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THE COMPLEX DISPOSAL TRENCHES CONTAIN A WIDE VARIETY OF WASTES AND ARE CONSIDERED TO BE A POSSIBLE SOURCE OF GROUND WATER CONTAMINATION. THE PROPOSED INTERIM RESPONSE ACTION WILL CONSIST OF MONITORING THE TRENCHES, BECAUSE MONITORING IS THE ONLY ALTERNATIVE COMPLETELY CONSISTENT WITH ANY FINAL REMEDY.

THIS FINAL DECISION DOCUMENT PROVIDES SUMMARIES OF:

1. ALTERNATIVES CONSIDERED
2. SIGNIFICANT EVENTS LEADING TO THE INITIATION OF THE IRA
3. THE IRA PROJECT
4. APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS, STANDARDS, CRITERIA, AND LIMITATIONS (ARAR'S) ASSOCIATED WITH THE PROGRAM.

APPENDICES INCLUDE:

1. COMMENTS AND RESPONSES
2. METHODS OF ANALYSIS
3. ANALYTES DETECTED ABOVE CERTIFIED REPORTING LIMIT.

14. SUBJECT TERMS
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FOR THE INTERIM RESPONSE ACTION
AT THE
COMPLEX DISPOSAL TRENCHES
ROCKY MOUNTAIN ARSENAL
APRIL 1990
CONTRACT NO. DAAA15-88-D-0022/0002
VERSION 4.0

Prepared by:

WOODWARD-CLYDE CONSULTANTS

Prepared for:

PROGRAM MANAGER FOR ROCKY MOUNTAIN ARSENAL

TABLE OF CONTENTS

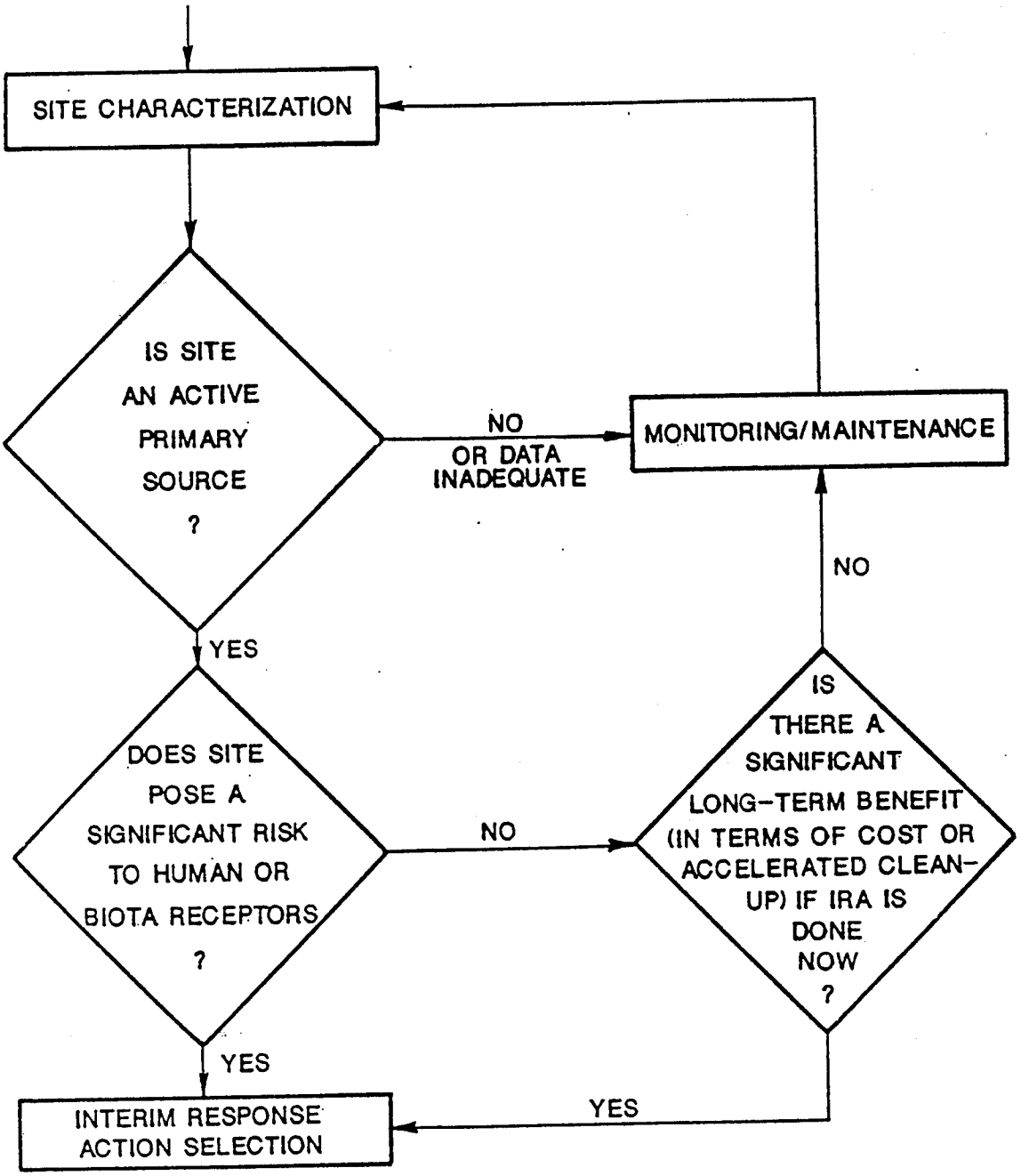
FIGURES

1.0 INTRODUCTION

The Interim Response Action (IRA) alternatives assessment and decision process for the Complex Disposal Trenches at the Rocky Mountain Arsenal (RMA) are being conducted as part of the IRA process for RMA in accordance with the Federal Facility Agreement and the Technical Program Plan.

Determinations concerning the implementation of this IRA have been reached through a consideration of the objectives of Sections 2.3(a), 22.5, and 22.6 of the Federal Facility Agreement, and by application of the Decision Flow Chart for Other Contamination Sources IRAs adopted by the Organizations and the State of Colorado at the June 7, 1989 Subcommittee meeting (Figure 1-1).

Alternatives have been reviewed based on their overall protectiveness of human health and the environment; benefit in terms of accelerated cleanup, including technical benefit of performing an IRA now, timeliness of implementation, and consistency with the final remedy; and benefit in terms of cost. Due to the type of response actions being considered for this IRA, it is assumed for evaluation purposes that any of the alternatives under evaluation would be designed to meet Applicable or Relevant and Appropriate Requirements (ARARs) to the maximum extent practicable. The preferred IRA consists of monitoring the Complex Disposal Trenches for migration of contaminants.



Job No. : 22238-4200	DECISION FLOW CHART FOR OTHER CONTAMINATION SOURCES IRAs
Prepared by: K.A.S.	
Date: 12/18/89	Figure 1-1

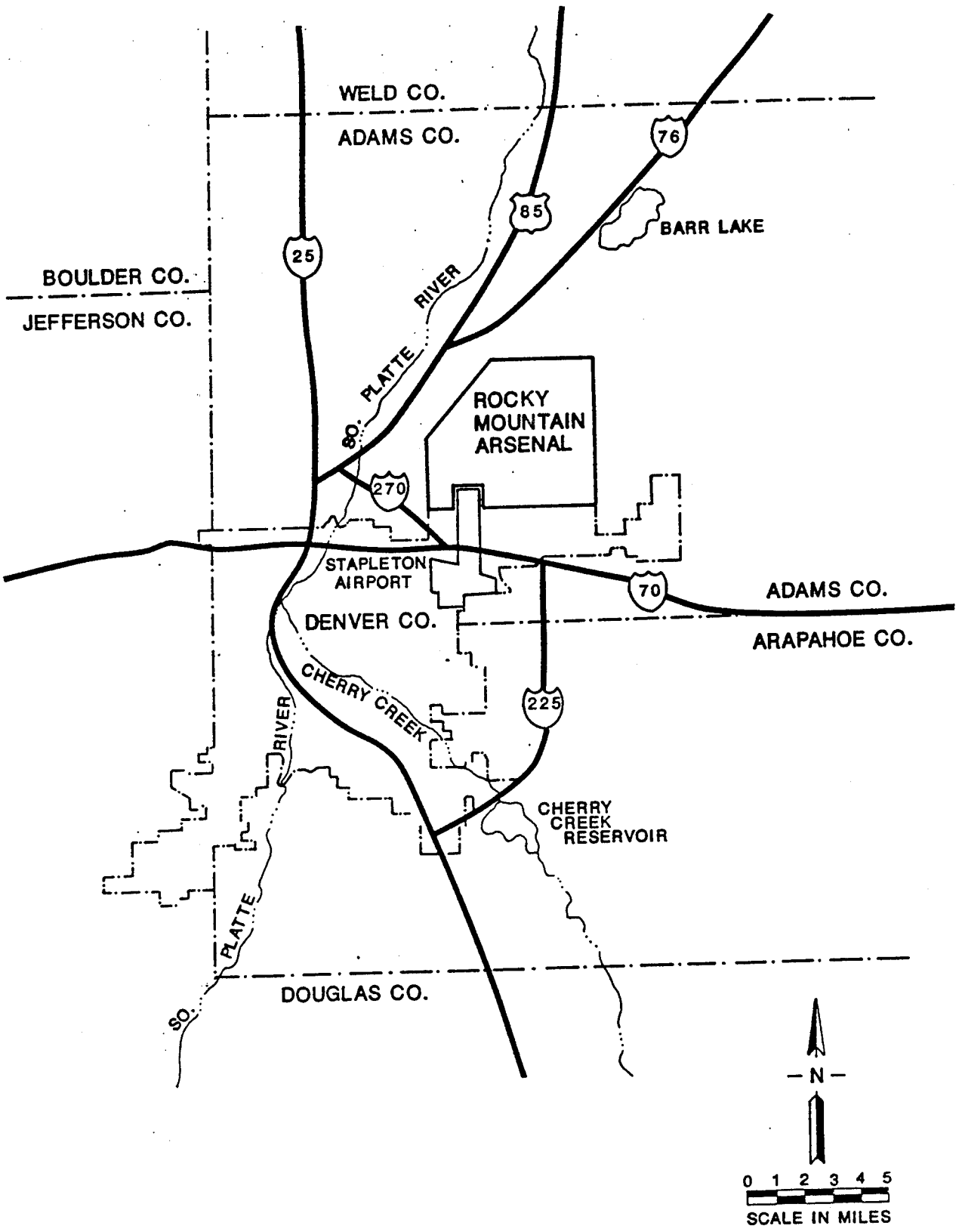
2.0
HISTORY OF THE COMPLEX DISPOSAL TRENCHES

Rocky Mountain Arsenal (RMA) occupies more than 17,000 acres (approximately 27 square miles) in Adams County, directly northeast of metropolitan Denver, Colorado (see Figure 2-1). The property was purchased by the U.S. Government in 1942 for use in World War II to manufacture and assemble chemical warfare materials, such as mustard and lewisite, and incendiary munitions. Starting in the 1950s, RMA produced the nerve agent GB (isopropyl methylphosphonofluoridate) until late 1969. A significant amount of chemical warfare materials destruction took place during the 1950s and 1960s. Since 1970, RMA has primarily been involved with the destruction of chemical warfare materials. The last military operations at RMA ended in the early 1980s. In November 1988, the RMA was reduced to inactive military status reflecting the fact that the only remaining mission at the Arsenal is contamination cleanup. In addition to these military activities, major portions of the plant facilities were leased to private industries, including Shell Oil Company, for the manufacture of various insecticides and herbicides between 1947 and 1982.

The Phase I and Phase II Contamination Assessment Reports (CARs) (ESE 1988a and 1988b) as well as the Central Study Area Report (CSAR) (Ebasco 1989a) and the North Central Study Area Report (NCSAR) (Ebasco 1989b) describe the nature and extent of contamination throughout Section 36. These reports describe the soil and groundwater throughout Section 36 as being contaminated with a wide range of organics, ICP metals (cadmium, chromium, copper, lead, and zinc), arsenic, and mercury.

Basin A, located immediately west of the Complex Disposal Trenches, was the primary liquid waste disposal site at RMA in the 1940s and 1950s. Although Basin A no longer contains standing liquids, the remaining sludge and soil beneath Basin A is contaminated with volatile organic compounds, organosulfur compounds, organophosphorus compounds, organochlorine pesticides, arsenic, and mercury (Ebasco 1989b).

The Complex Disposal Trenches are located in the east-central portion of Section 36, in Site 36-17. Site 36-17 is a 107-acre site that is divided into a northern (Site 36-17N) and a southern (Site 36-17S) portion. Site 36-17N is further subdivided into eight anomalous areas located during a geophysical investigation conducted during the Phase I fieldwork (ESE 1988a). These areas are identified as Anomalous Areas A through H. The Complex Disposal Trenches in Anomalous Areas A and H are evaluated as being in close, or direct, contact with groundwater during parts of the year. Trenches in Anomalous Areas B and C are known to contain hazardous materials from previous investigations.



Job No. : 22238-4200	LOCATION MAP RMA
Prepared by: K.A.S.	
Date: 12/18/89	Figure 2-1

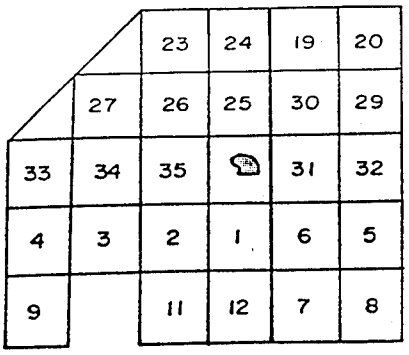
Trenches in Anomalous Areas A, B, C, and H are considered for a possible interim response action in the IRA Alternatives Assessment (WCC 1989a). Figure 2-2 identifies the Anomalous Areas and the trench areas considered for this IRA.

Site 36-17S also contains some disposal trenches that are being investigated for an IRA by Shell Oil Company. This IRA Decision Document focuses only on the Army Complex Disposal Trenches in Site 36-17N.

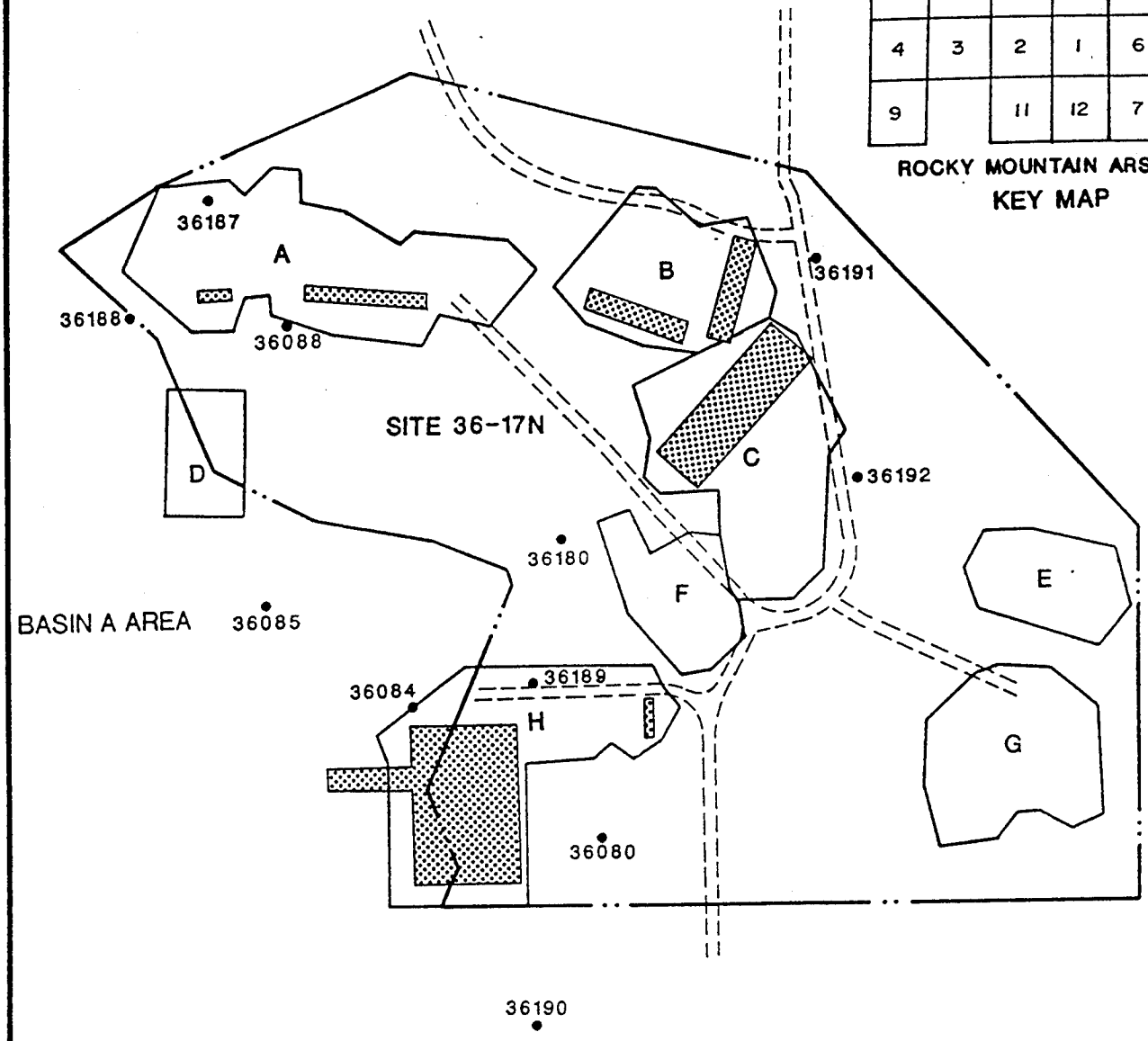
Site 36-17N was the primary solid waste disposal area at RMA in the 1940s and 1950s. Solid chemical waste and potentially contaminated tools, equipment, unwanted containers, rejected incendiaries, and empty munitions casings were decontaminated with caustic or another decontaminant and then hauled to burning pits and burned to ensure complete decontamination by incineration. The burning pits/trenches, approximately 8 to 10 feet deep, 15 feet wide, and up to 100 to 200 feet long, typically had a bottom layer of approximately 4 to 5 tons of lumber. The solid waste was placed on top of the lumber until the pit was full. Additional lumber and approximately 300 to 500 gallons of fuel oil were then placed into the pit, and the contents were burned. Remaining metal was checked for contamination and reburned, if necessary. The decontaminated, salvageable metal remained in the pit; some of it was later removed and sold as scrap. The pit was then backfilled which buried the nonsalvageable materials. Burning and disposal pits appear to have been dug in the area on a regular basis until the late 1960s (ESE 1988a).

Phase I and Phase II field investigations found that the Complex Disposal Trenches contain a wide variety of wastes, as well as potentially hazardous materials. The waste types include contaminated soil, scrap metal, concrete rubble, wood and charcoal, drums of waste chemicals, and glass vials containing unknown liquids. The hazardous materials, which are potentially present, include unexploded ordnance, Army agents or agent degradation products, and unburned incendiaries (ESE 1988a and 1988b). An additional field investigation conducted in spring and summer 1989 confirmed these findings (WCC 1989b). Contaminants found in the Complex Disposal Trenches soils include the ICP metals (cadmium, chromium, copper, lead, and zinc), arsenic, mercury, organochlorine pesticides, diisopropylmethyl phosphonate (DIMP), and organosulfur compounds.

The alluvial groundwater in the Complex Disposal Trench area flows to the north and northwest under unconfined conditions, then northwest out of the Basin A neck. Anomalous Areas A and H are located on the eastern fringe of this portion of the north-northwest flowing alluvial aquifer. The top of the bedrock surface protrudes above the groundwater table along the prominent northwest to southeast



ROCKY MOUNTAIN ARSENAL
KEY MAP

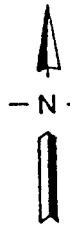


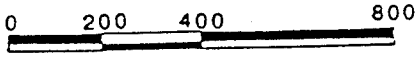
LEGEND

D Anomalous area (A-H)

● Well location

Trench areas considered for IRA





SCALE IN FEET

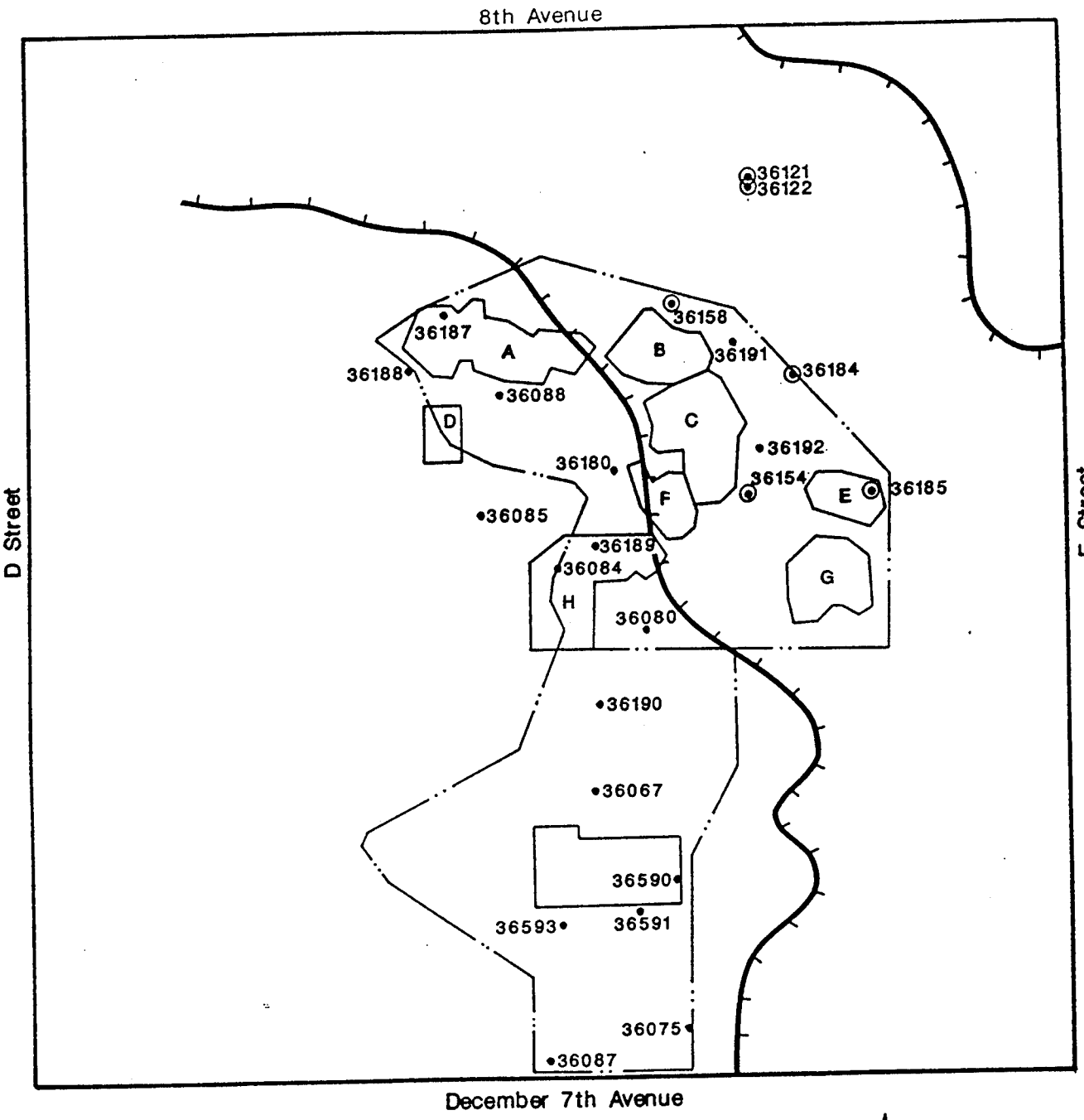
Job No. : 22238-4200	LOCATION OF TRENCHES IN SITE 36-17N
Prepared by: K.A.S.	
Date: 12/18/89	Figure 2-2

trending bedrock ridge in Section 36. The alluvium that caps the bedrock ridge is unsaturated. Anomalous Areas B and C are located over this unsaturated alluvium.

Groundwater contamination in the vicinity of the Complex Disposal Trench area is summarized in Appendix B. Figure 2-3 shows the locations of the groundwater monitoring wells used for the summary in Appendix B. The Central Study Area Report (Ebasco 1989a) and the RMA data base provide details of the groundwater contamination in the vicinity of the Complex Disposal Trenches.

Groundwater in the saturated alluvium underlying Anomalous Areas A and H is highly contaminated with organic contaminants. The plume for these contaminants originates in Site 36-17S and moves up through Site 36-17N underlying Anomalous Areas A and H. Contaminant concentrations do not generally increase as the contaminant plume in the alluvial aquifer moves from Site 36-17S through Site 36-17N. The contaminants include volatile organic compounds; DBCP; organophosphorous compounds (DIMP, dimethylmethyl phosphonate [DMMP], and methylphosphonic acid [MPA]); and organosulfur compounds, both mustard related (dithiane and oxathiane) and herbicide related (chlorophenylmethyl sulfide [CPMS], chlorophenylmethyl sulfoxide [CPMSO], and chlorophenylmethyl sulfone [CPMSO2]). Low concentrations of organochlorine pesticides, and relatively low concentrations of arsenic are also present in the plume moving from Site 36-17S through Site 36-17N. Some ICP metals are present only in a few wells at relatively low concentrations. Groundwater flow rates were calculated using the lower and upper limits of estimated hydraulic gradients and hydraulic conductivities for Section 36. On the basis of these parameters, the calculated flow rate in the alluvial aquifer ranges from approximately 7 to 186 feet/year.

Wells completed in the bedrock, northeast of Anomalous Areas B and C, show some concentrations of volatile halogenated organics, volatile aromatic organics, and DIMP. These contaminants were not found in soil samples in Anomalous Areas B and C. However, due to the heterogeneous nature of the trench contents, there is some possibility that the groundwater contamination is coming from these trenches. Another explanation for this contamination may be that groundwater from the contaminated alluvial aquifer is infiltrating the bedrock. Although the majority of alluvial groundwater entering Site 36-17N from the south encounters the bedrock ridge and is subsequently diverted to the northwest, the bedrock is not absolutely impermeable. Some alluvial groundwater may penetrate either the bedrock itself, or any fracture in the bedrock that may be present, and move down the hydraulic gradient in the Denver Formation to the northeast. Therefore, some contamination present in the alluvial aquifer could possibly be transported through the bedrock. Movement of this contamination would be much slower than in the saturated alluvium because of the lower hydraulic conductivity of the bedrock. The



LEGEND

Unsaturated alluvium

• Monitoring well sampled during Spring 1989

⊙ Other monitoring wells used for groundwater contamination summary table in Appendix B

N

0 800 1600

SCALE IN FEET

Job No. : 22238-4200	MONITORING WELL LOCATIONS
Prepared by: K.A.S.	
Date: 12/18/89	Figure 2-3

calculated flow rate to the northeast of the Complex Disposal Trench area, where flow occurs primarily in the Denver Formation, ranges from approximately 0.2 to 1.6 feet/year. However, there are no monitoring wells upgradient of Anomalous Areas B and C which can be used to evaluate contaminant migration from the alluvial aquifer into the bedrock. Therefore, data do not exist to evaluate whether groundwater contamination in the bedrock is due to the Anomalous Area B and C trenches or infiltration from the alluvial aquifer.

In summary, soil samples taken in the Complex Disposal Trench area show metals to be the primary contaminants, with some indications of organics. It appears that the alluvial aquifer is contaminated primarily with a wide range of organic compounds. Although the Army Complex Disposal Trenches appear to be contributing to the degradation of groundwater quality, wells upgradient of the trenches area indicate that the alluvial aquifer is heavily contaminated prior to entering the Complex Disposal Trench area. The metals that are the primary contaminants in the soil samples from the trenches have been detected in the alluvial groundwater. However, groundwater sampling and analysis show no clear trend of metal contaminant distribution downgradient of the trenches area.

On February 1, 1988, a proposed Consent Decree was lodged in the case of U.S. v. Shell Oil Company with the U.S. District Court in Denver, Colorado. The proposed Consent Decree was revised after public comments were received, and a modified proposed Consent Decree was lodged with the Court on June 7, 1988. In February 1989, a Federal Facility Agreement was entered into between Shell Oil Company and five federal agencies: the U.S. Environmental Protection Agency, the Army, the Department of the Interior, the Department of Health and Human Services, and the Department of Justice, which established procedures for implementing the Arsenal cleanup program as specified in the Technical Program Plan and incorporates many provisions of the modified proposed Consent Decree. The Army and Shell Oil Company agreed to share certain costs of the remediation to be developed and performed under the oversight of the U.S. Environmental Protection Agency, with opportunities for participation by the State of Colorado. The long-term remediation is a complex task that will take several years to complete. The Federal Facility Agreement specifies 13 IRAs determined to be necessary and appropriate. The Remediation of Other Contamination Sources is one of the 13 IRAs. The Complex Disposal Trenches are one of several sites being addressed by the remediation of other contamination sources IRA.

3.0
INTERIM RESPONSE ACTION OBJECTIVE

The objective of the Interim Response Action (IRA) Alternatives Assessment for the Complex Disposal Trenches is to assess whether immediate action at this site is appropriate and to recommend, if necessary, an interim response action alternative to mitigate the threat of release of contaminants from the Complex Disposal Trenches on an interim basis, pending determination of the final remedy in the Onpost Record of Decision (ROD).

The IRA alternatives have been evaluated with respect to the criteria specified in the Federal Facility Agreement, paragraphs 22.5 to 22.7. The evaluation of these criteria is applied within the context of the Decision Flow Chart for Other Contamination Sources IRAs (Figure 1-1). These criteria are:

- Overall protection of human health and the environment
- Benefit in Terms of Accelerated Cleanup
  - Technical Benefit of Performing an IRA Now
  - Timeliness of implementation
  - Consistency with the final remedy
- Benefit in Terms of Cost

This Decision Document provides a summary of the alternative technologies considered, a chronology of the significant events leading to the initiation of the IRA, a summary of the IRA project, and a summary of the ARARs (legal and regulatory standards, criteria, or limitations) associated with the program. Due to the type of response actions being considered in this IRA Alternatives Assessment, it is assumed for evaluation purposes that any of the alternatives under evaluation would be designed to meet ARARs to the maximum extent practicable.

As specified in the Federal Facility Agreement, this IRA will, by monitoring and adding to the site characterization, to the maximum extent practicable, be consistent with and contribute to the efficient performance of the Final Response Action.

This section describes the interim response action (IRA) alternatives developed in the IRA Alternatives Assessment for the Complex Disposal Trenches and discusses the evaluation of these alternatives.

4.1 INTERIM RESPONSE ACTION ALTERNATIVES

Appropriate interim response action alternatives for the Complex Disposal Trenches were evaluated in the "Alternatives Assessment of Interim Response Actions for Other Contamination Sources - Complex Disposal Trenches" (WCC 1989). These alternatives include:

- Monitoring
- Containment
- Source Removal and Temporary Storage

Following is a brief description of these alternatives.

4.1.1 Monitoring

This alternative would consist of conducting groundwater sampling in the vicinity of the Complex Disposal Trenches. Additional monitoring wells would be constructed to better evaluate the effect of the trenches on groundwater contamination. Monitoring would allow continued tracking of the effect of the Complex Disposal Trenches on overall groundwater quality in Section 36.

4.1.2 Containment

This alternative would consist of two aspects of containment. The first would be subsurface barriers to prevent lateral migration of contaminants with the groundwater. The subsurface barriers would be either slurry walls or sheet pilings, that would be constructed so that they are keyed into the low permeability strata beneath the disposal trenches. Since the trenches in Anomalous Areas A and H have the potential for lateral contaminant migration due to their proximity to groundwater, they would be the trenches requiring these barriers.

The other aspect of containment would be the use of either multilayered caps or groundwater extraction and treatment. A multilayered cap can minimize infiltration of precipitation and surface water through the trench contents. Groundwater extraction and treatment would maintain a reverse hydraulic gradient across the subsurface barrier, thereby reducing contaminant migration. Trenches in Anomalous Areas A, B, C, and H would be partially contained by one, or a combination of these technologies.

4.1.3 Source Removal and Temporary Storage

This alternative would consist of excavating the contents of the trenches considered for this IRA and storing those contents in a temporary waste pile on site. This alternative would remove the trench contents and isolate them from the environment. This alternative would require the construction of the temporary waste pile, containment pads for the sorting operation, and temporary structures with exhaust air scrubbers to control air emissions during excavation. A water treatment facility may be required since some of the trench contents may require dewatering and subsequent water treatment. Finally, the excavation operation would require specially trained personnel because of the possible presence of Army agents or unexploded ordnance.

4.2 IRA ALTERNATIVES EVALUATION

The previous section described alternatives for addressing the waste materials in the Complex Disposal Trenches as an interim response action (IRA). The three IRA alternatives considered technically feasible for this site are monitoring, containment, and source removal with temporary storage.

The IRA Alternatives Assessment (WCC 1989a) evaluates the feasible alternatives for this site with respect to the criteria specified in the Federal Facility Agreement, paragraphs 22.5 to 22.7. The evaluation of these criteria is applied within the context of the Decision Flow Chart for the Other Contamination Sources IRAs (Figure 1-1). These criteria, interpreted within the context of the Decision Flow Chart, are:

- Overall protectiveness of human health and the environment
- Benefit in terms of accelerated cleanup
  - Technical benefit of performing an IRA now
  - Timeliness of implementation
  - Consistency with the final remedy
- Benefit in terms of cost

Any alternative chosen for this IRA will, to the maximum extent practicable, attain applicable or relevant and appropriate requirements (ARARs), as required by paragraph 22.7 of the Federal Facility Agreement.

As discussed in the IRA Alternatives Assessment, there does not appear to be a significant risk to human or biota receptors posed by the current situation at this site. Consequently, based on the decision logic in Figure 1-1, the question of whether there is a long-term benefit in terms of accelerated cleanup or cost determines the recommended action for this site.

4.2.1 Overall Protectiveness of Human Health and the Environment

The site does not appear to be posing a significant risk to human health and the environment (i.e., biota) at this time. There are no municipal or private wells currently drawing from the portion of the aquifer affected by the trenches. The North and Northwest Boundary Systems have been installed to intercept and treat contaminated groundwater that may be emanating from this area, prior to the groundwater flowing offpost where human receptors may be impacted. Prior to reaching the boundary systems, groundwater may also be intercepted by the Basin F or Basin A Neck groundwater extraction and treatment systems. In addition, no biota appear to be significantly exposed to the contaminated groundwater beneath Section 36. Since there is little plant life growing in this area, plant uptake will be minimal.

Monitoring would allow continued tracking of contaminant movement, thereby providing additional information on protection of human health and the environment. Monitoring would also provide a warning if conditions change at the site, and risk to human health and the environment increases. If additional groundwater quality degradation can be seen to be the result of the trench contamination, a reevaluation of the site would be initiated, as described in Section 6.0. There would be minor short-term impacts on workers, if additional wells need to be installed, and no short-term impacts on the community during that operation.

Although the site does not appear to be posing a significant risk to human health and the environment at this time, both the containment and source removal alternatives can be designed to be protective of human health and the environment. Both alternatives reduce the mobility of contamination by removing it from contact with the alluvial groundwater, and by minimizing percolation of surface water and precipitation through the waste material. Both alternatives may increase the volume of material that may ultimately need to be addressed because possible cap construction materials from the containment alternative and waste pile construction materials from the source removal alternative may require remediation as part of the Final Onpost Record of Decision (ROD). Some containment alternatives as well as the source removal

alternative do not mitigate the toxicity of the materials. Although the groundwater extraction and treatment containment alternative could have some mitigating effect on toxicity through groundwater treatment, this effect would be inconsequential relative to the amount of contaminated soil and groundwater throughout Section 36.

There are potential short-term impacts associated with implementing both the containment and source removal alternatives. Both alternatives involve intrusive activity. Intrusive activity in Section 36 introduces the potential for releasing air emissions and for contacting randomly buried objects, including possible unexploded ordnance. However, steps can be taken to minimize the impacts associated with intrusive activities, such as conducting geophysical surveys, having specially trained personnel perform the intrusive activities, and implementing engineering controls for air emissions.

4.2.2 Benefit in Terms of Accelerated Cleanup

This subsection discusses the technical benefit of performing an IRA now, the timeliness of the various alternatives considered, and the possible consistency of these alternatives with the final remedy.

4.2.2.1 Technical Benefit of Performing an IRA Now

The approach of this analysis is to consider the technical benefits of containment or source removal and temporary storage. If no benefit in their implementation can be shown, then the monitoring alternative would be the most appropriate IRA, in terms of technical benefit. This approach is consistent with the Decision Flow Chart shown in Figure 1-1.

The technical benefit in performing any containment or source removal action on the Army Complex Disposal Trenches is limited for several reasons. First, the amount of groundwater contamination contributed by the trenches in Anomalous Areas A and H is small compared to the contamination entering the site from upgradient sources. The past disposal practice of burning the waste material prior to burial appears to have been effective at limiting the residual organic contamination (WCC 1989a).

Reducing or removing the contaminant contribution from these trenches would have little effect on overall groundwater quality in the area. Although a containment alternative such as groundwater extraction and treatment would remove some of the contaminants from the aquifer, this type of operation would be more efficiently and effectively performed in the context of a comprehensive remedial effort during the final remedy. The amount of contaminants that could be removed in the time between implementation of an

IRA and the implementation of some final response action would be inconsequential in the context of the overall Section 36 groundwater remediation.

Also, the contribution of contaminants by these trenches to the alluvial groundwater would have little impact on the selection and design of a treatment system installed for the final cleanup of Section 36 groundwater. In other words, there do not appear to be contaminants specific to the Complex Disposal Trenches that would influence the treatment system selection process for the final cleanup of Section 36 groundwater.

In addition, information on the effects on groundwater from the trenches in Anomalous Areas B and C is not conclusive. There are existing wells to the northeast of these Anomalous Areas that have shown some organic contaminants. It has not been determined whether the source of these compounds is these trenches or whether these contaminants have migrated into the saturated bedrock from the alluvial aquifer. No monitoring wells screened in the saturated bedrock currently exist upgradient of Anomalous Areas B and C. These sites, therefore, require further groundwater characterization (both hydrogeologic and chemical) before their contribution to groundwater quality degradation can be evaluated.

Finally, soil throughout Section 36 is contaminated. Therefore, containment or removal of a minor fraction of the material that may ultimately require remediation is of limited benefit.

4.2.2.2 Timeliness of Implementation

Monitoring could be implemented in a timely manner. Groundwater monitoring wells may be able to be sampled in conjunction with the Comprehensive Monitoring Program (CMP). Numerous groundwater monitoring wells have been installed at RMA. If additional wells are determined to be necessary during the design phase of this IRA, procedures and requirements for well installation are firmly established.

Containment could be implemented in a fairly timely manner. The intrusive activities required for installing slurry walls, sheet pilings, or extraction wells would require geophysical surveys because of the possibility of encountering buried objects. Engineering controls may also be necessary to control possible air emissions.

Source removal and temporary storage cannot be implemented in a timely manner. As discussed in subsection 4.1.3, this alternative would require construction of a temporary waste pile and sorting areas. Temporary structures would need to be constructed for air emissions controls, and a water treatment facility may be required. Because of the potentially hazardous nature of the trench contents related to the possible

presence of Army agents or unexploded ordnance, specially trained personnel would need to conduct the excavation and sorting operation. The rate at which excavation would proceed has been estimated, for the purpose of this study, to be approximately 6 cubic yards per hour for each backhoe at the site. At this rate, it would take approximately 2 years to remove the waste material, assuming four crews, and based on excavating the trench areas considered for this IRA shown on Figure 2-2.

4.2.2.3 Consistency with the Final Remedy

Monitoring is the alternative most consistent with any final remedy. Some construction materials for the caps in the containment alternative and the temporary waste pile in the source removal alternative may need to be considered hazardous wastes during the final remedy. Therefore, both containment and source removal with temporary storage could generate additional materials that may require remediation, while providing minimal reduction of risk to human health and the environment and limited technical benefit. In addition, source removal with temporary storage would require rehandling of the waste materials during final remediation, which introduces a second opportunity for incidental exposure to workers and the community. Finally, a source removal IRA alternative may not be consistent with the final remedy since source removal would preclude a final in situ treatment alternative.

4.2.3 Benefit in Terms of Cost

Details of the costs associated with the three IRA alternatives considered technically feasible for this site, monitoring, containment, and source removal with temporary storage, are presented in the IRA Alternatives Assessment for this site (WCC 1989a). The alternatives were evaluated to determine whether there is a benefit in terms of cost in performing an interim action other than monitoring at this time.

Both containment and excavation with temporary storage may increase the overall cost of cleanup for this area because they generate construction materials that would require subsequent removal and treatment. In addition, excavation and temporary storage requires rehandling the trench materials during the final remedy. Therefore, both containment and excavation may add to the long-term cost of remediating this site.

Monitoring does not add to long-term costs, and is also the most cost-effective alternative. Consequently, there appears to be no cost benefit in performing any action other than monitoring at this time.

4.3 CONCLUSIONS

The preferred interim action for the Army Complex Disposal Trenches is monitoring. No technical or cost benefit can be identified for performing any additional action at this site at this time. A site-specific monitoring program will provide continuing information on the impacts of the Army trenches on the groundwater. A reevaluation procedure will be established to identify changing conditions which may warrant additional action at this site, and to establish procedures for assessing and implementing an appropriate action.

5.0
CHRONOLOGY OF EVENTS

The significant events leading to the proposed decision to monitor the Complex Disposal Trenches as described in Section 6.0 of this report are presented below.

Date	Event
June 1987	State of Colorado, Shell Oil Company, EPA, and the Army develop and agree, in a June 1987 report to the Court, to a prospective hot spot list that identifies candidate Interim Response Actions (IRAs) to be conducted. The hot spot list consists of five areas (the Section 36 Trenches, the Section 36 Lime Pits, the M-1 Settling Basins, the Motor Pool Area, and the Railroad Housing Track in the Rail Classification Yard) referred to as Other Contamination Sources in the proposed Consent Decree (Section 9.1, paragraph l), and in the Federal Facility Agreement, paragraph 22.1 (l).
February 1988	The State of Colorado, Shell Oil Company, and EPA are initially requested to identify potential ARARs for this IRA.
January 31, 1989	The Army instructs Woodward-Clyde Consultants (WCC) to develop plans for interim action investigation work in response to the hot spot list. Interim action investigation work includes the Complex Disposal Trenches.
April 13, 1989	A draft final Task Plan, including the work for the Complex Disposal Trenches, is submitted by the Army to the Organizations and the State for comment.
April 17, 1989	Field investigations begin for the other contamination sources IRA. Work includes investigation of the contaminant source(s) within the Complex Disposal Trenches.
June 29, 1989	A final Task Plan is issued by the Army with comments incorporated.
September 11, 1989	Field investigation completed
September 20, 1989	Draft Final Alternatives Assessment of Interim Response Actions for Other Contamination Sources - Complex Disposal Trenches and draft ARARs are distributed by the Army to the Organizations and the State for comment.

October 5, 1989	The Army is granted a 2-month extension on the Proposed Decision Document in order to further address comments on the Draft Final Alternatives Assessment from the Organizations and the State.
November 27, 1989	Draft Final Results of Field and Laboratory Investigations Conducted for the Remediation of Other Contamination Sources Interim Response Action is distributed by the Army to the Organizations and the State.
December 14, 1989	The Army announces the results of its reevaluation of existing data, per EPA comments, in a subcommittee meeting, and discusses the reasons monitoring is an appropriate interim action for this site at this time. A letter report on this conclusion is distributed to the Organizations and the State.
January 26, 1990	Final Alternatives Assessment of Interim Response Actions for Other Contamination Sources - Complex Disposal Trenches, is distributed by the Army to the Organizations and the State with comments incorporated.
January 26, 1990	Proposed Decision Document for the Interim Response Action at the Complex Disposal Trenches at the Rocky Mountain Arsenal is distributed by the Army to the Organizations and the State for comment.
March 28, 1990	Draft Final Decision Document for the Interim Response Action at the Complex Disposal Trenches at the Rocky Mountain Arsenal is distributed by the Army to the Organizations and the State with comments incorporated.
May 1, 1990	Decision Document for the Interim Response Action at the Complex Disposal Trenches at the Rocky Mountain Arsenal is finalized.

6.0 SUMMARY OF THE INTERIM RESPONSE ACTION

The preferred alternative for the Army Complex Disposal Trenches is monitoring. No technical or cost benefit in performing any additional action at this site can be identified at this time. A site-specific monitoring program will provide continuing information on the impacts of the Army trenches on groundwater. A reevaluation procedure will be established to identify changing conditions which may warrant additional action at this site, and to establish procedures for assessing and implementing appropriate action. The dimensions of this reevaluation procedure are discussed below.

6.1 MONITORING PROGRAM

The monitoring program will consist of periodic sampling and analysis of groundwater from existing wells upgradient and downgradient of the Complex Disposal Trench area. Additional wells will be required to adequately monitor upgradient and downgradient water quality in the vicinity of the Complex Disposal Trenches. The number and location of these wells will be determined during design and implementation of the IRA. Appropriate indicator analytes and sampling frequency will also be determined during design.

6.2 REEVALUATION PROCEDURE

As information is collected and compared to historical data, a periodic reevaluation will be performed to determine whether the basis for the present decision has changed. If the basis has changed, then the decision will be reviewed. A more aggressive action than monitoring may be selected, if a clear and significant benefit in terms of accelerated cleanup or cost can be demonstrated for such action. Such a review of the decision will be compatible with and consistent with the process used to reach the original decision. A procedure for reevaluation to identify changed conditions, and process for considering evidence of changed site conditions, will consist of the following elements:

- Monitoring
- Establishment of a frequency at which data will be reexamined
- Definition of a technical data set to be reexamined
- Criteria for determining that the basis for the present decision has changed
- Formation of a decision process to determine if mitigative action would yield a benefit

The following procedure is suggested in this Decision Document and will be finalized during the design of this IRA. The flow chart shown in Figure 6-1 parallels the text below.

- Monitoring

  Data for reevaluation will be taken from monitoring activities.

- Frequency

  Monitoring data will be assembled for reexamination of the Decision Flow Chart at a frequency of every other monitoring episode. A report will be prepared to document that reexamination.

- Technical Data Set

  The data to be included in the reexamination are:

  - Groundwater gradients
  - Concentrations of compounds of concern in both upgradient and downgradient wells
  - Observations of receptor population presence and density

  If any of the data change from the previous examination, then the following criteria will be evaluated to determine whether there is a change in the basis for the alternatives assessment decision.

- Criteria

  A change in the basis for the present decision will be indicated if:

  - Groundwater gradient data indicate groundwater in the bottom of the Complex Disposal Trenches in two consecutive monitoring episodes.

    and,

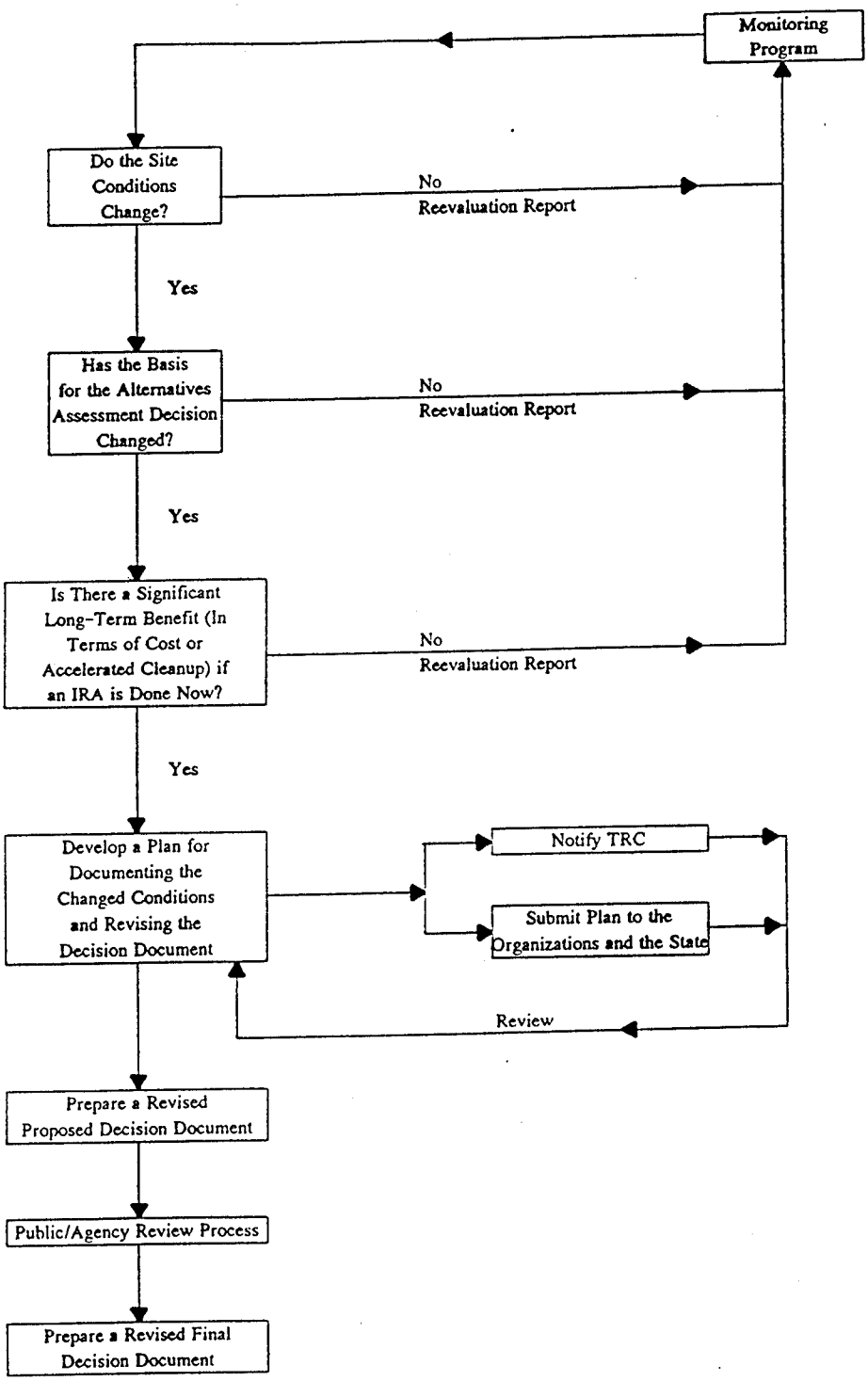
  - Increases or decreases in downgradient concentrations cannot be correlated to increases or decreases in upgradient concentrations in two consecutive monitoring episodes.

    and,

  - Downgradient concentrations are greater than during the IRA alternatives assessment by an order of magnitude or more.

    or,

  - A notable increase in receptor populations is observed.



Job No. : 22238-420	REEVALUATION PROCESS FOR ARMY COMPLEX TRENCHES IRA
Prepared by : K.A.S.	
Date : 3/21/90	Figure 6-1

- Decision Process

  If a change in the basis for the present decision is identified, then

  - A technical reevaluation to determine if mitigative action would yield a clear and significant benefit in terms of accelerated cleanup or cost will be conducted using the IRA alternatives assessment methods and interim action alternatives.

  - If a benefit will be gained, then a plan for documenting the changed conditions, selecting a preferred alternative, and revising the decision document, will be submitted to the Organizations and the State.

  - The public review process will be reopened: the Technical Review Committee (TRC) will be notified, public meetings (if needed) will be scheduled, and fact sheets (if needed) will be prepared.

  - A revised decision document, describing the changed conditions, alternatives considered, and selected action, will be issued. This decision document will contain the analysis that led to a revised decision (if the decision is revised).

This process and procedure will be finalized during the design of this IRA.

6.3 HEALTH & SAFETY PLAN

A Healthy & Safety Plan has been developed for the prevention of occupational injuries and illnesses during field activities at RMA. This plan addresses health and safety requirements of contractors and their authorized enforcement and compliance with this plan. The Health & Safety Plan was developed taking into consideration known hazards as well as potential risks. Comprehensive environmental monitoring and site-specific personal protection are combined in an effort to best protect workers.

A site-specific Health & Safety Plan for work to be performed on the Complex Disposal Trenches will be developed.

7.0
INTERIM RESPONSE ACTION PROCESS

With respect to the Interim Response Action (IRA) for the remediation of other contamination sources, for the Complex Disposal Trenches at Rocky Mountain Arsenal (RMA), the IRA process is as follows:

1. The Army issues the proposed Decision Document for the IRA for the interim remediation of other contamination sources, Complex Disposal Trenches, for a 30-day public comment period. During the 30-day comment period, the Army will hold one public meeting addressing the IRA decision. The proposed Decision Document is supported by an administrative record.

2. Promptly after the close of the comment period, the Army shall transmit to the other Organizations, Department of Interior (DOI), and the State, a draft final IRA Decision Document for the remediation of Other Contamination Sources, Complex Disposal Trenches.

3. Within 20 days after the issuance of a draft final IRA Decision Document for the interim remediation of Other Contamination Sources, Complex Disposal Trenches, an Organization (including the State if it has agreed to be bound by the Dispute Resolution process, as required by the FFA, or DOI under the provisions set forth in the FFA) may invoke Dispute Resolution.

4. After the close of the period for invoking Dispute Resolution, if Dispute Resolution is not invoked, or after the completion of Dispute Resolution, if invoked, the Army shall issue a final IRA Decision Document to the other Organizations, DOI, and the State. The Army shall also notify the public of the availability of the final IRA Decision Document with the supporting administrative record. Only preliminary design work for the IRA may be conducted prior to the issuance of the final IRA Decision Document.

5. The IRA Decision Document for the remediation activity at the Complex Disposal Trenches will be subject to judicial review in accordance with Section XXXIX of the Federal Facility Agreement except where such review is barred by Sections 113 and 121 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended, 42 U.S.C. Sections 6913 and 9621.

6. Following issuance of the final IRA Decision Document, the Army shall be the lead party responsible for designing and implementing the IRA in conformance with the Decision

Document. The Army shall issue a draft IRA Implementation Document to the DOI, the State, and the other Organizations for review and comment. The draft Implementation Document shall include final drawings and specifications, final design analysis, a cost estimate, and IRA deadlines for implementation of the IRA.

7. If any Organization (including the State) or the DOI, believes that the IRA is being designed or implemented in a manner that will not meet the objectives for the IRA set forth in the final IRA Decision Document, or is otherwise not being properly implemented, it may so advise the others and shall recommend how the IRA should be properly designed or implemented. Any Organization (including the State, if it has agreed to be bound by the process of Dispute Resolution, as required by the FFA, or the DOI under the circumstances defined in the FFA) may invoke Dispute Resolution to resolve the disagreement.

8. As Lead Party for the design and implementation of this IRA, the Army will issue the final Implementation Document, as described above, and will be responsible for implementing the IRA in accordance with the IRA Implementation Document.

8.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR THE REMEDIATION OF OTHER CONTAMINATION SOURCES - SECTION 36 TRENCHES INTERIM RESPONSE ACTION

8.1 INTRODUCTION

These Applicable or Relevant and Appropriate Requirements (ARARs) address a specific area identified for evaluation for remediation prior to the issuance of a Record of Decision (ROD) for the Onpost Operable Unit of the Rocky Mountain Arsenal. The remedial actions selected involve monitoring for the Army trenches and a containment approach involving a physical barrier and cover for the Shell trenches. Some standards are discussed in general terms, to be further defined as more specific remedial actions are identified.

8.2 AMBIENT OR CHEMICAL-SPECIFIC ARARS

Ambient or chemical-specific requirements set concentration limits or ranges in various environmental media for specific hazardous substances, pollutants, or contaminants. Such ARARs either set protective cleanup levels for the chemicals of concern in the designated media or indicate an appropriate level of discharge based on health and risk-based analyses and technological considerations.

The objectives of this IRA are discussed in the Final Assessment Documents. This IRA will be implemented prior to the final remediation to be undertaken in the context of the Onpost Operable Unit ROD. The lists of specific contaminants included in the Final Assessment Documents have been completed based upon the field data concerning these specific sources. The media of concern here are the water and the soils in the trench areas considered for remediation. However, no ambient or chemical-specific ARARs were identified concerning levels of contaminants for soils. Since the selected approaches for this IRA do not involve the treatment of groundwater from the area of either the Army or Shell trenches, no chemical-specific ARARs concerning water were selected for this IRA.

8.2.1 Air Emissions

The approaches selected by this IRA do not involve the operation of any treatment system which will result in air emissions. The capping in the area of the Shell trenches is expected to substantially reduce any current emissions coming from the soils in their current state. The monitoring to take place in the area of the Army trenches will not affect any emissions that may originate in that area, but air monitoring will identify any potential concerns regarding emissions from this area.

The standards contained at 40 CFR Part 50 were reviewed and determined to be neither applicable nor relevant and appropriate to apply as specific limitations to this IRA. These standards apply to Air Quality Control Regions (AQCR), which are markedly dissimilar from the area within which activity is being conducted pursuant to this IRA. An AQCR is generally a very large area, covering many square miles. The trenches cover an extremely small area, far smaller than an AQCR. These standards are not generally applied to specific emissions sources, such as automobile tailpipes or smokestacks. These considerations lead to the determination that these ambient air standards are neither relevant nor appropriate to apply as specific limitations within the context of this IRA.

Other air standards, such as those contained at 40 CFR Parts 60 and 61 and similar state standards such as those contained at 5 CCR 1001-10, Regulation 8 were not considered as potential ARARs since the IRA will not include a treatment system which causes air emissions.

8.3 Location-Specific ARARs

Location-specific requirements set restrictions on activities, depending on the characteristics of the site or the immediate environment, and function like action-specific requirements. Alternative remedial actions may be restricted or precluded, depending on the location or characteristic of the site and the requirements that apply to it.

Paragraph 44.2 of the Federal Facility Agreement provides that "wildlife habitat(s) shall be preserved and managed as necessary to protect endangered species of wildlife to the extent required by the Endangered Species Act (16 U.S.C. 1531 et seq.), migratory birds to the extent required by the Migratory Bird Treaty Act (16 U.S.C. 703 et seq.), and bald eagles to the extent required by the Bald Eagle Protection Act, 16 U.S.C. 688 et seq."

While this provision is not an ARAR, the statutory requirements are ARARs and will be complied with for purposes of this IRA. Based on where facilities related to this IRA are likely to be located the Army believes that this IRA will have no adverse impact on any endangered species or migratory birds or on the protection of wildlife habitats. Coordination will be maintained with the U.S. Fish and Wildlife Service to ensure that no such adverse impact arises from implementation of this IRA.

The provisions of 40 CFR 6.302(a) and (b) regarding construction that would have an adverse impact on wetlands or be within a floodplain are considered relevant and appropriate to apply in the context of this IRA. The Army will comply with these regulations to the maximum extent practicable to avoid construction

conducted pursuant to this IRA in a manner the would have an adverse impact on wetlands or be within a floodplain.

The regulations at 40 CFR 230 were reviewed and determined not to be applicable within the context of this IRA because no discharge of dredged or fill material into waters of the United States is contemplated. Because these regulations address only the disposal of such materials into the waters of the United States, which is not contemplated, they are not considered to be relevant and appropriate to apply in the context of this IRA.

The regulations at 33 CFR 320-330 were reviewed and determined to be neither applicable nor relevant and appropriate because they address actions affecting the waters of the United States. No such actions are contemplated within the context of this IRA.

8.4 Action-Specific ARARs

8.4.1 Description

Performance, design, or other action-specific requirements set controls or restrictions on activities related to the management of hazardous substances, pollutants, or contaminants. These action-specific requirements may specify particular performance levels, actions, or technologies as well as specific levels (or a methodology for setting specific levels) for discharged or residual chemicals.

8.4.2 Construction Occurring Incident to the IRA

8.4.2.1 Air Emissions

On the remote possibility that there may be air emissions during the course of the construction associated with this IRA, the Army has reviewed all potential ambient or chemical-specific air emission requirements. As a result of this review, the Army found that there are, at present, no National or State ambient air quality standards currently applicable or relevant and appropriate to any of the volatile or semivolatiles chemicals in the ground water found in the area in which construction is contemplated.

In the context of this IRA, there is only a very remote chance of any release of volatiles or semivolatiles and, even if such a release did occur, it would only be intermittent and of very brief duration (because the activity that produced the release would be stopped and modified appropriately if a significant air emission,

based upon specific standards contained in the Health and Safety Plan, was detected by the contractor's air monitoring specialist). The Army has significant experience with the construction of extraction and reinjection wells and has not experienced any problems from air emissions during construction of such facilities. Since minimal excavation of saturated material is anticipated, it is not believed that air emissions are likely to occur, as they might if large amounts of saturated material were excavated and necessitated drying. The site-specific Health and Safety Plan will adequately address these concerns. This plan to be developed for use in the IRA will detail operational modifications to be implemented in the event monitoring detects specific levels of such emissions.

The National Emissions Standards for Hazardous Air Pollutants (NESHAPS) were evaluated to determine whether they were applicable or relevant and appropriate to apply in the context of construction of this IRA. These standards were not considered applicable because they apply to stationary sources of these pollutants, not to construction activity. These standards were not considered relevant and appropriate because they were developed for manufacturing processes, which are significantly dissimilar to the short-term construction activity contemplated by this IRA.

The provisions of 40 CFR 50.6 will be considered relevant and appropriate. This standard is not applicable because it addresses Air Quality Control Regions, which are areas significantly larger than and different from the area of concern in this IRA. Pursuant to this regulation, there will be no particulate matter transported by air from the site beyond the installation boundary that is in excess of 50 micrograms per cubic meter (annual geometric mean) and the standard of 150 micrograms per cubic meter as a maximum 24-hour concentration will not be exceeded more than once per year.

The provisions of Colorado Air Pollution Control Regulation No. 2, concerning odor emissions is considered relevant and appropriate to apply at the installation boundary.

8.4.2.2 Worker Protection

The provisions of 29 CFR 1901.120 are applicable to workers at the site because these provisions specifically address hazardous substance response operations under CERCLA. It should be noted that these activities are presently governed by the interim rule found at 29 CFR 1910.120 but that by the time IRA activity commences at the site, the final rule found at 54 FR 9294 (March 6, 1989) will be operative. The final rule became effective on March 6, 1990.

8.4.2.3 General Construction Activities

The following performance, design, or other action-specific State ARARs have been identified by the Army as applicable:

Colorado Air Pollution Control Commission Regulation No. 1, 5 CCR 1001-3, Part III(D)(2)(b), Construction Activities:

a. Applicability - Attainment and Nonattainment Areas

b. General Requirement

Any owner or operator engaged in clearing or leveling of land or owner or operator of land that has been cleared of greater than one (1) acre in nonattainment areas for which fugitive particulate emissions will be emitted shall be required to use all available and practical methods which are technologically feasible and economically reasonable in order to minimize such emissions, in accordance with the requirements of Section III.D. of this regulation.

c. Applicable Emission Limitation Guideline

Both the 20% opacity and the no off-property transport emission limitation guidelines shall apply to construction activities; except that with respect to sources or activities associated with construction for which there are separate requirements set forth in this regulation, the emission limitation guidelines there specified as applicable to such sources and activities shall be evaluated for compliance with the requirements of Section III.D. of this regulation. (Cross Reference: Subsections e. and f. of Section III.D.2 of this regulation).

d. Control Measures and Operating Procedures

Control measures or operational procedures to be employed may include but are not necessarily limited to planting vegetation cover, providing synthetic cover, watering, chemical stabilization, furrows, compacting, minimizing disturbed area in the winter, wind breaks, and other methods or techniques.

Colorado Ambient Air Quality Standards, 5 CCR 1001-14, Air Quality Regulation A, Diesel-Powered Vehicle Emission Standards for Visible Pollutants:

a. No person shall emit or cause to be emitted into the atmosphere from any diesel-powered vehicle any air contaminant, for a period greater than 10 consecutive seconds, which is of such a shade or density as to obscure an observer's vision to a degree in excess of 40% opacity, with the exception of Subpart B below.

b. No person shall emit or cause to be emitted into the atmosphere from any naturally aspirated diesel-powered vehicle of over 8,500 lbs gross vehicle weight rating operated above 7,000 feet (mean sea level), any air contaminant for a period of 10 consecutive seconds, which is of a shade or density as to obscure an observer's vision to a degree in excess of 50% opacity.

c. Diesel-powered vehicles exceeding these requirements shall be exempt for a period of 10 minutes, if the emissions are a direct result of a cold engine start-up and provided the vehicle is in a stationary position.

d. This standard shall apply to motor vehicles intended, designed, and manufactured primarily for use in carrying passengers or cargo on roads, streets, and highways.

Colorado Noise Abatement Statute, C.R.S. Section 25-12-103:

a. Each activity to which this article is applicable shall be conducted in a manner so that any noise produced is not objectionable due to intermittence, beat frequency, or shrillness. Sound levels of noise radiating from a property line at a distance of twenty-five feet or more there from in excess of the db(A) established for the following time periods and zones shall constitute prima facie evidence that such noise is a public nuisance:

Zone	7:00 a.m. to next 7:00 p.m.	7:00 p.m. to next 7:00 a.m.
Residential	55 db(A)	50 db(A)
Commercial	60 db(A)	55 db(A)
Light Industrial	70 db(A)	65 db(A)
Industrial	80 db(A)	75 db(A)

b. In the hours between 7:00 a.m. and the next 7:00 p.m., the noise levels permitted in subsection (1) of this section may be increased by ten db(A) for a period of not to exceed fifteen minutes in any one-hour period.

c. Periodic, impulsive, or shrill noises shall be considered a public nuisance when such noises are at a sound level of five db(A) less than those listed in Subpart (a) of this section.

d. Construction projects shall be subject to the maximum permissible noise levels specified for industrial zones for the period within which construction is to be completed pursuant to any applicable construction permit issued by proper authority or, if no time limitation is imposed, for a reasonable period of time for completion of the project.

e. For the purpose of this article, measurements with sound level meters shall be made when the wind velocity at the time and place of such measurement is not more than five miles per hour.

f. In all sound level measurements, consideration shall be given to the effect of the ambient noise level created by the encompassing noise of the environment from all sources at the time and place of such sound level measurements.

In substantive fulfillment of Colorado Air Pollution Control Commission Regulation No. 1, this IRA will employ the specified methods for minimizing emission from fuel burning equipment and construction activities. In substantive fulfillment of Colorado's Diesel-Powered Vehicle Emission Standards, no diesel motor vehicles associated with the construction shall be operated in a manner that will produce emissions in excess of those specified in these standards.

The noise levels pertinent for construction activity provided in C.R.S. Section 25-12-103 will be attained in accordance with this applicable Colorado statute.

8.4.2.4 Wetlands Implications

Through estimation of the general area where any construction would occur or facilities be located, the Army does not believe that any wetlands could be adversely affected. However, until a final design is selected, it cannot be definitively determined that no impact on wetlands will occur. If the final site selection and/or design results in an impact on wetlands, the Army will review the regulatory provisions concerning wetlands

impact, generally identified as relevant and appropriate in the discussion of location-specific ARARs above, and other appropriate guidance, and will proceed in a manner consistent with those provisions. Coordination will be maintained with the U.S. Fish and Wildlife Service concerning any potential impacts on wetlands.

8.4.2.5 Groundwater Monitoring

The Army has determined that the substantive provisions of the regulations contained in 40 CFR § 264.97, and any provisions of 6 CCR 1007-3, § 264.97 which are more stringent than the federal regulations, are relevant and appropriate to apply to the groundwater monitoring which is to occur pursuant to this IRA. Pursuant to CERCLA Section 121(e), 42 U.S.C. §9621(e), no federal, state or local permit is required for the groundwater monitoring to be conducted. The specific monitoring program will be developed later in the IRA process and may utilize some number of the existing monitoring wells on the Arsenal, sampling conducted under the Comprehensive Monitoring Program, the addition of new wells and/or sampling requirements or any combination of these approaches in order to fulfill the substantive requirements of these regulations.

8.4.2.6 Construction of Physical Barrier and Cover for Shell Trenches

The substantive standards contained in 40 CFR §264.310, specifically those requirements contained in subsections a(2)-(4) and b(1) and (4), which describe the necessary standards and actions concerning landfill covers, are considered relevant and appropriate to apply to the construction and continued operation of this cover.

8.4.2.7 Land Disposal Restrictions and Removal of Soil

There are no action-specific ARARs that pertain to the excavation of soil during the construction associated with this IRA.

EPA is currently developing guidance concerning the Land Disposal Restrictions (LDR). While guidance is limited, the Army has not, at this time, made a determination that any waste subject to LDR will be present in the soil removed by this IRA. Further EPA guidance concerning the applicability of LDRs to CERCLA actions is likely to be issued prior to the implementation of this IRA and the Army will review such guidance as it is released. If it is determined that a waste subject to LDR is present, the Army will act in a manner consistent with EPA guidance then in effect for the management of such within the context of CERCLA actions.

Soil removal from the area will be performed in accordance with the procedures set forth in the Task No. 32 Technical Plan, Sampling Waste Handling (November 1987), and EPA's July 12, 1985, memorandum regarding "EPA Region VIII Procedure for Handling of Materials from Drilling, Trench Excavation and Decontamination during CERCLA RI/FS Operations at the Rocky Mountain Arsenal." While not an ARAR, EPA's July 12, 1985 guidance memorandum applies to this action as a TBC. Soils, not included for further treatment, generated by excavation during the course of this IRA, either at surface or subsurface, may be returned to the location from which they originated (i.e., last out, first in). Any materials remaining after completion of backfilling that are suspected of being contaminated (based on field screening techniques) will be properly stored, sampled, analyzed, and ultimately disposed as CERCLA hazardous wastes, as appropriate.

For material determined to be hazardous waste resulting from construction activities, substantive RCRA provisions are applicable to their management. These substantive provisions include but are not limited to: 40 CFR Part 262 (Subpart C, Pre-Transport Requirements), 40 CFR part 263 (Transporter Standards), and 40 CFR Part 264 (Subpart I, Container Storage and Subpart L, Waste Piles). The specific substantive standards applied will be determined by the factual circumstances of the accumulation, storage or disposal techniques actually applied to any such material.

8.4.2.8 Soil Treatment and Disposal

These proposed remedial actions do not include any significant possibility of onsite or offsite disposal of soils or contaminated material excavated pursuant to this IRA. The selected alternative of monitoring for the Army trenches only involves minimal excavation and should result in only small amounts of excavated soil remaining to be handled as discussed above. The containment structures contemplated in connection with the Shell trenches will result in some excavation of soil. However it is intended that the excavated soil be retained in the area of the trenches, covered by the containment structures which are to be built pursuant to this IRA. In the event that some material is later considered for disposal, ARARs for such activities have been generally identified, with more specific analysis to follow after any specific disposal determination is made. Onsite disposal of material is not contemplated. For offsite disposal of hazardous material the administrative and substantive provisions of 40 CFR Part 262, Subparts A,B,C and D, and any provisions of 6 CCR 1007-3, Part 262, Subparts A,B,C and D which are more stringent than the corresponding federal regulations, are considered relevant and appropriate.

8.5 COMPLIANCE WITH THE OTHER ENVIRONMENTAL LAWS

As is evident from the various portions of this document, this IRA was prepared in substantive compliance with 40 CFR 1502.16 (the regulations implementing the National Environmental Policy Act of 1969).

9.0
SCHEDULE

The Draft Implementation Document is scheduled for completion on October 1, 1990. The construction schedule will be contained in the Draft Implementation Document for this Interim Response Action (IRA). This milestone has been developed based upon the Final Assessment Document and the assumption that no dispute resolution will occur. If events that necessitate a schedule change or extension occur, the change will be incorporated in accordance with the Federal Facility Agreement.

10.0
CONSISTENCY WITH THE FINAL REMEDIAL ACTION

The Federal Facility Agreement states that all Interim Response Actions (IRAs) shall "to the maximum extent practicable, be consistent with and contribute to the efficient performance of Final Response Actions" (paragraph 22.5).

The selected alternative, by providing additional site characterization information which will be utilized in developing an appropriate future response action, either as part of the final remedy or prior to the final remedy, if appropriate, will be consistent with any Final Response Action.

11.0
REFERENCES

Ebasco Services, Inc. 1989a. March. Draft Final Remedial Investigation Report, Central Study Area. Version 2.1. RIC89166RO6.

Ebasco Services, Inc. 1989b. June. Proposed Final Remediation Investigation Report, Volume XI, North Central Study Area. Version 3.2. RIC89166RO7.

Environmental Science and Engineering, Inc. 1988a. January. Final Phase I Contamination Assessment Report, Site 36-17, Complex Disposal Activity, Version 3.2, Task No. 1. RIC 88013R05.

Environmental Science and Engineering, Inc. 1988b. September. Final Phase II Data Addendum, Site 36-17, Complex Disposal Activity, Version 3.1. RIC 88013R05A.

Woodward-Clyde Consultants. 1989a. Final Alternative Assessment of Interim Response Actions for Other Contamination Sources Complex Disposal Trenches.

Woodward-Clyde Consultants. 1989b. Final Results of Field and Laboratory Investigations Conducted to Evaluate Interim Response Actions for Other Contamination Sources.

APPENDIX A
COMMENTS AND RESPONSES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2405

FEB 26 1990

Ref: 8HWM-FF

Mr. Donald L. Campbell
Office of the Program Manager
Rocky Mountain Arsenal
ATTN: AMXRM-PM
Commerce City, Colorado 80022-2180

Re: Rocky Mountain Arsenal (RMA) Proposed Decision Document for the Interim Response Action for the Complex Disposal Trenches, January 1990.

Dear Mr. Campbell:

We have reviewed the above referenced report and have the enclosed comments.

Our major concern is the lack of a strong technical evaluation to support monitoring and periodic reevaluation of the site as the preferred alternative. The complex disposal trenches are a source of groundwater contamination. Whether the trenches are a significant source has not been thoroughly evaluated. Although the Army was given a two month extension on this IRA to further evaluate the existing data, it appears that they have used the time to rewrite the Alternative Assessment Document to select a different alternative without further technical evaluation. There exists a Draft Alternative Assessment Document which presents one preferred alternative and a final version of the same document in which a different preferred alternative is presented. The major difference in the two documents is differing subjective points of view. The monitoring alternative would be more defensible if there was a better technical evaluation in the Final Alternative Assessment Document.

The Final Alternative Assessment Document for this IRA does not evaluate accelerated cleanup of groundwater but the Decision Document eliminates it from further consideration in the Technical Benefits Section (refer to specific comment 2) via conclusions reached without performing a supporting evaluation. The impact of these trenches on the Denver Formation is not evaluated nor is a commitment made to monitor the Denver in the preferred alternative.

Please contact Linda Jacobson at (303) 294-7093, if you have questions on this matter.

Sincerely,

Connally Mears
EPA Coordinator for RMA Cleanup

Enclosure

cc: Col. Dan Voss, RMA-PMO
J. D. Smith, RMA-PMO
Jeff Edson, CDH
David Shelton, CDH
Vicky Peters, CAGO
Major Larry Rouse
Chris Hahn, Shell
George Roe, Shell
Robert Foster, DOJ

RESPONSE TO COMMENTS FROM THE EPA ON THE PROPOSED DECISION DOCUMENT FOR THE INTERIM RESPONSE ACTION FOR THE ARMY COMPLEX DISPOSAL TRENCHES

General Comment (summarizing the cover letter)

There is a lack of strong technical evaluation to support monitoring and periodic reevaluation of the site as the preferred alternative.

Response: The technical approach used to evaluate the need for mitigative action at the site was to develop a conceptual model of the site and test this with field sampling data; if the conceptual model was supported by the sampling data, then the site was considered to be sufficiently characterized to make a determination of whether or not mitigative action would yield a clear and significant benefit. This approach possible because of the substantial body of technical information from contamination assessment reports, the remedial investigation, and the CMP. These data provided a sound inductive basis for the development of the conceptual model.

The conceptual model holds that the Complex Disposal Trenches are located on the eastern fringes of a major flow system from the South Plants area, moving north then northwesterly, to Basin A Neck. The trenches ascend a bedrock high that serves as a barrier to easterly groundwater flow. The trenches are intermittently in contact with groundwater contaminated from upgradient sources, are usually unsaturated, and therefore are not continuous contaminant contributors to the major flow system. Mitigative action would be indicated if additional data suggested that the trenches were major contributors to the contaminant load of the main south-north flow system and some benefit in terms of accelerated cleanup or cost could be shown (a proposed reevaluation process is presented in Section 6.0 of this Decision Document).

Field sampling consisted of trenching, geophysics, and well development in the immediate vicinity of the trenches. These data confirmed that the trenches are usually unsaturated and that no firm conclusion can be reached about the correspondence between contaminant levels in and adjacent to the trenches and the contaminant levels in downgradient waters. Further, the presence of the bedrock high and its function as a hydraulic barrier were generally confirmed. Therefore, since field data confirm a conceptual model developed out of extensive existing data, by logical inference the Army concluded that mitigative action at this time would not yield a clear and significant benefit in terms of accelerated cleanup or cost. The Army believes that this logic is sound and the data that supported its development are also sufficient to support this conclusion.

Specific Comments

Comment 1: Page 4-3, Section 4.2.1, first paragraph. The text indicates that the site does not appear to be posing a significant risk to human health and the environment. There is not enough data presented in the Alternative Assessment to reach that conclusion in regards to the environment. The Denver Formation pathway has not been evaluated, which makes the stated conclusion premature.

Response: The evaluation of risk at this site is based on consideration of source, pathways, and receptors. Human health risk was judged to be insignificant because the source term from the Complex Disposal Trenches appears to be overwhelmed by other source terms originating

upgradient, and because there are no human receptors directly exposed or imminently threatened with exposure to contaminants originating in the Complex Disposal Trenches. This judgement is based on a qualitative assessment of risk factors, and is apparently acceptable to the EPA. In like fashion, the assessment of environmental risk (i.e. risk to biota) was qualitative, considering the same types of risk factors: source, pathways, and receptors. The reasoning used is summarized below.

- Source. The source term for environmental risk is the same as for human risk: buried contaminants that are in occasional contact with groundwater. The Complex Disposal Trenches source is markedly smaller in magnitude than upgradient sources to the south that are continuously contributing groundwater contaminants migrating north-northwest. Field tests did not demonstrate a significant worsening of these contaminant plumes downgradient of the Complex Disposal Trenches. Therefore, the Army trenches do not appear to be major contributors to the principal contaminant plumes in the area.

- Pathways. The IRA Alternative Assessment for this site reviewed the pathways for each class of contaminant detected or reported in the Complex Disposal Trenches, and concluded that the most likely pathway to the biosphere is groundwater. While several of the compounds of concern are reported to be susceptible to adsorption to soils, the general absence of plant life suggests that uptake of contaminants by plants will not be a major pathway.

- Receptors. Non-human receptors in the area would consist of plant communities, small animals such as prairie dogs that depend on the plant communities, and predatory species such as eagles that prey on smaller animals. The general absence of plant life has been established. Larger plant-eating species such as the ungulates are unlikely users of the area because the forage is sparse compared to other nearby areas of the Arsenal. Prairie dogs and other rodents were largely extirpated in this area by an earlier program that was concerned that burrowing animals would become contaminated and contribute to bioconcentration of contaminants in higher species. Because of the absence of small animal populations, this study concludes that higher species (the eagles) are not likely to be affected significantly by buried contaminants in the Complex Disposal Trenches.

The source term from the Complex Disposal Trenches area does not appear to be significant in comparison with other sources in the immediate area; the principal pathway appears to be groundwater, which is inaccessible to any would-be environmental receptors; and there is a general absence of environmental receptors. Therefore, the risk to the environment from the Complex Disposal Trenches is judged qualitatively to be low.

The comment on the lack of evaluation of the Denver Formation pathway as a contributor to short-term (IRA timeframe) environmental risk is not understood. Contaminant movement, per se, through the Denver has not been studied as part of this IRA. Although several Denver Formation monitoring wells downgradient of the Complex Disposal Trenches did show groundwater contamination, upgradient Denver Formation monitoring wells do not exist to allow determination of the contamination source. If contaminant movement was identified, it would resemble the alluvial contaminant plumes in two important ways: it may be dominated by large sources upgradient of the Complex Disposal Trenches, and it would be largely inaccessible to environmental receptors in the area of the Complex Disposal Trenches. For these reasons, if the Denver Formation pathway existed, it would not be judged to be a major contributor to environmental risk during the IRA timeframe in the general area of the Complex Disposal Trenches.

Comment 2: Page 4-3, Section 4.2.1, second paragraph. The argument is presented that more volume would be required to be treated if a containment system were installed for the trenches. This argument does not compare the projected volume of containment materials to the additional volume of material to be treated if no action is taken (only further monitoring).

Response: If a containment system were installed for the Army trenches, clean materials used for construction would come in contact with the contaminated materials in the trenches. The construction materials may subsequently be considered contaminated and require treatment during the final remediation. If monitoring is the interim action implemented at this site, contaminants may migrate from the trenches with the groundwater. This migration will take place in an aquifer already contaminated from upgradient sources. Thus, there is no uncontaminated media that will be affected by the possible migration of contaminants from the Army trenches during the term of this IRA. In other words, the Army believes that the volume of contaminated media to be treated would not increase under the monitoring alternative.

Comment 3: Page 4-4, Section 4.2.2.1, second paragraph, please provide reference to sampling data to support the assertion that only low levels of residual organic contamination are present in the trenches.

Response: Reference to the Final IRA Alternatives Assessment for this site has been added (WCC 1989a). Appendix B of the report includes the soil data from the Phase I and Phase II field investigations (ESE 1988a and 1988b) and the Spring 1989 investigation (WCC 1989b). An Appendix B has been added to this Decision Document, and includes soil and groundwater contamination data.

Comment 4: Page 4-4, Section 4.2.2.1, third paragraph. The text discusses groundwater extraction and treatment and reaches a conclusion about the significance of the amount of contaminants that could be removed from the groundwater. Since groundwater extraction and treatment was not evaluated in the Alternatives Assessment Document, the conclusion is without basis or foundation to be discussed in this document.

Further, we support the development of new monitoring wells and data to support the assertion that no contaminants are being released from these trenches which would influence the future groundwater remedial actions to be selected for the final cleanup of Section 36 groundwater.

Response: Contrary to the assertion in this comment that groundwater extraction and treatment was not evaluated in the Alternative Assessment Document, Section 3.2.4 of the Final Alternative Assessment Document is titled "Groundwater Extraction and Treatment," and does contain an evaluation of this topic.

Earlier sections of the Assessment Document demonstrate that the Complex Disposal Trenches are located on the margins of the principal groundwater flows through the area, are generally bounded on the northeast by a bedrock high, that the alluvial groundwater flows trend northwest, and that contaminant plumes in this area are dominated by sources upgradient of the Complex Disposal Trenches.

Given that it is established, on the basis of a site conceptual model that is confirmed by field testing, that the Complex Disposal Trenches are not major contributors to the contaminant plume even though the trenches containing contaminants are sometimes in contact with groundwater, it would make little sense to identify groundwater extraction and treatment as a major alternative short-term strategy that would prevent the spread of contaminants from

the trenches. The scale of northwest-trending contaminant plumes in this area is recognized by the Basin A Neck groundwater remediation IRA; another groundwater remediation IRA of a comparatively minor source on the eastern fringe of Basin A would not make a significant contribution to short-term cleanup of the alluvial aquifer in the area, and would not be cost effective.

The Assessment Document discusses groundwater extraction and treatment in relation to containment options for the Complex Disposal Trenches. If the access of contaminants in the trenches to pathways and receptors was judged to be serious enough to merit action (it was not so judged), then one form of action over the short-term was identified to be containment with a physical barrier system that could consist of a cap, and/or slurry wall and/or sheet pilings, with a groundwater extraction system that would maintain a hydraulic gradient towards the disposal trenches and impede the migration of contaminants outward or through these barriers. Any waters produced in this gradient-inducing scheme would be treated.

The conclusion reached about the significance of the amount of contaminants that could be removed from the groundwater is reached on the basis of straightforward logic that is well presented in the Assessment Document. No change in the wording of the Assessment Document or the Decision Document is proposed.

Comment 5: Page 4-5, it is stated that there are no monitoring wells in the saturated bedrock upgradient from the Anomalous Areas B and C. This indicates that further characterization is needed; thus, the installation of further monitoring wells is required for this IRA.

Response: The Army agrees. Additional monitoring wells will be installed as part of the preferred alternative (i.e. monitoring) for this IRA.

Comment 6: Page 4-5, the text needs to discuss how the monitoring alternative as presented is a further step than the "no action" alternative. Further, please discuss whether it is believed that quarterly monitoring to be performed as part of the CMP will alone be sufficient to adequately assess further contaminant releases.

Response: Section 4.3 "Conclusions" has been added to the text and discusses how the monitoring alternative is a further step than "no action". A site specific monitoring program will be developed during the design of this IRA to fully address the objectives of the IRA. The statement that "[g]roundwater monitoring wells may be able to be sampled in conjunction with the [CMP]" is meant to describe a possible mechanism for conducting the sampling, not to imply that the current CMP is necessarily sufficient for the purposes of this IRA. Although quarterly sampling was used for costing purposes in the IRA Alternatives Assessment for this site, the actual sampling frequency needed to meet the objectives of this IRA will be determined during design. Section 6.0 of this Decision Document has been revised to define the basis for site reevaluation during this IRA.

Comment 7: Page 4-6, Section 4.2.2.3. The text states that monitoring is the only alternative which is completely consistent with the final remedy. Other IRAs have implemented actions other than monitoring and have been determined to be consistent with the final remedy. Section 22.5 of the FFA does not require that an IRA be completely consistent with the final remedy.

Response: Monitoring is the action most consistent with the final remedy at this site because no technical or cost benefit in performing any other action at this time can be identified. Consistency with the final remedy was not the only criteria used to determine that monitoring is the preferred IRA for this site at this time. Although other actions may be consistent with

a final remedy, and the FFA does not require an IRA to be completely consistent with the final remedy, monitoring is the only interim action completely consistent with any final remedy at this site. The text has been changed to state that "[m]onitoring is the alternative most consistent with any final remedy."

Comment 8: Page 4-6, Section 4.2.3, Cost Benefit Analysis. A true cost-benefit analysis was not performed in the Alternative Assessment Document. The analysis only determined that monitoring is the lowest cost alternative to implement now, but the future cost impact of deferring the cleanup was not determined or evaluated. Based on those analysis results, no real analysis of benefit can be made.

Response: The intention in the Alternative Assessment Document is to evaluate whether there is a clear cost benefit in performing an IRA now, rather than to conduct a detailed cost-benefit analysis. The title of subsection 4.2.3 has been changed to "Benefit in Terms of Cost," and the text has been modified to clarify this point.

Comment 9: Page 6-1, please state what defines a "clear and significant benefit in implementing a more extensive IRA" in the site reevaluation phase for this IRA. Further, we request a statement defining the basis of reevaluation.

Response: A clear and significant benefit in implementing a more extensive IRA will be attained if 1) the interim action will result in an acceleration of the final cleanup, or 2) the interim action will reduce long-term costs. Section 6.0 of the Decision Document has been revised to define the basis of reevaluation.

Comment 10: Page 8-1, we agree that chemical-specific ARARs are not appropriate for the selection of monitoring without treatment for this location and point in time. We request the identification of "driver compounds" whose levels will be monitored and the establishment of "trigger levels" which will dictate further action.

Response: "Driver compounds," or indicator analytes, will be identified during the design of this IRA. The Army believes that "trigger levels" are not appropriate to dictate further action. A reevaluation process has been described in Section 6.0 of the revised Decision Document.

Comment 11: Page 8-1, please provide details of the air monitoring in this area, both the location and types of air monitoring being implemented. Please assess whether the air monitors are sufficiently positioned to monitor air releases from these areas.

Response: The CMP has two air monitoring stations in Section 36. For details of the air monitoring program, see R.L. Stoller, Comprehensive Monitoring Program Draft Final Technical Plan - Air Quality, August 1988, RIC 88340R01. This program has been judged to be sufficient to monitor releases from the buried materials in the Complex Disposal Trench area. The only air releases that may occur during implementation of the monitoring alternative for this IRA would be due to well installation. These possible minor air releases would be monitored using health and safety equipment (e.g., PIDs, OVAs) as has been done during other well installation at RMA.

Comment 12: Page 8-2, the Endangered Species Act, the Migratory Bird Treaty Act, and the Bald Eagle Protection Act serve as ARARs, per EPA Guidance (CERCLA Compliance with Other Laws Manuals, Volumes I and II).

Response: These statutes are identified as ARARs in the revised Decision Document.

Recd
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akp

Shell Oil Company

One Shell Plaza
P.O. Box 4320
Houston, Texas 77210

February 23, 1990

Office of the Program Manager for Rocky Mountain Arsenal
ATTN: AMXRM-PM: Mr. Donald L. Campbell
Rocky Mountain Arsenal, Building 111
Commerce City, Colorado 80022-2180

Dear Mr. Campbell:

Enclosed herewith are Shell Oil's comments on Proposed Decision Document, Army Complex Disposal Trenches, January 1990.

Sincerely,

George Roe
Technical Manager
Denver Site Project

/ajg

Enclosure

cc: (w/enclosure)

Office of the Program Manager for Rocky Mountain Arsenal
ATTN: AMXRM-IA: Mr. J. D. Smith
Rocky Mountain Arsenal, Building 111
Commerce City, CO 80022-2180

Office of the Program Manager for Rocky Mountain Arsenal
ATTN: AMXRM-RP: Mr. Kevin T. Blose
Rocky Mountain Arsenal, Building 111
Commerce City, CO 80022-2180

Mr. Bradley S. Bridgewater
Department of the Army
Environmental Litigation Branch
Pentagon Room IC480
ATTN: DAJA-ELL: Major Lawrence E. Rouse
Washington, DC 20310-2210

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cc: Victoria L. Peters, Esq.
Assistant Attorney General
CERCLA Litigation Section
1560 Broadway, Suite 250
Denver, CO 80202

Mr. Robert L. Duprey
Director, Hazardous Waste Management Division
U.S. Environmental Protection Agency, Region VIII
One Denver Place
999 18th Street, Suite 500
Denver, CO 80202-2405

Mr. Connally Mears, 8HWM-SR
EPA Coordinator for Rocky Mountain Arsenal
US EPA, Region VIII, Superfund
999 18th Street, Denver Place, Suite 500
Denver, CO 80202-2405

Mr. Thomas P. Looby
Assistant Director
Colorado Department of Health
4210 East 11th Avenue
Denver, CO 80220

Mr. Jeff Edson
Hazardous Materials and Waste Management Division
Colorado Department of Health
4210 East 11th Avenue
Denver, CO 80220

RESPONSE TO COMMENTS FROM SHELL OIL COMPANY ON THE PROPOSED DECISION DOCUMENT FOR THE INTERIM RESPONSE ACTION FOR THE ARMY COMPLEX DISPOSAL TRENCHES

General Comments

Comment 1: Shell concurs with the selection of monitoring as the most appropriate alternative for the Army trenches at this time.

Response: Shell's comment is noted.

Comment 2: Shell agrees with the Army commitment to monitoring made at the recent public meeting, and recommends focusing on selected indicator analytes at or outside the boundaries to detect lateral or vertical migration over time. The risk posed by this site is still not defined clearly enough to conclude that monitoring in a "status-quo" mode will be sufficient for the life of the IRA. Further characterization of the trench contents is not needed for the IRA, and should be done separately if needed by the Feasibility Study.

Response: Indicator analytes, or driver compounds, will be selected during the design of this IRA. The Army agrees that monitoring may not be sufficient for the life of the IRA. Periodic re-evaluation will be performed to evaluate the benefit of additional interim action. The Army also agrees that further characterization of the trench contents should only be done if needed for the Feasibility Study.

Specific Comments

Comment 1: On page 1-1, final sentence, recommend adding ". . . for migration of contaminants."

Response: Agreed. The text has been changed.

Comment 2: On Page 2-1, second paragraph, recommend changing the sequencing of ICP metals, arsenic, and mercury to match that on Page 2-3, last sentence.

Response: The text has been changed.

Comment 3: Page 2-1, last paragraph, continuing to Page 2-3, is the first place where it is stated that only areas A, B, C, and H have been selected for alternatives assessment and decision-making, other portions of the 36-17N having been screened out. It would be helpful if this information were condensed and relocated to the Introduction.

Response: The introduction is intended to present a brief summary of the IRA decision for this site. Detailed discussion of the site and the evaluation are more appropriate in later sections.

Comment 4: The shaded areas of Figure 2-2 need to be darkened or crosshatched to stand out clearly.

Response: The figure has been revised.

Comment 5: On Page 2-5, Shell Oil Company is also a party to the Federal Facility Agreement.

Response: The text has been changed.

Comment 6: The first paragraph on Page 4-2 discusses multi-layer caps to minimize infiltration of precipitation. Simulations using the EPA HELP model have shown that simple soil and vegetative covers can effectively prevent the infiltration of precipitation to groundwater at RMA. They are more cost-effective for the time period of an IRA.

Response: Agreed. The type of cap would be determined during design, if a cap were to be chosen for an interim action at this site.

Comment 7: On Page 4-2, the FFA criteria listed (4 bullets) are from 22.5 and 22.6. We recommend adding a bullet for cost-effectiveness or stating (from 22.6) that the goal of the assessment was to evaluate appropriate alternatives and select the most cost-effective that attains the objective of the IRA.

Response: The bullet "Reasonableness of cost" has been changed to "Benefit in Terms of Cost."

Comment 8: Page 4-2, last sentence, add ". . . as required by paragraph 22.7 of the Federal Facility Agreement."

Response: The text has been changed.

Comment 9: The subsections of Section 4.2 do not match with the bullets listed as criteria to be discussed. Specifically, 4.2.2 has some further subsets which match the criteria and some that do not. The intent may be to discuss contribution to the efficient performance of the final remedy, as discussed in paragraph 22.5 of the FFA. If so, we recommend rewording to clarify.

Response: The bullets have been revised to more clearly show that criteria from the Federal Facility Agreement are discussed within the context of the decision logic generally accepted by the Organizations and the State in the June 7, 1989 subcommittee meeting.

Comment 10: In Section 4.2.2.1, second paragraph, the past disposal practice is better described as "burning" (as on Page 2-3) rather than "incinerating".

Response: The text has been changed.

Comment 11: On Page 4-5, the conclusion of the paragraph discussing relative soil volumes would be accurate only if the level of contamination and/or the final treatment were the same; that is clearly not the case and we recommend deleting this paragraph.

Response: The Army agrees. Portions of the paragraph which can be misinterpreted have been removed..

Comment 12: The CMP is mentioned on Page 4-5 in 4.2.2.2 and on Page 6-1 as the possible mechanism for continued groundwater monitoring. We agree that it is appropriate to first see if this existing program can supply the data needed, to avoid duplication of effort. However, as noted in our general comment, careful selections of the location, indicator analytes, and frequency are needed. These are significant uncertainties (such as described in the last paragraph of Page 4-4 and continuing to 4-5) that can only be resolved with a program more site-specific.

Response: The Army intends to develop a site-specific monitoring program for the Army Complex Disposal Trenches. The CMP is mentioned as a mechanism for conducting the actual sampling. Indicator analytes and sampling frequency will be determined during design. Section 6.0 has been revised to clarify this.

Comment 13: In Section 6.0, the full suite of RMA analytes should not be required to monitor for contaminant migration over time. Shell recommends the selection of appropriate target analytes, basis mobility, already-known presence or absence, etc.

Response: Section 6.0 has been revised to state that indicator anlaytes will be determined during the design of this IRA.

Comment 14: The reference to 40 CFR part 50 on Page 8-2, first paragraph, describes the contained standards as neither applicable nor relevant and appropriate, but on Page 8-4, third paragraph, 40 CFR part 50.6 is considered as relevant and appropriate.

Response: The Draft Final Decision Document was revised to reflect that the limitations contained in 40 CFR Part 50 are neither applicable nor relevant and appropriate to apply as specific emissions limitations to this IRA but the particulate standards contained in Section 50.6 are relevant and appropriate to apply at the installation boundary.

RESPONSE TO COMMENTS FROM SHELL OIL COMPANY ON THE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR THE COMPLEX DISPOSAL TRENCHES IRA AND SHELL TRENCHES IRA

With respect to the above-referenced documents, Shell Oil Company reserves the right to comment on how any substantive RCRA standards, including land disposal restrictions, may apply to the IRAs.

Response: Shell's comment is noted. As Shell is aware, the IRA process provides for further opportunity for review and comment.

Rec'd 2 Mar 9 11:31 dkf

STATE OF COLORADO

COLORADO DEPARTMENT OF HEALTH

4210 East 11th Avenue
Denver, Colorado 80220-3716
Phone (303) 320-8333

Telefax:
(303) 322-9076 (Main Building/Denver)
(303) 320-1529 (Ptarmigan Place/Denver)
(303) 248-7198 (Grand Junction Regional Office)

Roy Romer
Governor

Thomas M. Vernon, M.D.
Executive Director

February 26, 1990

Mr. Donald Campbell
Office of the Program Manager
Rocky Mountain Arsenal
AMXRM-PM, Building 111
Commerce City, CO 80022-2180

Re: State Comments on the Proposed Decision Document for the Interim Response Action at the Complex Disposal Trenches, Rocky Mountain Arsenal, January 1990

Dear Mr. Campbell:

Upon review of the above-referenced document, the State is especially concerned with four key issues that remain unresolved. They include:

1. The fact that the State believes that Site 36-17N is currently insufficiently characterized. In addition to the selected alternative of ground water monitoring, the State strongly supports a program that will adequately characterize these trenches. Only after the site is adequately characterized can the fate of these trenches be properly determined. To facilitate this needed characterization, the State will submit the Central Study Area Data Gap Rectification Proposal for additional characterization.

2. The selection of monitoring as the "preferred alternative" for the Army trenches is based upon rationale that is inconsistent with that presented by Shell in its Proposed Decision Document for Section 36 trenches. Such inconsistencies indicate that the decision-making criteria is being applied after decisions have already been made, and are not actually driving the decision-making process.

3. The monitoring alternative does not comprise an IRA. This selected decision is inconsistent with the Primary objective for the Other Contamination Sources IRA, as presented in the Final Technical Program Plan, to "mitigate the threat of releases from selected "hot spot" contamination sources." For this reason, the State, in its January 2, 1990 letter, recommended that the issuance of the Decision Document be postponed until sufficient information is gathered, and a modified alternative assessment can be conducted.

4. It is currently unclear how the IRA process will revisit the selected decision if future site characterization indicates that the trenches require immediate remediation. An appropriate mechanism should be set forth in the Decision Document.

RMA 90-0396 '2

The State welcomes the opportunity to meet with the Army to discuss these issues in order to facilitate their resolution.

If you have any questions, please feel free to call.

Sincerely,

Jeff Edson
RMA Project Manager
Hazardous Materials and
Waste Management Division

JE/cf

cc: Michael Hope
Chris Hahn
Edward McGrath
John Moscato
Connally Mears
Bruce Ray
Tony Truschel
Major Lawrence E. Rouse

RESPONSE TO COMMENTS FROM THE STATE OF COLORADO
ON THE PROPOSED DECISION DOCUMENT FOR THE INTERIM RESPONSE ACTION
FOR THE COMPLEX DISPOSAL TRENCHES

General Comments

Comment 1: The State agrees that groundwater monitoring is an effective method for gathering additional data needed at Site 36-17N; however, it alone cannot serve as a substitute for adequate trench characterization that has, to date, not been accomplished. The Army must, in addition to utilizing groundwater monitoring, thoroughly investigate all of the trench areas to characterize them adequately.

The Final Alternatives Assessment of Interim Response Actions for Other Contamination Sources Complex Disposal Trenches, January 1990, presents a very biased picture regarding the degree of characterization completed at this site because it fails to present the percentage of borings and exploratory trenches that were actually completed in the trenches during the Phase I and Phase II field investigation, and the field program conducted during the Spring of 1989. State review of the Phase I and Phase II investigations reveal that only one of the thirty Phase I borings completed was located within a trench, and, according to the Army, only eleven of the twenty Phase II borings targeted for the trenches were actually located in the trenches; the remaining nine were completed in undisturbed soils. Since contamination migration from the trenches into the groundwater would be predominately downward (not lateral), borings placed on the perimeter or outside of the disposal trench boundaries do not accurately characterize contamination beneath the trenches.

In addition, no borings were completed in any trench or pit within Anomalies E and G, and it is questionable whether Borings 3591 and 3592 in Anomaly F actually characterize the disposal trenches in that anomaly (see forthcoming Central SAR Data Gap Rectification Proposal). Therefore, the contaminant summary presented by the Army for these anomalies does not represent actual contaminant distributions below the trenches. Additionally, the majority of trenches in Anomalies A, B, and C, known to exist from Phase I geophysical data and aerial photograph interpretations, have not been investigated.

Finally, the investigation of the Spring of 1989 concentrated almost exclusively on Anomaly H. Of the twenty-five exploratory trenches completed in the program, twenty-two were completed within or immediately to the west of that anomaly. Only two trenches were completed in Anomaly A (both defining the same trench identified in the Phase II investigation), and a single exploratory trench was completed in Anomaly F. This boring encountered undisturbed soils. No trenches or borings were completed in Anomalies B, C, E, or G, which remain essentially uncharacterized.

Only after the site has been sufficiently characterized can the fate of these trenches be properly determined. To assist the Army in this endeavor, the State will submit a characterization plan for Site 36-17N as part of the State's Central Study Data Gap Plan.

Response: The Army maintains that the Army Complex Disposal Trenches have been characterized adequately for the purposes of this IRA. Additional data may be gathered, if determined to be necessary by the Feasibility Study. However, adequate information on the types of wastes and contaminants exists to evaluate appropriate final response action alternatives for this site.

The Phase I investigation was intended primarily to explore the undisturbed soils in Site 36-17N. In addition to the soil borings taken during the Phase II investigation, several exploratory trenches were excavated, to better identify disposal trenches. Nineteen grab samples were taken from the bottoms of the exploratory trenches during the Phase II investigation. These grab samples showed the major contaminants in these trenches to be ICP metals, which are relatively immobile.

The Spring 1989 field investigation concentrated on better defining the disposal trenches in Anomalous Areas A and H because these trenches are in closest contact with groundwater. Disposal trenches in Anomalous Areas B and C were characterized adequately in previous investigations for the purposes of this IRA. Based on previous investigations, disposal trenches in Anomalous Areas E and G are not considered for interim action, except perhaps additional monitoring, because they do not appear to 1) be in direct contact with groundwater; 2) contain Army agents or degradation products; or 3) be leaching contaminants to groundwater.

The Army will consider the State's site characterization recommendations during the Feasibility Study.

Specific Comments

Comment 1: p.1-1 1.0 Introduction - There appears to be an inconsistency with the Army's selection of the monitoring alternative. It has been conclusively demonstrated by monitoring well data that Anomalies A & H are "significantly" contributing to groundwater contamination (and therefore should be considered "hot-spots"); yet a containment or removal/temporary storage alternative was not selected, as was the case with the adjacent Shell trenches. Please explain why Site 36-17N trenches that are contributing to the groundwater contamination will be monitored, while the adjacent Shell trenches will utilize a containment option.

Response: Shell's utilization of a containment system will reduce further migration of a contaminant plume which includes dense nonaqueous phase liquids (DNAPLs). Containment of this plume now will provide a technical and cost benefit by limiting the spread of DNAPL contamination before a final remedy can be implemented.

The Army Complex Disposal Trenches are located over an alluvial aquifer which is contaminated from upgradient sources. While the Army trenches do appear to be adding contaminants to the aquifer, containment of this contribution would have little effect on overall groundwater quality in the area. Also, there do not appear to be contaminants specific to these trenches that would influence the treatment system selection process for the final cleanup of Section 36 groundwater. This is a fundamentally different situation than the Shell Section 36 Trenches and cannot be meaningfully compared with the Shell Trenches. Consequently, there does not appear to be a technical or cost benefit in containing the Army trenches at this time. However, the monitoring alternative chosen for this IRA includes periodic reevaluation which could lead to additional action, including containment, if some technical or cost benefit can be shown.

Comment 2: p. 1-2 Figure 1-1, Decision Flow Chart - Clarification is needed as to how the decision process will return to consideration of remedial alternatives if further site characterization indicates that the trenches require immediate remediation. The Final Decision Document should recognize a procedure by which a new or revised Decision Document would be implemented in the event that additional site characterization indicates such a need.

Response: A procedure for reevaluation of this site during the life of the IRA is described in Section 6.0 of the revised Decision Document.

Comment 3: p. 2-4 Figure 2-2 - Location of Trenches in Site 36-17N - This figure appears to be generally lacking in information. Groundwater contamination data for the listed wells are not included, and a number of groundwater monitoring well locations (such as 36090, 36121, 36158, 36184, and 36185) are also omitted. Figure 2-2, or additional figures, should contain such data.

Response: Figure 2-3 has been added to show monitoring well locations. Appendix B was added to the Draft Final Decision Document and includes soil and groundwater contamination data.

Comment 4: p. 2-5 2.0 History of the Complex Disposal Trenches, 8th paragraph - The text states that "[t]he Complex Disposal Trenches in Anomalous Areas A and H are evaluated as being in close, or direct contact with the groundwater during part of the year," suggesting that only these anomalies are contributing to groundwater contamination. Recent data from downgradient wells adjacent to the other anomalies refute this conclusion. In addition, trenches in all anomalies appear to meet one or all of the criteria enumerated in the Army's Final Task Plan Remediation of Other Contamination Sources, Volume I, 6/89, pg. 5-13 for determining which trenches would be included in the IRA. These criteria consist of the following:

a. Currently or historically in contact with groundwater (Anomalies A & H);

b. Disposal sites for Army agent or degradation products (Anomalies B, C, G, and possibly E and F); or

c. Impacting or potentially impacting the groundwater due to contaminant leaching.

For example, recent data from unconfined Denver Well 36185 "located downgradient and to the northeast of Anomaly G, indicate the presence of contaminant compounds suspected and confirmed to have been disposed of within the anomaly" (Central Study Area Report [CSAR], Appendix CSA-F, Army Response to Shell Comment 102). This well is also located downgradient of Anomaly E, indicating that trenches in the anomaly may also be contributing contaminants to groundwater. Similarly, contamination data from Well 36184 indicate that trenches in Anomaly F as well as C may be contributing contamination to groundwater since both anomalies are upgradient of this well. (Anomaly C is recognized by the Army as a possible primary source of groundwater contamination, see p.2-1,2 of Proposed Decision Document).

Accordingly, the State contends that all trenches in these Site 36-17N anomalies may be contributing to groundwater contamination, and hence require further characterization.

The detections of diisopropylmethyl phosphonate (DIMP) and dimethylmethyl phosphonate (DMMP) in wells 36184 and 36185 indicate also that upgradient trenches were disposal sites for Army agents and by-products, thereby satisfying the second criterion. Since well 36184 is downgradient of both Anomaly C and F, F cannot be excluded as a possible source of Army degradation products. In addition, the Army concludes that Army agents or degradation products were disposed of in Anomalies B and C. Ground disturbances in Anomaly B were evident in the 1948 aerial photographs, as were ground disturbances in Anomaly F (Site 36-17 Phase I CAR, page 12), indicating that Anomalies B and F were used concurrently as disposal sites. Because B and F were operated contemporaneously and Army agents are known to have been disposed of in Anomaly B trenches, it is possible that

Anomaly F was also used as an "army agent disposal site". If so it should have been included in the IRA.

Response: The Army concurs with the State's review of the site history, but does not agree with the State's inferences. It is true that Denver monitoring wells (36184 and 36185) located downgradient of the Army trenches do show groundwater contamination. Other Denver Formation monitoring wells (36191 and 36192) installed during the 1989 field investigation for this IRA show very little groundwater contamination. It is unclear whether the groundwater contamination in the Denver Formation is coming from the trenches, or is infiltrating from the alluvial aquifer. There are currently no Denver wells located upgradient of the Complex Disposal Trenches to provide information for this determination. The Army believes that the data are inconclusive to determine whether the Army trenches are contributing to groundwater contamination in the Denver Formation. This question can be addressed by installing upgradient wells during the implementation of the monitoring alternative proposed for this IRA.

Comment 5: p. 4-3 4.2.1 - 1st paragraph - The Army's statement that "[t]he site does not appear to be posing a significant risk to human health and the environment at this time" is contradicted by the data available from the site. As the State pointed out in its January 2, 1990, letter from Mr. Jeff Edson to Mr. Donald Campbell, a number of Army trenches are known to be contributing significant concentrations of contaminants to the groundwater and soils. Therefore, although there may not be direct human and biota receptors at this time, the vadose soils and underlying groundwater are being exposed to continuing degradation. Consequently, contrary to the Army's assertion, groundwater monitoring of the trenches cannot be considered to be protective of the environment. Accordingly, these statements should be modified or deleted from the text.

Response: Please see the response to the EPA's Specific Comment No. 1. In addition, the text has been revised to state that "[m]onitoring would allow continued tracking of contaminant movement, thereby providing additional information on protection of human health and the environment."

Comment 6: p. 4-5 4.2.2.1 fifth paragraph - The State concurs with the need for further characterization in these areas. See General Comment #1. As previously agreed by the Army at the December 14, 1989, Army Trenches Subcommittee Meeting, the State should be involved in the design of the Site 36-17N well monitoring program. The State requests that the development of the program be initiated and approved by both parties prior to distribution of the implementation document.

Response: Development of the monitoring program can begin following finalization of this Decision Document. Opportunities will exist for input from the Organizations and the State during the development of the program.

Comment 7: p. 4-6 4.2.2.3:

a. The text states that "a source removal IRA alternative may not be consistent with the final remedy since source removal would preclude a final in situ treatment alternative." What sort of in situ treatment would be possible in trenches that contain drummed waste, unexploded ordnance and unburned incendiaries?

b. The Army's statement that [m]onitoring is the only alternative completely consistent with any final remedy" is inconsistent with the rationale presented in Shell's Proposed Decision Document for Section 36 Trenches. On page 35 of that document, Shell states

its belief that "this IRA will be consistent with and contribute to the efficient performance of the Final Response Action by reducing the spread of contaminants in groundwater . . ." Since the Army will not be reducing the spread of contaminants, its selected alternative presumably will not be consistent with the final remedy for the trench area. The statement, therefore, should be modified or deleted.

In addition, the Army has rejected the capping alternative in part because it could "generate additional materials that may require remediation . . ."; yet, the capping alternative was selected by Shell in part because "it can reasonably be assumed to be consistent with and contribute to the efficient performance of the Final Response Action by reducing the spread of contamination during the IRA". (Page 10, Shell Proposed Decision Document). Monitoring/maintenance, on the other hand, was rejected by Shell because "it did not meet the objectives of the IRA", namely, the reduction of "lateral migration of dissolved and separate-phase (i.e., DNAPL) contaminants emanating from the Shell trenches" (page 6). The inconsistencies of these approaches to the two sets of trenches should be reconciled in the respective texts.

Response:

a. Some type of in situ solidification may be a feasible alternative, or a new in situ technology may be developed in time for the ROD.

b. Monitoring is the alternative most consistent with the final remedy for the Army trenches because no technical or cost benefit in performing any other action at this time can be identified. Although other actions may be consistent with a final remedy, monitoring is the only action completely consistent with any final remedy for this site. The text has been changed to state that "[m]onitoring is the alternative most consistent with any final remedy."

The State appears to consider the Army and Shell trenches to be similar sites, therefore requiring similar interim actions. The Army does not agree with this interpretation. Because these two sites are fundamentally different, the Army has determined that the same interim action is not appropriate for both sites, and therefore there are no inconsistencies requiring reconciliation. Shell has reached the same conclusion (see response to Shell's General Comment No. 1).

The Army disposal practice of burning trench contents prior to burial appears to have been effective in destroying most organic contaminants, and leaving primarily metal contaminants that are relatively immobile. Although the Army trenches do appear to be contributing to groundwater contamination, the aquifer in this area is already contaminated from upgradient sources. Therefore, there does not appear to be a technical or cost benefit in performing any action other than monitoring at this site at this time.

The Shell trenches do appear to be an active source of groundwater contamination, including dense nonaqueous phase liquids (DNAPLs). Shell had determined, and the Army concurs, that there is a technical and cost benefit in containing this source at this time and preventing the spread of DNAPLs.

Comment 8: p. 5-1 5.0 Chronology of Events - A number of events that warrant inclusion have been omitted. They include:

October 5, 1989 The State, EPA, and Shell concur that a two-month extension on the IRA Decision Document is necessary to enable the Army to further review existing data, and identify data gaps prior to the parties commenting on the Army's preferred alternative of slurry wall and cap.

November 14, 1989 Army announces that it is changing its preferred alternative from slurry wall and cap to that of monitoring, despite the fact that the extension was granted, by the parties, in order for the Army to address site characterization needs, not to change the selection of the preferred alternative.

December 14, 1989 Army Letter Report is distributed to the parties. The report summaries the Army's conclusion that Site 36-17N is not currently a "hot spot" area, and that remediation of the sources is therefore not necessary.

January 2, 1990 State submits a position letter to the Army stating that it strongly disagrees with the conclusions presented in the Army Letter Report.

Response: The Army agrees with adding the October 5, 1989 2-month extension and the December 14, 1989 subcommittee meeting to the Chronology of Events. The other items do not appear to be appropriate for inclusion in the Chronology of Events.

The December 14, 1989 Letter Report did not conclude that the Army Complex Disposal Trenches are not currently a "hot spot." The Army trenches are a source of groundwater contamination. However, the report concluded that there is no technical or cost benefit in performing any action other than monitoring at this site at this time.

RESPONSES TO COMMENTS FROM THE STATE OF COLORADO ON APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR THE REMEDIATION OF OTHER CONTAMINATION SOURCES - SECTION 36 TRENCHES INTERIM RESPONSE ACTION

Comment 1: Page 8-2, Section 8.1.2.1: The section on air emissions states that the standards of 40 C.F.R. Part 50, the National Primary and Secondary Ambient Air Quality Standards, are considered neither applicable nor relevant and appropriate to the IRA. The State has previously commented on the inappropriateness of not considering the standards as ARARs. These standards are clearly ARARs because the area affected by the IRA is within an Air Quality Control Region. In addition, the provisions of 40 CFR 50.6 are considered relevant and appropriate later in the ARARs analysis (Section 8.4.2.1) making the above-specified paragraph inconsistent with the Army's later analysis. The document should be revised to include the National Primary and Secondary Ambient Air Quality Standards as ARARs.

Response: The Draft Final Decision Document was revised to reflect that the specific limitations contained in 40 CFR Part 50 are neither applicable nor relevant and appropriate to apply to a specific emissions source. The provisions of 40 CFR 50.6 are not applied to a specific source.

Comment 2: Page 8-4, Section 8.4.2.1: The paragraph states that the provisions of 40 C.F.R. Section 50.6 are considered relevant and appropriate. However, Shell should also consider Colorado Ambient Air Standards for Total Suspended Particulates (TSP), which are stricter than the federal standards. The State has not yet adopted the federal PM10 standard, but rather invokes the TSP standards. Therefore both the federal and State standards apply as ARARs. Colorado's TSP standard is 150 ug/m^3 (24-maximum concentration) and 60 ug/m^3 (annual geometric mean). This standard is applicable at the property boundary and includes background concentrations as well as source impacts.

Response: The Draft Final Decision Document was revised in response to this comment. It is noted that the Army, not Shell, is responsible for the identification of ARARs.

Comment 3: Page 8-4, Section 8.4.2.3: In the section on general construction activities ARARs, Colorado regulation No. 2, pertaining to odorous emissions should be included. For a predominantly residential or commercial area, the standard requires that odors must not be detected after the emissions have been diluted with seven or more volumes of odor-free air.

Response: The Draft Final Decision Document was revised in response to this comment.

Comment 4: Page 8-9, Section 8.4.2.7: The document provides that for off-site disposal of hazardous material, the substantive provisions of 40 CFR part 262 (the document reads part 22), and stricter corresponding State regulations found at 6 CCR 1007-3, part 262, are considered relevant and appropriate. However, for any off-site disposal of hazardous wastes, the Army must comply with all pertinent Colorado Hazardous Waste Management Act regulations, both procedural and substantive, including 6 CCR 1007-3, part 262.

Response: The Draft Final Decision Document was revised in response to this comment.

APPENDIX B
SOIL AND GROUNDWATER CONTAMINATION DATA

APPENDIX B
SOIL AND GROUNDWATER CONTAMINATION DATA

This appendix contains groundwater and soil contamination data obtained during field investigations. The groundwater monitoring well data were obtained from the RMA data base. The monitoring well data in Table B-2 are presented in three groups:

- Alluvial wells in Site 36-17S, to provide information on groundwater contamination upgradient of the Complex Disposal Trenches.
- Alluvial wells in Site 36-17N, to provide information on groundwater quality in the vicinity of the Complex Disposal Trenches.
- Denver Formation wells in Site 36-17N, to provide information on the Denver Formation groundwater quality downgradient of the Complex Disposal Trenches. No Denver Formation wells exist upgradient of the trenches.

The soil data are presented in Plate B-1. These data were obtained from the Contamination Assessment Reports (ESE 1988a and 1988b) and the 1989 field investigation for this IRA.

TABLE B-1
METHODS OF ANALYSIS AND ANALYTES

CHEMICAL NAME	ABBREVIATION
VOLATILE ORGANIC COMPOUNDS/GCMS	
1,1-Dichloroethane	11DCLE
1,2-Dichloroethane	12DCLE
1,1,1-Trichloroethane	111TCE
1,1,2-Trichloroethane	112TCE
Benzene	C6H6
Bicycloheptadiene	BCHPD
Carbon tetrachloride	CCL4
Chlorobenzene	CLC6H5
Chloroform	CHCL3
Dibromochloropropane	DBCP
Dicyclopentadiene	DCPD
Dimethyldisulfide	DMDS
Dimethyl ketone	DMK
Ethylbenzene	ETC6H5
m-Xylene	13DMB
Methylene chloride	CH2CL2
Methylisobutyl ketone	MIBK
o- and p-Xylene	XYLEN
Tetrachloroethylene	TCLEE
Toluene	MEC6H5
Trans-1,2-dichloroethylene	12DCE
Trichloroethylene	TRCLE
HALOCARBONS/GCHALL	
1,2-Dichloroethane	12DCLE
1,1,2-Trichloroethane	112TCE
Carbon tetrachloride	CCL4
Chloroform	CHCL3
Methylene chloride	CH2CL2
Trichloroethene	TRCLE
Chlorobenzene	CLC6H5
Tetrachloroethene	TCLEE
HALOCARBONS/GCCON	
1,1-Dichloroethane	11DCLE
1,2-Dichloroethane	12DCLE
1,1-Dichloroethene	11DCE
1,1,1-Trichloroethane	111TCE
1,1,2-Trichloroethane	112TCE
Carbon tetrachloride	CCL4
Chlorobenzene	CL6H5
Chloroform	CHCL3
Methylene chloride	CH2CL2
Tetrachloroethene	TCLEE

Table B-1
(continued)

HALOCARBONS/GCCON continued	
Trans-1,2-dichloroethylene	12DCE
Trichloroethene	TRCLE
AROMATICS/GCPID	
Benzene	C6H6
Ethylbenzene	ETC6H5
m-Xylene	13DMB
o- and p-Xylene	XYLEN
Toluene	MEC6H5
VOLATILES/GCFID	
Bicycloheptadiene	BCHPD
SEMIVOLATILE ORGANIC COMPOUNDS/GCMS	
1,4-Oxathiane	OXAT
2,2-bis(Para-chlorophenyl)-1,1-dichloroethane	PPDDE
2,2-bis(Para-chlorophenyl)-1,1-1-trichloroethane	PPDDT
Aldrin	ALDRN
Atrazine	ATZ
Chlordane	CLDAN
Chlorophenylmethyl sulfide	CPMS
Chlorophenylmethyl sulfone	CPMSO2
Chlorophenylmethyl sulfoxide	CPMSO
Dibromochloropropane	DBCP
Dicyclopentadiene	DCPD
Dieldrin	DLDRN
Diisopropylmethyl phosphonate	DIMP
Dimethylmethyl phosphonate	DMMP
Dithiane	DITH
Endrin	ENDRN
Hexachlorocyclopentadiene	HCPD/CL6CP
Isodrin	ISODR
Malathion	MLTHN
Parathion	PRTHN
Supona	SUPONA
Vapona	DDVP
ORGANOCHLORINE PESTICIDES/GCEC	
2,2-bis(Para-chlorophenyl)-1,1-dichloroethane	PPDDE
2,2-bis(Para-chlorophenyl)-1,1,1-trichloroethane	PPDDT
Aldrin	ALDRN
Chlordane	CLDAN

Table B-1
(continued)

ORGANOCHLORINE PESTICIDES/GCEC continued	
Dieldrin	DLDRN
Endrin	ENDRN
Hexachlorocyclopentadiene	CL6CP
Isodrin	ISODR
ORGANOPHOSPHORUS COMPOUNDS/GCFPD	
Diisopropylmethyl phosphonate	DIMP
Dimethylmethyl phosphonate	DMMP
ORGANOSULFUR COMPOUNDS/GCFPD	
1,4-Oxathiane	OXAT
Chlorophenylmethyl sulfide	CPMS
Chlorophenylmethyl sulfone	CPMSO2
Chlorophenylmethyl sulfoxide	CMPSO
Dimethyldisulfide	DMDS
ORGANOSULFUR COMPOUNDS/GCFPD (cont'd)	
Dithiane	DITH
Benzothiazole	BTZ
AGENT PRODUCTS/HPLC	
Chloroacetic Acid	CLC2A
Thiodiglycol	TDGCL
AGENT PRODUCTS/IONCHROM	
Fluoracetic Acid	FC2A
Isopropylmethylphosphonic Acid	IMPA
Methylphosphonic Acid	MPA
METALS/ICP	
Cadmium	Cd
Chromium	Cr
Copper	Cu
Lead	Pb
Zinc	Zn
NITROGEN PHOSPHORUS PESTICIDES/GCEC	
Atrazine	ATZ
Malathion	MLTHN
Supona	SUPONA
Vapona	DDVP
Parathion	PRTHN

TABLE B-2
ANALYTES DETECTED ABOVE CERTIFIED REPORTING LIMIT

Alluvial Wells in Site 36-17S

CONTAMINANT	36067	36075	36087	36190	36590	36591	36593	SUMMARY
Volatile Organic Compounds/GCMS								
11DCLE	1(130)	-	-	-	-	-	-	1(130)
12DCLE	1(430)	-	-	-	-	-	-	1(430)
111TCE	-	-	-	-	-	-	-	-
112TCE	1(160)	-	-	-	-	-	-	1(160)
C6H6	4(220-20000)	2(6.4-47)	-	1(12)	-	-	-	7(6.4-20000)
BCHPD	-	-	-	-	-	-	-	-
CCL4	-	-	1(1100)	-	-	-	-	1(1100)
CLC6H5	1(55)	1(1.7)	1(460)	-	-	-	-	3(1.7-460)
CHCL3	4(220-7100)	7(1.2-65)	1(8800)	3(71-2600)	-	-	-	15(1.2-8800)
DBCP	-	-	-	-	-	-	-	-
DCPD	1(3200)	-	-	-	-	-	-	1(3200)
DMDS	-	-	-	-	-	-	-	-
ETC6H5	1(25)	-	-	-	-	-	-	1(25)
13DMB	1(>90)	-	-	-	-	-	-	1(>90)
CH2CL2	3(2800-8100)	-	-	2(400-520)	-	-	-	5(400-8100)
MIBK	-	-	1(1200)	-	-	-	-	1(1200)
XYLEN	2(64-150)	-	-	-	-	-	-	2(64-150)
TCLEE	2(110-280)	-	-	-	-	-	-	2(110-280)
MEC6H5	3(140-700)	-	-	-	-	-	-	3(140-700)
12DCE	1(120)	-	-	-	-	-	-	1(120)
TRCLE	1(120)	5(1.0-1.7)	-	2(1.6-34)	-	-	-	8(1.0-120)
DMK	-	-	1(29000)	-	-	-	-	1(29000)

TABLE B-2
(Continued)

Alluvial Wells in Site 36-17S

CONTAMINANT	36067	36075	36087	36190	36590	36591	36593	SUMMARY
Halocarbons/GCHALL								
CCL4	-	-	-	-	1(230)	1(4300)	1(100)	3(100-4300)
CHCL3	-	-	-	-	1(47)	1(4300)	1(290)	3(47-4300)
CH2CL2	-	-	-	-	1(3.9)	1(1700)	1(15)	3(3.9-1700)
TRCLE	-	-	-	-	1(56)	1(99)	1(37)	3(37-99)
CLC6H5	-	-	-	-	-	-	1(19)	1(19)
Aromatics/GCPID								
C6H6	-	-	-	-	-	-	1(280)	1(280)
ETC6H5	-	-	-	-	-	1(8.4)	-	1(8.4)
13DMB	-	-	-	-	-	1(25)	-	1(25)
XYLEN	-	-	-	-	1(2.7)	1(23)	-	2(2.7-23)
MEC6H5	-	-	-	-	-	1(670)	-	1(670)
Semivolatile Organic Compounds/GCMS								
OXAT	-	-	-	-	-	-	-	
PPDDE	-	-	-	-	-	-	-	
PPDDT	-	-	-	-	-	-	-	
ALDRN	-	-	-	-	-	-	-	
ATZ	-	-	-	-	-	-	-	
CLDAN	-	-	-	-	-	-	-	
CPMS	-	-	-	-	-	-	1(23)	1(23)
CPMSO	-	-	-	-	-	-	1(260)	1(260)
CPMSO2	-	-	-	3(21-45)	-	-	1(9.2)	4(9.2-45)
DBCP	-	-	-	3(>300)	-	-	-	3(>300)
DCPD	-	-	-	2(29-35)	-	-	-	2(29-35)

TABLE B-2
(Continued)

Alluvial Wells in Site 36-17S

CONTAMINANT	36067	36075	36087	36190	36590	36591	36593	SUMMARY
Semivolatile Organic Compounds/GCMS (cont'd)								
DLDRN	-	-	-	-	-	-	-	-
DIMP	-	-	-	3(>200)	-	-	-	3(>200)
DMMP	-	-	-	-	-	-	-	-
DITH	-	-	-	1(13)	-	-	-	1(13)
ENDRN	-	-	-	-	-	-	-	-
CL6CP	-	-	-	-	-	-	-	-
ISODR	-	-	-	-	-	-	-	-
MLTHN	-	-	-	-	-	-	-	-
PRTHN	-	-	-	-	-	-	-	-
SUPONA	-	-	-	-	-	-	-	-
DDVP	-	-	-	-	-	-	-	-
Organochlorine Pesticides/GCEC								
PPDDE	2(0.68-0.74)	-	-	3(1.0->10)	1(0.74)	1(0.65)	-	5(0.65->10)
PPDDT	2(2.2-2.7)	-	-	3(0.86-3.4)	1(0.15)	1(0.77)	-	7(0.15-3.4)
ALDRN	2(0.70-0.78)	-	-	3(0.76-1.8)	1(0.17)	1(0.96)	-	7(0.17-1.8)
CLDAN	1(13)	-	-	2(12-17)	-	1(59)	-	4(12-59)
DLDRN	2(1.7-1.9)	-	1(0.093)	1(2.4)	1(0.19)	1(4.5)	-	6(0.093-4.5)
ENDRN	2(1.9-2.0)	-	-	2(2.2-3.0)	1(0.19)	1(0.71)	-	6(0.19-3.0)
CL6CP	2(0.93-1.9)	-	1(3.3)	1(2.4)	1(0.87)	1(3.1)	-	6(0.87-3.3)
ISODR	2(5.6-5.8)	-	1(0.22)	2(2.6-3.3)	1(0.081)	1(0.45)	-	7(0.081-5.8)
Organophosphorous Compounds/GCFPD								
DIMP	1(550)	1(0.47)	1(2.8)	3(1000-1200)	1(1.1)	1(47)	-	8(0.47-1200)
DMMP	1(1600)	-	2(11-2200)	3(1200-2000)	1(1100)	1(750)	1(12)	9(11-2200)

TABLE B-2
(Continued)

Alluvial Wells in Site 36-17S

CONTAMINANT	36067	36075	36087	36190	36590	36591	36593	SUMMARY
Organosulfur Compounds/GCFPD								
OXAT	-	-	-	3(5.6-8.6)	-	-	-	3(5.6-8.6)
BTZ	-	-	-	3(16-34)	-	-	-	3(16-34)
CPMS	-	-	-	1(6.6)	-	-	-	1(6.6)
CPMSO	-	1(36)	-	3(22-41)	-	-	-	4(22-41)
CPMS02	-	-	-	3(16-69)	-	-	-	3(16-69)
DMDS	-	-	-	3(8.5-950)	-	-	-	3(8.5-950)
DITH	-	-	-	2(14-19)	-	-	-	2(14-19)
Dibromochloropropane/GCECD								
	1(2300)	-	-	3(530-1200)	1(63)	1(900)	1(13)	7(13-2300)
Agent Products/HPLC								
CLC2A	-	-	-	-	-	-	-	-
TDGCL	-	-	-	-	-	-	-	-
Agent Products/IONCHROM								
FC2A	-	-	-	-	-	-	-	-
IMPA	-	-	-	-	-	-	-	-
MPA	-	-	-	-	-	-	-	-
ICP METALS								
Cd	-	-	-	-	-	-	-	-
Cr	-	1(9.7)	-	2(50-67)	-	-	-	3(9.7-67)
Cu	-	1(9.5)	-	1(27)	-	-	-	2(9.5-27)
Pb	-	-	-	-	-	-	-	-
Zn	-	2(25-29)	-	3(27-150)	-	-	-	5(25-150)

TABLE B-2
(Continued)

Alluvial Wells in Site 36-17S

CONTAMINANT	36067	36075	36087	36190	36590	36591	36593	SUMMARY
Arsenic/AA	-	-	-	3(16-55)	-	-	-	3(16-55)
Mercury/AA	-	-	-	-	-	-	-	-

- = Not analyzed or not detected above CRL
number of indications is followed by (range ug/l)

TABLE B-2
(Continued)

Alluvial Wells in Site 36-17N

CONTAMINANT	36080	36084	36085	36088	36180	36187	36188	36189	SUMMARY
Volatile Organic Compounds/GCMS									
11DCLE	-	-	-	-	-	-	-	-	-
12DCLE	1(4.9)	1(19)	-	1(79)	2(130-180)	-	1(16)	2(19-21)	8(4.9-180)
111TCE	-	-	-	-	-	-	-	-	-
112TCE	1(1.1)	1(21)	-	-	-	-	-	2(3.8-4.0)	4(1.1-21)
C6H6	1(0.78)	1(7.7)	-	-	1(230)	-	-	-	3(0.78-230)
BCHPD	-	-	-	-	-	-	-	-	-
CCL4	-	-	-	-	-	-	-	-	-
CLC6H5	-	1(5.3)	-	-	1(1700)	-	-	-	2(5.3-1700)
CHCL3	1(5.5)	1(38)	-	-	1(26)	-	-	2(2.2-2.5)	5(2.2-38)
DBCP	-	-	-	-	-	-	-	-	-
DCPD	-	-	-	-	-	-	-	-	-
DMDS	-	-	-	-	-	-	-	-	-
ETC6H5	-	-	-	-	-	-	-	-	-
13DMB	-	-	-	-	-	-	-	-	-
CH2CL2	-	-	-	-	-	-	-	-	-
MIBK	-	-	-	1(170)	-	-	-	-	1(170)
XYLEN	-	-	-	-	-	-	-	-	-
TCLEE	-	1(7.6)	-	-	-	-	1(7.2)	-	2(7.2-7.6)
MEC6H5	-	-	-	-	-	-	-	-	-
12DCE	1(5.4)	1(75)	-	-	-	-	-	2(7.8-8.6)	4(5.4-75)
TRCLE	1(20)	1(>83)	-	-	2(110-270)	-	1(2.4)	2(97-100)	7(2.4-270)
DMK	-	-	-	1(940)	-	-	-	-	1(940)

TABLE B-2
(Continued)

Alluvial Wells in Site 36-17N

CONTAMINANT	36080	36084	36085	36088	36180	36187	36188	36189	SUMMARY
Halocarbons/GCHALL									
12DCLE	-	-	-	-	2(130-140)	-	-	-	2(130-140)
112TCE	-	-	-	-	2(2.3-2.6)	-	-	-	2(2.3-2.6)
CLC6H5	-	-	-	-	1(350)	-	-	-	1(350)
CHCL3	-	-	-	-	2(5.5-10)	-	-	-	2(5.5-10)
TCLEE	-	-	-	-	1(4.5)	-	-	-	1(4.5)
TRCLE	-	-	-	-	1(100)	-	-	-	1(100)
Halocarbons/GCCON									
12DCLE	-	4(12-22)	1(1.7)	-	2(170-210)	-	-	-	7(1.7-210)
111TCE	-	3(12-36)	-	-	1(1.1)	-	-	-	4(1.1-36)
112TCE	-	-	-	-	2(4.1-4.6)	-	-	-	2(4.1-4.6)
CCL4	-	-	-	-	1(3.8)	-	-	-	1(3.8)
CLC6H5	-	3(2.5-4.4)	-	-	2(2.2-1400)	-	-	-	5(2.2-1400)
CHCL3	-	3(28-44)	-	-	2(5.8-18)	-	-	-	5(5.8-44)
TCLEE	-	4(6.1-8.3)	-	-	2(4.1-6.0)	-	-	-	6(4.1-8.3)
12DCE	-	3(61-78)	-	-	3(2.1-2.4)	-	-	-	6(2.1-78)
TRCLE	-	4(86-1100)	1(0.68)	-	2(12-170)	-	-	-	7(0.68-1100)
Aromatics/GCPID									
C6H6	-	3(8.5-15)	-	-	4(11-20)	-	-	-	7(8.5-20)
ETC6H5	-	-	-	-	2(2.4-6.3)	-	-	-	2(2.4-6.3)
13DMB	-	-	-	-	1(5.0)	-	-	-	1(5.0)
XYLEN	-	-	-	-	2(6.5-14)	-	-	-	2(6.5-14)
MEC6H5	-	-	-	-	2(>11-170)	-	-	-	2(>11-170)

TABLE B-2
(Continued)

Alluvial Wells in Site 36-17N

CONTAMINANT	36080	36084	36085	36088	36180	36187	36188	36189	SUMMARY
Volatiles/GCFID									
BCHPD	-	-	-	-	1(2.3)	-	-	-	1(2.3)
Semivolatile Organic Compounds/GCMS									
OXAT	-	3(45-57)	-	-	1(160)	-	1(59)	2(120-130)	7(45-130)
PPDDE	-	-	-	-	-	-	-	-	-
PPDDT	-	-	-	-	-	-	-	-	-
ALDRN	-	-	-	-	-	-	-	-	-
ATZ	-	-	-	-	-	-	-	-	-
CLDAN	-	-	-	-	-	-	-	-	-
CPMS	-	-	-	-	-	-	-	-	-
CPMSO	-	-	-	-	-	-	-	-	-
CPMSO2	-	-	-	-	-	-	-	-	-
DBCP	-	-	-	-	-	-	-	-	-
DCPD	-	-	-	-	-	-	-	-	-
DLDRN	-	-	-	-	-	-	-	-	-
DIMP	-	3(>200-6000)	-	-	1(>200)	-	1(>200)	2(>200)	7(>200-6000)
DMMP	-	-	-	-	-	-	-	-	-
DITH	-	2(>100-350)	-	-	1(>100)	-	-	2(>100)	5(>100-350)
ENDRN	-	-	-	-	-	-	-	-	-
CL6CP	-	-	-	-	-	-	-	-	-
ISODR	-	-	-	-	-	-	-	-	-
MLTHN	-	-	-	-	-	-	-	-	-
PRTHN	-	-	-	-	-	-	-	-	-
SUPONA	-	-	-	-	-	-	-	-	-
DDVP	-	-	-	-	-	-	-	-	-

TABLE B-2
(Continued)

Alluvial Wells in Site 36-17N

CONTAMINANT	36080	36084	36085	36088	36180	36187	36188	36189	SUMMARY
Organochlorine Pesticides/GCEC									
PPDDE	1(6.4)	1(0.75)	1(0.17)	1(0.34)	2(0.23-0.67)	-	-	-	6(0.23-6.4)
PPDDT	1(19)	3(0.13-1.6)	1(0.47)	-	1(0.34)	-	-	-	6(0.13-19)
ALDRN	-	-	-	-	1(3.4)	-	1(8.2)	2(0.75-6.9)	4(0.75-8.2)
CLDAN	-	1(9.7)	-	-	2(9.9-120)	-	-	-	3(9.7-120)
DLDRN	1(3.7)	2(0.51-0.67)	2(0.34-0.79)	1(0.39)	2(0.23-2.1)	1(0.056)	1(0.78)	2(0.11-0.12)	12(0.056-3.7)
ENDRN	1(17)	1(0.33)	2(0.17-0.32)	1(0.098)	3(0.16-0.50)	-	-	2(0.085-0.11)	10(0.085-17)
CL6CP	-	-	-	1(0.15)	1(0.096)	-	-	2(0.066-0.071)	4(0.056-0.15)
ISODR	1(20)	2(0.074-3.2)	1(0.16)	1(0.83)	2(0.76-0.94)	1(0.063)	1(0.75)	2(0.18-0.19)	11(0.063-20)
Nitrogen Phosphorous Pesticides/GCEC									
ATZ	-	1(15)	-	-	1(25)	-	-	-	2(15-25)
MLTHN	-	1(1.2)	-	-	1(14)	-	-	-	2(1.2-14)
SUPONA	-	-	-	-	1(0.97)	-	-	-	1(0.97)
DDVP	-	1(0.86)	-	-	-	-	-	-	1(0.86)
Organophosphorous Compounds/GCFPD									
DIMP	1(8600)	4(10-14000)	2(90-170)	1(95)	4(2600-7800)	1(1.9)	1(27000)	2(5400-6200)	16(1.9-27000)
DMMP	-	2(1.8-18)	1(7.8)	1(30)	-	-	-	-	4(1.8-30)
Organosulfur Compounds/GCFPD									
OXAT	-	4(40-68)	1(11)	-	3(130-170)	1(24)	1(94)	2(220)	12(11-220)
BTZ	-	1(5.3)	-	-	1(23)	-	-	-	2(5.3-23)
CPMS	-	1(11)	-	-	3(13-19)	-	-	-	4(11-19)
CPMSO	-	2(15-48)	-	-	-	-	-	1(18)	3(15-48)

TABLE B-2
(Continued)

Alluvial Wells in Site 36-17N

CONTAMINANT	36080	36084	36085	36088	36180	36187	36188	36189	SUMMARY
Organosulfur Compounds/GCFPD (cont'd)									
CPMSO2	-	1(>100)	-	-	1(14)	-	1(160)	2(31-33)	5(14-160)
DMDS	-	-	-	-	-	-	-	-	-
DITH	-	4(>22-490)	1(140)	-	3(1700-2100)	1(250)	1(690)	2(1800)	12(>22-2100)
Dibromochloropropane/GCECD									
	1(190)	-	-	-	2(0.20-8.5)	-	-	-	3(0.20-190)
Agent Products/HPLC									
CLC2A	-	-	-	-	-	-	-	-	-
TDGCL	-	-	-	-	-	-	-	-	-
Agent Products/IONCHROM									
FC2A	-	-	-	-	-	-	-	-	-
IMPA	-	-	-	-	-	-	-	-	-
MPA	-	-	-	-	-	-	-	-	-
ICP METALS									
Cd	-	-	-	-	1(16)	-	-	-	1(16)
Cr	-	1(59)	-	-	1(82)	-	-	-	2(59-82)
Cu	1(120)	-	-	-	2(11-31)	-	-	-	3(11-120)
Pb	-	-	-	-	-	-	-	-	-
Zn	1(35)	3(23-42)	1(27)	-	3(22-280)	1(24)	-	-	9(22-280)

TABLE B-2
(Continued)

Alluvial Wells in Site 36-17N

CONTAMINANT	36080	36084	36085	36088	36180	36187	36188	36189	SUMMARY
Arsenic	-	3(>50-130)	1(>50)	-	2(44-67)	2(48)	1(78)	2(71-73)	11(44-130)
Mercury	-	-	-	-	-	1(0.13)	1(0.23)	2(0.12)	4(0.12-0.23)

- = Not analyzed or not detected above CRL
number of indications is followed by (range ug/l)

TABLE B-2
(Continued)

Denver Wells in Site 36-17N

CONTAMINANT	36121	36122	36154	36158	36184	36185	36191	36192	SUMMARY
Volatile Organic Compounds/GCMS									
11DCLE	-	-	-	-	-	-	1(44)	-	1(44)
12DCLE	-	-	-	1(43)	-	-	-	-	1(43)
111TCE	-	-	-	-	-	-	-	-	-
112TCE	-	-	-	-	-	-	-	-	-
C6H6	-	-	-	-	-	1(360)	-	-	1(360)
BCHPD	-	-	-	-	-	-	-	-	-
CCL4	-	-	-	-	-	-	1(1.8)	-	1(1.8)
CLC6H5	-	-	-	-	-	-	-	-	-
CHCL3	-	-	-	-	1(4900)	-	1(90)	-	2(90-4900)
DBCP	-	-	-	-	-	-	-	-	-
DCPD	-	-	-	-	-	-	-	-	-
DMDS	-	-	-	-	-	-	-	-	-
ETC6H5	-	-	-	-	-	-	-	-	-
13DMB	-	-	-	-	-	-	-	-	-
CH2CL2	-	-	-	-	1(9300)	1(120)	-	-	2(120-9300)
MIBK	-	-	-	-	-	-	-	-	-
XYLEN	-	-	-	-	-	-	-	-	-
TCLEE	-	-	-	-	-	1(2900)	1(320)	-	2(320-2900)
MEC6H5	-	-	-	-	-	-	-	-	-
12DCE	-	-	-	-	-	-	-	-	-
TRCLE	-	-	-	-	1(500)	1(170)	1(27)	-	3(27-500)
11DCE			-	-	1(1900)	1(67)	-	-	2(67-1900)
Halocarbons/GCHALL									
12DCLE	-	-	-	2(2.8-7.0)	-	-	-	-	2(2.8-70)
CCL4	-	-	-	1(3.3)	-	-	-	-	1(3.3)

TABLE B-2
(Continued)

Denver Wells in Site 36-17N

CONTAMINANT	36121	36122	36154	36158	36184	36185	36191	36192	SUMMARY
Halocarbons/GCCON									
CHCL3	-	-	1(4.5)	-	1(6700)	-	-	-	2(4.5-6700)
CLC6H5	-	-	1(24)	-	-	-	-	-	1(24)
111TCE	-	-	-	-	1(180)	1(56)	-	-	2(56-180)
11DCE	-	-	-	-	1(2000)	1(130)	-	-	2(130-2000)
11DCLE	-	-	-	-	1(51)	-	-	-	1(51)
12DCE	-	-	-	-	1(8.8)	-	-	-	1(8.8)
CCL4	-	-	-	-	1(140)	-	-	-	1(140)
CH2CL2	-	-	-	-	1(17000)	-	-	-	1(17000)
TCLEE	-	-	-	-	1(15)	1(5700)	-	-	2(15-5700)
TRCLE	-	-	-	-	1(880)	1(280)	-	-	2(280-880)
12DCLE	-	-	-	-	-	1(11)	-	-	1(11)
Aromatics/GCPID									
C6H6	1(1.6)	-	-	-	1(25)	1(210)	-	-	3(1.6-210)
Semivolatile Organic Compounds/GCMS									
OXAT	-	-	-	-	-	-	-	-	-
PPDDE	-	-	-	-	-	-	-	-	-
PPDDT	-	-	-	-	-	-	-	-	-
ALDRN	-	-	-	-	-	-	-	-	-
ATZ	-	-	-	-	-	-	-	-	-
CLDAN	-	-	-	-	-	-	-	-	-
CPMS	-	-	-	-	-	-	-	-	-
CPMSO	-	-	-	-	-	-	-	-	-
CPMSO2	-	-	-	-	-	-	-	-	-
DBCP	-	-	-	-	-	-	-	-	-

TABLE B-2
(Continued)

Denver Wells in Site 36-17N

CONTAMINANT	36121	36122	36154	36158	36184	36185	36191	36192	SUMMARY
Semivolatile Organic Compounds/GCMS (cont'd)									
DCPD	-	-	-	-	-	-	-	-	-
DLDRN	-	-	-	-	-	-	-	-	-
DIMP	-	-	-	-	-	-	-	-	-
DMMP	-	-	-	-	-	-	-	-	-
DITH	-	-	-	-	-	-	-	-	-
ENDRN	-	-	-	-	-	-	-	-	-
CL6CP	-	-	-	-	-	-	-	-	-
ISODR	-	-	-	-	-	-	-	-	-
MLTHN	-	-	-	-	-	-	-	-	-
PRTHN	-	-	-	-	-	-	-	-	-
SUPONA	-	-	-	-	-	-	-	-	-
DDVP	-	-	-	-	-	-	-	-	-
Organochlorine Pesticides/GCEC									
PPDDE	-	1(0.098)	1(0.12)	-	1(0.074)	-	-	-	3(0.074-0.12)
PPDDT	-	-	1(0.30)	-	1(0.30)	-	-	-	2(0.30)
ALDRN	-	-	-	-	1(2.0)	-	-	-	1(2.0)
CLDAN	-	-	-	-	1(4.4)	-	-	-	1(4.4)
DLDRN	-	-	-	-	1(0.098)	1(0.050)	-	-	2(0.050-0.098)
ENDRN	-	-	-	-	2(0.12-0.19)	-	-	-	2(0.12-0.19)
CL6CP	-	-	-	-	1(0.19)	-	-	-	1(0.19)
ISODR	-	-	-	-	1(0.44)	-	-	-	1(0.44)

TABLE B-2
(Continued)

Denver Wells in Site 36-17N

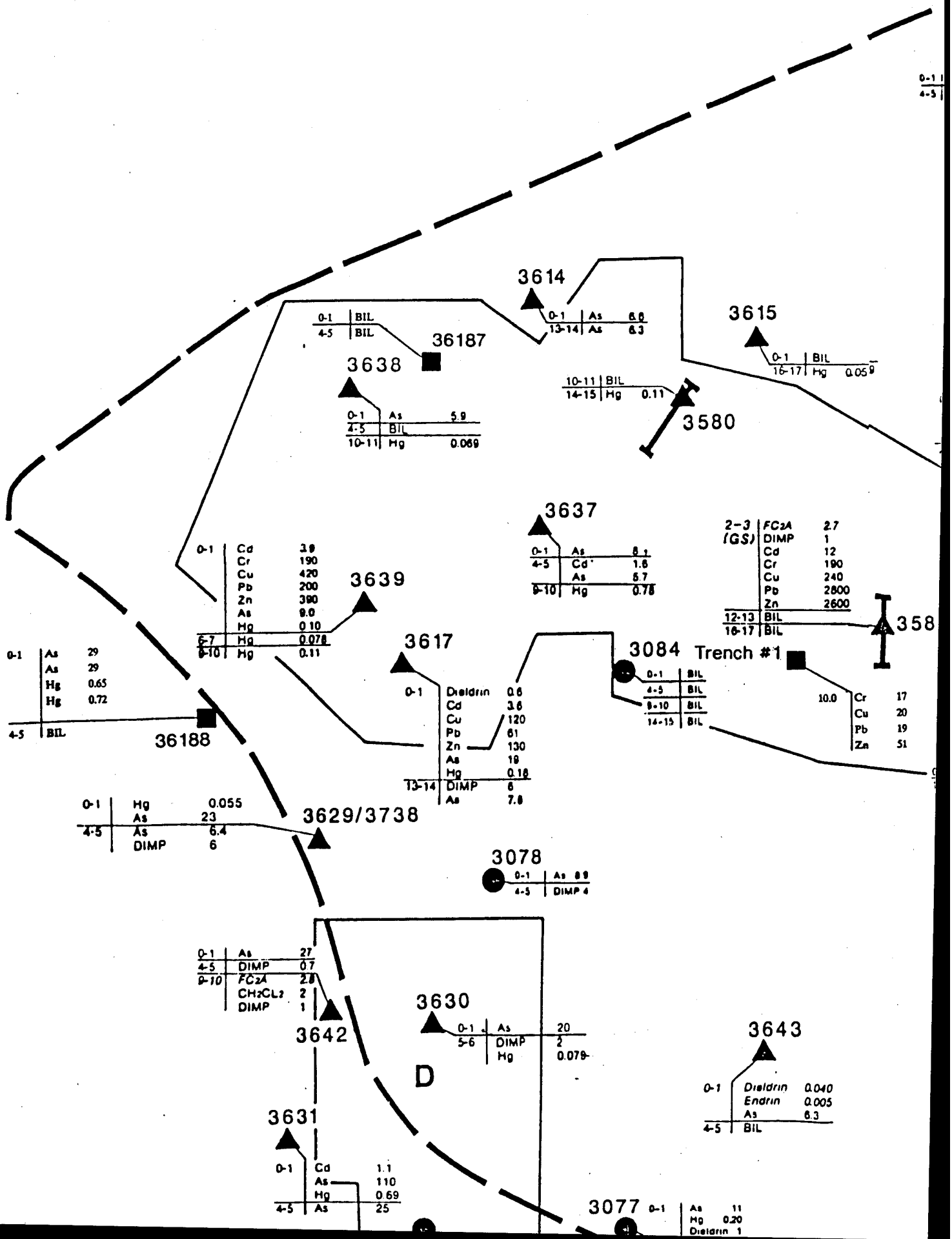
CONTAMINANT	36121	36122	36154	36158	36184	36185	36191	36192	SUMMARY
Nitrogen Phosphorous Pesticides/GCEC									
ATZ	-	-	-	-	1(93)	-	-	-	1(93)
PRTHN	-	-	-	-	1(1.3)	-	-	-	1(1.3)
SUPONA	-	-	-	-	-	1(1.2)	-	-	1(1.2)
Organophosphorous Compounds/GCFPD									
DIMP	-	-	-	-	2(2700-3200)	2(180-200)	-	-	4(180-3200)
DMMP	-	-	-	-	-	2(6.5-37)	-	-	2(6.5-37)
Organosulfur Compounds/GCFPD									
OXAT	-	-	-	-	-	-	-	-	-
BTZ	-	-	-	-	-	-	-	-	-
CPMS	-	-	-	-	-	-	-	-	-
CPMSO	-	-	-	-	-	-	-	-	-
CPMSO2	-	-	-	-	-	-	-	-	-
DMDS	-	-	-	-	-	-	-	-	-
DITH	-	-	-	-	-	-	-	-	-
Dibromochloropropane/GCECD									
	-	-	-	-	-	1(1.1)	1(0.93)	-	2(0.93-1.1)
Agent Products/HPLC									
CLC2A	-	-	-	-	-	-	-	-	-
TDGCL	-	-	-	-	-	-	-	-	-

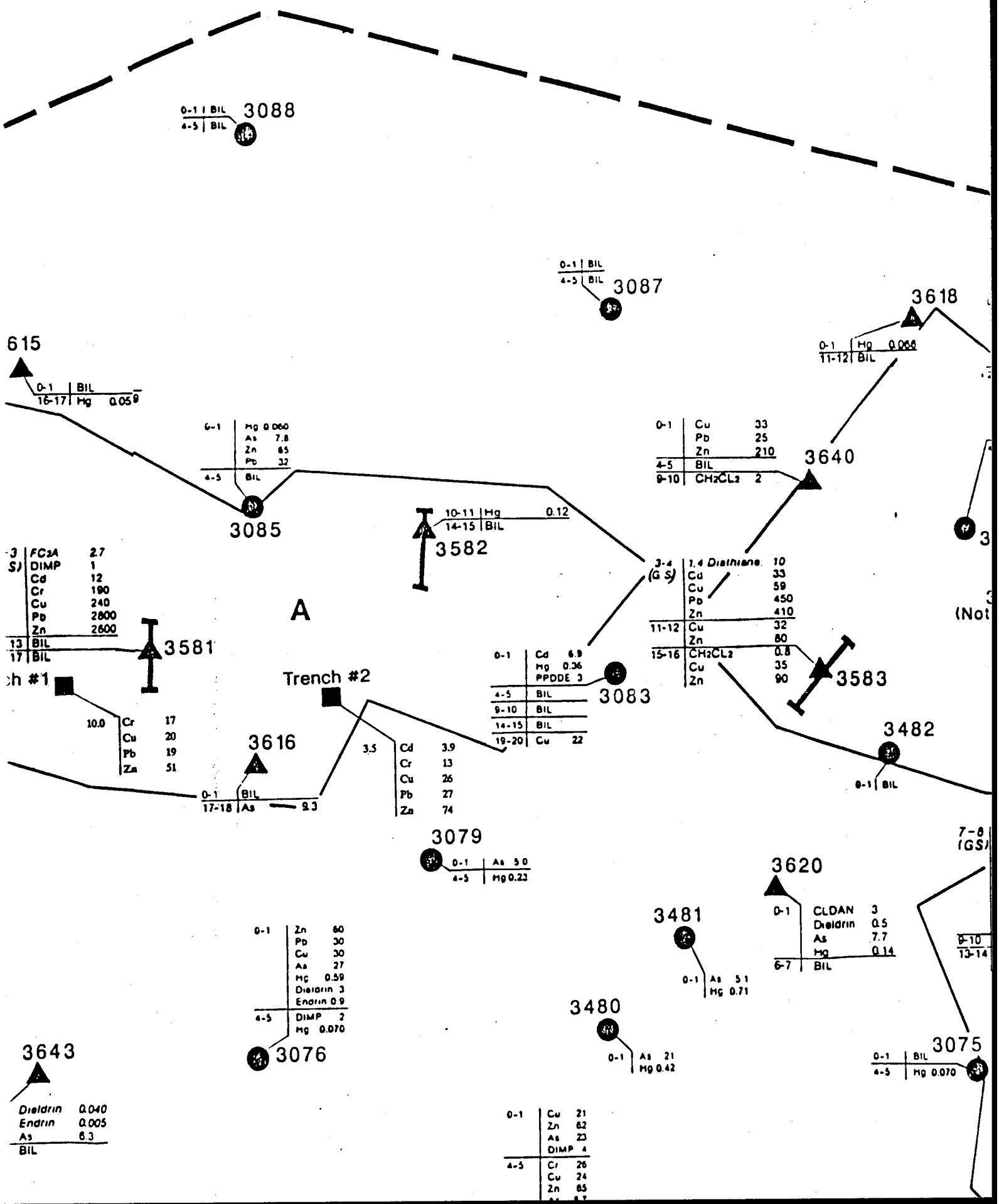
TABLE B-2
(Continued)

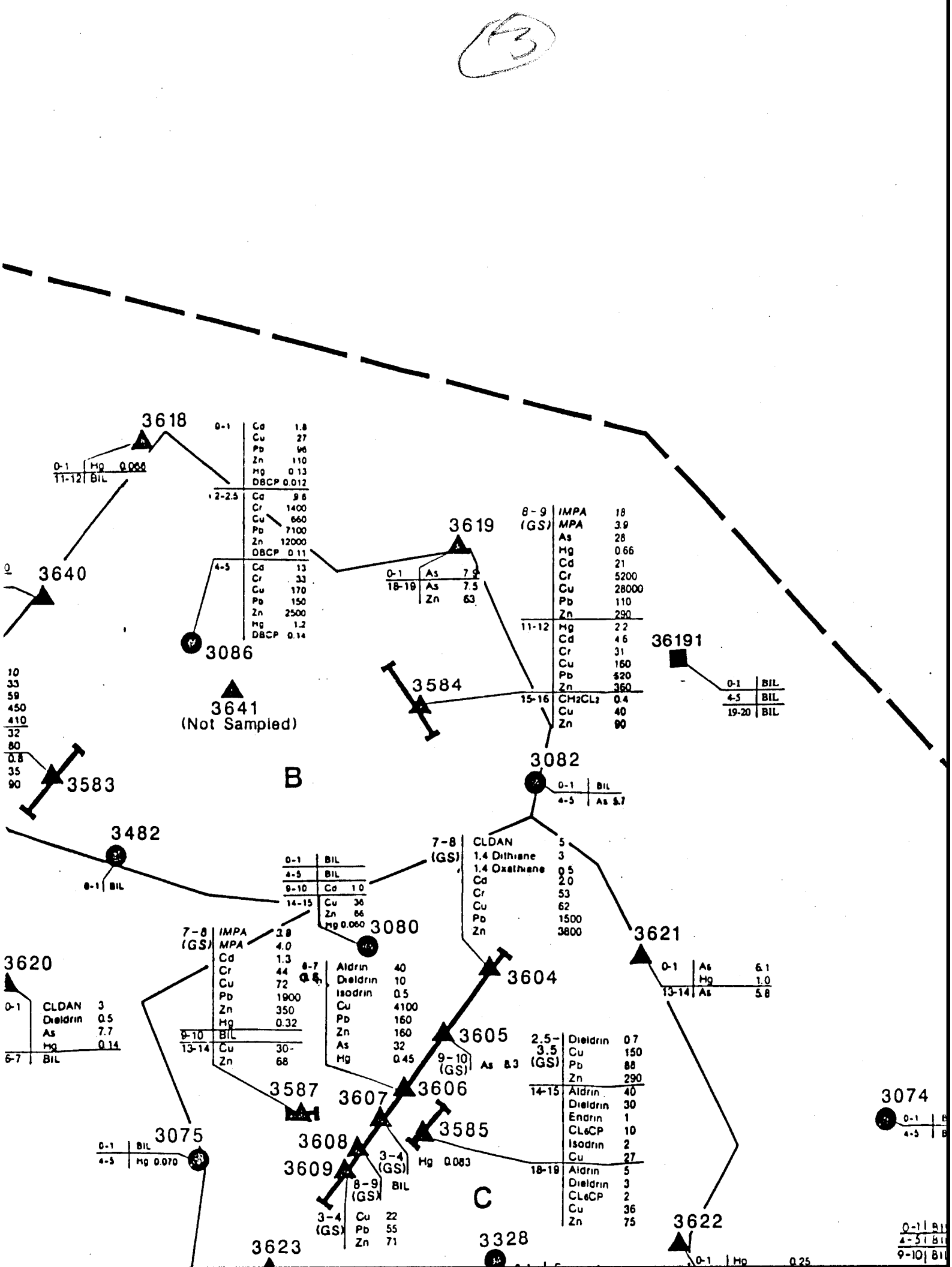
Denver Wells in Site 36-17N

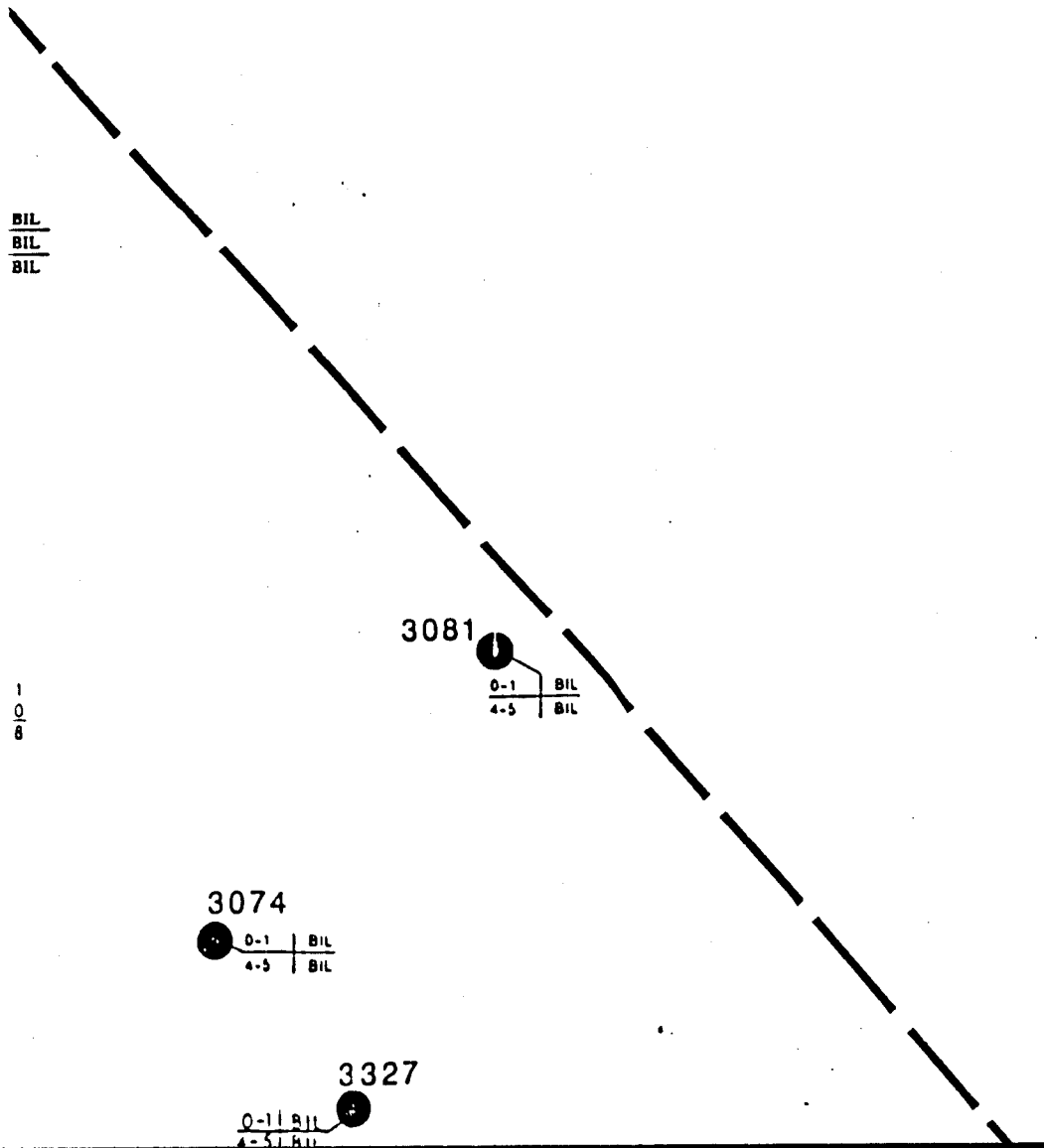
CONTAMINANT	36121	36122	36154	36158	36184	36185	36191	36192	SUMMARY
Agent Products/IONCHROM									
FC2A	-	-	-	-	-	-	-	-	-
IMPA	-	-	-	-	-	-	-	-	-
MPA	-	-	-	-	-	-	-	-	-
ICP METALS									
Cd	-	-	-	-	-	-	-	-	-
Cr	1(26)	-	-	-	-	-	-	-	1(26)
Cu	-	-	1(39)	-	-	-	-	-	1(39)
Pb	-	-	-	-	-	-	-	-	-
Zn	2(28-68)	1(34)	-	-	2(23-80)	-	-	2(420-500)	7(23-500)
Arsenic	-	-	-	-	2(6.7)	-	-	-	2(6.7)
Mercury	-	-	-	-	-	-	-	-	-
Cyanide/Technicon	-	1(13)	-	-	-	1(160)	-	-	2(13-160)

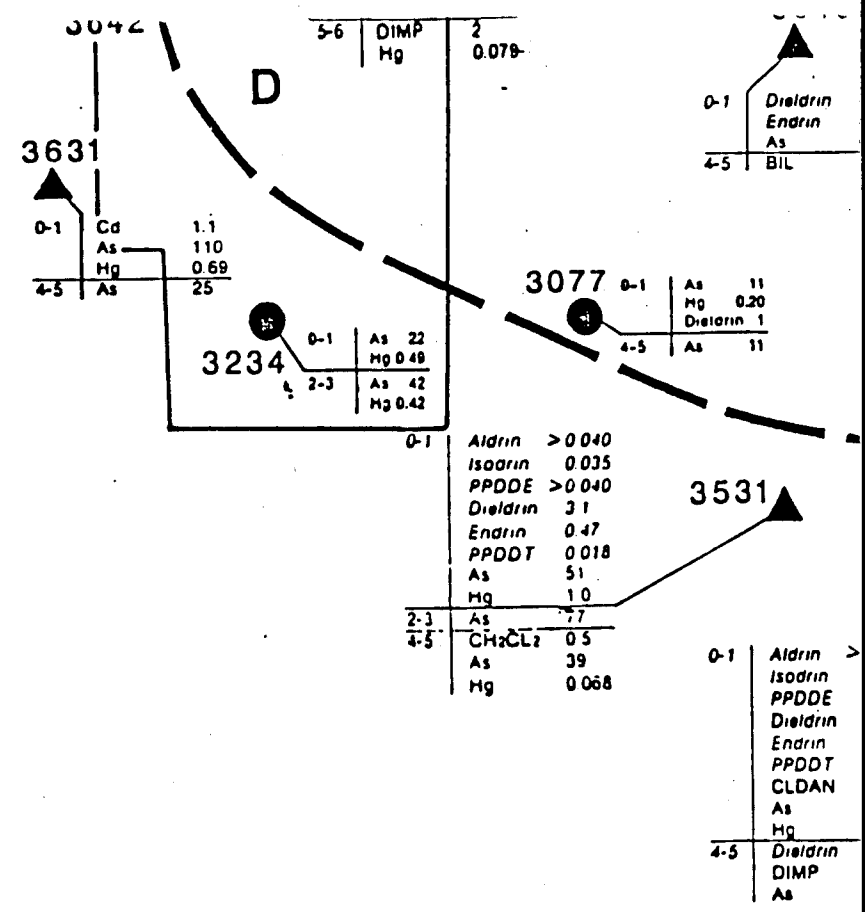
- = Not analyzed or not detected above CRL
number of indications is followed by (range ug/l)


3614
0-1 As 6.6
13-14 As 6.3
0-1 BIL
4-5 BIL
36187
3638
0-1 As 5.9
4-5 BIL
10-11 Hg 0.069
3615
0-1 BIL
16-17 Hg 0.059
10-11 BIL
14-15 Hg 0.11
3580
3637
0-1 As 8.1
4-5 Cd 1.6
As 5.7
9-10 Hg 0.78
2-3 FC2A 2.7
(GS) DIMP 1
Cd 12
Cr 190
Cu 240
Pb 2800
Zn 2600
12-13 BIL
16-17 BIL
358
0-1 Cd 3.9
Cr 190
Cu 420
Pb 200
Zn 390
As 9.0
Hg 0.10
6-7 Hg 0.078
9-10 Hg 0.11
3639
3617
0-1 Dieldrin 0.6
Cd 3.6
Cu 120
Pb 61
Zn 130
As 19
Hg 0.18
13-14 DIMP 6
As 7.8
3084 Trench #1
0-1 BIL
4-5 BIL
9-10 BIL
14-15 BIL
10.0 Cr 17
Cu 20
Pb 19
Zn 51
0-1 As 29
As 29
Hg 0.65
Hg 0.72
4-5 BIL
36188
0-1 Hg 0.055
As 23
4-5 As 6.4
DIMP 6
3629/3738
3078
0-1 As 8.9
4-5 DIMP 4
0-1 As 27
4-5 DIMP 0.7
9-10 FC2A 2.8
CH2Cl2 2
DIMP 1
3642
3630
0-1 As 20
5-6 DIMP 2
Hg 0.079
D
3643
0-1 Dieldrin 0.040
Endrin 0.005
As 6.3
4-5 BIL
3631
0-1 Cd 1.1
As 110
Hg 0.69
4-5 As 25
3077 0-1 As 11
Hg 0.20
Dieldrin 1


3088
0-1 | BIL
4-5 | BIL
3087
0-1 | BIL
4-5 | BIL
615
0-1 | BIL
16-17 | Hg 0.05
3085
0-1 | Hg 0.060
As 7.8
Zn 65
Pb 32
4-5 | BIL
3582
10-11 | Hg 0.12
14-15 | BIL
3618
0-1 | Hg 0.068
11-12 | BIL
3640
0-1 | Cu 33
Pb 25
Zn 210
4-5 | BIL
9-10 | CH2CL2 2
3581
FC2A 2.7
DIMP 1
Cd 12
Cr 190
Cu 240
Pb 2600
Zn 2600
13 | BIL
17 | BIL
A
3-4 (G S) | 1,4 Dithiane 10
Cd 33
Cu 59
Pb 450
Zn 410
11-12 | Cu 32
Zn 80
15-16 | CH2CL2 0.8
Cu 35
Zn 90
3583
3083
0-1 | Cd 6.9
Hg 0.36
PPDDE 3
4-5 | BIL
9-10 | BIL
14-15 | BIL
19-20 | Cu 22
Trench #1
10.0 | Cr 17
Cu 20
Pb 19
Zn 51
Trench #2
3.5 | Cd 3.9
Cr 13
Cu 26
Pb 27
Zn 74
3616
0-1 | BIL
17-18 | As 9.3
3482
0-1 | BIL
3079
0-1 | As 5.0
4-5 | Hg 0.23
3620
0-1 | CLDAN 3
Dieldrin 0.5
As 7.7
Hg 0.14
6-7 | BIL
3481
0-1 | As 5.1
Hg 0.71
3480
0-1 | As 21
Hg 0.42
3075
0-1 | BIL
4-5 | Hg 0.070
0-1 | Zn 60
Pb 30
Cu 30
As 27
Hg 0.59
Dieldrin 3
Endrin 0.9
4-5 | DIMP 2
Hg 0.070
3076
3643
Dieldrin 0.040
Endrin 0.005
As 6.3
BIL
0-1 | Cu 21
Zn 62
As 23
DIMP 4
4-5 | Cr 26
Cu 24
Zn 85
(Not


3618
0-1 | Hg 0.066
11-12 | BIL
0-1 Cd 1.8
Cu 27
Pb 96
Zn 110
Hg 0.13
DBCP 0.012
2-2.5 Cd 9.6
Cr 1400
Cu 660
Pb 7100
Zn 12000
DBCP 0.11
4-5 Cd 13
Cr 33
Cu 170
Pb 150
Zn 2500
Hg 1.2
DBCP 0.14
3086
3640
3619
0-1 As 7.9
18-19 As 7.5
Zn 63
8-9 (GS) IMPA 18
MPA 3.9
As 28
Hg 0.66
Cd 21
Cr 5200
Cu 28000
Pb 110
Zn 290
11-12 Hg 2.2
Cd 4.6
Cr 31
Cu 160
Pb 520
Zn 360
15-16 CH2CL2 0.4
Cu 40
Zn 90
36191
0-1 BIL
4-5 BIL
19-20 BIL
3584
3641
(Not Sampled)
10
33
59
450
410
32
80
0.8
35
90
3583
B
3082
0-1 BIL
4-5 As 5.7
3482
0-1 BIL
0-1 BIL
4-5 BIL
9-10 Cd 1.0
14-15 Cu 36
Zn 86
Hg 0.060
3080
7-8 (GS) CLDAN 5
1.4 Dithiane 3
1.4 Oxathiane 0.5
Cd 2.0
Cr 53
Cu 62
Pb 1500
Zn 3800
3621
0-1 As 6.1
Hg 1.0
13-14 As 5.8
3620
0-1 CLDAN 3
Dieldrin 0.5
As 7.7
Hg 0.14
6-7 BIL
7-8 (GS) IMPA 3.8
MPA 4.0
Cd 1.3
Cr 44
Cu 72
Pb 1900
Zn 350
Hg 0.32
9-10 BIL
13-14 Cu 30-
Zn 68
6-7 Aldrin 40
Dieldrin 10
Isodrin 0.5
Cu 4100
Pb 160
Zn 160
As 32
Hg 0.45
3604
3605
9-10 (GS) As 8.3
2.5-3.5 (GS) Dieldrin 0.7
Cu 150
Pb 88
Zn 290
14-15 Aldrin 40
Dieldrin 30
Endrin 1
CL6CP 10
Isodrin 2
Cu 27
18-19 Aldrin 5
Dieldrin 3
CL6CP 2
Cu 36
Zn 75
3587
3607
3606
3585
3608
3609
3-4 (GS) Hg 0.083
8-9 (GS) BIL
3-4 (GS) Cu 22
Pb 55
Zn 71
3075
0-1 BIL
4-5 Hg 0.070
C
3074
0-1
4-5
3622
0-1 Hg 0.25
3623
3328
0-1 BIL
4-5 BIL
9-10 BIL


BIL
BIL
BIL
3081
0-1 | BIL
4-5 | BIL
3074
0-1 | BIL
4-5 | BIL
3327
0-1 | BIL



36-1

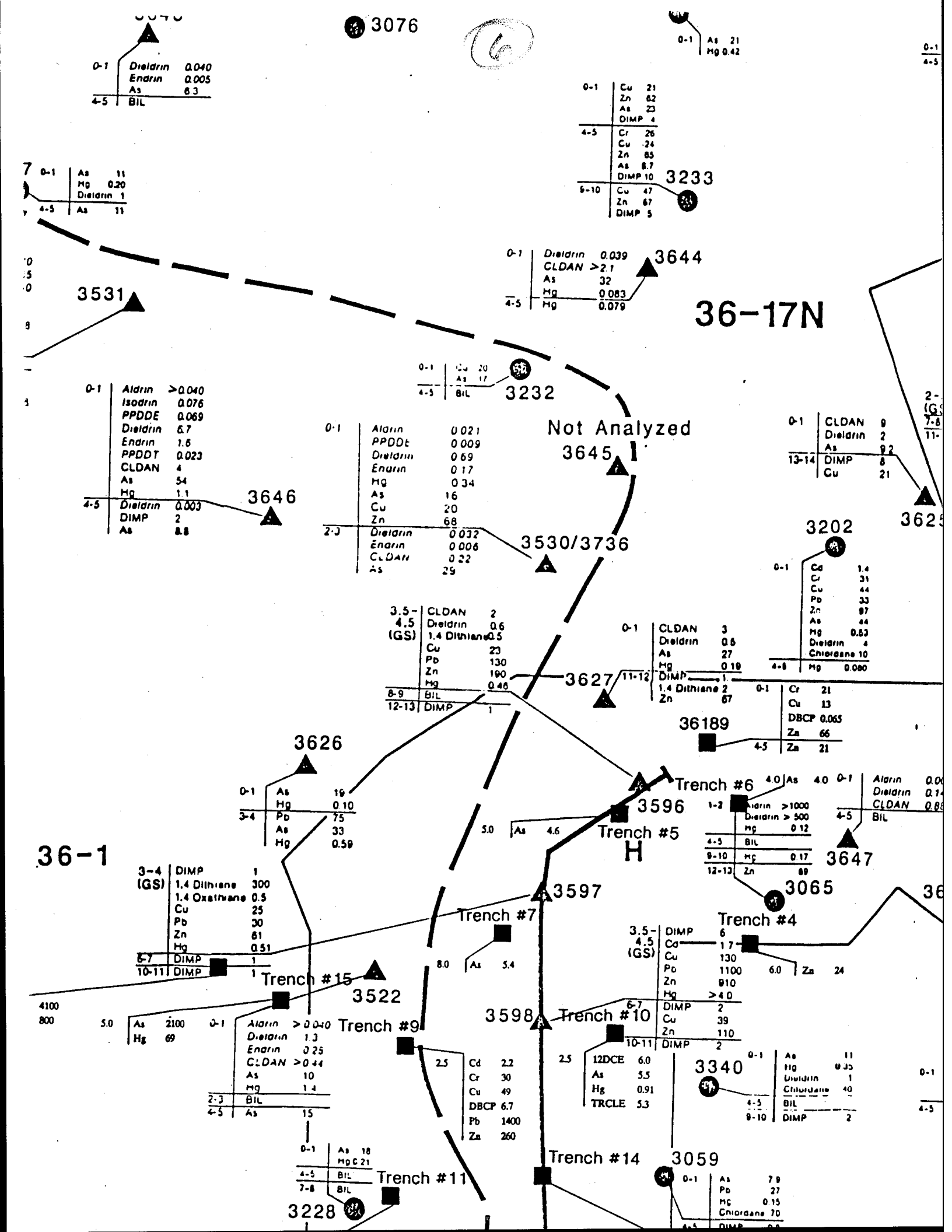
3-4
(GS

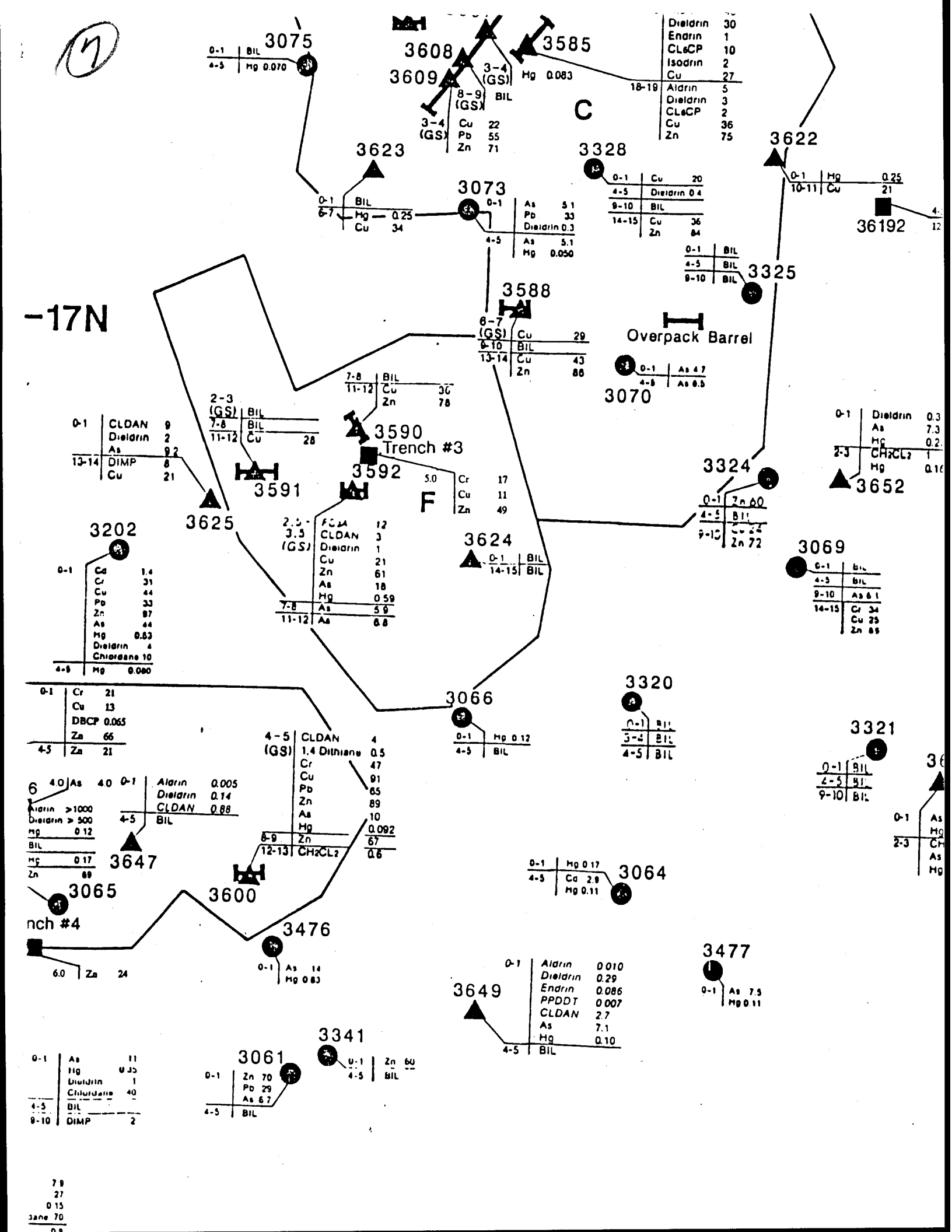
6-7
10-1

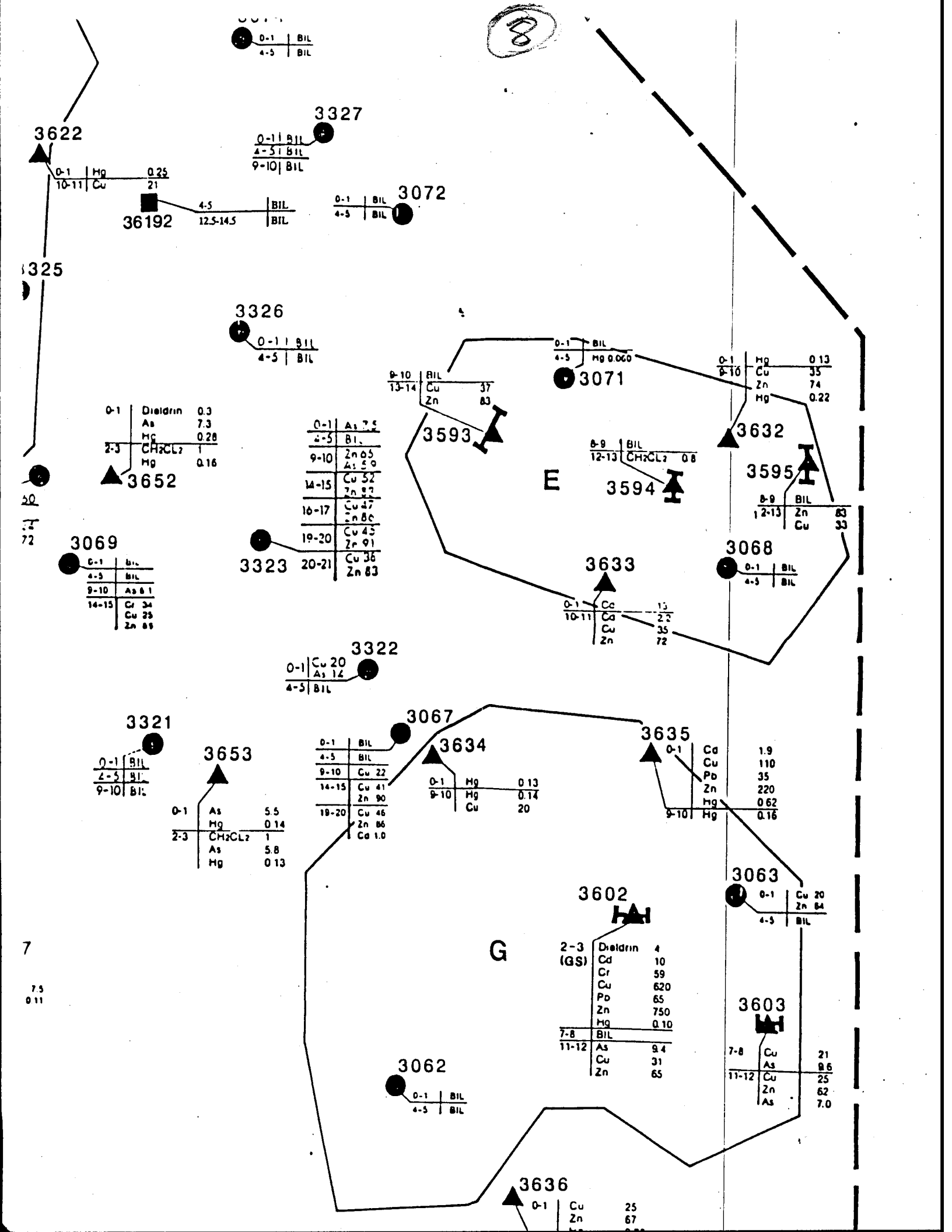
Trench #16

4.0 As 4100
Hg 800

5.0 As
Hg


3076
0-1 Dieldrin 0.040
Endrin 0.005
As 6.3
4-5 BIL
0-1 As 21
Hg 0.42
0-1 Cu 21
Zn 82
As 23
DIMP 4
4-5 Cr 26
Cu 24
Zn 85
As 8.7
DIMP 10
3233
9-10 Cu 47
Zn 67
DIMP 5
0-1 As 11
Hg 0.20
Dieldrin 1
4-5 As 11
0-1 Dieldrin 0.039
CLDAN >2.1
As 32
Hg 0.083
3644
4-5 Hg 0.079
3531
36-17N
0-1 Cu 20
As 17
4-5 BIL
3232
0-1 Aldrin >0.040
Isodrin 0.076
PPDDE 0.069
Dieldrin 6.7
Endrin 1.6
PPDDT 0.023
CLDAN 4
As 54
Hg 1.1
4-5 Dieldrin 0.003
DIMP 2
As 8.8
3646
Not Analyzed
3645
0-1 Aldrin 0.021
PPDDE 0.009
Dieldrin 0.69
Endrin 0.17
Hg 0.34
As 16
Cu 20
Zn 68
2-3 Dieldrin 0.032
Endrin 0.006
CLDAN 0.22
As 29
3530/3736
0-1 CLDAN 9
Dieldrin 2
As 9.2
13-14 DIMP 8
Cu 21
3625
3202
0-1 Cd 1.4
Cr 31
Cu 44
Pb 33
Zn 87
As 44
Hg 0.83
Dieldrin 4
Chlordane 10
4-8 Hg 0.080
3.5-4.5 (GS) CLDAN 2
Dieldrin 0.6
1.4 Dithiane 0.5
Cu 23
Pb 130
Zn 190
Hg 0.46
8-9 BIL
12-13 DIMP 1
3627
0-1 CLDAN 3
Dieldrin 0.6
As 27
Hg 0.19
11-12 DIMP 1
1.4 Dithiane 2
Zn 67
0-1 Cr 21
Cu 13
DBCP 0.065
36189
Zn 66
4-5 Zn 21
3626
0-1 As 19
Hg 0.10
3-4 Pb 75
As 33
Hg 0.59
Trench #6
4.0 As 4.0
1-2 Aldrin >1000
Dieldrin >500
Hg 0.12
4-5 BIL
9-10 Hg 0.17
12-13 Zn 89
3596
5.0 As 4.6
Trench #5
H
0-1 Aldrin 0.0
Dieldrin 0.1
CLDAN 0.8
4-5 BIL
3647
3065
36-1
3-4 (GS) DIMP 1
1.4 Dithiane 300
1.4 Oxathiane 0.5
Cu 25
Pb 30
Zn 81
Hg 0.51
6-7 DIMP 1
10-11 DIMP 1
3597
Trench #7
8.0 As 5.4
3.5-4.5 (GS) DIMP 6
Cd 1.7
Cu 130
Pb 1100
Zn 910
Hg >4.0
6.0 Zn 24
Trench #4
Trench #15
3522
4100
800
5.0 As 2100
Hg 69
0-1 Aldrin >0.040
Dieldrin 1.3
Endrin 0.25
CLDAN >0.44
As 10
Hg 1.4
2-3 BIL
4-5 As 15
Trench #9
3598
Trench #10
6-7 DIMP 2
Cu 39
Zn 110
10-11 DIMP 2
2.5 Cd 2.2
Cr 30
Cu 49
DBCP 6.7
Pb 1400
Zn 260
2.5 12DCE 6.0
As 5.5
Hg 0.91
TRCLE 5.3
3340
0-1 As 11
Hg 0.35
Dieldrin 1
Chlordane 40
4-5 BIL
8-10 DIMP 2
0-1 As 18
Hg 0.21
4-5 BIL
7-8 BIL
Trench #11
3228
Trench #14
3059
0-1 As 7.9
Pb 27
Hg 0.15
Chlordane 70


-17N
3075
0-1 BIL
4-5 Hg 0.070
3608
3609
3585
3-4 (GS) Hg 0.083
8-9 (GS) BIL
3-4 (GS) Cu 22 Pb 55 Zn 71
C
18-19 Aldrin 5 Dieldrin 3 CL6CP 2 Cu 36 Zn 75
Dieldrin 30 Endrin 1 CL6CP 10 Isodrin 2 Cu 27
3623
0-1 BIL
6-7 Hg 0.25 Cu 34
3073
0-1 As 5.1 Pb 33 Dieldrin 0.3
4-5 As 5.1 Hg 0.050
3328
0-1 Cu 20
4-5 Dieldrin 0.4
9-10 BIL
14-15 Cu 36 Zn 84
3622
0-1 Hg 0.25
10-11 Cu 21
36192
0-1 BIL
4-5 BIL
9-10 BIL
3325
3588
6-7 (GS) Cu 29
9-10 BIL
13-14 Cu 43 Zn 86
Overpack Barrel
0-1 As 4.7
4-8 As 8.5
3070
7-8 BIL
11-12 Cu 30 Zn 78
2-3 (GS) BIL
7-8 BIL
11-12 Cu 28
3590
Trench #3
3591
3592
5.0 Cr 17 Cu 11 Zn 49
F
0-1 CLDAN 9 Dieldrin 2 As 9.2
13-14 DIMP 8 Cu 21
3625
3324
0-1 Zn 60
4-5 BIL
9-10 Zn 72
0-1 Dieldrin 0.3 As 7.3 Hg 0.2
2-3 CH2CL2 1 Hg 0.16
3652
3202
0-1 Cd 1.4 Cr 31 Cu 44 Pb 33 Zn 87 As 44 Hg 0.83 Dieldrin 4 Chlordane 10
4-8 Hg 0.080
2.5-3.5 (GS) FCM 12 CLDAN 3 Dieldrin 1 Cu 21 Zn 61 As 18 Hg 0.59
7-8 As 5.9
11-12 As 6.8
3624
0-1 BIL
14-15 BIL
3069
0-1 BIL
4-5 BIL
9-10 As 6.1
14-15 Cr 34 Cu 25 Zn 85
0-1 Cr 21 Cu 13 DBCP 0.065 Zn 66
4-5 Zn 21
3066
0-1 Hg 0.12
4-5 BIL
3320
0-1 BIL
3-4 BIL
4-5 BIL
4-5 (GS) CLDAN 4 1.4 Dithiane 0.5 Cr 47 Cu 91 Pb 65 Zn 89 As 10 Hg 0.092 Zn 67
8-9 12-13 CH2CL2 0.6
6 4.0 As 4.0
Aldrin >1000 Dieldrin > 500 Hg 0.12
BIL
Hg 0.17
Zn 89
0-1 Aldrin 0.005 Dieldrin 0.14 CLDAN 0.88
4-5 BIL
3647
3600
3321
0-1 BIL
4-5 BIL
9-10 BIL
3065
nch #4
6.0 Zn 24
3476
0-1 As 14 Hg 0.83
0-1 Hg 0.17
4-5 Cd 2.9 Hg 0.11
3064
3477
0-1 As 7.5 Hg 0.11
0-1 Aldrin 0.010 Dieldrin 0.29 Endrin 0.086 PPDDT 0.007 CLDAN 2.7 As 7.1 Hg 0.10
4-5 BIL
3649
3341
0-1 Zn 60
4-5 BIL
3061
0-1 Zn 70 Pb 29 As 6.7
4-5 BIL
0-1 As 11 Hg 0.35 Dieldrin 1 Chlordane 40
4-5 BIL
9-10 DIMP 2
7.9
27
0.15
Zane 70


3622
0-1 Hg 0.25
10-11 Cu 21
36192
4-5 BIL
12.5-14.5 BIL
3327
0-1 BIL
4-5 BIL
9-10 BIL
3072
0-1 BIL
4-5 BIL
3325
3326
0-1 BIL
4-5 BIL
3652
0-1 Dieldrin 0.3
As 7.3
Hg 0.28
2-3 CH2CL2 1
Hg 0.16
3323
0-1 As 7.5
4-5 Bil.
9-10 Zn 65 As 5.9
14-15 Cu 52 Zn 87
16-17 Cu 47 Zn 86
19-20 Cu 45 Zn 91
20-21 Cu 36 Zn 83
3069
0-1 Bil.
4-5 BIL
9-10 As 8.1
14-15 Cr 34 Cu 25 Zn 89
3322
0-1 Cu 20 As 14
4-5 BIL
3321
0-1 BIL
2-5 BIL
9-10 BIL
3653
0-1 As 5.5
Hg 0.14
2-3 CH2CL2 1
As 5.8
Hg 0.13
3067
0-1 BIL
4-5 BIL
9-10 Cu 22
14-15 Cu 41 Zn 90
19-20 Cu 46 Zn 86 Co 1.0
3634
0-1 Hg 0.13
9-10 Hg 0.14 Cu 20
3062
0-1 BIL
4-5 BIL
3071
0-1 BIL
4-5 Hg 0.060
9-10 BIL
13-14 Cu 37 Zn 83
3593
E
3594
8-9 BIL
12-13 CH2CL2 0.8
3632
0-1 Hg 0.13
9-10 Cu 35 Zn 74 Hg 0.22
3595
8-9 BIL
12-13 Zn 83 Cu 33
3068
0-1 BIL
4-5 BIL
3633
0-1 Cd 1.3
10-11 Cd 2.2 Cu 35 Zn 72
3635
0-1 Cd 1.9 Cu 110 Pb 35 Zn 220 Hg 0.62
9-10 Hg 0.16
3602
2-3 (GS) Dieldrin 4 Cd 10 Cr 59 Cu 620 Pb 65 Zn 750 Hg 0.10
7-8 BIL
11-12 As 9.4 Cu 31 Zn 65
G
3063
0-1 Cu 20 Zn 84
4-5 BIL
3603
7-8 Cu 21 As 9.6
11-12 Cu 25 Zn 62 As 7.0
3636
0-1 Cu 25 Zn 67

(9)

Legend

Phase I Boring — Site Investigated

Phase II Boring — Phase II Pit Boring

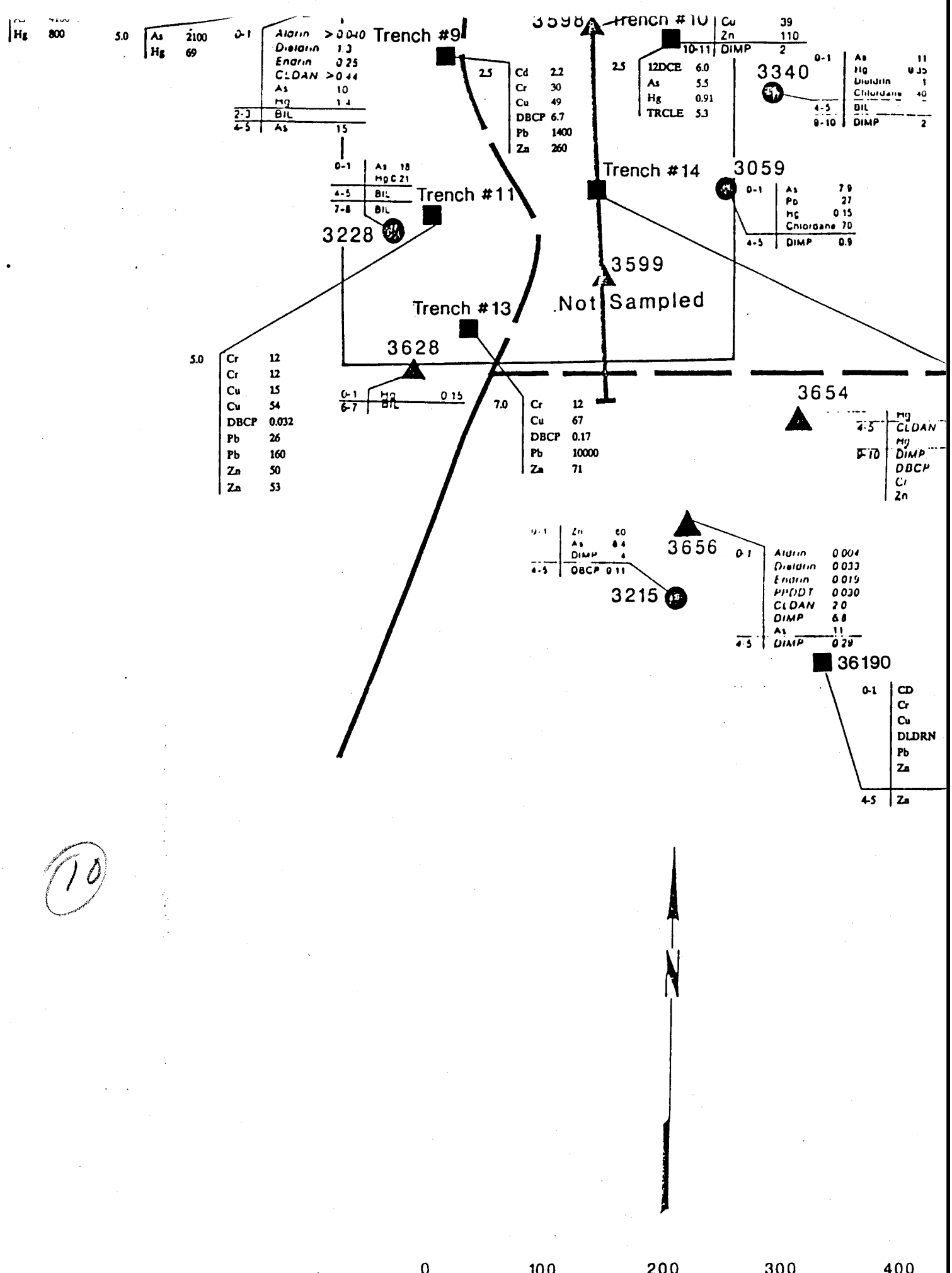
Sample Interval (ft) — 0-1 | Hg 0.17 – Level (ug/g)
4-5 | PPDDE 0.0098 — *Analytes detected by different method in Phase II – See text*
7-8 | Bedrock sample

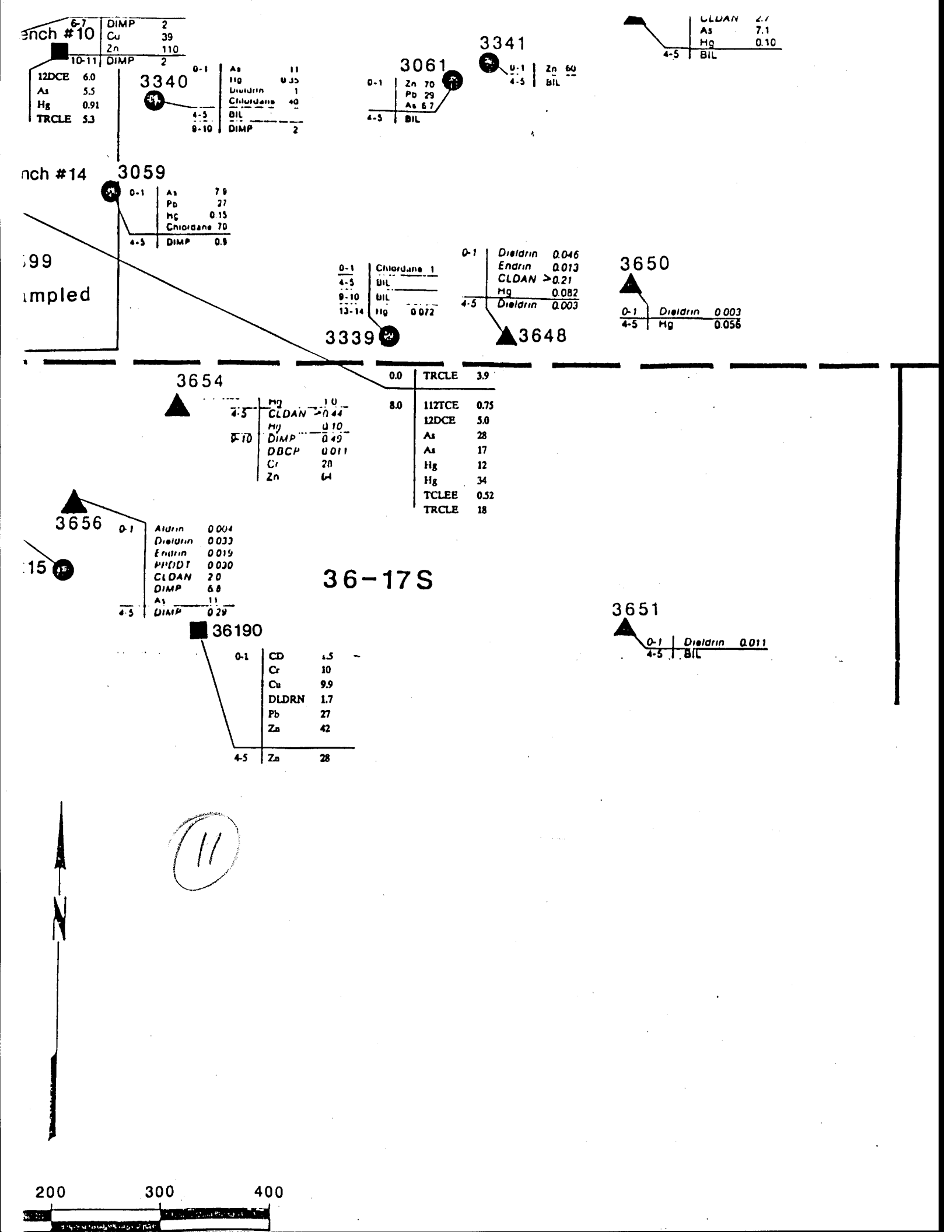
BIL - Below Indicator Level

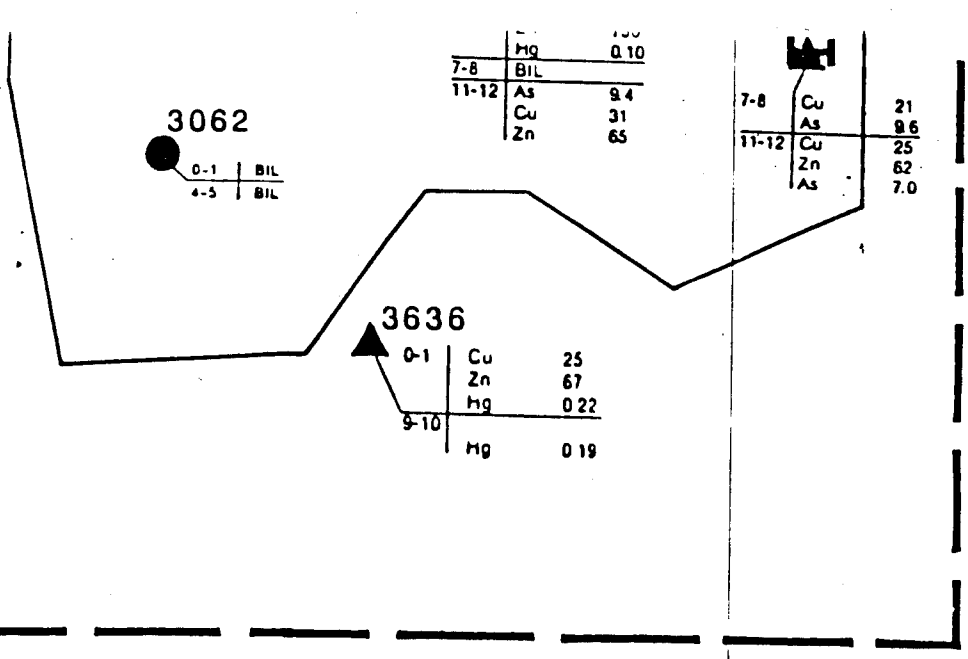
> Quantitative Concentration was not Achieved Due to Dilution Constraints.

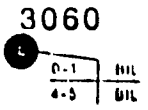
7-8 (GS) Depth of Grab Sample

Suspected Disposal Areas A through H Based on Geophysical Exploration Results and Aerial Photography


Trench #9
Trench #10
Trench #11
Trench #13
Trench #14
Not Sampled
3598
3599
3228
3628
3340
3059
3654
3656
3215
36190
Hg 800
5.0 As 2100
Hg 69
0-1 Aldrin >0.040
Dieldrin 1.3
Endrin 0.25
CLDAN >0.44
As 10
Hg 1.4
2-3 BIL
4-5 As 15
2.5 Cd 2.2
Cr 30
Cu 49
DBCP 6.7
Pb 1400
Zn 260
Cu 39
Zn 110
10-11 DIMP 2
2.5 12DCE 6.0
As 5.5
Hg 0.91
TRCLE 5.3
0-1 As 18
Hg 0.21
4-5 BIL
7-8 BIL
0-1 As 7.9
Pb 27
Hg 0.15
Chlordane 70
4-5 DIMP 0.9
5.0 Cr 12
Cr 12
Cu 15
Cu 54
DBCP 0.032
Pb 26
Pb 160
Zn 50
Zn 53
0-1 Hg 0.15
6-7 BIL
7.0 Cr 12
Cu 67
DBCP 0.17
Pb 10000
Zn 71
4-5 CLDAN
DIMP
DBCP
Cr
Zn
0-1 Zn 60
As 8.4
DIMP 4
4-5 DBCP 0.11
0-1 Aldrin 0.004
Dieldrin 0.033
Endrin 0.019
PPDDT 0.030
CLDAN 2.0
DIMP 6.8
As 11
4-5 DIMP 0.29
0-1 CD
Cr
Cu
DLDRN
Pb
Zn
4-5 Zn
0
100
200
300
400


nch #10
6-7 DIMP 2
Cu 39
Zn 110
10-11 DIMP 2
12DCE 6.0
As 5.5
Hg 0.91
TRCLE 5.3
3340
0-1 As 11
Hg 0.35
Dieldrin 1
Chlordane 40
4-5 BIL
8-10 DIMP 2
3061
0-1 Zn 70
Pb 29
As 6.7
4-5 BIL
3341
0-1 Zn 60
4-5 BIL
CLDAN 2.7
As 7.1
Hg 0.10
4-5 BIL
nch #14
3059
0-1 As 7.9
Pb 27
Hg 0.15
Chlordane 70
4-5 DIMP 0.9
99
mpled
0-1 Chlordane 1
4-5 BIL
9-10 BIL
13-14 Hg 0.072
3339
0-1 Dieldrin 0.046
Endrin 0.013
CLDAN >0.21
Hg 0.082
4-5 Dieldrin 0.003
3648
3650
0-1 Dieldrin 0.003
4-5 Hg 0.056
3654
4-5 Hg 1.0
CLDAN >0.44
9-10 Hg 0.10
DIMP 0.49
DBCP 0.011
Cr 20
Zn 64
0.0 TRCLE 3.9
8.0 112TCE 0.75
12DCE 5.0
As 28
As 17
Hg 12
Hg 34
TCLEE 0.52
TRCLE 18
3656
0-1 Aldrin 0.004
Dieldrin 0.033
Endrin 0.019
PPDDT 0.030
CLDAN 2.0
DIMP 6.8
As 11
4-5 DIMP 0.29
15
36-17S
36190
0-1 CD 1.5
Cr 10
Cu 9.9
DLDRN 1.7
Pb 27
Zn 42
4-5 Zn 28
3651
0-1 Dieldrin 0.011
4-5 BIL
11
N
200
300
400


Hg 0.10
7-8 BIL
11-12 As 9.4
Cu 31
Zn 65
3062
0-1 BIL
4-5 BIL
7-8 Cu 21
As 9.6
11-12 Cu 25
Zn 62
As 7.0
3636
0-1 Cu 25
Zn 67
Hg 0.22
9-10 Hg 0.19


3060
0-1 BIL
4-5 BIL

12

Legend

Phase I Boring — Site Investigated

Phase II Boring — Phase II Pit Boring

Sample Interval (ft) — 0-1 | Hg 0.17 – Level (ug/g)
4-5 | PPDDE 0.0098 — *Analytes detected by different method in Phase II – See text*
7-8 — Bedrock sample

BIL - Below Indicator Level

\> Quantitative Concentration was not Achieved Due to Dilution Constraints.

7-8 (GS) Depth of Grab Sample

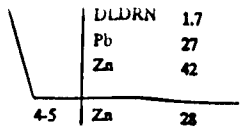
Suspected Disposal Areas A through H Based on Geophysical Exploration Results and Aerial Photography

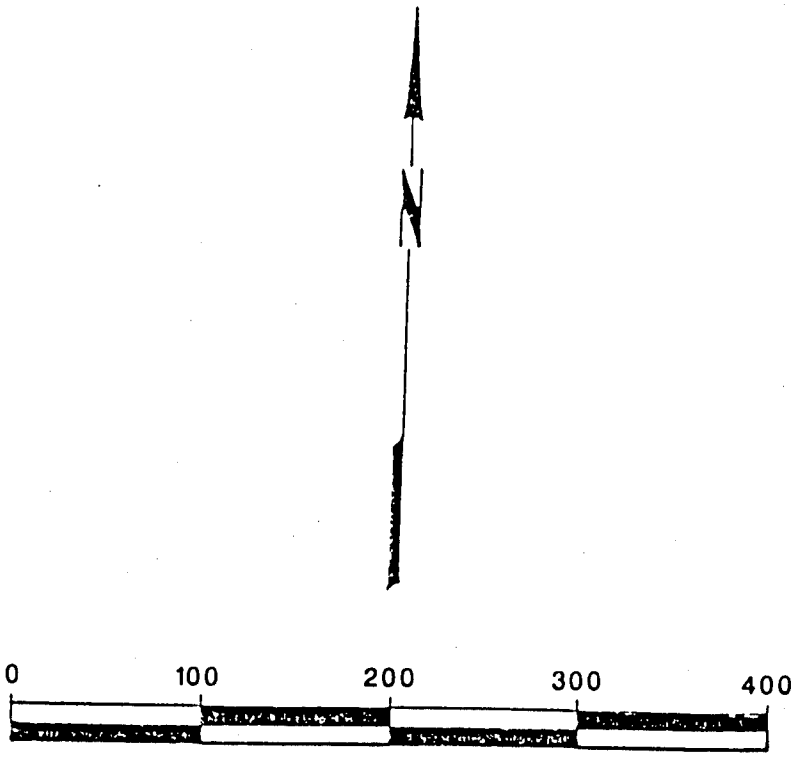
3530/3736 Phase II Boring with False Lewisite Detection / Redrilled Phase II Boring
Chemical Results not Available

Soil Sample from 1989 Field Investigation for IRA Alternatives Assessment

SOURCE: ESE 1988b.(Figure 36-17-11-2)
WCC 1989b

13





TO APPROXIMATE SCALE

Prepared for:
U.S. Army Program Manager's Office
For Rocky Mountain Arsenal

(14)

SOIL SAMPLING RESULTS FROM PREVIOUS INVESTIGATIONS OF SITE 36-17N

Figure B-1