedures including the following: notification of the Regional Administrator in writing of a finding indicative of ground-water contamination; resampling efforts, including identification of wells to be sampled and analytical parameters; submittal of an application for a permit modification to establish a compliance monitoring program; and provisions for a demonstration that a source other than a regulated unit, or that error in sampling, analysis or evaluation was responsible for the finding.

(8) Annual sampling of silo wells, as proposed by ESII-B, may not be frequent enough to determine in a timely manner whether contamination previously detected in those areas actually represents a release to ground water.

(9) Wells and piezometers which currently exist within the interior of the site or along the northern site boundary, and which do not bridge

both aquifers, should be maintained for the purpose of obtaining water elevation information throughout the permitted life of the facility. If sufficient numbers of such wells do not exist after determining which should be abandoned due to bridging, additional wells or piezometers should be installed to ensure that ground water flow directions in the upper aquifer can be accurately and routinely evaluated.

(10) Wherever possible, wells should be purged of three or more volumes of water to ensure that samples are representative of formation water, and then immediately sampled. Wells should be purged to dryness only when the aquifer yield in a given location precludes a continuous purge-to-sample routine.

GROUND WATER SAMPLE DATA

INSPECTION DATA

The analytical results obtained from ground water samples obtained during this inspection are summarized in Appendix C. A discussion of the usability of the data is reproduced in Appendix D. Data for total phenolics and pesticides are reported to be unusable, based on quality assurance considerations. Also unreliable are values for nitrate nitrogen, TOC and, in certain specified samples, chloride, sulfate and ammonia nitrogen. Region 10 had intended to use the major ion data, including the carbonate/bicarbonate balance, to supplement the geochemical characterization of the site; however, this was not possible because the data were reported as qualitative rather than quantitative. Acetone was abundant in blank samples and therefore, the values reported for all samples are unreliable as indicators of its presence in ground water.

The balance of the data is usable, with usability classified as either quantitative, semi-quantitative, or qualitative, as delineated in Appendix D. Aside from the pesticide data, all results for volatile and semivolatile compounds are quantitative. Samples were obtained for dioxin analyses, but the samples were not analyzed until sometime after the other samples, and the results presently cannot be located. This report will be amended to reflect the results if they are discovered or reproduced.

The sample analysis data are for the most part unremarkable. Low levels of chloroform were detected in silo wells SW-1 and SW-3, consistent with the

results ESII-B has obtained recently for those wells. An unidentifiable semivolatile compound was reported in SW-3 at 17 ug/l, although it was not reported in the duplicate sample obtained from that well. Low levels of phthalate compounds were reported in wells MW-11, MW-13, PCB-1, PCB-2, PCB-3, MW-16 and MW-21, and in a field blank. Phthalates were not detected in the stainless steel silo wells, reinforcing the belief that phthalates are released from the polyvinyl chloride well casings. N-butylbenzenesulfonamide was tentatively identified in well D-19 at an estimated concentration of 9 ug/l. The same compound was tentatively identified in MW-3 at an estimated concentration of 17 ug/l. An unidentifiable semi-volatile compound was identified at an estimated 215 ug/l in MW-5.

REVIEW OF ESII-B SAMPLING DATA FOR INTERIM STATUS WELLS

A review of the available ground-water data for the interim status monitoring well network from January 1984 through December 1986 was conducted. As mentioned previously, it was not until late in the report preparation process that EPA realized that ESII-B had been conducting monthly analyses for samples from the interim status wells that were much more extensive than had been believed. These data were requested and obtained for the sampling events in 1984 through 1986. In May 1986, ESII-B discontinued monthly sampling and also discontinued analyzing ground-water samples for the extensive list of organic parameters that it had been obtaining since January 1984. Since May 1986, only those parameters required by 40 CFR Part 265 Subpart F reportedly have been obtained for the evaluation of RCRA ground water monitoring wells (except four upper aquifer, downgradient wells, which are sampled quarterly for volatile organic compounds as part of the silo well

monitoring program). In addition to the 40 CFR Part 265 Subpart F parameters required of a facility operating a detection monitoring system, ESII-B's historical data base includes monthly samples from January 1984 through April 1986, analyzed for the following parameters: Priority Pollutant volatile organics and base/neutral extractable compounds; Priority Pollutant acid extractable compounds and pesticides/PCBs (analyzed in only three sampling events, in 1984); and a few constituents from the 40 CFR Part 261, Appendix VIII list of hazardous constituents, which had been reported from the first sampling event in January 1984, when EPA and IDHW obtained split samples for analysis. Those constituents are isophorone, naphthalene, pyrene and 2,4,5-T, all reported at concentrations below 1 ug/l.

Trichloroethane was routinely discovered in wells MW-1, MW-3 and MW-5 in 1984. ESII-B discovered that the pumps installed in those wells contained substances other than stainless steel. It was reported that glue present in the pumps contained solvents. The pumps were replaced in January 1985, and the detected levels of trichloroethane subsequently decreased and eventually disappeared. The levels of trichloroethane in well MW-5 (the well with the highest concentrations) ranged between 12 and 61 ug/l during 1984. In April 1985, the concentration of trichloroethane in MW-5 was reported as 11 ug/l. Trichloroethylene was detected in MW-3 at 3 ug/l in April 1984, but was also detected in a trip blank sample that month. In April 1985, trichloroethylene and tetrachloroethylene were reported at concentrations of 7.6 and 7.4 ug/l, respectively. None of these compounds was detected in samples after May 1985, including those obtained during this inspection.

Methylene chloride and trichlorofluoromethane have occurred regularly in ESII-B ground-water samples. Because many blank samples, both field and trip, have shown the presence of comparable concentrations of these compounds, they are not reliable indicators of contamination at this site. Also abundant in the PVC wells are phthalate compounds. The balance of ESII-B's data base reflects infrequent "hits" of organic compounds at low concentrations, the existence of which have not been substantiated by subsequent sampling events. For example, chloroform was reported in MW-5 and MW-3 at 0.6 ug/l in February 1984 but has not been reported since. (It was, however, reported in a field blank in June 1984.) Pyrene, reported in wells MW-4 and MW-5 in the January 1984 sampling event, was reported in MW-2 in August 1985 at a concentration of 2.21 ug/l. Fluoranthene was reported in the same well during the same sampling event at 3.15 ug/l.

Analyses from 1986, obtained monthly by ESII-B for its extensive parameter list only through April of that year, show the following compounds as being detected, all in March: isophorone, 2.2 ug/l, MW-10; benzo(a)pyrene, 3.53 ug/l, MW-16 (upgradient well); benzo(a)pyrene, 5.05 ug/l, MW-24; benzo(k)fluoranthene, 6.13 ug/l, MW-16 (upgradient well); and benzo(k)fluoranthene, 9.49 ug/l, MW-24. Isophorone was reported in the January 1984 sampling event in wells MW-4, MW-5 and upgradient well MW-6 (all below 1 ug/l concentration) and had not been detected again until March 1986. Otherwise, the compounds noted above had not been detected previously, were not detected in the April 1986 sampling event, and were not detected in the samples obtained during this inspection. Not unlike these values, occasional spikes of TOC or TOX appear in ESII-B's historical data base, although the significance of these indicator parameters cannot be evaluated since statistical analyses were not performed for them.

Total phenolics presents a parameter category of interest at ESII-B. Total phenolics have been reported in a few wells over the period during which ESII-B has been sampling, but not all wells appear to be affected. Data for total phenolics are shown in Table 11. There are no reports of total phenolics detected in the upgradient wells in the upper aquifer, although MW-6, a lower aquifer, upgradient well, shows the presence of phenolics on three occasions, all below 100 ug/l. Well MW-11 shows a single reported value in October 1985 of 294,000 ug/l, several orders of magnitude greater than any other value reported. This value was confirmed by ESII-B to exist in the technical data report as well as in the summary data report, which EPA received.

Although values for total phenolics are prescribed for use as indicators of ground water quality, the presence of total phenolics above detection limits is not necessarily an indication that ground-water contamination has occurred. Phenolics comprise a class of aromatic organic compounds which occur in nature, but they also represent one of the highest-volume chemical groups produced in the United States. Examples of phenolics are phenol, the cresols, xylenols, resorcinol, naphthols, and chlorinated phenols, such as pentachlorophenol.

The presence of total phenolics in ESII-B's data base does not have any immediately clear significance. Except for three sampling events early in 1984, ESII-B's analytical efforts have not included the acid extractable compounds from the Priority Pollutant list, which consist of individual phenolic compounds. The analytical methodology used by ESII-B's laboratory may be responsible for the fact that only occasionally are values reported for

Table 11.
Historical Reports of Total Phenolics;
ESII-B Ground Water Samples, January 1984 to April 1986

<u>Well</u>	<u>Sample Date*</u>	<u>Total Phenolics ug/l</u>	<u>Notes</u>
MW-1	1/84	16	Sample analyzed by IDHW
	9/84	290	
	1/85	750	
	5/85	68	
	10/85	69	
MW-2	1/84	22	Sample analyzed by IDHW
	9/84	170	
	2/85	79	
	7/85	74	
MW-3	1/84	22	Sample analyzed by IDHW
	12/84	720	
	1/86	99	
MW-4	1/84	13	Sample analyzed by EPA
	4/85	54	
	7/85	53	
MW-5	1/84	23	Sample analyzed by EPA
MW-6	1/84	25	
	2/85	93	Sample analyzed by EPA
	2/86	56	
MW-10	10/85	120	
MW-11	10/85	294,000**	
MW-21	10/85	80	
	1/86	51	

* ESII-B monthly data for total phenolics is available for wells MW-1 through MW-6 from January 1984-1986 and in wells MW-10, MW-11, MW-13, MW-15, MW-16, MW-21, MW-24, and MW-25 from January 1985-April 1986. Where no data is reported in this table, no total phenolics were detected.

** ESI confirmed that this value is found in the laboratory raw data report as well as the summary data report. However, the company recently requested its laboratory to confirm the value independently.

total phenolics. Method 9065 of SW-846, which has the relatively high detection limit of 50 ug/l, has been employed. It is not unlikely that phenolic compounds occur naturally in the ground water beneath the ESII-B site, but have not been reported because of the method detection limit. During the process of preparing this report, EPA recommended to ESII-B that it request its laboratory to change the subject methodology to SW-846 method 9066, which has a detection limit as low as 2 ug/l; or to some other EPA-approved methodology which has a relatively low detection limit. By doing so, the significance of the already-reported total phenolics data should become more apparent.

Total dissolved solids (TDS) in the ground water at ESII-B also may be of value to monitor. ESII-B has conducted limited analyses of total dissolved solids, but a limited data base that was developed in 1984 and 1985 is complemented by ESII-B's analysis for TDS in its samples split with EPA during this inspection. Historical TDS data for the wells sampled during the inspection, along with corresponding specific conductance values, are tabulated in Table 12. It is interesting to note that in certain wells, such as MW-3, PCB-2, and SW-2, TDS values increased by approximately three-fold. Although no previous TDS data exist for SW-1 and SW-3-2, the recent values are very high compared with the most of the values for other parts of the site. High total dissolved solids in the region of the silo complex would tend to add credence to the previously discussed theory that vertical recharge preferentially occurs in that area. However, since the value for SW-3 is reported to be below detection limit, which is not a plausible value for any ground-water sample, the reliability of all of the TDS data reported from this sampling event must be questioned. ESII-B has been asked to have its

Table 12.
Historical Specific Conductance and Total Dissolved Solids Data
for Wells Sampled During the June 1986 EPA Inspection^a

<u>Well</u>		<u>12/84</u>	<u>2/85</u>	<u>4/85</u>	<u>8/85</u>	<u>11/85</u>	<u>6/86</u>
MW-3	TDS ^D COND ^C	1080 1500			990 1410		3700 990
MW-5	TDS COND	862 1450			862 1430		870 905
MW-9	TDS COND	724 1010			722 1010		640 660
MW-10	TDS COND	802 1110			840 1160		700 760
MW-11	TDS COND	1270 1710			1270 1780		30 ^d 1310
MW-13	TDS COND	652 1050			744 1220		740 735
MW-16	TDS COND					900 1340	950 1020
MW-21	TDS COND		498 814	582 937			810 925
MW-25	TDS COND					715 1100	690 735
PCB-1	TDS COND				912 1430		500 1100
PCB-2	TDS COND				960 1380		2800 1025
PCB-3	TDS COND				1060 1400		1900 850
SW-1	TDS COND						3000 1225
SW-2	TDS COND			1060 1460			2800 1100

Table 12.(continued)
 Historical Conductivity and Total Dissolved Solids Data
 for Wells Sampled During the June 1986 EPA Inspection^a

<u>Well</u>		<u>12/84</u>	<u>2/85</u>	<u>4/85</u>	<u>8/85</u>	<u>11/85</u>	<u>6/86</u>
SW-3	TDS COND				1250 1600		BDL ^d 1000
SW-3-2	TDS COND						4600 1060
D-18	TDS COND						2600 675
D-19	TDS COND		934 1325		1050 1420		934 1100

- a All values are from ESII-B data except 6/86 conductivity, obtained by EPA during this inspection. Values for conductivity are given only for dates when TDS values were also obtained.
- b Values in mg/l.
- c Values in umhos/cm.
- d ESII-B has been asked to verify these values.

laboratory verify the value reported for SW-3. Regardless, analyzing for total dissolved solids on a regular basis would be advisable at this site, since it may provide valuable information as to the localized status of site geochemistry and hydrology, and, therefore, contaminant transport.

CONCLUSIONS

There does not appear to be any reliable evidence of ground-water contamination at the site boundary of ESII-B in either of the two monitored aquifers. From a regulatory standpoint, ESII-B must fulfill its interim status obligations to carry out required statistical analyses in order to obtain a RCRA permit allowing it to operate in a detection monitoring mode. Long-term sampling of wells in the silo complex area will be necessary to definitively determine whether ground water contamination exists from past practices in that area. The discussion below is limited to data generated from the interim status ground water monitoring wells.

The occasional reports of the detection of various organic compounds at low concentrations, not consistent in location or substantiated in time, are not readily explainable. Technically, probably the best parameters to be used as indicators of ground-water contamination at ESII-B are volatile organic compounds. ESII-B's monthly analyses of Priority Pollutant volatile organic compounds serve as a good indication that ground water contamination had not occurred, at least until May 1986 when ESII-B discontinued that schedule. However, such demonstration is somewhat diminished by the existing well construction and the purging/sampling techniques employed by the facility.

While the analytical tests have been thorough, the quality of many of the samples, and thus the reliability of the data generated from them, is questionable.

Specific changes in ESII-B's purging and sampling techniques are recommended earlier in this report in the review of the facility's interim status ground water monitoring program. Once ESII-B improves the degree of reliability that can be placed in the samples it collects, additional analyses should be conducted to confirm the absence of ground-water contamination in the interim status wells. Analyses for total phenolics should continue, but with a methodology that provides a detection limit lower than 50 ug/l. It is also recommended that ESII-B include total dissolved solids in its parameter list, at least periodically, to follow trends in these values and to be alerted to any dramatic elevations in TDS values which might be an early indicator of contaminant transport.

APPENDIX A
FIELD MEASUREMENTS

FIELD PARAMETERS
GHTF INSPECTION, ESII-2
JUNE 1986

<u>date</u>	<u>well</u>	<u>parameter</u>				
6/17	PCB-3	time	1022	1045	1149	
		temp(°C)	18.1	19.0	20.0	
		pH	7.0	7.0	6.95	
		cond(umhos/cm)	875	850	850	
6/17	MW-11	time	1510	1530	1600	1725
		temp	21.6	24.2	24.1	21.2
		cond	1400	1260	1240	1310
		pH	6.8	6.9	6.9	6.9
6/18	MW-10	time	0845	0910	0940	0958
		temp	20.3	20.7	21.8	21.2
		cond	750	800	765	750
		pH	7.05	7.1	7.2	7.1
6/18	MW-25	time	1210	1300	1420	
		temp	22.2	22.5	23.2	
		cond	720	750	735	
		pH	7.3	7.3	7.3	
6/19	MW-13	time	0835	0900	1400	
		temp	19.0	20.2	22.1	
		cond	720	750	735	
		pH	7.3	7.3	7.3	
6/19	MW-16	time	1000	1035	1155	1212
		pH	6.9	7.0	7.0	7.1
		cond	1020	1050	980	1020
		temp	18.3	18.3	18.5	18.6
6/20	PCB-1	time	945	915	950	
		temp	18.4	18.2	18.4	
		pH	7.2	7.1	7.2	
		cond	1125	1100	1100	

<u>date</u>	<u>well</u>	<u>parameter</u>					
6/20	MW-21	time	1410	1500	1510		
		temp	20.4	21.3	21.5		
		pH	7.1	7.1	7.2		
		cond	875	940	925		
6/23	SW3-2	time	0950	1040	1202		
		pH	6.9	6.9	7.0		
		cond	1240	1100	1060		
		temp	19.5	19.3	19.3		
6/23	SW-1	time	1010	1115	1500	5/24	1030
		temp	20.2	21.3	21.5		21/1
		pH	7.2	7.2	7.0		7.1
		cond	975	900	925		1225
6/23	SW-2	time	1045	1155	1452	5/24	1320
		temp	18.8	19.4	19.8		19.3
		pH	7.1	7.0	6.9		6.85
		cond	900	800	860		1100
6/23	SW-3	time	1056	1446	1625		
		temp	20.3	21.3	22.7		
		pH	7.3	7.3	7.2		
		cond	950	1120	1000		
6/24	MW-3	time	0905	0930	6/25	0853	0932
		temp	19.6	19.3		19.0	19.0
		pH	7.2	7.2		7.0	7.4
		cond	1050	1050		1000	990
6/24	D-18	time	1345	1420	1453		
		temp	18.8	18.5	18.6		
		pH	7.4	7.2	7.1		
		cond	650	550	575		
6/25	MW-5	time	0842	1343	1308		
		temp	19.3	21.9	21.1		
		pH	7.05	6.85	7.0		
		cond	900	930	905		

<u>date</u>	<u>well</u>	<u>parameter</u>				
6/25	PCB-2	time	0955	1030		
		pH	7.05	7.05	7.05	1145
		cond	1000	1015		7.0
		temp	19.3	19.6	1020	1025
					20.2	19.0
6/25	D-19	time	1040	1115	1145	
		temp	19.9	19.6	19.7	
		pH	7.0	7.0	7.0	
		conductivity	980	1100	1100	
5/25	FW-3	time	1050	1715	1730	
		temp	19.5	19.4	18.7	18.9
		cond	750	675	690	660
		pH	7.2	7.1	7.1	7.0

(compiled from field notebooks)

APPENDIX B

PARAMETERS, ANALYTICAL METHODS AND DETECTION LIMITS
FOR EPA SAMPLES OBTAINED AT ESII-B

Table B-1

ANALYTICAL PARAMETER LIST AND DETECTION LIMITS

<u>detection limit, ug/l</u>	<u>VOLATILES</u>
10	chloromethane
5	1,1,2,2-tetrachloroethane
10	bromomethane
5	1,2-dichloropropane
10	vinyl chloride
5	trans-1,3-dichloropropene
10	chloroethane
5	trichloroethylene
5	methylene chloride
5	dibromochloromethane
10	acetone
5	1,1,2-trichloroethane
5	carbon disulfide
5	benzene
5	1,1-dichloroethene
5	cis-1,3-dichloropropene
5	1,1-dichloroethane
10	2-chloroethylvinylether
5	trans-1,2-dichloroethene
5	bromoform
5	chloroform
10	2-hexanone
5	1,2-dichloroethane
10	4-methyl-2-pentanone
10	2-butanone
5	tetrachloroethene
5	1,1,1-trichloroethane
5	toluene
5	carbon tetrachloride
5	chlorobenzene
10	vinyl acetate
5	ethylbenzene
5	bromodichloromethane
5	styrene
20	acenaphthene
20	phenol
100	2,4-dinitrophenol
100	4-nitrophenol
20	bis(2-chloroethyl)ether

Table B-1, continued

<u>detection limit, ug/l</u>	<u>SEMIVOLATILE COMPOUNDS</u>
20	dibenzofuran
20	2-chlorophenol
20	2,4-dinitrotoluene
20	1,3-dichlorobenzene
20	2,6-dinitrotoluene
20	1,4-dichlorobenzene
20	diethylphtalate
20	benzyl alcohol
20	4-chlorophenyl-phenylether
20	1,2-dichlorobenzene
20	fluorene
20	2-methylphenol
100	4-nitroaniline
20	bis(2-chloroisopropyl)ether
100	4,6-dinitro-2-methylphenol
20	4-methylphenol
20	n-nitrosodiphenylamine(l)
20	4-bromophenyl-phenylether
20	hexachloroethane
20	hexachlorobenzene
20	nitrobenzene
100	pentachlorophenol
20	isophorone
20	phenanthrene
20	2-nitrophenol
20	anthracene
20	2,4-dimethylphenol
20	di-n-butylphtalate
20	fluoranthene
100	benzoic acid
20	bis(2-chloroethoxy)methane
20	benzidine
20	2,4-dichlorophenol
20	pyrene
20	1,2,4-trichlorobenzene
20	butylbenzylphtalate
20	napthalene
40	3,3-dichlorobenzidine
20	4-chloroaniline
20	benzo(a)anthracene
20	hexachlorobutadiene
20	bis(2-ethylhexyl)phtalate

Table B-1, continued

<u>detection limit, ug/l</u>	<u>SEMIVOLATILE COMPOUNDS</u>
20	4-chloro-3-metnylpnenol
20	chrysene
20	2-methylnepthalene
20	di-n-octyl pnthalate
20	nexachlorocyclopentadience
20	benzo(b)fluoranthene
100	2,4,5-tricnloropnenol
20	benzo(a)pyrene
20	2-chloronaphthalene
20	indeno(1,2,3-cd)pyrene
100	2-nitroaniline
20	dibenz(a,n)anthracene
20	dimethyl pnthalate
20	benzo(g,h,i)perylene
20	acenaphthylene
100	3-nitroaniline

<u>detection limit, ug/l</u>	<u>PESTICIDES and PCBs</u>
.05	alpha-BHC
.05	delta-BHC
.05	heptachlor
.05	heptachlor epoxide
.10	dieldrin
.10	endrin
.10	4,4'-DDD
.10	4,4'-DDT
.10	endrin ketone
1.0	toxaphene
.50	aroclor-1221
.50	aroclor-1242
1.0	aroclor-1254

Table B-1, continued

<u>detection limit, ug/l</u>	<u>PESTICIDES/PCBs</u>
1.0	aroclor-1254
.05	beta-BHC
.05	delta-BHC
.05	gamma-BHC (lindane)
.05	aldrin
.05	endosulfan I
.10	4,4'-DDE
.10	endosulfan II
.10	endosulfan sulfate
.50	methoxychlor
.50	chlordan
.50	aroclor-1016
.50	aroclor-1232
.50	aroclor-1248
1.0	aroclor-1260

<u>detection limit, ug/l</u>	<u>METALS AND OTHERS</u>
100	aluminum
3	antimony
6	arsenic
4	barium
4	beryllium
0.5	cadmium
93	calcium
8	chromium
16	cobalt
12	copper
21	vanadium
12	zinc
500	sulfate
1000	total organic carbon
238	magnesium
3	manganese
0.2	mercury
20	nickel
2160	potassium
10	selenium
10	silver
156	sodium
5	thallium
10	iron
2	lead
10	cyanide
1000	chloride

Table B-1, continued

<u>detection limit, ug/l</u>	<u>METALS AND OTHERS</u>
50	bromide
300	nitrate
1000	total organic halide
100	purgeable organic carbon
50	nitrite
10	total phenols
5	purgeable organic halide
100	carbonate/bicarbonate

Table B-2

Sample Preparation and Analysis Techniques and Methods

Parameter	Preparation Technique	Analysis Technique	Method Reference
Specific Organic Constituents			
Volatiles	Purge and trap Direct Injection	Gas Chromatography - Mass Spectroscopy	CLP Method (a)
		Gas Chromatography - Mass Spectroscopy or	CLP Method
		Gas Chromatography with Flame Ionization Detection	CLP Method
		Gas Chromatography - Mass Spectroscopy	CLP Method
		Gas Chromatography with Electron Capture Detection	CLP Method
		Gas Chromatography with Electron Capture Detection	Method 8150 (b)
Semi-volatiles	Methylene chloride extraction		
Pesticides/PCB	Methylene chloride/hexane extraction		
Herbicides	Diethylether extraction/methylation		
Elemental Constituents			
Mercury	Wet digestion for dissolved and total	Cold Vapor Atomic Absorption Spectroscopy	CLP Method
As, Pb, Se and Tl	Acid digestion for total	Furnace Atomic Absorption Spectroscopy	CLP Method
Other Elements	Acid digestion for total	Inductively Coupled Plasma Emission Spectroscopy	CLP Method
Field Measurements			
Conductance	None	Electrometric, Wheatstone Bridge	Method 120.1 (c)
pH	None	Potentiometry	Method 150.1 (c)
Non-specific Organic Parameters			
POX	None	Purgeable combust, Microcoulometry	EPA 600/4-84-008
TOX	Carbon absorption	Carbon combust, Microcoulometry	Method 9020 (b)
POC	None	Purgeable combust, Non-dispersive Infrared	Groundwater, vol.22, p. 18-23, 1984
TOC	None	Carbon combust or oxidized, carbonaceous analyzer	Method 9060 (b)
General Constituents			
Ammonia	Particulates settled	Ion Selective Potentiometry of supernatant	Method 350.3 (c)
Chloride	Particulates settled	Mercuric Precipitation Titration of supernatant	Method 9252 (b)
Fluoride	Manual Distillation	SPADNS Colorimetry	Method 340.1 (c)
Nitrate	Particulates settled	Brucine Sulfate colorimetry of supernatant	Method 9200 (b)
Sulfate	Particulates settled	Barium Sulfate Turbidimetry of supernatant	Method 9038 (b)
Cyanide	Manual distillation	Pyridine Pyrazolone Colorimetry	CLP Method
Total Phenolics	Automated Distillation	Ferricyanide 4-Aminopyridine Auto-Colorimetry	Method 420.2 (c)

a) Contract Laboratory Program, IIFB methods.

b) Test Methods for Evaluating Solid Wastes, SW-846.

c) Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020.

APPENDIX C

SUMMARY OF CONCENTRATIONS FOR SUBSTANCES REPORTED
IN GROUND WATER AND BLANK SAMPLES OBTAINED DURING
THE EPA INSPECTION AT ESII-B

TABLE C-1
KEY TO SAMPLE IDENTITIES

<u>Sample Source</u>	<u>Inorganics Sample No.</u>	<u>Organics Sample No.</u>
Trip Blank	MQA 461	
Equip. Blank on SS Pump	MQA 447	Q1250
Field Blank near MW-25 & MW-10	MQA 445	Q1236
Field Blank near MW-16	MQA 454	Q1234
Field Blank near SW-3	MQA 440	Q1243
Bailer Blank	MQA 452	Q1229
PCB-1	MQA 443	Q1241
PCB-2	MQA 444	Q1232
PCB-3	MQA 449	Q1233
SW-1	MQA 458	Q1238
SW-1 dup.	MQA 456	Q1247
SW-2	MQA 457	Q1245
SW-3	MQA 450	Q1246
SW-3 dup.	MQA 442	Q1239
SW-3-2	MQA 459	Q1231
MW-3	MQA 436	Q1248
MW-5	MQA 460	Q1225
MW-9	MQA 433	Q1249
MW-10	MQA 455	Q1222
MW-11	MQA 434	Q1244
MW-13	MQA 439	Q1223
MW-16	MQA 451	Q1228
MW-21	MQA 453	Q1240
MW-25	MQA 446	Q1242
D-18	MQA 448	Q1235
D-19	MQA 441	Q1237
		Q1230

TABLE C-2
ANALYTICAL RESULTS

SAMPLE NO:
SAMPLE LOCATION:
SAMPLE TYPE:

Q1231/MQ442 Q1239/MQ450 Q1245/MQ456 Q1247/MQ458 Q1250/MQ4461
WELL SW-3 WELL SW-3 WELL SW-1 WELL SW-1 TRIP BLK
BUP BUP BUP DUP

VOA	ACETONE	7.2 JBI	8.8 JBI		7.6 JBI	8 JBI
	CHLOROFORM	2.4 J	3.9 J	5.4	5.2	
	METHYLENE CHLORIDE					
SEMI-VOA	PHENOL					
	1,4-DICHLOROBENZENE					4.2 J
	BIS(2-ETHYLHEXYL)PHTHALATE					
	DI-N-BUTYLPHTHALATE					
	DI-N-OCTYLPHTHALATE					
PEST/PCB	NO HITS					
TIC-VOA-PT	NO HITS					
TIC-SEMI-VOA	N-BUTYLBENZENESULONAMIDE					
	TETRAMETHYLTHIOUREA					
	UNKNOWN		17 J			
	UNKNOWN					
TOTAL METALS	ALUMINUM					
	ANTIMONY					
	ARSENIC					
	BARIUM	62	58	13.6	14.1	5
	BERYLLIUM			224	251	
	CADMIUM					
	CALCIUM	153000	134000	102000	112000	192
	CHROMIUM				9	
	COBALT					
	COPPER					
	IRON	1710	1470	787	1340	
	LEAD					
	MAGNESIUM	70800	64100	58500	69200	
	MANGANESE	493	446	221	256	
	MERCURY					
	NICKEL					
	POTASSIUM	28700	26800	28200	30100	
	SELENIUM					
	SILVER					
	SODIUM	162000	120000	148000	165000	719
	THALLIUM					

ALL CONCENTRATIONS ARE IN UG/L.

SITE: ENVIROSAFE, ID (#33)
CASE NO: 6044

SAMPLE NO:
SAMPLE LOCATION:
SAMPLE TYPE:

Q1231/MQA442
WELL SW-3
DUP

Q1239/MQA450
WELL SW-3
DUP

Q1245/MQA456
WELL SW-1
DUP

Q1247/MQA458
WELL SW-1
DUP

Q1250/MQA461

TRIP BLK

VANADIUM						
ZINC					61	
INORG.	AMMONIA NITROGEN					
INDIC.	BROMIDE	5200	2200	2900	8200	
	CHLORIDE		50			
	CYANIDE	124000	42000	48000	490000	
	NITRATE NITROGEN					
	NITRITE NITROGEN			780	1060	
	POC					
	POX					
	SULFATE					
	TOC	195000	380000	195000	480000	
	TOTAL PHENOLS	3200	3200	5200	3400	
	TOX	76		20		1200
	CARBONATE					
	BICARBONATE	693000	782000	973000	776000	12000

ALL CONCENTRATIONS ARE IN $\mu\text{g/L}$.

SITE: ENVIROSAFE, ID (433)
CASE NO: 6044

SAMPLE NO:
SAMPLE LOCATION:
SAMPLE TYPE:

Q1236/MQ447 Q1229/MQ440 Q1241/MQ452 Q1234/MQ445 Q1243/MQ454
EQUIP BLK FIELD BLK EQUIP BLK FIELD BLK FIELD BLK

VOA	ACETONE		8 JBI	8.8 JBI	5.4 JBI	4.3 JBI	8.6 JBI
	CHLOROFORM			2.4 J			
	METHYLENE CHLORIDE						
SEMI-VOA	PHENOL			2.4 J			
	1,4-DICHLOROBENZENE		8.4 J				
	BIS(2-ETHYLHEXYL)PHTHALATE						
	DI-N-BUTYLPHTHALATE					2.6 J	
	DI-N-OCTYLPHTHALATE						
PEST/PCB	NO HITS						
FIC-VOA-PT	NO HITS						
TIC-SEMI-VOA	N-BUTYLBENZENESULONAMIDE						
	TETRAMETHYLTHIOUREA						
	UNKNOWN	(PUR 861) 64 J					
	UNKNOWN	26 J					
		200 J					
TOTAL METALS	ALUMINUM						
	ANTIMONY						
	ARSENIC						
	BARIUM						
	BERYLLIUM	6		7	9	9	
	CADMIUM						
	CALCIUM						
	CHROMIUM	232		353	311	320	
	COBALT						
	COPPER						
	IRON						
	LEAD						
	MAGNESIUM						
	MANGANESE						
	MERCURY		0.2				
	NICKEL						
	POTASSIUM						
	SELENIUM						
	SILVER						
	SODIUM	884	599	918	830	718	
	THALLIUM						

ALL CONCENTRATIONS ARE IN $\mu\text{g/L}$.

SITE: ENVIRSAFE, ID (433)
CASE NO: 6044

SAMPLE NO:
SAMPLE LOCATION:
SAMPLE TYPE:

	Q1234/MBA447	Q1229/MBA440	Q1241/MBA452	Q1234/MBA445	Q1243/MBA454
	EQUIP BLK	FIELD BLK	EQUIP BLK	FIELD BLK	FIELD BLK
VANADIUM					
ZINC	13				
INORG. AMMONIA NITROGEN		150			
INDIC. BROMIDE					100
CHLORIDE		10000			
CYANIDE		1200			
NITRATE NITROGEN					
NITRITE NITROGEN					
POC					
POX	7				
SULFATE		3000			
TDC	1200				
TOTAL PHENOLS	32			1000	1100
TOX					41
CARBONATE					
BICARBONATE		6000	6000	6000	6000

ALL CONCENTRATIONS ARE IN $\mu\text{g/L}$.

SITE: ENVIRSAFE, ID (433)
CASE NO: 6044

SAMPLE NO:
SAMPLE LOCATION:
SAMPLE TYPE:

Q1248/HQ4159 WELL SW-3-2 LV-6	Q1222/HQ4133 WELL MW-9 LV-6	Q1223/HQ4134 WELL MW-11 LV-6	Q1225/HQ4136 WELL MW-3 LV-6	Q1228/HQ4139 WELL MW-13 LV-6
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VOA	ACETONE		13 B		11 B		7.6 JB		200 B		5.8 JB
	CHLOROFORM										
	METHYLENE CHLORIDE										
SEMI-VOA	PHENOL										
	1,4-DICHLOROBENZENE										
	BIS(2-ETHYLHEXYL)PHTHALATE										
	DI-N-BUTYLPHTHALATE						2.2 J				2 J
	DI-N-OCTYLPHTHALATE										
PEST/PCB	NO HITS										
TIC-VOA-PT	NO HITS										
TIC-SEMI-VOA	N-BUTYLBENZENESULONAMIDE										
	TETRAMETHYLTHIOUREA										
	UNKNOWN						(PUR 894) 17J				
	UNKNOWN										
TOTAL METALS	ALUMINUM										
	ANTIMONY				566				5440		
	ARSENIC				46.8						
	BARIUM				48						
	BERYLLIUM	45					43		60		7
											573
	CADMIUM										
	CALCIUM										
	CHROMIUM	159000			94600		140000		143000		46600
	COBALT	17							23		
	COPPER	16									
	IRON										
	LEAD	703			9410		144		4450		194
	MAGNESIUM				2.9				3.4		
	MANGANESE	73200			38500		66900		68500		25400
	MERCURY	443			295		141		367		141
	NICKEL										
	POTASSIUM										
	SELENIUM	29000			24600		24900		29700		14700
	SILVER										
	SODIUM	133000			74700		133000		119000		167000
	THALLIUM										

ALL CONCENTRATIONS ARE IN $\mu\text{g/L}$.

DATE: ENVIROSAFE, ID (133)
CASE NO: 6044

SAMPLE NO:
SAMPLE LOCATION:
SAMPLE TYPE:

	Q1248/HQA439 WELL SW-3-2 LV-6	Q1222/HQA433 WELL MW-9 LV-6	Q1223/HQA434 WELL MW-11 LV-6	Q1225/HQA436 WELL MW-3 LV-6	Q1228/HQA439 WELL MW-13 LV-6
VANADIUM					
ZINC	35	21		51	
INORG. AMMONIA NITROGEN					
INDIC. BROMIDE	4400	700	3500	5600	
CHLORIDE	60		60		
CYANIDE	33600	13900	4800	13400	60
NITRATE NITROGEN					24600
NITRITE NITROGEN	300	270	220	310	520
POC					
POX					
SULFATE					
TOC		180000	100000	50000	8600
TOTAL PHENOLS	2700	1700	2000	2900	6100
TOX			5		
CARBONATE					
BICARBONATE	645000	394000		681000	764000

ALL CONCENTRATIONS ARE IN UG/L.

SITE: ENVIROSAFE, ID (#33)
CASE NO: 6044

SAMPLE NO:	Q1237/MDA448	Q1230/MDA441	Q1232/MDA443	Q1233/MDA444	Q1235/MDA446
SAMPLE LOCATION:	WELL D-18	WELL D-19	WELL PCB-1	WELL PCB-2	WELL MW-25
SAMPLE TYPE:	LV-6	LV-6	LV-6	LV-6	LV-6

VOA	ACETONE	9.7 JB	43 B	9 J	77 B	5.4 JB
	CHLOROFORM					
	METHYLENE CHLORIDE					
SEMI-VOA	PHENOL					
	1,4-DICHLOROBENZENE					
	BIS(2-ETHYLHEXYL)PHTHALATE			5.2 J	3.6 J	
	DI-N-BUTYLPHTHALATE					
	DI-N-OCTYLPHTHALATE			2.2 J		
PEST/PCB	NO HITS					
TIC-VOA-PT	NO HITS					
TIC-SEMI-VOA	N-BUTYLBENZENESULONAMIDE		(PUR 889) 9J			
	TETRAMETHYLTHIOUREA					
	UNKNOWN					
	UNKNOWN					
TOTAL METALS	ALUMINUM	4310	678	1450	6180	
	ANTIMONY					
	ARSENIC	1372		11		15.9
	BARIUM	204	36	361	119	560
	BERYLLIUM					
	CADMIUM	0.5				
	CALCIUM	90700	131000	79600	135000	53400
	CHROMIUM	83			16	
	COBALT					
	COPPER	13			30	
	IRON	61000	1080	2360	4800	293
	LEAD	29.1			22.8	
	MAGNESIUM	27400	62000	44800	63800	29800
	MANGANESE	1370	269	209	529	51
	MERCURY					
	NICKEL					
	POTASSIUM	19700	26800	23100	30000	19900
	SELENIUM	11.4				11.9
	SILVER					
	SODIUM	73600	96800	165000	138000	157000
	THALLIUM					

ALL CONCENTRATIONS ARE IN ug/L.

SITE: ENVIROSAFE, ID (#33)
CASE NO: 6044

SAMPLE NO:
SAMPLE LOCATION:
SAMPLE TYPE:

Q1237/MBA448 WELL 9-18 LV-6	Q1230/MBA441 WELL 9-19 LV-6	Q1232/MBA443 WELL PCB-1 LV-6	Q1233/MBA444 WELL PCB-2 LV-6	Q1235/MBA446 WELL NW-25 LV-6
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VANADIUM					
ZINC	44				
	57			58	62
INORG. AMMONIA NITROGEN	900	2800	1600	6800	100
INDIC. BROMIDE					50
CHLORIDE	140000	19400	42000	36000	25300
CYANIDE					
NITRATE NITROGEN	240	230	4800		
NITRITE NITROGEN					
POC					
POX					
SULFATE					
TOC	135000	2050000	22000	365000	800
TOTAL PHENOLS	1800	1400	3900	400	3700
TOX					
CARBONATE					
BICARBONATE	370000	645000	767000		681000

ALL CONCENTRATIONS ARE IN $\mu\text{g/L}$.

SITE: EMVIRDSHAF, ID (433)
CASE NO: 6044

SAMPLE NO:
SAMPLE LOCATION:
SAMPLE TYPE:

Q1238/MDA449
WELL PCB-3
LV-6

Q1240/MDA451
WELL MW-16
LV-6

Q1242/MDA453
WELL MW-21
LV-6

Q1244/MDA455
WELL MW-10
LV-6

Q1246/MDA457
WELL SW-2
LV-6

VOA	ACETONE	7.2 JBI	16	5.9 JBI	4.3 JBI	
	CHLOROFORM					
	METHYLENE CHLORIDE					
SEMI-VOA	PHENOL					
	1,4-DICHLOROBENZENE					
	BIS(2-ETHYLHEXYL)PHTHALATE	5.6 J	2.8 J	2.2 J		
	DI-N-BUTYLPHTHALATE					
	DI-N-OCTYLPHTHALATE					
PEST/PCB	NO HITS					
TIC-VOA-PT	NO HITS					
TIC-SEMI-VOA	N-BUTYLBENZENESULONAMIDE					
	TETRAMETHYLTHIOUREA					
	UNKNOWN					
	UNKNOWN					12 J
TOTAL METALS	ALUMINUM	24600	2050			
	ANTIMONY					
	ARSENIC	14		41.2		
	BARIUM	146	441	685	35	41
	BERYLLIUM					
	CADMIUM					
	CALCIUM	171000	103000	52200	92200	135000
	CHROMIUM	42				16
	COBALT					
	COPPER	250				16
	IRON					
	LEAD	24400	1880	546	261	383
	MAGNESIUM	30.6				
	MANGANESE	61400	50600	29800	47900	60600
	MERCURY	813	216	47	170	489
	NICKEL					
	POTASSIUM					
	SELENIUM	29200	28200	20200	24200	28600
	SILVER					
	SODIUM	98600	135000	165000	89000	103000
	THALLIUM					

ALL CONCENTRATIONS ARE IN ug/L.

SITE: ENVIRONMENTAL ID (433)
CASE NO: 6044

SAMPLE NO:
SAMPLE LOCATION:
SAMPLE TYPE:

	01238/MDA449 WELL PCO-3 LV-6	01240/MDA451 WELL MW-16 LV-6	01242/MDA453 WELL MW-21 LV-6	01244/MDA455 WELL MW-10 LV-6	01246/MDA457 WELL SW-2 LV-6
VANADIUM	52				
ZINC	267	35		23	
INORG. AMMONIA NITROGEN	500	2700	6800	2200	5200
INDIC. BROMIDE		10			60
CHLORIDE	13600	54000	23800	14600	19000
CYANIDE					
NITRATE NITROGEN	70	1080	500		
NITRITE NITROGEN					
POC					
POX					
SULFATE					
TDC	650000	86000	12000	600000	600000
TOTAL PHENOLS	2800	2600	4200	1400	2900
TOX				10	
CARBONATE					
BICARBONATE	512000	657000	705000	561000	537000

ALL CONCENTRATIONS ARE IN $\mu\text{g/L}$.

SITE: ENVIRONMENTAL ID (#33)

CASE NO: 6044

SAMPLE NO: 01249/100440
 SAMPLe LOCATION: WELL MW-5
 SAMPLe TYPE: LU-6

VOA	ACETONE	6.8	JB1
	CHLOROFORM		
	METHYLENE CHLORIDE		
SEMI-VOA	PHENOL		
	1,4-DICHLOROBENZENE		
	BIS(2-ETHYLHEXYL)PHTHALATE		
	DI-N-BUTYLPHTHALATE		
	DI-N-OCTYLPHTHALATE		
PEST/PCB	NO HITS		
TIC-VOA-PT	NO HITS		
TIC-SEMI-VOA	N-BUTYLBENZENESULONAMIDE		
	TETRAMETHYLTHIOUREA		
	UNKNOWN	215	J
	UNKNOWN		
TOTAL METALS	ALUMINUM	166	
	ANTIMONY		
	ARSENIC	9.3	
	BARIUM	859	
	BERYLLIUM		
	CADMIUM		
	CALCIUM	75300	
	CHROMIUM	576	
	COBALT		
	COPPER		
	IRON	591	
	LEAD		
	MAGNESIUM	42300	
	MANGANESE	72	
	MERCURY		
	NICKEL		
	POTASSIUM	20400	
	SELENIUM		
	SILVER		
	SODIUM	179000	
	THALLIUM		

ALL CONCENTRATIONS ARE IN UG/L.

A2-12

DATE: ENVIRSAFE, IS (13)
CASE NO: 6044

SAMPLE NO: 01249/MDM460
SAMPLE LOCATION: WELL NW-5
SAMPLE TYPE: LW-6

	VANADIUM		
	ZINC		
INORG.	AMMONIA NITROGEN		
INDIC.	BROMIDE		
	CHLORIDE		
	CYANIDE		
	NITRATE NITROGEN		
	NITRITE NITROGEN		
	POC		
	POX		
	SULFATE		
	TOC		
	TOTAL PHENOLS		
	TOX		
	CARBONATE		
	BICARBONATE		

APPENDIX D

EVALUATION OF QUALITY CONTROL DATA AND ANALYTICAL DATA
GENERATED FROM EPA SAMPLES OBTAINED AT ESII-B

Evaluation of Quality Control Data and Analytical Data

1.0 Metals

1.1 Performance Evaluation Standards

Metal analyte performance evaluation standards were not evaluated in conjunction with the samples collected from this facility.

1.2 Metals QC Evaluation

Total metal spike recoveries were calculated for the twenty-three metals spiked into four field samples (MQA434, 439, 448, and 450). Twenty metal average spike recoveries were within the data quality objectives (DQO) for this Program. The total aluminum average spike recovery was above DQO with a recovery of 186 percent. The total selenium and thallium average spike recoveries were below DQO with recoveries of 70 and 63 percent, respectively. Various individual metal spike recoveries were also outside DQO. These are listed in Table 3-2a of Reference 2 as well as in the following Sections. All reported laboratory control sample (LCS) recoveries and all calibration verification standard (CVS) recoveries were within Program DQOs.

The average relative percent differences (RPDs) for all metallic analytes except aluminum and iron were within the DQOs.

Required analyses were performed on all metals samples submitted to the laboratory.

No contamination was reported in the laboratory blanks. Sampling blanks all contained metal contamination (barium, calcium, sodium, or zinc) including field blank MQA440 which also showed mercury contamination at 0.2 ug/L.

1.3 Furnace Metals

The antimony, cadmium, and lead quality control was acceptable. All antimony, cadmium, and lead results should be considered quantitative.

The arsenic spike recoveries for samples MQA434 and 439 (40 and 135 percent) were outside DQO, however, the average of the three arsenic spikes was an acceptable 94 percent. Aluminum concentrations in the field samples should not have affected the arsenic results because the laboratory used Zeeman background correction. Overall, arsenic results should be considered semi-quantitative.

High iron concentrations in some of the field samples should not have affected the selenium results because the laboratory used Zeeman background correction. The selenium spike recoveries for samples MQA434 and 450 were low and below DQO (66 and 52 percent). The average recovery of the three selenium spikes was also below DQO (70 percent). All selenium results should be considered semi-quantitative and biased approximately 40 percent low due to low spike recovery.

Thallium spike recoveries for samples MQA434, 439, 448, and 450 were low (61, 65, 63, and 63 percent, respectively). All thallium results should all be considered to be biased low by approximately 35 percent and semi-quantitative due to low spike recovery.

1.4 ICP Metals

Individual spike recoveries were outside DQO for aluminum in sample MQA448 (414 percent), calcium in sample MQA450 (127 percent), magnesium in sample MQA450 (136 percent), manganese in sample MQA450 (127 percent), and sodium in sample MQA450 (130 percent). High spike recoveries indicate results which are biased high.

The ICP serial dilution results were outside DQO for barium, calcium, magnesium, manganese, and sodium in sample MQA443. Results for these metals in this sample should be considered semi-quantitative.

Although high sulfate concentrations were found in many of the samples it does not appear to have interfered with the barium determination as barium spikes were within DQO.

The low level (twice CRDL) linear range checks for chromium, copper, nickel, and silver had poor recoveries. The accuracy reported for these elements is not unexpected for results near the detection limit. All chromium results, except those for sample MQA460, should be considered qualitative with a bias ranging from minus 75 to plus 35 percent. Chromium results for sample MQO460 should be considered to be quantitative. All copper results should be considered semi-quantitative and biased high by approximately 15 percent. All nickel results should be considered semi-quantitative. Nickel results for samples MQA434, 445, 446, 447, 449, and 455 should be considered biased low by approximately 12 percent. Nickel results for samples MQA436, 439, 440, 441, 442, 443, 444, 448, 450, 451, 452, 453, 454, 456, 457, 458, 459, 460, and 461 should be considered biased low by approximately 20 percent. All silver results, except samples MQA434, 445, 446, 447, 449, and 455 which were not affected, should be considered semi-quantitative and biased low by 15 to 65 percent. Silver results for samples MQA434, 445, 446, 447, 449, and 455 should be considered quantitative.

Duplicate relative percent differences (RPDs) for iron and vanadium in duplicate pair MQA456/458 and for sodium in duplicate pair MQA442/450 were large. The sodium and vanadium results should be considered semi-quantitative and the iron results qualitative.

Matrix duplicate RPDs for aluminum and iron in sample MQA443 were outside precision DQOs. Aluminum and iron results should be considered qualitative.

Beryllium, cobalt, potassium, and zinc results, as well as chromium results for sample MQA460 and silver results for samples MQA434, 445, 446, 447, 449, and 455 should be considered quantitative. Barium, calcium, barium, calcium, copper, magnesium, manganese, nickel, silver (with the above mentioned exceptions), sodium, and vanadium results should be considered semi-quantitative. Aluminum, iron, and chromium (with the above mentioned exception) results should be considered qualitative.

1.5 Mercury

Mercury blank contamination of 0.2 ug/L was found in one of the field blanks but was not detected in any of the other field blanks or samples. All mercury results should be considered quantitative with an acceptable probability of false negatives.

2.0 Inorganic and Indicator Analytes

2.1 Performance Evaluation Standard

Inorganic and indicator analyte performance evaluation standards were not evaluated in conjunction with the samples collected from this facility

2.2 Inorganic and Indicator Analyte QC Evaluation

The average spike recoveries of all of the inorganic and indicator analytes were within the accuracy DQOs for all analytes (accuracy DQOs have not been established for bromide and nitrite nitrogen matrix spikes but their average recoveries were both 92 percent, which should be considered acceptable). This indicates acceptable recoveries for all inorganic and indicator analytes. All LCS and CVS recoveries reported in the raw data for inorganic and indicator analytes were within Program DQOs. Average RPDs for all inorganic and indicator analytes were within Program DQOs. Precision DQOs have not been established for bromide and nitrite nitrogen.

Requested analyses were performed on all samples for the inorganic and indicator analytes.

No laboratory blank contamination was reported for any inorganic or indicator analyte. Contamination involving a variety of analytes was found in three of the sampling blanks (MQA440, 452, and 454) at significant levels. These contaminants and their concentrations are listed in Section 3.2.4 (page 3-3) of Reference 2.

2.3 Inorganic and Indicator Analyte Data

The quality control results for cyanide and bromide are acceptable. The results for these analytes should be considered quantitative.

The holding times for the nitrate nitrogen analyses ranged from approximately 4 to 13 days from receipt of samples which is significantly longer than the recommended 48 hour holding time for unpreserved samples. Field blank sample MQA440 was contaminated with nitrate nitrogen at 1200 ug/L (24 times the DL). The nitrate nitrogen results should be considered unreliable due to the blank contamination.

The holding times for the nitrite nitrogen analyses ranged from approximately 4 to 13 days from receipt of samples which is significantly longer than the recommended 48 hour holding time for unpreserved samples. The nitrite nitrogen results should be considered to be semi-quantitative.

The RPD for chloride in both pairs of field duplicates (MQA442/450 and MQA456/458) was large. Field blank sample MQA440 was contaminated with

chloride at 10,000 ug/L (100 times DL). Chloride results much greater than 10,000 ug/L (samples MQA442, 448, and 458) should be considered qualitative while all other lower results (all other samples) should be considered unreliable.

The RPD for sulfate in both pairs of field duplicates (MQA442/450 and MQA456/458) was large. Field blank sample MQA440 was contaminated with sulfate at 3000 ug/L (30 times DL). Sulfate results between one and 30,000 ug/L (samples MQA439, 443, 446, and 453) should be considered unreliable and all other sulfate results should be considered qualitative.

One of four ammonia nitrogen matrix spikes (sample MQA448) was outside DQO. The matrix spike/matrix spike duplicate RPD for sample MQA451 was outside DQO although two others for ammonia nitrogen were within DQO. The ammonia nitrogen RPDs for both pairs of field duplicates were large. Ammonia nitrogen contamination was found in field blanks MQA440 (150 ug/L) and MQA454 (100 ug/L). These values are equal to or above the DL of 100 ug/L. Ammonia nitrogen results for samples MQA443 and 446 are unreliable due to blank contamination. All other ammonia nitrogen results should be considered qualitative.

The total phenol RPDs for both pairs of field duplicates were large. Total phenol contamination was found in field blanks MQA447 (32 ug/L) and MQA454 (41 ug/L). These values are above the total phenol DL of 10 ug/L. All total phenol results should be considered unreliable due blank contamination.

The daily TOC instrument calibration data encompassing the expected concentration ranges of the samples were not supplied with the raw data by the laboratory. The TOC RPD for one of the two pairs of field duplicates was high. TOC contamination was found in blanks MQA445 (1000 ug/L), MQA447 (1200 ug/L), MQA454 (1100 ug/L), and MQA461 (1200 ug/L). These values are equal to or above the TOC DL of 1000 ug/L. The TOC results should be considered unreliable due to blank contamination.

Initial calibration verification and continuing calibration verification standards for POC were not analyzed. No calibration curve information was supplied with the raw data. The POC results should be considered semi-quantitative.

Instrument calibration data for TOX were not found for any of the analytical batches although these standards were analyzed. Calibration verification standards and blanks should be analyzed every 10 samples and at the beginning and end of each day's analyses. These standards were not analyzed at the end of at least two analysis batches. This affects samples MQA433, 434, 440, 441, 448, 452, and 453. High levels of chloride (above 200 mg/L) were found in only one sample and no TOX was detected in that sample. Chloride interference is, therefore, not suspected with the TOX analysis. The TOX results should be considered quantitative except for samples MQA433, 434, 440, 441, 448, 452, and 453 which should be considered semi-quantitative.

Calibration curve information was not reported in the POX raw data. A three point calibration curve should be analyzed for each day's analytical batches. Continuing calibration blanks (CCBs) were not analyzed frequently enough and, along with continuing calibration verifications (CCVs), were not

analyzed at the end of the analytical batches. The POX results should be considered quantitative except for sample MQA460 which should be considered semi-quantitative as there was no corresponding final CCV or CCB.

An initial and final calibration verification were the only calibration verifications analyzed for carbonate/bicarbonate. A continuing calibration verification should be analyzed every ten samples as well as at the beginning and end of the analytical batch. Spike recovery for one of the four matrix spikes (MQA448) was outside DQO. The RPD for one of the two sets of field duplicates was large. The holding times for the carbonate/bicarbonate analyses ranged from 24 hours to eight days. Although no holding time is specified for this analysis, a 24 hour holding time is recommended. Results for samples MQA433 and 436, which were analyzed in 24 hours, should be considered quantitative while all other carbonate/bicarbonate results should be considered semi-quantitative.

3.0 Organics and Pesticides

3.1 Performance Evaluation Standard

Organic performance evaluation standards were not evaluated in conjunction with the samples collected from this facility.

3.2 Organic QC Evaluation

All matrix spike average recoveries were within established Program DQOs for accuracy. Individual matrix spike recoveries which were outside the accuracy DQO will be discussed in the appropriate Section below. All surrogate spike average recoveries were also within DQOs for accuracy. Individual surrogate spike recoveries which were outside the accuracy DQO will be discussed in the appropriate Section below.

All matrix spike/matrix spike duplicate average RPDs were within Program DQOs for precision. Individual matrix spike RPDs which were outside the precision DQO will be discussed in the appropriate Section below. All average surrogate spike RPDs were also within DQOs for precision.

All organic analyses were performed as requested. Direct injection volatile, herbicide, and dioxin analyses were neither requested nor performed for any samples.

Laboratory blank contamination was reported for organics and is discussed in the appropriate Sections below.

Detection limits for the organic fractions are summarized in the appropriate Sections below.

3.3 Volatiles

Quality control data indicate that volatile organics were determined acceptably. The chromatograms appear acceptable. Initial and continuing calibrations, tunings, blanks, matrix spikes, matrix spike duplicates, and surrogate spikes are acceptable.

Sample Q1222 was listed, by mistake, as sample Q1212 on the mass calibration and tuning form (Form V) for 6/30/86.

Acetone was found in nine laboratory blanks at estimated values of 5 to 9 ug/L. The CRDL for acetone is 10 ug/L. Acetone results in this range should be considered unreliable.

The volatiles data are acceptable. The probability of false negative results for the volatiles is acceptable. The estimated detection limits for the volatiles is the CRDL. The volatile compound results should be considered to be quantitative.

3.4 Semivolatiles

Calibrations, tunings, blanks, matrix spikes, matrix spike duplicates, surrogate spikes, and chromatograms were acceptable for the semivolatiles.

Unidentified compounds were found in two semivolatile method blanks at concentration of 11 (estimated concentration) and 53 ug/L.

The matrix spike and matrix spike duplicate recovery of 1,2,4-trichlorobenzene (103 and 104 percent) were above DQO (39 to 98 percent).

The surrogate percent recoveries for 2-fluorophenol in samples Q1228 and Q1229 (42 percent in each) were outside the DQO (43 to 116 percent).

The semivolatile data are acceptable and the results should be considered quantitative. The probability of false negatives is acceptable. Estimated semivolatile detection limits were twice CRDL for all samples.

3.5 Pesticides

The initial and continuing calibrations, blanks, and chromatographic quality for pesticides were acceptable. The matrix spike, matrix spike duplicate, and surrogate data were within acceptable limits.

Pesticide method blank chromatograms show slight contamination. Due to the laboratory's use and variation of enlargement factors, the extent of this contamination cannot be assessed.

Table 1 of Reference 3 (for organic analyses) lists peaks contained in the pesticide chromatograms which were in the retention time window of pesticide HSL compounds but which were not addressed by the laboratory in their data workup.

The estimated method detection limits for the pesticides fraction were CRDL for all samples. The pesticides results should be considered to be unreliable due to the lack of identification by the organic laboratory of many possible pesticide peaks in the chromatograms. There is an enhanced probability of false negatives for pesticides.

Data Usability Summary

4.0 Graphite Furnace Metals

Quantitative: antimony, cadmium, and lead

Semi-quantitative: arsenic, selenium, and thallium

4.1 ICP Metals

Quantitative: beryllium, cobalt, potassium, zinc, chromium for sample MQA460, and silver for samples MQA434, 445, 446, 447, 449, and 455

Semi-quantitative: barium, calcium, copper, magnesium, manganese, nickel, sodium, and vanadium and silver with the above mentioned exceptions

Qualitative: aluminum and iron and chromium with the above mentioned exception

4.2 Mercury

Quantitative: all mercury data

4.3 Inorganic and Indicator Analytes

Quantitative: cyanide and bromide, TOX and POX with exceptions, and carbonate/bicarbonate for samples MQA433 and 436

Semi-quantitative: nitrite nitrogen, POC, TOX results for samples MQA433, 434, 440, 441, 448, 452, and 453, POX results for sample MQA460, and carbonate/bicarbonate results with exceptions

Qualitative: chlorine results for samples MQA442, 450, and 448, sulfate results with exceptions, and ammonia nitrogen results except for samples MQA433 and 446

Unreliable: nitrate nitrogen, chloride with above mentioned exceptions, sulfate results for samples MQA439, 443, 446, and 453, ammonia nitrogen results for samples MQA433 and 446, total phenols, and TOC

4.4 Organics

Quantitative: all volatiles and semivolatiles results

Unreliable: all pesticides data

References

1. **Organic Analyses:** CompuChem Laboratories, Inc.
P.O. Box 12652
3308 Chapel Hill/Nelson Highway
Research Triangle Park, NC 27709
(919) 549-8263

Inorganic and Indicator Analyses:
Centec Laboratories
P.O. Box 956
2160 Industrial Drive
Salem, VA 24153
(703) 387-3995

2. Quality Control Data Evaluation Report (Revision) for EnviroSAFE, Idaho, 9/25/1986, Prepared by Lockheed Engineering and Management Services Company, Inc., for the US EPA Hazardous Waste Ground-Water Task Force.
3. Draft Inorganic Data Usability Audit Report (Revision) and Draft Organic Data Usability Report, for the EnviroSAFE, Idaho site, Prepared by Laboratory Performance Monitoring Group, Lockheed Engineering and Management Services Co., Las Vegas, Nevada, for US EPA, EMSL/Las Vegas, 9/26/1986 and 9/23/1986.

APPENDIX E

GROUND WATER ANALYTICAL DATA FOR ORGANIC COMPOUNDS
DETECTED IN SILO WELLS

APPENDIX E

GROUND WATER ANALYTICAL DATA FOR ORGANIC COMPOUNDS
DETECTED IN SILO WELLS

WELL SW1

DATA POINT	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PARAMETER	10/84	10/85	4/85	6/85	10/85	12/85	1/86	2/86	3/86	4/86	6/86	7/86	7/86	8/86
CARBON TET	ND	ND	ND	15.7	ND	17.7	17.5	17.5	17.5	65.8	ND	ND	ND	ND
CHLOROFORM	11.7	58.7	ND	86.9	180	177	150	115	177	147	147	7.89	ND	14.7
METHYL CHLORIDE	15	ND	ND	54.5	ND	13.5	ND	22.3	ND	41.3	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

WELL SW1

DATA POINT	15	16	17	18
PARAMETER	9/86	10/86	11/86	12/86
CARBON TET	ND	ND	ND	ND
CHLOROFORM	4.78	3.48	2.4	8.7
METHYL CHLORIDE	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND

WELL SW2

DATA POINT	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PARAMETER	10/84	10/85	4/85	6/85	10/85	12/85	1/86	2/86	3/86	4/86	6/86	7/86	7/86	8/86
CARBON TET	ND	ND	4.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROFORM	108.4	107.1	108.4	3.4	ND	4.52	8.62	14.2	9.1	5.28	ND	ND	ND	ND
METHYL CHLORIDE	ND	ND	ND	ND	ND	ND	ND	22.8	11.4	ND	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

WELL SW2

DATA POINT	15	16	17	18
PARAMETER	9/86	10/86	11/87	12/86
CARBON TET	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND
METHYL CHLORIDE	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND

WELL SW3

DATA POINT	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PARAMETER	10/84	10/85	4/85	6/85	10/85	12/85	1/86	2/86	3/86	4/86	6/86	7/86	7/86	8/86
CARBON TET	ND	ND	ND	ND	ND	ND	ND	ND	3.77	3.82	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	293	7.1	14.8	18.1	32	36.5	37.1	ND	ND	ND	ND
METHYL CHLORIDE	ND	ND	ND	27.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	2.75	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

WELL SW3

DATA POINT	15	16	17	18
PARAMETER	9/86	10/86	11/86	12/86
CARBON TET	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND
METHYL CHLORIDE	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND

NOT
QUALITY-
ASSURED

WELL SW-2

DATA POINT	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PARAMETER	1/86	2/86	3/86	4/86	5/86	6/86	7/86	8/86	9/86	10/86	11/86	12/86	13/86	14/86
CARBON TET	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METHYL CHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

WELL SW3-2

DATA POINT	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PARAMETER	1/86	2/86	3/86	4/86	5/86	6/86	7/86	8/86	9/86	10/86	11/86	12/86	13/86	14/86
CARBON TET	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METHYL CHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

WELL SW1-2

DATA POINT	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PARAMETER	1/86	2/86	3/86	4/86	5/86	6/86	7/86	8/86	9/86	10/86	11/86	12/86	13/86	14/86
CARBON TET	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METHYL CHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

NOT
QUALITY-
ASSURED

WELL MW3

DATA POINT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
PARAMETER	1/86	2/86	3/86	4/86	5/86	6/86	7/86	8/86	9/86	10/86	11/86	12/86	13/86	14/86	15/86	16/86	17/86	18/86
CARBON TET	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METHYL CHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

WELL MW4

DATA POINT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
PARAMETER	1/86	2/86	3/86	4/86	5/86	6/86	7/86	8/86	9/86	10/86	11/86	12/86	13/86	14/86	15/86	16/86	17/86	18/86
CARBON TET	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METHYL CHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

WELL MW10

DATA POINT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
PARAMETER	1/86	2/86	3/86	4/86	5/86	6/86	7/86	8/86	9/86	10/86	11/86	12/86	13/86	14/86	15/86	16/86	17/86	18/86
CARBON TET	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METHYL CHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

RESULTS
NOT
YET
REC'D

WELL MW11
DATA POINT
PARAMETER
CARBON TET
CHLOROFORM
METHYL CHLORIDE
TRICHLOROETHYLENE

7	8	9	10	11	12	13	14	15	16	17	18
1/86	2/86	3/86	4/86	5/86	6/86	7/86	8/86	9/86	10/86	11/86	12/86
ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

RESULTS
NOT
YET
REC'D

WELL PCB-1
DATA POINT
PARAMETER
CARBON TET
CHLOROFORM
METHYL CHLORIDE
TRICHLOROETHYLENE

10	11	13	18
4/86	5/86	7/86	12/86
ND	ND	ND	ND
ND	ND	ND	ND
ND	ND	ND	ND
ND	ND	ND	ND

WELL PCB-2
DATA POINT
PARAMETER
CARBON TET
CHLOROFORM
METHYL CHLORIDE
TRICHLOROETHYLENE

10	11	14	17
4/86	5/86	8/86	11/86
ND	ND	ND	ND
ND	ND	ND	ND
ND	ND	ND	ND
ND	ND	ND	ND

WELL PCB-3
DATA POINT
PARAMETER
CARBON TET
CHLOROFORM
METHYL CHLORIDE
TRICHLOROETHYLENE

10	11	16
4/86	5/86	10/86
ND	ND	ND
ND	ND	ND
ND	ND	ND
ND	ND	ND

WELL SW1FB
DATA POINT
PARAMETER
CARBON TET
CHLOROFORM
METHYL CHLORIDE
TRICHLOROETHYLENE

5	13	14	16	17	18
10/85	7/86	8/86	10/86	11/86	12/86
ND	ND	ND	ND	ND	ND
ND	ND	ND	ND	ND	ND
ND	ND	ND	ND	ND	ND
ND	ND	ND	ND	ND	ND

NOT
QUALITY-
ASSURED

WELL SW1B
DATA POINT
PARAMETER
CARBON TET
CHLOROFORM
METHYL CHLORIDE
TRICHLOROETHYLENE

5 7
10/85 1/86
ND ND
ND ND
ND ND
ND ND

WELL SW2FB
DATA POINT
PARAMETER
CARBON TET
CHLOROFORM
METHYL CHLORIDE
TRICHLOROETHYLENE

5 8 13 14 15 16 17 18
10/85 2/86 7/86 8/86 9/86 10/86 11/86 12/86
ND ND ND ND ND ND ND
ND ND ND ND ND ND ND
ND ND ND ND ND ND ND
ND ND ND ND ND ND ND

WELL SW2TB
DATA POINT
PARAMETER
CARBON TET
CHLOROFORM
METHYL CHLORIDE
TRICHLOROETHYLENE

5 7 8 16 17
10/85 1/86 2/86 10/86 11/86
ND ND ND ND ND
ND ND ND ND ND
ND ND ND ND ND
ND ND ND ND ND

WELL SW3FB
DATA POINT
PARAMETER
CARBON TET
CHLOROFORM
METHYL CHLORIDE
TRICHLOROETHYLENE

5 7 9 10 13 14 15 16 17 18
10/85 1/86 3/86 4/86 7/86 8/86 9/86 10/86 11/86 12/86
ND ND ND ND ND ND ND ND ND ND
ND ND ND ND ND ND ND ND ND ND
ND ND ND ND ND ND ND ND ND ND
ND ND ND ND ND ND ND ND ND

WELL SW3TB
DATA POINT
PARAMETER
CARBON TET
CHLOROFORM
METHYL CHLORIDE
TRICHLOROETHYLENE

5 7 9 10
10/85 1/86 3/86 4/86
ND ND ND ND
ND ND ND ND
ND ND ND ND
ND ND ND ND

NOT
QUALITY-
ASSURED

WELL SW3-2FB
DATA POINT
PARAMETER
CARBON TET
CHLOROFORM
METHYL CHLORIDE
TRICHLOROETHYLENE

2/86-MA	2/86-MB	2/86-AVG	8	15	17	18
5.7	ND	2.85	ND	9/86	11/86	12/86
8.8	12	10.4	ND	ND	ND	ND
ND	ND	ND	ND	ND	ND	ND
ND	ND	ND	ND	ND	ND	ND

WELL SW3-2TB
DATA POINT
PARAMETER
CARBON TET
CHLOROFORM
METHYL CHLORIDE
TRICHLOROETHYLENE

2/86-M	2/86-R	2/86-AVG	8	14
ND	ND	ND	ND	8/86
ND	ND	ND	ND	ND
ND	ND	ND	ND	ND
ND	ND	ND	ND	ND

WELL SW1-2FB
DATA POINT
PARAMETER
CARBON TET
CHLOROFORM
METHYL CHLORIDE
TRICHLOROETHYLENE

16	17	18
10/86	11/86	12/86
ND	ND	ND
ND	ND	ND
ND	ND	ND
ND	ND	ND

WELL SW TR
DATA POINT
PARAMETER
CARBON TET
CHLOROFORM
METHYL CHLORIDE
TRICHLOROETHYLENE

11
7/86
ND
ND
ND
ND

WELL PCB 2TB
DATA POINT
PARAMETER
CARBON TET
CHLOROFORM
METHYL CHLORIDE
TRICHLOROETHYLENE

11	14
5/86	8/86
ND	ND
ND	ND
ND	ND
ND	ND

ANALYSIS
SECTION