CONCEPTUAL PROGRAM PLAN FOR RI/FS AT THE IAAP

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Draft Final

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SECTION 1
INTRODUCTION

1.1 BACKGROUND

In September 1990, the U.S. Environmental Protection Agency (EPA) and the U.S. Department of the Army signed a federal facility agreement (FFA) pursuant to Section 120 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) relative to the Iowa Army Ammunition Plant (IAAP).[1] After the FFA underwent public comment, it became effective on 10 December 1990. This agreement, also called an interagency agreement (IAG), required that a remedial investigation (RI) be performed to determine the nature and extent of the threat to public health and the environment caused by the release of hazardous substances at IAAP. The agreement also required that a feasibility study (FS) be performed to identify, evaluate and select alternatives for remedial action to mitigate environmental and health hazards at IAAP.

Also required by the FFA, is a Conceptual Program Plan (CPP) that is intended to define the major sequence of events and provide a general approach for completing these activities. This document comprises the CPP. It has been prepared following the EPA guidance.[2] Where it is possible, specific details are provided.

To date, 43 sites of known or suspected contamination have been identified at IAAP, 30 of which are listed as solid waste management units (SWMUs) in the FFA. The sites are as follows:

1. Line 1
2. Line 2
3. Line 3
4. Line 3A
5. Lines 4A & 4B
6. Lines 5A & 5B
7. Line 6
8. Line 7
9. Line 8
10. Line 9
11. Line 80/Pink water lagoon (red water pond)
12. Explosive disposal area (open burning area)
13. Incendiary disposal area
14. Boxcar unloading area
15. Old fly ash waste pile
16. Former wastewater impoundment (line 1 lagoon)
17. Pesticide pit
18. Possible demolition site
19. Contaminated clothing laundry
20. Inert disposal area (blue sludge lagoon)
21. Demolition area
22. Oil-based waste site
23. Deactivation furnace
24. Contaminated waste processor

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[1] FFA under CERCLA Section 120, In the Matter of U.S. Department of the Army, Middletown, IA, Administrative Docket No. VII-F-90-0029, September 1990.

[2] Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, EPA/540/G-89/004, OSWER Directive 9355.3-01, October 1988.

25. Explosive waste incinerator
26. Sewage plant/sludge beds
27. Fly ash landfill
28. Construction debris landfill
29. Line 3A sewage plant/sludge beds
30. Firing site area (test fire area)
31. Yard B ammunition box chipper disposal pit
32. Burn cages
33. Burn cage ash landfill
34. West burn pads
35. West burn pads landfill
36. North burn pads
37. North burn pads landfill
38. Building 600-86 septic system
39. Fire training pit
40. Roundhouse transformer storage
41. Line 3A pond
42. Abandoned coal storage
43. Fly ash disposal area

1.2 PREVIOUS INVESTIGATIONS AND RESPONSE ACTIONS

The IAAP has been the site of numerous investigations in recent years. These investigations are listed below:

- Aquatic Field Survey, 1976.
- Installation Assessment, 1978.
- Aerial Color Infrared Photography Interpretation, 1979.
- Contamination Survey (entire site 1981).
- Remedial Investigation, 1981-1982.
- Underground Pollution Investigation (pink water lagoon, Line 800 evaporation pond and Line 6 leach beds), 1980-1981.
- Follow-on Remedial Investigation, 1983-1984.
- Hazardous Waste Special Study (explosives disposal & demolition areas), 1984.
- Sampling of all groundwater wells and selected surface water sites, 1985.
- Off-Post Sampling, 1985.
- Confirmatory Survey of Line 1, Line 800, firing site area, perimeter wells, Long Lake and impoundment, 1985-1986.
- Sampling of groundwater and surface water (limited sites), 1987.
- RCRA Facility Assessment, 1987.
- Groundwater Quality Assessment (inert landfill and Line 6), 1989.
- RCRA Part B Hazardous Waste Permit Inventory.
- Feasibility Study and Endangerment Assessment (former Line 1 impoundment and Line 800 pink water lagoon), 1985-1989.
- Contamination Assessment (service station petroleum leak site), 1989-1990.

These studies will be described in more detail in Section 3.

There have been several remedial actions at IAAP:

- Blue sludge from the Line 3 wastewater treatment plant and from Line 800 was excavated in 1984 and relocated to a drying bed. The excavation was backfilled and capped with clay. While the blue sludge was determined to be nonhazardous within the context of EPA regulations, it was found to have elevated chromium and copper levels and was therefore isolated as a precautionary measure.

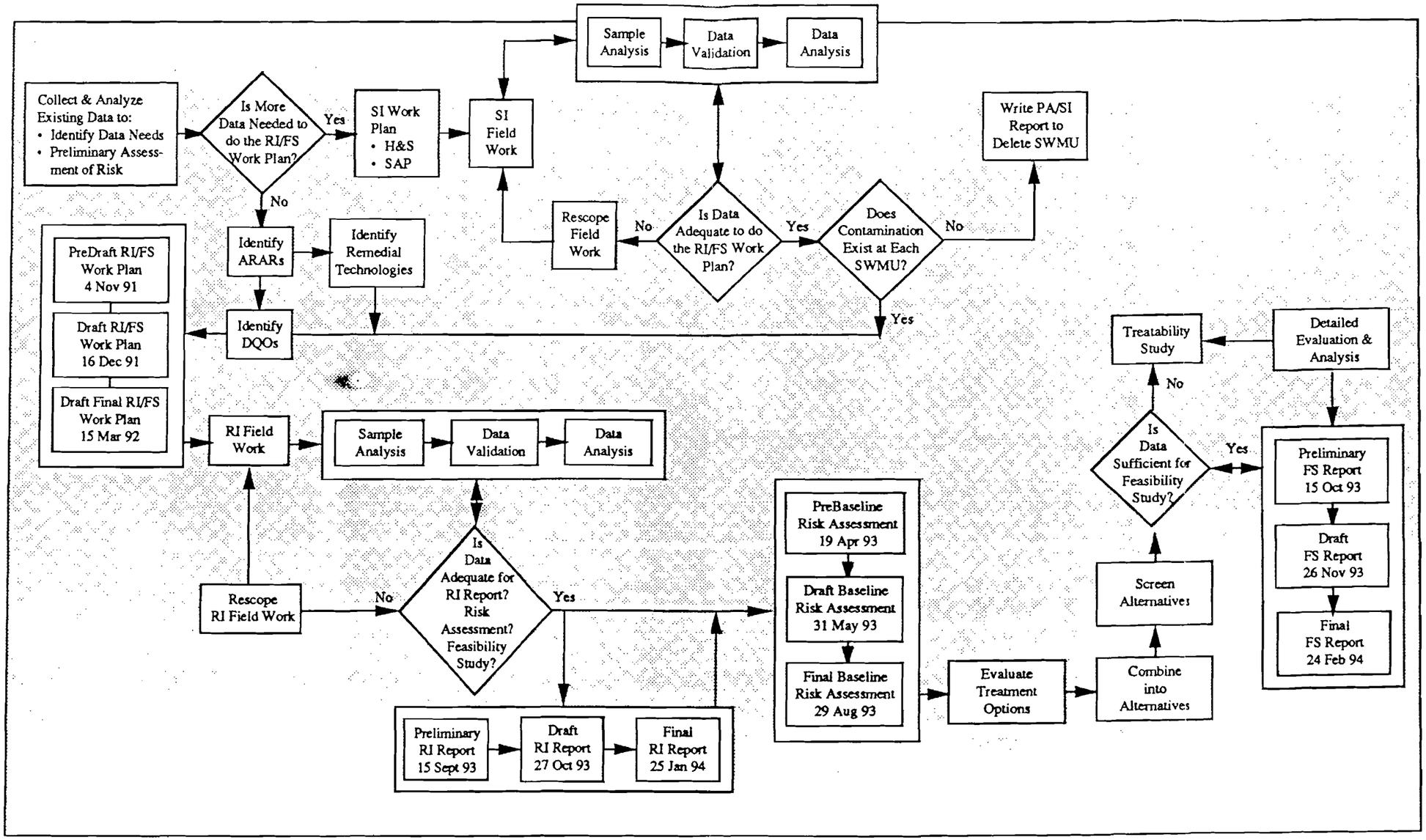
- Also in 1984, the crushed limestone filter beds associated with the Line 6 lead azide treatment sumps were removed. Similarly, the Line 6 drainage ditches were excavated.
- Trench No. 5 of the Inert Landfill underwent a closure operation. This trench had accepted ash from the contaminated waste processor, explosive waste incinerator and the open burning grounds. Twelve inches of final cover was placed, compacted, and graded.

In addition to the preceding remedial actions, there have been a number of underground storage tank removals at IAAP, including two within the past year.

1.3 PROGRAM PLAN

Exhibit 1-1 is a detailed display of the program plan that will occur at IAAP beginning with the preliminary assessment and continuing through the site investigation (SI) and the remedial investigation/feasibility study (RI/FS).

Exhibit 1-1. Program Plan for IAAP



SECTION 2
IDENTIFICATION OF NECESSARY REMOVAL RESPONSES

As of the writing of the CPP, no evidence has been found that would support a recommendation for any immediate or emergency removal actions. Representatives of USATHAMA and its environmental consultants have visually inspected the sites on at least two recent occasions. Environmental files from the following locations have been reviewed at a level of detail sufficient to determine relevance to the project:

- USATHAMA, Edgewood, MD;
- U.S. Army files at IAAP, Burlington, IA; and,
- Mason and Hanger-Silas Mason Company (operating contractor of the IAAP) Burlington, IA.

If, upon more detailed review of the relevant files, information is encountered that would support a recommendation for immediate remedial action, it will be brought to the immediate attention of the Army and documented in subsequent drafts of this CPP. Moreover, timeframes associated with the recommended actions will be addressed and will be commensurate with the degree of severity of the hazard.

SECTION 3
SUMMARY OF PREVIOUS INVESTIGATIONS

3.1 SAMPLING RESULTS AND DATA TRENDS

As indicated in Section 1.2, there has been an extensive amount of environmental investigation at IAAP. The key studies are summarized at Exhibit 3-1 and discussed in detail below.

Exhibit 3-1. Key Historical Studies at IAAP

INVESTIGATION	TIMEFRAME	APPLICABLE SITES OR AREAS
Aquatic Field Survey	1975	Brush Creek, Spring Creek
Installation Assessment	1978	Plantwide
Aerial Color Infrared Photographic Survey	1979	Plantwide
Contamination Survey	02-10/81	Long Creek, Brush Creek, Spring Creek, Demolition Area, Yard K, Line 800 Pink Water Lagoon, Souther Plant Boundary
Underground Pollution Investigation	10/80-10/81	Former Line 1 Impoundment, Line 6 Lead Azide Treatment Sumps, Line 4A Evaporation Spray Lagoon
Follow-on Contamination Survey	1983	Brush Creek, Spring Creek, Line 800 Pink Water Lagoon, Line 1 Impoundment
Midwest Site Confirmation Survey	09-10/85	Brush Creek, Spring Creek, Long Creek, Mathes Lake
RCRA Facility Assessment	1986	Pesticide Pit, Boxcar Unloading Area, Line 4, Line 6, Explosives Disposal Area, Flyash Landfill
Confirmatory Sampling of Selected Groundwater & Surface Water Sites	06/87	Brush Creek, Spring Creek, Long Creek, Mathes Lake, Demolition Area
Groundwater Quality Assessment	1988	Inert Landfill, Line 6
Petroleum Creek/Spill Area Assessment	1988-1989	Petroleum Leak/Spill Area
Endangerment Assessment/ Feasibility Study	08/89	Former Line 1 Impoundment, Line 800 Pink Water Lagoon

In 1975, Environmental Control Technology Corporation conducted two aquatic field surveys at IAAP -- the first in June and the second in October.[3] The purpose of the surveys was to determine the biological and chemical impacts of discharges from the facility. Brush Creek was the primary area of study since it received the greatest volume of treated wastewater discharge. Eight sampling stations were established on Brush Creek and two on Spring Creek, the latter stations representing an attempt to determine possible impacts from the explosives disposal area. Seven process outfalls were also monitored during the surveys. Water and sediment samples were analyzed for nutrients, minerals, heavy metals, and explosive-related compounds.

It was found that industrial discharges were affecting water quality in Brush Creek as evidenced by dissolved solids and nutrients. Boiler blowdown water and sewage treatment plant effluent were judged to be the chief contributors to these contaminant observations. Low levels of TNT and its transformation products were observed in water and sediment samples from all except one station in Brush Creek.

An installation assessment of IAAP was conducted by the USATHAMA in 1978.[4] This study involved personnel interviews and a review of records of various government agencies. Its purpose was to evaluate the use, storage, treatment, and disposal of toxic and hazardous materials at the plant to define any conditions that may adversely affect health and welfare or result in environmental degradation.

The installation assessment found no evidence of off-site migration of contamination in surface water quality data. However, it identified three areas of known or possible contamination within the IAAP boundary:

- Line 800 pink water lagoon (TNT and heavy metals contamination in subsurface soil);
- Former Line 1 pink water impoundment (wastewater contamination of Brush Creek stream banks); and,
- Possible off-site groundwater contamination by explosives and associated wastes through unknown mechanisms).

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3 Aquatic Field Surveys at Iowa, Radford, and Joliet Army Ammunition Plants, Volume 1-Iowa Army Ammunition Plant, Contract No. DAMD-17-75-C-5046, Environmental Control Technology Corporation, Final Report, November 1976.

4 Installation Assessment of Iowa Army Ammunition Plant, Report No. 127 U.S. Army Toxic and Hazardous Materials Agency, January 1980.

The findings of this study were as follows:

- Migration of contaminants from the pesticide pit has been observed outside of the fence surrounding the pit.
- A former sulfuric acid disposal pit was identified south of Line 3A near water tower 3A-145.
- Two former demolition areas were identified near the installation's southern boundary, along Augusta Road--one east of the pistol range and the other south of Yard D. There is the potential for contamination by TNT, Composition B, Composition C and white phosphorus.
- Although the inert disposal area has not shown any evidence of contamination, there is a period (early World War II years) for which no information is available as to materials that were buried.
- Resolution is needed of the conflict between limited geological data tending to refute likely migration, and documentation that migration of contamination has occurred.
- There is a need for more information on the groundwater at IAAP, especially near potential sources of contamination and at the boundaries of the installation.
- A follow-on USATHAMA survey was recommended to better define contaminants that may be migrating from the installation.
- A recommendation was made that IAAP expand its water quality monitoring program, especially where streams exit the facility.

In August and September 1979, Rome Research Corporation performed an aerial color infrared photography interpretation study at IAAP.[5] The purpose of this study was to locate signs of vegetation stress attributable to present or past disposal activities.

Nine sites containing stressed vegetation were identified. Field visits were conducted in September 1979 to confirm the imagery interpretation. Three stressed areas were attributed to trees affected with Dutch Elm disease; two areas were attributed to the fact that some trees were stressed or dead due to old age, but that younger growth was thriving; and, the following four areas are believed to have been stressed by toxic materials:

- North end of explosives disposal area;
- Area between Lines 2 and 3, south of Oliver Road;
- Flyash pile in the vicinity of sewage treatment plant; and,
- Small cemetery between Yards E and G near the southern boundary of the installation.

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5 Aerial Color Infrared Photography Interpretation, Iowa Army Ammunition Plant, Contract No. DAAK11-78-C-0137, Rome Research Corporation.

It should be noted that the aerial photography program covered the entire installation, except for a small area where flight overlap was not achieved. It would be prudent to visually survey this missed area for signs of vegetative stress.

From February through October 1981, Environmental Research Group, Inc. conducted a preliminary contamination survey of IAAP.[6] The survey consisted of installing monitoring wells, collecting groundwater, surface water, sediment and soil samples, and analyzing these samples for selected explosives, nutrients, organics, heavy metals, PCBs and pesticides. The contamination survey was viewed as a baseline study to identify areas of concern/future investigation. It examined the following areas: Long Creek, Brush Creek and Spring Creek watersheds, demolition area, Storage Yard K, southern facility boundary, and the Line 800 pink water lagoon.

Study sites were chosen by USATHAMA based on information from previous investigations. The sites consisted of 31 groundwater wells, 15 soil sampling locations, and 20 sites for collection of surface water and sediment samples. Sample sites were concentrated around the explosives disposal area, Line 800 pink water lagoon, demolition area, Line 1 and inert disposal area, as well as the property boundary and stream locations.

The following conclusions or recommendations resulted from the study:

- Exceptionally high barium levels were found in all groundwater and surface water samples, even those upgradient from probable sources of contamination. There are no known barium ore deposits in the region that could account for the elevated barium level in every sample. While it is known that barium nitrate was used at the installation, it is difficult to explain the levels found in areas with no apparent pathways from probable sources. Accordingly, further investigation into these observations is recommended.
- The method specified by USATHAMA for analyzing soil and sediment samples for sulfates was found to be unreliable; therefore, the analytical results for sulfates are considered to be unacceptable.
- In the Long Creek watershed, elevated lead concentrations were found in two soil samples; however, it is believed that the lead may have migrated into the facility from outside sources.
- Contaminants from the facility are not migrating off site via the Long Creek watershed.
- No contamination was found in the demolition area, Storage Yard K, or along the southern boundary of IAAP.

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6 Iowa Army Ammunition Plant Contamination Report, Contract No. AAA09-78-C-3008, Environmental Research Group, Final Report, 17 September 1982.

- The explosives disposal area, located along Spring Creek, appears to be contaminating the creek with RDX and 2,4,6-TNT. However, groundwater flow from this area does not appear to be a migration pathway.
- TNT and RDX were found in surface water samples in the Brush Creek watershed (excluding those sites associated with the Line 800 pink water lagoon). Trace amounts of 2,4,6-TNT were found in sediments along Brush Creek. These measurements may be attributable to an NPDES-permitted discharge into the creek. There was a high concentration of RDX in one of the groundwater samples in this watershed, possibly the result of activities at the former Line 1 impoundment. It may be that contaminated groundwater is seeping into Brush Creek.
- Explosives-contaminated sediments remain at the former Line 1 impoundment that are subject to erosion and scour which could release explosives contaminants into the creek.
- In the area of the Line 800 pink water lagoon, very high levels of RDX and high levels of 2,4,6-TNT were found in three wells. However, there is no evidence that the contamination is migrating off the facility via the groundwater.

An underground pollution investigation was conducted by SCS Engineers between October 1980 and October 1981.[7] This study examined groundwater and surface water quality in the area of the former Line 1 pink water lagoon and groundwater quality in the areas surrounding the detonator Line 6 lead azide treatment sumps/leach beds and the Line 4A evaporation spray lagoon. Four monitoring wells and six soil borings were located at the pink water lagoon. Four monitoring wells and 14 soil borings were located at the Line 6 treatment area. Five monitoring wells were located in the five borings made at the Line 6 treatment area. Five monitoring wells were located in the five borings at the Line 4A evaporation lagoon.

Surface water samples were collected in Brush Creek upstream and downstream of the pink water lagoon. Sediment samples and effluent samples were collected from the pink water lagoon and the Line 6 treatment sumps. These samples were analyzed for RCRA hazardous waste criteria-ignitability, corrosivity, reactivity, and extraction procedure toxicity. Groundwater samples were taken at all three study areas.

The study produced the following recommendations or conclusions:

- Additional study should be conducted to determine the extent of explosive-contaminated sediments in Brush Creek resulting from the former Line 1 pink water impoundment. Further, the creek valley should be investigated for deposits of eroded, contaminated sediments.

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7 Underground Pollution Investigation at Iowa Army Ammunition Plant, Burlington, IA, Contract No. DACA87-80-C-0333, SCS Engineers, Final Report, 22 February 1982.

- Subsurface water contamination has not occurred at former Line 1 pink water impoundment or Line 6 treatment areas, nor is contamination of water supply aquifers likely.
- Potential exists for surface water contamination at those two areas. Surfacial soil samples should be taken in the drainageways downgradient from the Line 6 treatment area. Migration pathways should be identified.
- Additional study of the Line 6 treatment area should be conducted to determine the presence or absence of heavy metals-contaminated soil surrounding the leach beds.
- Contaminants of concern in the Line 4A evaporation lagoon groundwater samples were all below EPA groundwater quality criteria.

A follow-on study of the 1981 Contamination Survey was conducted by Battelle Project Management Division in late 1983.[8] This study focused on:

- Quantifying the groundwater contamination by explosives near the Line 800 pink water lagoon.
- Defining the groundwater flow regime around the pink water lagoon and establishing the relationship between groundwater and the Brush Creek drainage system.
- Determining whether explosives contamination exists within Spring Creek and in groundwater at the facility boundary within the Spring Creek watershed.
- Quantifying the extent of explosives contamination in sediments at the former Line 1 impoundment on Brush Creek.

The follow-on study included the installation of four shallow and four deep monitoring wells around the Line 800 pink water lagoon, sampling of sediment from the Line 800 pink water lagoon and the former Line 1 impoundment, sampling of groundwater and surface water within the Brush Creek and Spring Creek watersheds, and visual reconnaissance of the Brush Creek area (for signs of interaction between the creek and groundwater).

Findings of the follow-on study were as follows:

- Based on three surface water samples and one boundary groundwater sample, no explosives contamination was found in the Spring Creek watershed.
- Soils and sediments within the Line 800 pink water lagoon are contaminated with explosives and their related compounds, as well as with heavy metals. However, the horizontal and vertical extent of contamination in the northeast end of the lagoon could not be determined from available data. In the southwest end, data indicate vertical migration. The follow-on study examined only a five-foot depth for soil

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8 Follow-on Study of Contamination at the IAAP, Report No. DRXTH-AS-CR-84297, Battelle Project Management Division, Final Report, 29 August 1984.

and sediment samples; further examination is recommended to determine the true extent of vertical contamination.

- High levels of RDX and other explosives (in excess of human health criteria) were observed in shallow wells near the pink water lagoon. It was suggested that leaching of explosives-contaminated sediments into groundwater is occurring.
- Direction of contaminant migration in groundwater from the pink water lagoon needs to be determined. Three different directions have been identified as likely pathways.
- RDX was found in one bedrock well west of the pink water lagoon. It is uncertain whether this resulted from migration (in a direction opposite the expected flow direction), contamination of the well during drilling and sampling, or by some other means. The data were inconclusive as to contaminant migration in the bedrock aquifer near the pink water lagoon. It was recommended that all wells around the pink water lagoon be resampled during periods of high and low water levels.
- Interaction between groundwater and surface water at Brush Creek could not be determined quantitatively.
- 2,4,6-TNT, RDX, other explosives and metals exist in sediment in the former Line 1 impoundment.
- RDX is migrating from the site in Brush Creek, although in concentrations well below the fresh water aquatic life criterion. It is likely that significant input of RDX into Brush Creek is occurring at the former Line 1 impoundment.
- Shallow groundwater in the Brush Creek drainage system has also been contaminated with RDX from sediments in the former Line 1 impoundment. Contamination at levels above human health criteria was found at a well some distance from the impoundment while two wells close to the impoundment were uncontaminated. The pathway for the observed contamination is not known.
- Additional study is required to define the impact of current surface water discharges on contamination in the Brush Creek watershed.

In September and October 1985, Dames and Moore conducted a study of potential groundwater migration off site.[9] In this study, called the Midwest Site Confirmatory Survey, 65 groundwater and 19 surface water samples were collected from six areas within IAAP, including Brush, Spring, and Long Creeks and Mathes Lake.

The primary area of concern was found to be the Line 800 pink water lagoon, where elevated levels of explosives and chloroform were found in groundwater samples. High chloroform levels were found in groundwater samples in the demolition area. High levels of explosives and chloroform were found in groundwater samples in the explosives disposal area.

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9 Midwest Site Confirmatory Survey, IAAP, Contract # DAAK-11-44-D0002, Dames and Moore, August 1986.

Additionally, methylene chloride was found in two wells, and hexavalent chromium, explosives, chloroform and methylene chloride were found in surface water samples.

In 1986, under contract to EPA, Ecology and Environment, Inc. conducted an RFA at IAAP.[10] Limited sampling was performed at sites selected by EPA. The RFA examined active and former hazardous waste treatment, storage and disposal facilities.

The following numbers of samples were taken: soil-17, sediment-7, groundwater-9, surface water-1, and petroleum waste-1. The sites sampled were the pesticide pit, boxcar unloading area, Lines 4 and 6, explosives disposal area, and flyash landfill. Results of the sampling program were:

- Soil and sediment samples at Line 6 contained very high concentrations of barium, lead and zinc. Both here and at the open burning area, high metals concentrations were found upgradient and downgradient of the source.
- Groundwater samples at Lines 4 and 6 contained significant levels of heavy metals, as did the surface water sample at Line 4 spray evaporation pond.
- The open burning pit (in the explosives disposal area) showed very high levels of explosives in soil samples.
- Heavy metal concentrations upgradient and downgradient of the open burning pit were high, with barium levels being exceptionally high.
- At the boxcar unloading area, high metal and organic levels were measured.
- The soil sample at the flyash landfill had elevated metal concentrations.
- Soil and sediment samples from the pesticide pit showed significant pesticide levels downgradient. No groundwater data were available directly downgradient of the pit.

The RFA produced the following conclusions and recommendations.

- High concentrations of heavy metals, especially barium, present the most persistent problem, although the barium source has not been identified. High concentrations upgradient of potential sources suggest that there may be multiple pathways, which are not necessarily related to groundwater flow.
- Factors such as high solubility and rapid degradation of explosives may indicate the need for additional monitoring of soils and surface water near areas of explosives disposal.
- Air sampling during incineration and open burning may provide information on the distribution of barium.

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10 RCRA Facility Assessment, IAAP, Contract No. 68-01-7251, Ecology and Environment, Inc., Final Report, 28 September 1987.

- The lack of a continual and complete set of soil, surface water and groundwater sampling data are inhibiting a comprehensive evaluation of contaminant migration.
- Additional sampling to determine the existence of past or present releases is recommended for: pesticide pit (soil, groundwater), flyash landfill (sediment, surface water), incendiary disposal area (type of materials buried), explosives disposal area (soil, sediment), Line 4A (groundwater), Line 6 (soil, sediment, groundwater), demolition area (soil, sediment), firing site (soil, sediment), possible demolition site (soil, sediment), inert disposal area (sediment, groundwater[11]), petroleum spill area.

In June 1987, Environmental Science and Engineering performed confirmatory sampling of 17 monitoring wells and five surface water sites.[12] The purpose of this study was to better document the presence or absence of chloroform and methylene chloride found in an earlier survey, the Midwest Site Confirmatory Survey conducted by Dames and Moore in 1985.

One groundwater sample from the demolition area was found to contain an elevated level of chloroform. No methylene chloride was detected in any of the samples. However, some samples were found to contain a nontarget compound -- 1,1,2-trichloro-1,2,2-trifluroethane -- although the quantities could not be determined.

In 1988, Terracon Consultants conducted a groundwater quality assessment[13] at the inert landfill and Line 6 areas to evaluate the potential for contamination of groundwater by those activities. Nine wells were installed at the inert landfill and 27 wells at Line 6. Soil properties and aquifer characteristics were determined in addition to the analysis of groundwater samples.

Synthetic organic compounds were detected in three wells upgradient from the inert landfill. Arsenic was found in two wells at the inert landfill. Cyanide was found in a bedrock well at Line 6.

It was recommended that additional testing be performed at the inert landfill -- collecting soil samples for vertical permeability analysis, installing two shallow groundwater wells, and monitoring them along with the three wells where synthetic organic compounds were detected. It was also recommended that well T30 at Line 6 be resampled and analyzed for cyanide.

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11 New well locations are recommended since Wells C-6 and G-7 are not properly placed for detection of releases.

12 Confirmatory Sampling of Selected Groundwater and Surface Water Sites, IAAP (exact title unknown), Environmental Science and Engineering, Inc., Final Report, October 1987.

13 Groundwater Quality Assessment, Inert Landfill and Line 6 Areas, IAAP, Terracon Consultants, Inc., Final Report, December 1989.

In November 1988, PACE Laboratories conducted a soil gas analysis at the petroleum leak/spill area. This assessment arose from the finding of contamination during excavation of three underground storage tanks at a service station in the north-central portion of the facility. During the course of the assessment, the excavation was expanded and it was discovered that two gasoline tanks, which were previously removed, had been located in the immediate area of the excavation.

Soil gas analyses indicated very high levels of organic vapors. Groundwater seeping into the excavation had a noticeable gasoline sheen on the surface. A soil gas plume of hydrocarbons approximately 100-feet wide extends 100-200 feet south of the excavated area. It was suggested that the soil gas concentrations may have been indicative of free product in the soil or floating on the water table.

Further soil and groundwater investigation was conducted by Dames and Moore in 1989 to determine the extent of hydrocarbon contamination.[14] This study led to the following conclusions:

- Shallow groundwater contamination is horizontally confined to the immediate area of the source (no more than 50 feet from the excavation boundary). Vertical contamination is almost entirely limited to the shallow groundwater table.
- Contaminated groundwater has not reached the deep portions of the glacial till.
- Soil contamination is similarly limited horizontally and vertically to the immediate vicinity of the source.
- Soil gas testing indicated gaseous hydrocarbons over an area slightly larger than the area of soil and groundwater contamination.
- Contamination of surface water and sediments was not found at the nearest downgradient stream.
- Potential health and environmental risks were considered to be negligible because groundwater in the area is not a source of drinking water and because contaminated soils are isolated from human activity.
- No additional remedial action was recommended. However, periodic soil gas monitoring was recommended to check for accumulation. Additional groundwater monitoring was recommended to confirm the downward hydraulic gradient and to check for hydrocarbons and lead.

In August 1989, Dames and Moore prepared a feasibility study[15] to evaluate remedial alternatives at two IAAP sites--the former Line 1 impoundment and the Line 800 pink water

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14 Petroleum Leak/Spill Area, IAAP, Contract No. DAAA15-85-D-0008, Dames and Moore, Final Assessment Report, March 1990.

15 Endangerment Assessment/Feasibility Study, IAAP: Former Line 1 Impoundment and Line 800 Pink Water Lagoon, Contract No. DAAA15-85-D-0016, Dames and Moore, Draft Final Report, July-August 1989.

lagoon. This study was based on data collected during numerous investigations between 1980 and 1987. Target risk levels of 10^{-4}, 10^{-5} and 10^{-6} were used in assessing the need for remediation. Contaminants of concern were RDX in soil/sediment at the former Line 1 impoundment and RDX and 2,6-DNT in groundwater at the Line 800 pink water lagoon.

At the 10^{-4} risk level, no remediation was found to be necessary at either site, although groundwater monitoring at Line 800 and surface water monitoring at Line 1 were recommended. At the more stringent risk levels, some degree of remediation would be necessary for the indicated materials at both sites. Further, although soils and surface water in the Line 800 lagoon did not represent health risks at the 10^{-5} and 10^{-6} levels, their remediation would be necessary to effect the remediation of the groundwater.

Sixteen technologies were identified as suitable for remedial action at the two sites. Combinations of these technologies were evaluated; the recommended alternative for the 10^{-6} risk level was excavation and removal of soil/sediment from the Line 1 impoundment and placement into the dewatered Line 800 pink water lagoon, with final capping of the entire area. Also, groundwater in the bedrock aquifer would be pumped and treated. For the 10^{-5} risk level, the approach would be the same except that the quantity of material requiring remediation would be smaller.

An endangerment assessment conducted by Dames and Moore in conjunction with the feasibility study identified a number of major pathways for human exposure to contaminants released from the former Line 1 impoundment and the Line 800 pink water lagoon:

Former Line 1 Impoundment

- Consumption of deer that drink contaminated water and feed on vegetation growing in areas of contaminated soil;
- Consumption of beef and dairy products from cattle that drink water from Brush Creek;
- Dermal contact with surface water by children with access to Brush Creek south of the IAAP boundary; and,
- Dermal contact with sediments by children with access to Brush Creek south of the IAAP boundary.

Line 800 Pink Water Lagoon

- Consumption of deer that drink contaminated water and feed on vegetation growing in areas of contaminated soil; and,
- Inhalation of dust by IAAP maintenance personnel.

Consumption of groundwater from future wells installed outside of IAAP property along Brush Creek represents an additional pathway from both sites.

3.2 MIGRATION PATHWAYS

Migration pathways at the installation can be characterized as detailed below.

3.2.1 Groundwater

Surface aquifers have low hydraulic conductivities which would tend to indicate slow vertical migration of contaminants and moderate to slow horizontal migration. Data relating to the lithologic nature of bedrock aquifers immediately below the unconsolidated soils/sediments are not conclusive. It is likely that the primary route of contamination of the bedrock aquifers is through recharge at outcroppings. Entry through soil can also occur by way of shrinkage cracks, root holes and piping. Groundwater flow in the limestone aquifer is predominantly in a southerly/ southeasterly direction. Water supply wells south or southeast of IAAP could be receptors of groundwater contaminants.

Potential sources of groundwater contamination identified by the RFA are the Line 4A spray evaporation pond (metals), Line 6 (explosives), former Line 1 impoundment (explosives), Line 800 pink water lagoon (explosives), inert disposal area (increased specific conductivity and decreased pH), and explosives disposal area (explosives).

3.2.2 Surface Water

Surface water flows from the installation in Spring Creek, Brush Creek and Long Creek. A small portion of the site drains into Skunk River, which flows south of IAAP. The potential for surface water contamination fluctuates with the amount of precipitation.

The Long Creek watershed includes the inert disposal area, laundry, firing site, possible demolition site and petroleum spill site. Elevated lead concentrations were found in soil and sediment samples in this watershed.

The Spring Creek watershed includes the explosive waste incinerator, contaminated waste processor, explosives disposal area and incendiary disposal area. RDX was found in surface water at the southeast property boundary in Spring Creek. Since ash is drummed at the explosive waste incinerator and contaminated waste processor, those areas are not considered likely sources of surface water contamination.

The Brush Creek watershed includes the old flyash landfill, former Line 1 impoundment, Line 800 pink water lagoon, pesticide pit and Lines 4A and 6. Explosives have been found in surface water and sediments along Brush Creek. The well at the school house, adjacent to the pesticide pit, has reportedly been contaminated with pesticides, although no documentation to that effect has been found. Residual explosives from the Lines 4A and 6 drainage ditches could contribute to surface water contamination. Erosion of the old flyash landfill immediately adjacent to Brush Creek continues to occur. There may be a relationship between the surface water and groundwater in the watershed as evidenced by the fact that shallow well contamination south of the installation was reported to have been corrected by elimination of effluent discharges to Brush Creek from the former Line 1 impoundment.

The Skunk River watershed includes the demolition area, billet splitter, and Storage Building 900-194-8 (the latter two sites are not areas of concern within the scope of the current study). There is potential for surface water contamination by explosives from the demolition area. Although surface water and sediment samples have not been taken in the demolition area, one soil sample contained a detectable level of lead.

3.2.3 Air

The possibility exists for emission of air contaminants as a result of operations at the deactivation furnace, explosive waste incinerator, and contaminated waste processor. Particulate emissions could contain heavy metals. It has been theorized that emissions of volatilized air contaminants released at the open burning pit may have condensed during plume travel and were deposited onto the ground over a wide area.

3.3 SUMMARY

In summary, 12 investigations were performed at IAAP between 1975 and 1989. The areas receiving the most attention during these studies were the former Line 1 impoundment, Line 800 pink water lagoon demolition area, and the Brush Creek, Spring Creek, and Long Creek watersheds.

A consolidation of all of the findings and recommendations of the respective investigations would be beyond the scope of this CPP. It is of interest, however, to highlight some of the salient points raised by these studies:

- There is little evidence of environmental contamination having migrated from the facility. The data supporting this conclusion, however, are limited and generally were collected within the facility boundaries.
- Virtually all of the previous studies recommended further investigation or identified deficiencies in the quantity of available data. It appears that the Army heeded these recommendations as several of the studies were extensions or continuations of earlier work.
- There is a need to better characterize groundwater movement and extent of contamination, explain the presence of unexpected contaminants and contaminants in unexpected locations, define interrelationships between pathways (especially groundwater and surface water) and understand the environmental degradation of known contaminants.
- The following "new" areas of contamination or suspected contamination were identified:
  - Former demolition area south of Yard D along Augusta Road;
  - Former sulfuric acid disposal pit south of Line 3A near water Tower 3A-145; and,
  - Small cemetery between Yards E and G.

  Further investigation of these areas is recommended to determine whether they should be included in the current study.
- A small area of the facility was missed by the infrared aerial photography survey. It should be delineated and visually inspected for signs of vegetation stress.

During the detailed review of data gathered from various Army sources, items such as those outlined above will be identified and addressed.

SECTION 4
FUTURE INVESTIGATIVE ACTIVITIES AND SITE ACTIONS

4.1 INTRODUCTION

This section describes the future investigative activities and site actions that will occur at IAAP. The first investigative activity will be an SI. The purpose of the SI is to conduct limited sampling activities to address all potential areas of contamination. The results of the SI will give an indication of whether the sites should go on to an RI, removal action, or a no further action.

As part of the preparation of the SI and RI Work Plan, previous work that was described in Sections 1-3 will be used to help establish timeframes for major subtasks. Field work will be planned and conducted to obtain data necessary for characterizing individual sites. The analysis and quality control of samples taken in the field will ensure that the precision and accuracy of the data is sufficient for preparing an FS. The site investigations will primarily be reported in the RI/FS Report. After the record of decision (ROD) is made by the EPA, remedial design and construction activities will begin..

4.2 PLANNING

The CPP develops the conceptual structure upon which the detailed plans for each program element will be built. Exhibit 1-1 shows the scheduling and relationship of two major plans, the Site Investigation (SI) Work Plan, and the RI/FS Work Plan.

The SI Work Plan, which consists of the Health and Safety Plan (HSP) and the Sampling and Analysis Plan (SAP) will be drafted, reviewed, and approved prior to initiating the SI Field Work. The concept of the SI HSP is to address, in detail, the procedures and equipment that will be used at IAAP to protect the sampling and drilling crews. The SAP will also address what samples will be taken and the procedures used to reduce and quantify field sampling and laboratory analysis errors. The SI Work Plan addresses the need to obtain sufficient site characterization data during the SI field work to write an RI/FS Work Plan.

The RI/FS Work Plan will be developed based on the information obtained during the SI activities. Data quality objectives (DQOs) be identified and reviewed at least twice prior to incorporation into the RI/FS Work Plan. The RI/FS Work Plan is similar in content to the SI

Work Plan with respect to the health and safety of the samplers and the need for high quality data. However, it is different from the SI Work Plan because it develops a plan for obtaining the detailed data needed to quantify the extent of the contamination and evaluate the technologies that may be used to mitigate the contamination.

4.3 FIELD WORK

The field work will be comprised of two different sampling events. The SI field work will occur in the summer of 1991, and the RI/FS field work will occur in the summer of 1992.

The SI field work will be an execution of the SI Work Plan. Mobilization activities will include: establishing office and lodging accommodations; identifying and procuring office and sampling equipment and vehicle rentals; and, subcontracting with a driller. Drilling will follow the USATHAMA Geotechnical Requirements Manual. Initial planning indicates the need for a sampling crew of 12 people who would be on site for eight weeks. More detailed planning will be documented in the SI Work Plan.

The RI/FS field work will be an execution of the RI/FS Work Plan. Conceptually, mobilization, health and safety, and sampling and analysis will be similar to the SI field work. Initial planning indicates the need for 12 people for 10 weeks. This will be refined as the RI/FS Work Plan is developed.

SI Field Work

There are 43 SWMU investigation sites as IAAP. As a result of the preliminary assessment, one of these sites will be recommended for an RI and will not be sampled during the SI field work. The other 42 sites require SIs.

The SI field work will consist of collecting samples at the 42 sites. Activities include the following collection samples:

- Surface soil;
- Subsurface soil (using a hand auger);
- Surface water; and,
- Groundwater.

No well drilling or soil boring activities are currently planned, although these activities may occur during the RI field work.

Collection methods are either grab samples or composite samples. Grab samples are a single discrete sample of soil over a six inch column at a specified depth; a surface sample, not more than six inches deep; or, a discrete water sample. Composited samples may be the result of combined sampled media from several different locations, or a single location composited to a 12-inch depth from the surface.

Exhibit 4-1 identifies each of the 43 SWMUs at IAAP and shows the number and type of samples to be collected at that site.

The SI Field Sampling Plan gives a detailed description of each site, and specific considerations and analyses categories for each sample. Maps of each site are included that show site layout and sample locations.

RI/FS Work Plan Preparation

The RI/FS Work Plan will be developed using the data and information obtained during the preliminary assessment and SI. The purpose of the RI/FS Work Plan is to establish the sampling data that is required to define each contaminated site with data that meets the established DQOs.

Potentially-contaminated sites will be addressed collectively, though sites with similar contaminants will be grouped when planning the technical approach to the RI/FS.

The endangerment assessment and the FS at the Lines 1 and 800 lagoons was performed under a separate contract, which is no longer in effect. The Army will have to procure a new contract, using the same contractor that performed the original endangerment assessment and FS at these lagoons, to address EPA's comments. If any additional field work is required to address EPA's comments, it will be included as part of the RI field work scheduled for start in April 1992.

Data from the SI report is critical input for the development of the RI/FS Work Plan. Analytical data from the SI field work will indicate which sties and specific locations are contaminated. In order to develop the sampling locations and depths for the RI field work. a detailed examination of the potential pathways that caused the contamination at each site must be conducted. Based on pathway analysis, results of SI sampling and the characteristics of the contaminants, a grid pattern for sampling and well drilling will be established for each contaminated site that will result in the definition and boundaries of the contamination plume. In some cases, such as with some explosives, where the pathways are not well understood, more samples will be planned to be certain of defining the plume and meeting the DQOs.

Exhibit 4-1. Summary of Samples

SWMU	Surface Soil* (scoop)	Subsurface Soil** (auger)	Surface Water	Sediment	Ground Water
1 - Line 1	1	5	1	1	
2 - Line 2	2	4	1	2	
3 - Line 3	5	7	1	1	
4 - Line 3A	10		3	2	
5 - Lines 4A &4B		14	3	1	
6 - Lines 5A & 5B	1	19			
7 - Line 6		12			1
8 - Line 7	3	11	1		
9 - Line 8		8	2	2	
10 - Line 9	7		2		
11 - Line 800		12			
12 - Explosive Disposal Area	2				4
13 - Incendiary Disposal Area			2	2	
14 - Boxcar Unloading Area	3			1	
15 - Old Fly Ash Waste Pile	1	1	3	3	
16 - Former Wastewater Impoundment***					
17 - Pesticide Pit	1				
18 - Possible Demolition Site		3			
19 - Contaminated Clothing Laundry		1		1	
20 - Inert Disposal Area	2	5	4	4	
21 - Demolition Area	2	1	1		5
22 - Unidentified Substance Waste Site		1	1	1	
23 - Deactivation Furnace	1	4			
24 - CWP	1	2	1		

* Number of subsamples is specified in the FSP.
** Depths and numbers of subsamples are specified in the FSP.
*** No samples needed.

Exhibit 4-1. Summary of Samples (Continued)

SWMU	Surface Soil* (scoop)	Subsurface Soil** (auger)	Surface Water	Sediment	Ground Water
25 - Explosive Waste Incinerator	2			1	
26 - Sewage Plant/Sludge Beds	2		2	1	
27 - Fly Ash Landfill	1	2			3
28 - Construction Debris Landfill	3		1		
29 - Line 3A Sewage Plant	2		1		
30 - Test Fire (FS) Area		11	2	1	
31 - Yard B Ammo Box Chipper Pit	1	1			
32 - Burn Cages		2			
33 - Burn Cages Landfill		2			
34 - W. Burn Pads	2	2			
35 - W. Burn Pads Landfill	1	3	3	3	
36 - N. Burn Pads		4	1	1	
37 - N. Burn Pads Landfill		2	3	3	
38 - Building 600-68 Septic System		1			
39 - Fire Training Pit		5			
40 - Roundhouse Transformer Storage Area	2	4			
41 - Line 3A Pond		3			
42 - Abandoned Coal Storage Yard		5	2	2	
43 - Fly Ash Disposal Area	1	3	2	2	

* Number of subsamples is specified in the FSP.
** Depths and numbers of subsamples are specified in the FSP.

Elimination of Solid Waste Management Sites

Historical data from each site will be reviewed and analyzed to identify potential sources of contamination that could have occurred due to previous practices.

Analytical data that was generated from previous investigations will be analyzed with respect to contamination levels, sample location, and analytes.

After review of the above information, each site will be studied to identify the most likely sources and pathways of contamination. After the potential sources and pathways of

contamination are carefully examined, sample locations for the SI field work will be chosen where contamination, if present, is most likely to occur.

If no contamination is present in the SI samples and if the review of historical records and past analytical data indicates no contamination, the SWMU will be recommended for elimination from further investigation.

4.4 ANALYSIS

Samples taken in the field for explosives analysis will be shipped by overnight delivery to Roy F. Weston, Inc. in Lionville, PA for laboratory analysis. Samples taken in the field for all other analyses will be shipped by overnight delivery to DataChem Laboratories in Salt Lake City, UT. The detailed descriptions of the proposed analytical procedures will be written in the SI SAP and later refined in the RI/FS SAP. The procedures required by USATHAMA PAM 11-41, Quality Assurance Program Plan (QAPP), will be followed precisely.

Weston and DataChem will enter data into USATHAMA's Installation Restoration Data Management Information System (IRDMIS). This data will pass a QA/QC check before being entered into the database or used for further analysis. Feedback to the field sampling team will allow more samples to be taken while the teams are in the field, if necessary.

Data validation and analysis will quantify the precision and accuracy of the data before it is analyzed and used as the basis for making decisions concerning the IAAP .

4.5 REPORTING

The IAG identifies 43 SWMUs and establishes the timeframe for completion of tasks. The dates are listed in Appendix A and on Exhibit 1-1. This section will address the SI Work Plan, the Preliminary Assessment/Site Investigation (PA/SI) Reports, the RI/FS Work Plan, the RI Report, and the FS Report.

The IAG does not establish a deliverable date for the SI Work Plan. The need for an SI Work Plan became evident during the collection and analysis of existing data. The timing of the SI Work Plan is critical to completion of the preliminary Draft RI/FS Work Plan, which is due on 4 November 1991. The SI Work Plan must be written, reviewed, and approved in time to do the SI field work in the summer of 1991.

The IAG identifies 43 SWMUs that may not all be contaminated. If the existing data from historical studies shows no history of contamination for a particular SWMU, the concept is to

sample the site adequately to verify whether or not the site is actually contaminated. If the sampling data show no contamination, a PA/SI report will be written for that particular SWMU recommending to EPA that the SWMU be deleted from the IAG.

The RI/FS Work Plan is due to USATHAMA and EPA according to the following schedule.

ACTION	DATE
Preliminary Draft RI Work Plan	04 Nov 91
Draft RI Work Plan	16 Dec 91
Draft Final RI Work Plan	15 Mar 92

The content of this report has already been described. The RI/FS Work Plan will address the remaining SWMUs after those to be eliminated have been removed from consideration. In other words, the RI/FS Work Plan will include only contaminated SWMUs.

The RI Report and the FS Report are due according to the following schedule.

ACTION	DATE
Preliminary Draft RI Report	29 Apr 93*
Draft RI Report	10 June 93
Draft Final RI Report	08 Sep 93
Preliminary Draft FS Report	02 Jun 94*
Draft FS Report	14 Jul 94
Draft Final FS Report	12 Oct 94

* Advance deliverables specific to the Army.

4.6 IDENTIFICATION OF POTENTIAL OPERABLE UNITS

After data from the SI field work is analyzed, identification of potential operable units can begin. An operable unit is defined in 40 CFR 300.6 as the discrete part of the entire response action that decreases a release, threat of release, or pathway of exposure. At present, no operable units have been identified for IAAP. As data are collected during the SI and RI, operable units may be determined and the project schedule will be updated to reflect these designations.

4.7 SEQUENCE OF DESIGN AND CONSTRUCTION ACTIVITIES

In the sequence of events outlined by EPA for conducting a site clean-up on an NPL site, the major design and construction activities occur after an FS has been conducted and an ROD is made by the EPA. For the IAAP, the FS will be completed on 24 February 1994 and a final ROD will be completed on 20 January 1995.

SECTION 5
DETERMINATION OF ARARS

Under Section 121(d)(1) of the CERCLA, as reauthorized in 1986, remedial actions must attain a degree of cleanup that assures protection of human health and the environment. Additionally, CERCLA remedial actions that leave any hazardous substance, pollutant, or contaminant onsite must meet, upon completion of the remedial action, a level or standard of control that at least attains standards, requirements, limitations, or criteria that are "applicable or relevant and appropriate (ARAR)" under the circumstances of the release.

The definition of ARARs is found in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Final Rule, 40 CFR Part 300, 8 March 1990. A preliminary list of the major federal ARARs that may be applicable to IAAP as identified in earlier studies is presented at Appendix B. Development of ARARs will be consistent with agency guidance and Section X.F of the IAG. Specifically,

- Prior to issuance of a draft report, the Project Managers shall meet to identify all ARARs applicable to the report being addressed; and,
- USATHAMA will identify potential state ARARs and contact state and local agencies that are a potential source of ARAR information.

As stated in the IAG, ARARs can only be identified on a site-specific basis and must be re-examined throughout the RI/FS process until an ROD is issued. The input of the IAG Project Managers during formulation of the ARARs will be invaluable.

Data Quality Objectives

DQOs are statements (qualitative and quantitative) developed by data users to specify the quality of the data needed from a particular data collection activity (such as field sampling) that can support decisions or regulatory actions.

For the analytical data originating from the IAAP site investigations, EPA DQO Levels III and IV will be applied. High quality analytical data are also needed to support the selection of the remedial alternative that is selected for remediation. The site's QAPP will contain a detailed discussion of the DQOs for each type of analysis being conducted in both qualitative and

quantitative terms. The QAPP will also identify the type of sampling and analysis system to be used.

Major data uses are as follows:

- Define vertical and lateral extent of contamination and determine affected volumes of both soil and groundwater;
- Develop remedial action alternatives;
- Support the risk assessment; and,
- Develop a site conceptual model for understanding transport of contaminants via groundwater, surface water, and air routes.

For the RI Work Plan, DQOs will be established, according to the EPA Guidance Document on DQOs. The QAPP that will accompany the RI Work Plan will contain a detailed discussion of the DQOs for each type of analysis being conducted in both the qualitative and quantitative terms. The QAPP will also identify the type of sampling and analysis to be used.

SECTION 6
BASELINE RISK ASSESSMENT

Evaluations of environmental and public health risks are incorporated into several stages of the performance of an RI/FS. As part of the RI site characterization, a baseline assessment of risks under existing conditions must be prepared. The risks remaining after implementation of the remedial alternatives under consideration, as well as the risks posed during the remediation process, must be evaluated as part of the FS. Calculated risk estimates, together with ARARs, technological considerations, and other site-specific factors, form the basis for determining cleanup goals and procedures at the site.

The data necessary to conduct the risk assessment will be collected during the SI and RI and risk calculations will be performed on a site by site basis. The collected data will be evaluated to determine if sufficient information is available to perform a baseline risk assessment. The assessment will be prepared in accordance with the Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part A (EPA/540/1-89/002).

6.1 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment will be conducted for both the baseline risks at IAAP under existing conditions and the residual risks remaining after remediation. All potential exposure routes will be considered.

The human risk assessment will include the following factors:

- Estimation of exposure point concentrations of indicator chemicals;
- Estimation of chemical intakes;
- Toxicity assessment; and,
- Risk characterization.

6.2 ENVIRONMENTAL RISK ASSESSMENT

The underlying approach to environmental risk assessment parallels that of human health risk assessment, i.e., estimated exposure levels are compared to selected criteria that represent "safe" levels of exposure. Unfortunately, appropriate criteria levels are frequently unavailable for either the specific ecological system or species of concern at a particular site. As a result,

presentation of the qualitative nature of potential impacts extrapolated from results on similar species or systems is often necessary. As with the human health risk assessment, an environmental risk assessment will be conducted for baseline risks, residual risks remaining after remediation, and risks occurring during remediation. Risk assessment results will contribute to decisions regarding appropriate cleanup measures.

Areas to be covered in the Environmental Risk Assessment will include:

- Hazard identification;
- Exposure evaluation; and,
- Toxicity assessment.

SECTION 7
FEASIBILITY STUDY

The FS process provides a structured means to identify and evaluate remedial alternatives that remedy the human health and/or environmental risks associated with a hazardous waste site. The FS will be conducted in accordance with the requirements of CERCLA; the NCP (National Oil and Hazardous Substances Pollution Contingency Plan); Final Draft "Guidance for Conducting Remedial Investigation and Feasibility Studies Under CERCLA," October 1988; and, other EPA guidance documents.

The FS will be performed in the following phases, consistent with current EPA guidance:

- Identification, development, and screening of remedial action alternatives;
- Refinement of the alternatives and the selection of alternatives for detailed analysis; and,
- Detailed analysis of the remedial alternatives.

Preliminary development and screening of potential remedial action alternatives will be performed early in the assessment process concurrent with the preparation of the RI Work Plan. RI field activities to obtain specific data will be described in detail in the RI Work Plan. Development and screening of the alternatives will be initiated and integrated with the development of operable units as described in Section 4.6. The FS will proceed in a stepwise fashion as follows:

- Develop remedial action objectives;
- Develop general remedial response actions;
- Identify volumes or areas of media to which the response actions can be applied;
- Identify and screen the technologies for each response action;
- Identify and evaluate process options in terms of effectiveness, implementability, and costs; and,
- Assemble the representative technologies into alternatives representing a range of treatment and containment combinations.

In order to identify and evaluate remedial action alternatives, past SARA RODs, decision documents for other DoD installations, must be reviewed and a literature search conducted to identify potential treatment alternatives for the waste types at IAAP. The review and assessment of

this information will also focus on treatability studies and the identification of innovative technologies.

The remedial alternative screening will be the basis for establishing what, if any, additional data is necessary to select, design, and implement remediation. Finally, this report will be used as the core of the total FS. The results of the remedial screening process will be presented in a report that will identify data gaps, general methods to fill data gaps, and the need for treatability studies. Treatability studies may be required at IAAP, as detailed in Section 8 of this plan.

The screening of remedial alternatives is an iterative activity that occurs throughout the RI/FS process. The preliminary evaluation of alternatives will continue throughout the RI in order to refine the data requirements for the FS. As new data requirements are identified, RI activities will be modified to result in the data obtained.

The FS report integrates information from the RI and treatability studies as necessary, and presents the detailed analysis of the remedial alternatives using the nine criteria developed by EPA.

The outline for the FS report is shown at Appendix C.

SECTION 8
TREATABILITY STUDIES

Identification of Treatability Studies for Soils

In order to select remedial alternatives during the FS, it may be necessary to have treatability study data for some of the treatment methods. The treatability studies will yield the data to determine how effective a treatment method will be in treating the contaminated soils and sediments and groundwater found at IAAP. The treatability studies will also aid in the selection of alternatives and in the implementation of the selected alternatives and will indicate whether a given technology will meet the cleanup goals selected for the site. Conducting treatability studies prior to the FS will improve the ability to select an alternative that will be effective. Treatability studies are especially warranted for the assessment of innovative/alternative technologies.

Treatability studies may be recommended to determine the following:

- Effectiveness of the treatment alternative on the waste;
- Difference in performance between competing manufacturers (e.g., activated carbon adsorption isotherms, polymer jar tests);
- Differences in performance between alternative chemicals (e.g., alum versus lime versus ferric chloride versus sodium sulfide);
- Sizing requirements for pilot-scale studies (e.g., chemical feed systems);
- Screening of technologies to be pilot tested (e.g., sludge dewatering);
- Sizing of those treatment units that would sufficiently affect the cost of implementing the technology; and,
- Compatibility of materials with the waste.

The completion of treatability studies will be contingent on the results of the baseline risk assessment and background data collected during the RI. Since only low levels of organics and inorganics have been detected in the previous investigations, treatment may not be necessary. As discussed in Section 7, treatability studies performed on similar types of waste will be identified, reviewed, and evaluated for applicability to IAAP. Any incineration treatability testing for explosives-contaminated soil will be performed through the U.S. Army Corps of Engineers and is not anticipated for this task.

In addition to the treatability studies that will be performed, once the RI has been completed, aquifer testing will be conducted as part of the RI groundwater investigation activities. This data will be useful in determining the feasibility of certain groundwater remediation methods.

SECTION 9
COMMUNITY RELATIONS

Community relations is a useful and important aspect of the RI/FS process. Community relations activities serve to keep communities informed of the activities and help the IAAP anticipate and respond to community concerns.

USATHAMA has already developed the Community Relations Plan (CRP), which has been reviewed by the EPA. Community activities may include:

- Providing technical information for fact sheets, news releases, or public meetings;
- Preparing fact sheets and distribution; and,
- Holding public meetings.

APPENDIX A

IAAP IAG SCHEDULE - 9 JANUARY 1991

IAAP IAG SCHEDULE - 9 JAN 91

Project: IATEPS2B Date: Jan 16, 1991 9:18 AM

1	IAG-IAG EFFECTIVE DATE Sched Start: Dec 10, 1990 8:00 AM	0.00 Days Sched Finish: Dec 10, 1990 8:00 AM
2	IAG-DRAFT POTENTIAL AOC SUPPLMNT Sched Start: Dec 10, 1990 8:00 AM	72.00 Days Sched Finish: Feb 19, 1991 5:00 PM
3	IAG-EPA/ARMY REVIEW 1 Sched Start: Feb 20, 1991 8:00 AM	45.00 Days Sched Finish: Apr 5, 1991 5:00 PM
4	IAG-FINAL POTENTIAL AOC SUPPLMNT Sched Start: Apr 6, 1991 8:00 AM	45.00 Days Sched Finish: May 20, 1991 5:00 PM
5	IAG-PRE CONCEPT PROG PLAN/[DQO] Sched Start: Apr 9, 1991 8:00 AM	30.00 Days Sched Finish: May 8, 1991 5:00 PM
6	IAG-ARMY REVIEW 2 Sched Start: May 9, 1991 8:00 AM	21.00 Days Sched Finish: May 29, 1991 5:00 PM
7	IAG-DRAFT CONCEPT PROG PLAN/[DQO] Sched Start: May 30, 1991 8:00 AM	21.00 Days Sched Finish: Jun 19, 1991 5:00 PM
8	IAG-EPA/ARMY REVIEW 2 Sched Start: Jun 20, 1991 8:00 AM	45.00 Days Sched Finish: Aug 3, 1991 5:00 PM
9	IAG-FINAL CONCEPT PROG PLAN [DQO] Sched Start: Aug 4, 1991 8:00 AM	45.00 Days Sched Finish: Sep 17, 1991 5:00 PM
10	IAG-DRAFT COMMUNITY RELATION PLAN Sched Start: Dec 10, 1990 8:00 AM	60.00 Days Sched Finish: Feb 7, 1991 5:00 PM
11	IAG-EPA/ARMY REVIEW 3 Sched Start: Feb 8, 1991 8:00 AM	45.00 Days Sched Finish: Mar 24, 1991 5:00 PM
12	IAG-FINAL COMMUNITY RELATION PLAN Sched Start: Mar 25, 1991 8:00 AM	45.00 Days Sched Finish: May 8, 1991 5:00 PM
13	IAG-PRE RI/FS WORKPLAN/[H&SP] Sched Start: Aug 7, 1991 8:00 AM	90.00 Days Sched Finish: Nov 4, 1991 5:00 PM
14	IAG-ARMY REVIEW 4 Sched Start: Nov 5, 1991 8:00 AM	21.00 Days Sched Finish: Nov 25, 1991 5:00 PM
15	IAG-DRAFT RI/FS WORKPLAN/[H&SP] Sched Start: Nov 26, 1991 8:00 AM	21.00 Days Sched Finish: Dec 16, 1991 5:00 PM
16	IAG-EPA/ARMY REVIEW 4 Sched Start: Dec 17, 1991 8:00 AM	45.00 Days Sched Finish: Jan 30, 1992 5:00 PM
17	IAG-FINAL RI/FS WORKPLAN/[H&SP]	45.00 Days

	Sched Start: Jan 31, 1992 8:00 AM	Sched Finish: Mar 15, 1992 5:00 PM
19	IAG-RI FIELD WORK PREP	30.00 Days
	Sched Start: Mar 16, 1992 8:00 AM	Sched Finish: Apr 14, 1992 5:00 PM
19	IAG-RI FIELD WORK	365.00 Days
	Sched Start: Apr 15, 1992 8:00 AM	Sched Finish: Apr 14, 1993 5:00 PM
20	IAG-PRE BLRISK ASSESS/[INIT SA]	120.00 Days
	Sched Start: Dec 21, 1992 8:00 AM	Sched Finish: Apr 19, 1993 5:00 PM
21	IAG-ARMY REVIEW 5	21.00 Days
	Sched Start: Apr 20, 1993 8:00 AM	Sched Finish: May 10, 1993 5:00 PM
22	IAG-DRAFT BLRISK ASSESS/[INIT SA]	21.00 Days
	Sched Start: May 11, 1993 8:00 AM	Sched Finish: May 31, 1993 5:00 PM
23	IAG-EPA/ARMY REVIEW 5	45.00 Days
	Sched Start: Jun 1, 1993 8:00 AM	Sched Finish: Jul 15, 1993 5:00 PM
24	IAG-FINAL BLRISK ASSESS/[INIT SA]	45.00 Days
	Sched Start: Jul 16, 1993 8:00 AM	Sched Finish: Aug 29, 1993 5:00 PM
25	IAG-PRE RI REPORT	60.00 Days
	Sched Start: Jul 18, 1993 8:00 AM	Sched Finish: Sep 15, 1993 5:00 PM
26	IAG-ARMY REVIEW 6	21.00 Days
	Sched Start: Sep 16, 1993 8:00 AM	Sched Finish: Oct 6, 1993 5:00 PM
27	IAG-DRAFT RI REPORT	21.00 Days
	Sched Start: Oct 7, 1993 8:00 AM	Sched Finish: Oct 27, 1993 5:00 PM
28	IAG-EPA/ARMY REVIEW 6	45.00 Days
	Sched Start: Oct 28, 1993 8:00 AM	Sched Finish: Dec 11, 1993 5:00 PM
29	IAG-FINAL RI REPORT	45.00 Days
	Sched Start: Dec 12, 1993 8:00 AM	Sched Finish: Jan 25, 1994 5:00 PM
30	IAG-PRE FS REPORT/[DETAIL AA]	45.00 Days
	Sched Start: Sep 1, 1993 8:00 AM	Sched Finish: Oct 15, 1993 5:00 PM
31	IAG-ARMY REVIEW 7	21.00 Days
	Sched Start: Oct 16, 1993 8:00 AM	Sched Finish: Nov 5, 1993 5:00 PM
32	IAG-DRAFT FS REPORT/[DETAIL AA]	21.00 Days
	Sched Start: Nov 6, 1993 8:00 AM	Sched Finish: Nov 26, 1993 5:00 PM
33	IAG-EPA/ARMY REVIEW 7	45.00 Days
	Sched Start: Nov 27, 1993 8:00 AM	Sched Finish: Jan 10, 1994 5:00 PM
34	IAG-FINAL FS REPORT/[DETAIL AA]	45.00 Days
	Sched Start: Jan 11, 1994 8:00 AM	Sched Finish: Feb 24, 1994 5:00 PM
35	IAG-PRE PROPOSED PLAN	45.00 Days

	Sched Start: Jan 14, 1994 8:00 AM	Sched Finish: Feb 27, 1994 5:00 PM
36	IAG-ARMY REVIEW 8	21.00 Days
	Sched Start: Feb 28, 1994 8:00 AM	Sched Finish: Mar 20, 1994 5:00 PM
37	IAG-DRAFT PROPOSED PLAN	21.00 Days
	Sched Start: Mar 21, 1994 8:00 AM	Sched Finish: Apr 10, 1994 5:00 PM
38	IAG-EPA/ARMY REVIEW 8	45.00 Days
	Sched Start: Apr 11, 1994 8:00 AM	Sched Finish: May 25, 1994 5:00 PM
39	IAG-FINAL PROPOSED PLAN	45.00 Days
	Sched Start: May 26, 1994 8:00 AM	Sched Finish: Jul 9, 1994 5:00 PM
40	IAG-NOTICE OF AVAILABILITY	15.00 Days
	Sched Start: Jul 10, 1994 8:00 AM	Sched Finish: Jul 24, 1994 5:00 PM
41	IAG-PUBLIC COMMENT	30.00 Days
	Sched Start: Jul 25, 1994 8:00 AM	Sched Finish: Aug 23, 1994 5:00 PM
42	IAG-PUBLIC MEETING	15.00 Days
	Sched Start: Jul 25, 1994 8:00 AM	Sched Finish: Aug 8, 1994 5:00 PM
43	IAG-PRE RECORD OF DECISION	60.00 Days
	Sched Start: Jul 13, 1994 8:00 AM	Sched Finish: Sep 10, 1994 5:00 PM
44	IAG-ARMY REVIEW 9	21.00 Days
	Sched Start: Sep 11, 1994 8:00 AM	Sched Finish: Oct 1, 1994 5:00 PM
45	IAG-DRAFT RECORD OF DECISION	21.00 Days
	Sched Start: Oct 2, 1994 8:00 AM	Sched Finish: Oct 22, 1994 5:00 PM
46	IAG-EPA/ARMY REVIEW 9	45.00 Days
	Sched Start: Oct 23, 1994 8:00 AM	Sched Finish: Dec 6, 1994 5:00 PM
47	IAG-FINAL RECORD OF DECISION	45.00 Days
	Sched Start: Dec 7, 1994 8:00 AM	Sched Finish: Jan 20, 1995 5:00 PM

APPENDIX B

POTENTIAL FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Potential ARARs for IAAP

Environmental Laws and Regulations	Description
I. RCRA	
A. Subtitle D land disposal criteria (40 CFR Part 257)	Solid waste disposal units may be employed for incinerator ash or other wastes.
B. Subtitle C requirements	
1. Closure and postclosure (40 CFR Part 264, Subpart G)	Some waste materials in former lagoons may be contained in place, requiring a cover.
2. Groundwater Monitoring and Protection (40 CFR Part 264, Subpart F)	Hazardous wastes may be capped in place, as described above.
3. Standards applicable to tanks and containers (40 CFR Part 264, Subparts I and J)	Hazardous wastes (e.g., spent carbon from carbon treatment of groundwater) may be temporarily stored onsite in containers and tanks.
4. Standards applicable to surface impoundments, waste piles, land treatment facilities (other than closure and postclosure requirements) (40 CFR Part 264, Subparts K, L, and M)	No hazardous waste surface impoundments or land treatment units will be constructed on site. Although waste piles may be temporarily used for sludge/sediment dewatering, the materials in these piles may not be considered hazardous if they include mixtures of soils, sediments, and/or sludges that are not reactive.
5. Locations standards (40 CFR Part 264, Subpart B)	The two former lagoon areas are not located within the 100-year floodplain or in a seismic area, as defined by the regulations.

Potential ARARs for IAAP
Continued

Environmental Laws and Regulations	Description
6. Transportation and disposal standards (40 CFR Part 264, Subpart B)	Any shipment of hazardous waste offsite must comply with RCRA transporter standards and Superfund offsite policy.
7. Incinerator standards (40 CFR Part 264, Subpart O)	Onsite incineration may be considered as a remedial alternative for the site.
8. Landfill standards (40 CFR Part 264, Subpart N)	No onsite hazardous waste landfill is being considered for the site.
9. Land disposal restrictions (40 CFR Part 268)	Contaminated soil/sediment and incinerator ash generated at site are not subject to land disposal restrictions under RCRA. Other wastes, such as spent carbon from carbon treatment of surface water, groundwater, and sludge may be subject to land disposal restrictions.
II. Clean Water Act	
A. NPDES requirements (40 CFR Parts 122-124)	Remedial actions may result in direct discharge to surface waters from a discreet source.
B. Effluent Guidelines (40 CFR Part 457)	Effluents generated from site remedial activities may be subject to the effluent guidelines for explosives manufacturing (Subpart C: Load, Assemble, and Pack Subcategory).
C. Ambient Water Quality Criteria (AWQC) (Federal Register, 1980; 1985)	Alternatives under consideration may result in discharges to surface waters. Therefore, AWQCs may be relevant and appropriate to these remedial actions.

Potential ARARs for IAAP
Continued

Environmental Laws and Regulations	Description
III. Safe Drinking Water Act	
A. Maximum Contaminant Levels (MCLs) (40 CFR Parts 141 and 143)	Groundwater affected by the two areas of concern may be a potential source of drinking water. MCL exceedances for certain metals have been observed in wells downgradient from the areas of concern.
IV. Toxic Substances Control Act	
A. Polychlorinated biphenyls (PCB) requirements (40 CFR Part 761)	PCB incineration, disposal, and cleanup requirements might apply to remedial alternatives under consideration.
V. Clean Air Act	
A. National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50)	Certain remedial alternatives involving earth moving operations and incineration may result in emissions to air.
B. National Emission Standards for Hazardous Air Pollutants (NESHAPS)	Certain alternatives involving earth moving operations and incineration may involve emissions to air.
VI. Occupational Safety and Health Administration (OSHA) Requirements	
A. Requirements for workers at remedial action sites (29 CFR Part 1910)	Any remedial action onsite must be performed in consideration of applicable OSHA standards.

Potential ARARs for IAAP
Continued

Environmental Laws and Regulations	Description
VII. U.S. Department of Transportation (DOT) Regulations (49 CFR Parts 170-179)	Contaminated soils and other wastes may be transported offsite for disposal.
VIII. Response in a floodplain or wetlands (40 CFR Part 6, Appendix A, and Executive Orders 11988 and 11990)	According to the FEMA Flood Insurance Rate Map (February 17, 1982), the study sites are above the 100-year floodplain. However, it needs to be confirmed that no wetlands proximate to the study sites could be affected by remedial actions.
IX. Conservation of Wildlife Resources (Fish and Wildlife Coordination Act)	Regulations to protect endangered species.
X. Preservation of Rivers on the National Inventory (40 CFR Part 6)	Specific requirements for wild and scenic rivers found in the vicinity of the study sites.
XI.. Preservation of Scientific, Historic, or Archaeological Data (Archaeology and Historic Preservation Act of 1974)	There may be scientific, historic, or archaeological sites located in the vicinity of the study sites.
XII. Iowa Water Pollution Disposal Regulations (IAC, Division 567, Titles VIII and IX)	These regulations specify water quality standards and discharge permit requirements.

Potential ARARs for IAAP
Continued

Environmental Laws and Regulations	Description
XIII. Iowa Solid Waste Disposal Regulations (IAC, Division 567, Titles VIII and IX)	These regulations would be applicable to the design, construction, and operation of any solid (i.e., nonhazardous) waste disposal facility.
XIV. Iowa Rules and Regulations Relating to Air Pollution Control II (IAC, Division 567, Title II)	Iowa air quality regulations are substantially equivalent to the Federal requirements. Therefore, compliance with Federal standards (as noted previously) will satisfy state requirements.

APPENDIX C

SUGGESTED FS REPORT FORMAT

APPENDIX C
SUGGESTED FS REPORT FORMAT

EXECUTIVE SUMMARY

1.0 INTRODUCTION

- 1.1 Purpose and Organization of Report
- 1.2 Background Information (Summarized from RI Report)
  - 1.2.1 Site Description
  - 1.2.2 Site History
  - 1.2.3 Nature and Extent of Contamination
  - 1.2.4 Contaminant Fate and Transport

2.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

- 2.1 Introduction
- 2.2 Remedial Action Objectives - Presents the development of remedial action objectives for each medium of interest (i.e., groundwater, soil, surface water, air, etc.). For each medium, the following must be discussed:
  - 2.2.1 Contaminants of interest
  - 2.2.2 Allowable exposure based on risk assessment
  - 2.2.3 Allowable exposure based on ARARs
  - 2.2.4 Development of remedial action objectives
- 2.3 General Response Actions - For each medium of interest, describes the estimation of areas or volumes to which treatment, containment, or exposure technologies may be applied.
- 2.4 Identification and Screening of Technology Types and Process Options - For each medium of interest, describes:
  - 2.4.1 Identification and Screening of Technologies
  - 2.4.2 Evaluation of Technologies and Selection of Representative Technologies

3.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

- 3.1 Development of Alternatives - Describes rationale for combination of technologies/ media into alternatives. Note: this discussion may be by operable units.
- 3.2 Screening Alternatives
  - 3.2.1 Introduction
  - 3.2.2 Alternative 1
    - 3.2.2.1 Description
    - 3.2.2.2 Evaluation
    - 3.2.2.3 Effectiveness
    - 3.2.2.4 Implementability
    - 3.2.2.5 Cost

SUGGESTED FS REPORT FORMAT (CONT'D.)

- 3.2.3 Alternative 2
  - 3.2.3.1 Description
  - 3.2.3.2 Evaluation
- 3.2.4 Alternative 3
- 3.2.5 Summary of Screening

4.0 DETAILED ANALYSIS OF ALTERNATIVES

- 4.1 Introduction
- 4.2 Alternative Analysis
  - 4.2.1 Alternative 1
    - 4.2.1.1 Description
    - 4.2.1.2 Assessment: Short-Term Effectiveness; Long-Term Effectiveness & Permanence; Reduction of Mobility, Toxicity, & Volume; Implementability; Cost; Compliance with ARARs; Overall Protection; State Acceptance; and Community Acceptance
  - 4.2.2 Alternative 2
    - 4.2.2.1 Description
    - 4.2.2.2 Assessment
  - 4.2.3 Alternative 3
  - 4.2.4 Summary of Alternative Analysis
- 4.3 Comparison Among Alternatives
  - 4.3.1 Short-Term Effectiveness
  - 4.3.2 Long-Term Effectiveness
  - 4.3.3 Reduction of Mobility, Toxicity, and Volume
  - 4.3.4 Implementability
  - 4.3.5 Cost
  - 4.3.6 Compliance with ARARs
  - 4.3.7 Overall Protection
  - 4.3.8 State Acceptance
  - 4.3.9 Community Acceptance
  - 4.3.10 Summary of Comparisons Among Alternatives
- 4.4 Summary of Detailed Analysis

BIBLIOGRAPHY

APPENDICES