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MEETING NOTES

TO: Distribution

DATE: November 23, 1993

FROM: Philip Nixon

MEMO #: SP307:112993:01

PROJECT #: Solar Pond IM/IRA

ATTENDANCE:

Harlan Ainscough, CDH
Arturo Duran, EPA
Mark Austin, EG&G
Phil Nixon, ES
Ted Kearns, DOE/KMI
Frazer Lockhart, DOE
Richard Henry, ED
Bob Segris, DOE
Ernie O'Tool, DOE/MMES
Steve Paris, EG&G
Randy Ogg, EG&G
Pete Sanford DOE/KMI
Pat Breen, Es
Lee Pivonka, G&M

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Alan MacGregor, ERM

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SUBJECT: Weekly Status Meeting

ADMIN RECORD

DOCUMENT CLASSIFICATION
REVIEW WAIVER PER
CLASSIFICATION OFFICE

A-OU04-000654

1) **ERMA Graphics Capabilities**

Phil Nixon showed the ERMA-GIS videotape to demonstrate the capabilities that ES is developing to support the OU4 projects. It was noted that the Intergraph ERMA-GIS system is much more complicated than most commercially available software packages, and therefore the expertise takes time to develop. ERMA-GIS graphics should be included in the first submittal of the IM/IRA.

2) **Comments on the ARAR Tables**

It was agreed that the Colorado Hazardous Waste Landfill Siting criteria would be added to the ARAR table. The portion of the table that identifies whether a regulation or document is applicable, appropriate & relevant, or to-be-considered will be replaced with a footnote designating that only the substantive requirements need to be complied with. Harlan Ainscough stated that the CDH has determined that a Certificate of Designation for a new hazardous waste landfill is not required for the OU4 IM/IRA based on Section 18 of the IAG. However the CDH specifies that the substantive requirements of the siting criteria would need to be met in order for DOE to leave the liners in-place. The DOE will need to provide a technical demonstration that the closure alternative meets the substantive requirements of the siting criteria if the liners are left in place. Frazer Lockhart stated that DOE legal counsel is still investigating whether the siting requirements are applicable to the closure of an existing surface impoundment.

Harlan Ainscough also indicated that DOE will not have to comply with the regulatory or substantive requirements of the solid waste disposal requirements for the construction rubble.

Harlan specified that CDH maintained that the Corrective Action Management Unit concept was not applicable to the project since the State of Colorado had not adopted the promulgated federal regulation. However he stated that if the soil concentrations meet the Land Disposal Restriction (LDR) requirements, then the soils could be consolidated under an engineered cover that meets the standards for a RCRA cover. The LDR requirements should be considered for the protection of groundwater.

It was questioned whether the 10 CFR 61 NRC low-level radioactive waste disposal requirements should be included as an ARAR. **ES will investigate this further and either delete the requirement from the ARAR table or provide justification for its inclusion. The ARAR table will be finalized for the November 30, 1993 meeting.**

3) **Comments on the IM/IRA-DD Part I and Part III preliminary draft**

Team members provided and discussed various comments on the draft document. **ES will incorporate the comments and suggestions for inclusion in the IM/IRA-DD round table review draft.** In general, the substantial comments include:

a) The introduction will be modified to include a discussion of why the IM/IRA-DD includes the RFI/RI data, the Post Closure Monitoring strategy, and the groundwater characterization workplan. **Randy Ogg will prepare a paragraph that discusses the**

evolution of the OU4 IM/IRA-DD as it was developed through the IAG dispute resolution process.

b) The Objectives and purpose topic sentence will be modified to state the general objectives of closing the Solar Evaporation Ponds, minimizing the environmental impacts, and remediating contaminated soils. A 10th objective will be added to reflect the fiscal constraint on the project.

c) The introduction will be modified to discuss the recent incorporation of the OU9 old process waste lines into the OU4 IM/IRA.

d) The document will be modified to make a distinction between the OU4 boundaries and the IHSS boundaries. It was discussed that the IHSS boundaries may be expanded to include the area of the original C-Pond.

e) The assumptions section will be modified to reflect that the IM/IRA was selected without having all of the RFI/RI data but receipt of the additional data is not expected to change any decision. The new data will be received and reviewed to verify that there are no impacts on the decisions prior to IM/IRA implementation.

f) The alternative scenarios will be modified to reflect that the removal of Building 788 is no longer included as a component of the IM/IRA.

g) The Backfill alternative will be added as engineered cover alternative 1 and it will be specified as a cover used at Los Alamos.

4) **Uranium 235 Background Criteria**

Becky Cropper presented the results of a calculation that demonstrated that the Rock Creek U-235 data is reflective of the natural U-235 isotopic distribution. Therefore, the Rock Creek U-235 data is appropriate for comparison to the OU4 surficial soil data. Arturo Duran was concerned that the mean + 2 standard deviation background concentration was too high. This could be possible if the U-235 samples had a wide range of detected concentrations. **ES will QA/QC the statistics to determine if the U-235 background number is correct.**

5) **Distribution of Hanford Barrier Information**

Randy Ogg distributed a document concerning engineering cover research and designs that have been developed at Hanford. EG&G is going to meet with representatives at Hanford to discuss their designs and their applicability to the Rocky Flats environment. EPA and CDH were invited to participate in the meeting in Hanford on December 7, 1993.

6) **NEPA Status**

Phil Nixon indicated that ES was preparing the description of the environmental setting portion of the Environmental Assessment (EA). The remaining sections of the EA will be prepared after the selected alternative is identified. It was discovered that Frazer Lockhart had not received a copy of the Action Description Memorandum (ADM). **Randy Ogg will investigate whether the ADM had been submitted to DOE.**

7) **Phase I RFI/RI Drilling Status**

Randy Ogg indicated that the drilling activities were complete and the analytical results should be receive soon.

Philip Nixon, Project Manager

Agenda 11/30/93

1.) Schedule Update 8:00- 8:15
- Andy Ledford

2.) Addition Comments on Sections I & III
IM/IRA 8:15- 8:30
- Team

3.) Questions & Comments on U-235
Background
- Team 8:30 - 8:45

4.) Re Definition of IHSS 101 Boundaries
- DOE 8:45- 9:15

Break 9:15- 9:30

5.) Detailed Evaluation of Alternatives
- Phil Nixon
9:30 - 11:30

6) New issues
- Team 11:30- 12:00

new

URANIUM BACKGROUND AND PHASE I CONCENTRATIONS

TYPICAL URANIUM ISOTOPIC ABUNDANCES (gram of isotope per 100 grams of uranium)[1]			
ISOTOPE	NATURAL	TYPICAL COMMERCIAL FEED ENRICHMENT	TYPICAL DEPLETED
U-234	0.0057	0.03	0.0005
U-235	0.7204	2.96	0.25
U-238	99.2739	97.01	99.75

(1) *The Health Physics and Radiological Health Handbook*; Bernard Shleien, editor; Scinta, Inc.; Silver Spring, MD; 1992.

ASSUMPTION: These isotopic abundance values are in units of grams of each of the uranium isotopes per 100 grams of uranium. For the purposes of this calculation, it was assumed that the overall mass percentage of each of the uranium isotopes with respect to each other remains the same for the OU-4 soils. In other words, U-234 accounts for 0.0057%, U-235 for 0.7204% and U-238 for 99.2739% of the natural uranium background.

STATISTICS TAKEN FROM THE OU-4 PCOC CALCULATIONS				
RADIONUCLIDE	SURFICIAL SOIL (pCi/g)		VADOSE SOIL (pCi/g)	
	95% UCL (Background)	95% UCL (All Data)	95% UCL (Background)	95% UCL (All Data)
U-234	1.17	2.5	1.0	2.92
U-235	0.07	0.17	0.1	0.2
U-238	1.25	1.86	0.719	1.75

Per *The Health Physics and Radiological Health Handbook*, the specific activity of the three isotopes in question are:

RADIONUCLIDE	SPECIFIC ACTIVITY (TBq/g)	SPECIFIC ACTIVITY (pCi/g)
U-234	2.31E-4	6.24E9
U-235	8.00E-8	2.16E6
U-238	1.24E-8	3.35E5

Specific Activity is defined as the relationship between the mass of a particular radioisotope and the activity associated with that mass. From this information we can now calculate the mass percentages for each of the three uranium isotopes. The following equation was utilized to calculate the grams of each of the uranium isotopes per gram of the OU-4 soils:

$$g_{isotope}/g_{soil} = 95\%\ \text{UCL Concentration (pCi/g}_{soil}\text{)/Specific Activity (pCi/g}_{isotope}\text{)}$$

For example:

$$g_{U\text{-}234}/g_{soil} = [1.17\ \text{pCi/g}_{soil}]/6.24\text{E9 pCi/g}_{U\text{-}234}$$

$$= 1.88\text{E-10}\ g_{U\text{-}234}/g_{soil}$$

The calculated mass values for each of the 95% UCL quantities is as follows:

RADIONUCLIDE	SURFICIAL SOIL ($g_{isotope}/g_{soil}$)		VADOSE SOIL ($g_{isotope}/g_{soil}$)	
	95% UCL (Background)	95% UCL (All Data)	95% UCL (Background)	95% UCL (All Data)
U-234	1.88E-10	4.01E-10	1.60E-10	4.68E-10
U-235	3.24E-8	7.87E-8	4.63E-8	9.26E-8
U-238	3.73E-6	5.55E-6	2.15E-6	5.22E-6

As we are going to compare this data to the naturally occurring mass percentages of the uranium isotopes, we must now normalize the above data. To accomplish this, we must first compute the total grams of uranium isotope per gram of OU-4 soil:

$$\text{U-234}\ (g_{isotope}/g_{soil}) + \text{U-235}\ (g_{isotope}/g_{soil}) + \text{U-238}\ (g_{isotope}/g_{soil}) = g_{uranium}\ \text{isotopes}/g_{soil}$$

Next, we must calculate the percentage each of the uranium isotopes contributes to the total quantity:

$$\frac{\text{U-234 } (g_{isotope}/g_{soil})}{g_{uranium} \text{ isotopes}/g_{soil}}$$

An example of this process is provided below:

Surficial Soil ($g_{isotope}/g_{soil}$)

U-234	1.88E-10
U-235	3.24E-8
U-238	3.73E-6
	3.76E-6

$$\frac{\text{1.88E-10 U-234 } (g_{isotope}/g_{soil})}{\text{3.76E-6 } g_{uranium} \text{ isotopes}/g_{soil}} = \text{5.00E-5}$$

5.00E-5 x 100% = 5.00E-3%

The following table provides the uranium isotopic mass percentage calculations for each of the uranium isotopes:

RADIONUCLIDE	SURFICIAL SOIL (%)		VADOSE SOIL (%)	
	95% UCL (Background)	95% UCL (All Data)	95% UCL (Background)	95% UCL (All Data)
U-234	5.00E-3	7.12E-3	7.28E-3	8.81E-3
U-235	8.61E-1	1.40E0	2.11E0	1.74E0
U-238	9.91E+1	9.86E+1	9.79E+1	9.82E+1

We can now calculate the ratio of U-234 and U-235 to U-238. This is accomplished in the following manner:

$$\frac{\text{Naturally Occurring U-234 Percentage}}{\text{Naturally Occurring U-238 Percentage}} = \text{Ratio of U-234 to U-238}$$

For example:

$$\frac{\text{0.0057 \% (Naturally Occurring U-234 Percentage)}}{\text{99.2739 \% (Naturally Occurring U-238 Percentage)}} = \text{5.74E-5 (Ratio of U-234 to U-238)}$$

The following table presents the ratios of U-234 and U-235 to U-238 for each of the scenarios in question:

ISOTOPE	SURFICIAL SOIL (ratio)		VADOSE SOIL (ratio)		NATURALLY OCCURRING URANIUM
	95% UCL (Background)	95% UCL (All Data)	95% UCL (Background)	95% UCL (All Data)	REFERENCE, *THE HEALTH PHYSICS AND RADIOLOGICAL HEALTH HANDBOOK*
U-234	5.05E-5	7.22E-5	7.44E-5	8.97E-5	5.74E-5
U-235	8.69E-3	1.42E-2	2.16E-2	1.77E-2	7.26E-3

For the purposes of additional clarification, the inverse of each is provided in the following table:

ISOTOPE	SURFICIAL SOIL (ratio)		VADOSE SOIL (ratio)		NATURALLY OCCURRING URANIUM
	95% UCL (Background)	95% UCL (All Data)	95% UCL (Background)	95% UCL (All Data)	REFERENCE, *THE HEALTH PHYSICS AND RADIOLOGICAL HEALTH HANDBOOK*
U-234	1.98E4	1.38E4	1.34E4	1.11E4	1.74E4
U-235	1.15E2	7.04E1	4.64E1	5.64E1	1.38E2

REVIEW DRAFT

Detailed Analysis of Alternatives

The Alternatives that were considered during the detailed analysis are as follows:

I. No Action
II. Containment of contaminated Materials without treatment
III. Containment of Liners with Insitu Soil Treatment
IV. Removal of Contaminated Liners
V. Removal of Contaminated Materials

The following subsections summarize the results of the detailed analysis of the alternatives.

1) **Overall Protection of Human Health and the Environment**
The No Action alternative would not be considered protective of human health and the environment because some contaminants were identified at concentrations that exceed their PRGs. It is estimated that a decontamination factor of 5 to 50 would be required to treat most of the contaminants such that the resulting concentrations would be equal to or less than the PRGs. This criteria would be achieved if either the pathways for a completed exposure were blocked or the contaminants were treated to meet the PRGs. An engineered cover would isolate the contaminants from surface water runoff and airborne exposure pathways, and minimize the potential for migration to groundwater. An engineered cover may not interfere with groundwater remediation because slurry cutoff walls or interception systems could be installed to keep groundwater from migrating into the contaminants left under the engineered cover. Therefore alternatives II - V would be considered protective of human health and the environment and were considered further.

2) **Compliance with ARARs**
The results of the ARARs analysis indicate that no chemical-specific ARARs have been promulgated for surface or vadose zone soils. All the alternatives could meet the identified location-specific ARARs. It is assumed based on an extensive evaluation of the regulations that the landfill siting requirements would not be triggered by closing the SEPs with liners and media left in place. It should be noted that DOE and the CDH may enter the IAG dispute resolution to resolve this controversial assumption. The No Action alternative would not meet the interim status closure requirements and is therefore not a viable alternative. The action-specific ARARs could be achieved for the other alternatives. The alternatives could meet the requirements of the to-be-considered documents that have been identified. It was agreed that all the alternatives (with the exception of the No Action alternative) should be considered further in the detailed analysis.

Since the No Action alternative failed the first two threshold criteria it could not be the recommended alternative. However, the alternative was included throughout the analysis to comply with the requirements of the National Environmental Policy Act (NEPA). The

remaining balancing criteria were evaluated and alternatives were scored "high" (if they best met the criteria), "medium" (if they adequately met the criteria), and "low" (if they had the lowest ability to meet a criteria).

3) **Long Term Effectiveness and Permanence**
The long term effectiveness criterion focusses on the long term impacts of the various alternatives. Long term effectiveness for an alternative at the Rocky Flats site would be maximized by the removal or treatment of the contaminated media because the contaminants would be removed from the site and could not cause further degradation of the environment. The alternatives utilizing in-situ treatment would reduce the potential for further environmental impact by degrading or stabilizing the contaminants in-place. However, with in situ treatment the contaminants are left in-place were long term leaching might be possible if adequate quality control is not achieved during construction. The long term effectiveness of an engineered cover with untreated contamination left in place has the highest potential for future degradation of the environment if the water table were to rise and contact the contaminated media, or if a channel for liquid migration developed in the engineered cover. Therefore, Alternatives IV and V scored high: Alternative III scored medium; and Alternative II scored low. Alternative I also received a low score.

4) **Reduction of Toxicity, Mobility, or Volume through Treatment**
This criterion focusses on how well an alternative reduces the risk from site contamination. Alternative II would reduce the mobility of contaminants as the engineered cap would minimize the amount of precipitation that contacted the contaminated media. The engineered cover would also reduce the potential for exposure. The potential groundwater exposure route is least addressed by this Alternative since the contaminants would not be immobilized and could leach if they were to come into contact with water due to a cover failure or a rising watertable. Alternative II would not reduce the volume of contamination. Alternatives III and IV would reduce the mobility and toxicity of contamination via potential insitu treatment and an engineered cover. The volume of contamination would remain unchanged with these alternatives. Alternative V would reduce the toxicity, mobility, and volume of contaminated material by removal of the liners and contaminated media. This alternative would have the lowest potential for contaminating groundwater. Therefore, Alternative II scored low; Alternatives III and IV scored medium; and Alternative V scored high. Alternative I would also receive a low score.

5) **Short-Term Effectiveness**
The short term effectiveness criterion focusses largely on how quickly the alternative would provide the remediation results and what the risks to the public and workers would be during the construction period. Alternative II would achieve the remedial action objectives the fastest because the construction of an engineered cover would be completed much faster than if material were excavated or treated insitu. Alternative II would also

provide less risk to the public and workers during construction because contaminated media would be left in place. The construction risk/exposure from Alternative III would exceed the risks from Alternative II since some materials may be excavated and contaminant exposure could occur during in-situ treatment. The risk/exposure potential would be the highest from Alternatives IV and V due to the excavation of contaminated materials and the potential treatment/transportation. Therefore, Alternative II received a high score; Alternative III received a medium score; and Alternatives IV and V received a low score. Alternative I also received a high score.

6) **Implementability**
This criterion focusses primarily on the ease and effectiveness of implementing an alternative. All of the alternatives are currently available and could be implemented at OU4. However, some alternatives would be easier to implement effectively than others. Engineered covers have been implemented at many sites effectively and are generally considered easy to construct. Insitu technologies would be more difficult to implement and could be very difficult to demonstrate that the required quality control has been achieved. The implementation of alternatives requiring excavation would also be complicated due to the difficulties associated with potential shoring of excavations, stockpiling of materials, and the sequencing of excavation and cover construction. In addition the implementation of a treatment methodology would provide other challenges. Packaging and shipment of low level radioactive waste to another state for disposal could be difficult to implement. Therefore, Alternative II scored high; Alternative III scored low because of the difficulties associated with insitu treatment; and Alternatives IV and V scored low due to the difficulties associated with excavation and shipping waste off site. Alternative I would score High.

7) **Cost**
A magnitude of cost estimate was prepared for each alternative based on capital costs that were received from EPA guidance documents, personal communication with vendors, and operating costs that were calculated from local labor rates and an estimated number of hours. Site factors were incorporated into the estimate to ensure that the proper magnitude was achieved for implementation at a DOE facility. Alternative II is likely to be approximately 3 to 15 million dollars. Alternative III is likely to range from 20 to 44 million dollars. Alternative IV is likely to range from 53 to 82 million dollars. Alternative V is likely to range from 57 to 122 million dollars with the costs of treatment or offsite disposal. Therefore, Alternative II received a high score; alternative III received a medium score; and Alternatives IV and V received a low score. Alternative I received a high score.

Selection of an Alternative For Recommendation

Alternative II is the selected IM/IRA to recommend for implementation at the OU4 Solar Evaporation Ponds (SEPs). The

alternative will consist of the following actions:

1) The liners will remain in-place
2) Contaminated soils from hotspots in the vicinity of the SEPs will be consolidated within the SEPs
3) An engineered cover meeting the RCRA requirements will be constructed over the SEPs.

The regulatory approval of this alternative will depend upon the determination that the liners can remain in-place without invoking the siting criteria for a new landfill, or that the site and the engineered cover can meet the substantive requirements of the siting criteria. The Corrective Actions Management Unit (CAMU) concept that has been promulgated at the Federal Level (but not promulgated by the State of Colorado) may have to be adopted for the project under provisions in Section 19 of the IAG. The CAMU concept would be required for soils to be consolidated within the SEPs if the contaminant concentrations exceed the Land Disposal Restriction (LDR) treatment standards. The justification for this alternative centers around the fact that the liners will be an integral component of the closure system. The liner will provide a stable structural base for the engineered cover that will reduce the potential for cover failure due to subsidence. This will be especially important if the engineered cover is required to be designed for an active life of 1000 years. The liner will meet the closure requirement of a low permeable barrier with a hydraulic conductivity less than or equal to the average of the subsurface soil hydraulic conductivity and the liner will contain the contaminated soils from the vicinity of the SEPs. The effectiveness of the liner to prevent contaminant migration will improve because the engineered cover will prevent the infiltration of precipitation and buildup of a hydraulic head. The lack of a hydraulic head should also prevent organics from leaching from the asphaltic liners. Therefore, the combination of the liner (to contain contaminated media) and the engineered cover (to prevent infiltration) will prevent leachate from developing and migrating into the groundwater. DOE will need to demonstrate the effectiveness of this alternative. This will include utilizing the Hydraulic Evaluation of Landfill Performance (HELP) model in conjunction with the column leaching test results and possibly vadose zone transport modeling results for the contaminants of concern.

FIGURE

OU4 PHASE I IM/IRA (19NOV93)

EVALUATION CRITERIA ** 1 & 2: Threshold Criteria 3 - 7: Primary Balancing Criteria	ALTERNATIVE SCENARIOS *				
	I.	II.	III.	IV.	V.
1) Overall Protection of Human Health and the Environment	No	Yes	Yes	Yes	Yes
2) Compliance with ARARs	No	Yes	Yes	Yes	Yes
3) Long-Term Effectiveness and Permanence	Low	Low	Medium	High	High
4) Reduction of Toxicity, Mobility, or Volume Through Treatment	Low	Low	Medium	Medium	High
5) Short-Term Effectiveness	High	High	Medium	Low	Low
6) Implementability	High	High	Low	Low	Low
7) Cost	High	High	Medium	Low	Low

Alternative Scenarios:

I. No Further Action

II. Containment of Contaminated Materials without Treatment

III. Containment of Liners with *In Situ* Soil Treatment

IV. Removal of Contaminated Liners

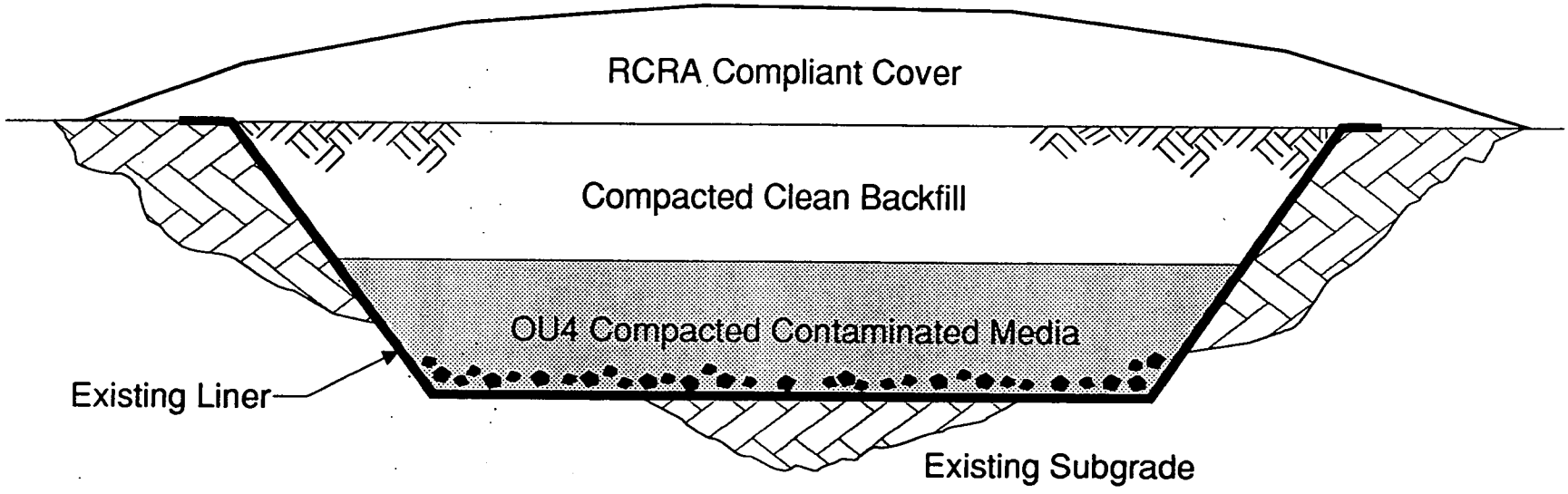
V. Removal of Contaminated Materials

* Refer to Section III.2.3 for Complete Explanation of Alternative Scenarios

** Refer to Section III.2.5 for Complete Explanation of Evaluation Criteria

FIGURE

OU4 PROPOSED IM/IRA



Note: Design concept. The actual depths and thicknessess will change dependent upon the quantity of contaminated media that is consolidated under the cover.

OVERALL PROTECTION TO HUMAN HEALTH AND THE ENVIRONMENT

Analysis Factor	Basis for Evaluation During Detailed Analysis	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Minimize Current Risk	Does the alternative have the potential to lower the current risk?	The current risk is not reduced because exposure pathways are not eliminated.	Eliminates pathways of exposure from air and surface soils. Exposures to groundwater may be impacted in a positive way due to reduction in concentrations that migrate to the groundwater.	Eliminates pathways of exposure from air and surface soils. Exposures to groundwater may be impacted more positively than Alternative II due to *in situ* treatment causing an increased reduction in concentrations that migrate to the groundwater.	Eliminates pathways of exposure from air and surface soils. Exposures to groundwater may be impacted more positively than Alternative III due to liner removal and *in situ* treatment causing an increased reduction in concentrations that migrate to the groundwater.	Eliminates pathways of exposure from air and surface soils. The removal of contaminated media will eliminate the current risks.
How alternative provides human health environmental protection	Does alternative treat contamination?	No treatment.	No treatment.	May treat contaminated media *in situ*.	May treat contaminated media *in situ*.	Contaminated media will be disposed or treated *ex situ*.
	Does alternative destroy or stabilize contaminants?	No contaminant destruction or stabilization.	No contaminant destruction or stabilization.	Contaminants may be stabilized or destroyed by *in situ* treatment.	Contaminants may be stabilized or destroyed by *in situ* treatment.	Contaminants will be removed and will be disposed or treated. Treatment will destroy or stabilize contaminants.
Need for institutional control measures	Is there a need to institutionally control risk?	Yes	Yes	Yes	Yes	No. Contaminants are removed so PRGs are met.
	What control measures need to be implemented?	Land use restrictions. The site would not be permitted for residential use.	Land use restrictions: No building directly on the engineered cover.	Land use restrictions: No building directly on the engineered cover.	Land use restrictions: No building directly on the engineered cover.	None
Results of the Analysis	Should the alternative be further evaluated?	No	Yes	Yes	Yes	Yes

R9-9-14.WPF

Attachment 3
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COMPLIANCE WITH ARARs

Analysis Factor	Basis for Evaluation During Detailed Analysis	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Chemical-specific ARARs	Can alternative achieve compliance with Chemical-Specific ARARs?	No Chemical-specific ARARs have been identified for surficial and vadose zone soil contaminants of concern.	No Chemical-Specific ARARs have been identified for surficial and vadose zone soil contaminants of concern.	No Chemical-Specific ARARs have been identified for surficial and vadose zone soil contaminants of concern.	No Chemical-Specific ARARs have been identified for surficial and vadose zone soil contaminants of concern.	No Chemical-Specific ARARs have been identified for surficial and vadose zone soil contaminants of concern.
Location-Specific ARARs	Can alternative achieve compliance with Location-Specific ARARs?	Yes	Yes[1]	Yes[1]	Yes	Yes
Action-Specific ARARs	Can alternative achieve compliance with Action-Specific ARARs?	No[2]	Yes	Yes	Yes	Yes
To-be-Considered Documents	Can alternative achieve compliance with other-defined criteria and guidances (TBCs)?[3]	Yes	Yes	Yes	Yes	Yes
ARARs that would be difficult to comply with.	Can the non-compliant ARAR requirements be waived?	Receipt of a waiver from non-compliant Action-Specific ARAR is unlikely.	Establishment of a CAMU may be required to facilitate consolidation of contaminated materials as part of closure activities.	Establishment of a CAMU may be required to facilitate consolidation of contaminated materials as part of closure activities.	Establishment of a CAMU may be required to facilitate consolidation of contaminated materials as part of closure activities.	No waivers would be anticipated.
Results of Analysis.	Should the alternative be further evaluated?	No	Yes	Yes	Yes	Yes

NOTES:

1.) Compliance based on the position that a Certificate of Designation (e.g., siting requirements) are not ARARs for the SEP closure activities.

2.) The No Further Action alternative does not comply with the closure requirements for an interim status surface impoundment; 6 CCR 1007-3, 265.228 requires all contaminated soils to be removed or a final cover installed. Since several hazardous waste constituents are above the calculated PRGs, some contaminated areas would be uncontrolled. The No Further Action alternative is being retained for the Detailed Analysis of Alternatives to serve as the baseline for comparing the other alternatives.

3.) The adoption of and compliance with TBCs is discretionary. Although it is envisioned that all of the alternatives will achieve compliance with the identified TBC's, final acceptance will be based on the approval of the IM/IRA Decision Document.

Attachment 3
SP307:112993:01
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LONG-TERM EFFECTIVENESS AND PERMANENCE

Analysis Factor	Basis for Evaluation During Detailed Analysis	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Magnitude of residual Risks	Are residual risks expected?	Risks will remain.	A protective cover is a physical barrier which will interrupt exposure pathways. It will also decrease the mobility of contaminants, beneath the cover, by reducing the potential leaching of the contaminants from the soils.	In addition to eliminating exposure pathways, with the engineered cover, this alternative has the added advantage of decreasing the risks associated with the contaminants themselves due to *in situ* treatment.	Risks will decrease for all exposure pathways due to the removal of the liners and potential *in situ* soil treatment.	Risks will decrease for all exposure pathways due to the removal of the liners and contaminated media.
	What is the magnitude of residual risks?	Magnitude of risks remain unchanged.	Sources of risk remain unchanged. The potential exists for large volumes of materials used in an engineered cover to be re-excavated if it is later determined that the in-place contaminated media should be removed. The use of a non-pervious protective cover such as a tarpaulin or an engineered cover may increase surface water runoff which may increase the mobility and migration of contaminants in the surrounding surface soils. This possibility could impact the demands placed upon the ITPH system.	Potential *in situ* treatment will reduce the magnitude of residual risks. The potential exists for large volumes of materials used in an engineered cover to be re-excavated if it is later determined that the in-place contaminated media should be removed. The use of an engineered cover may increase surface water runoff which may increase the mobility and migration of contaminants in the surrounding surface soils. This possibility could impact the demands on the ITPH system.	Removal of the liners and potential *in situ* treatment will reduce the magnitude of residual risks below those in Alternative III. The potential exists for large volumes of materials used in an engineered cover to be re-excavated if it is later determined that the in-place contaminated media should be removed.	The magnitude of the residual risk is greatly reduced by the removal of contaminant media.

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LONG-TERM EFFECTIVENESS AND PERMANENCE

Analysis Factor	Basis for Evaluation During Detailed Analysis	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Adequacy and reliability of controls	What is the likelihood that the technologies will meet required process efficiencies or performance specifications?	This alternative does not address any technologies and therefore information on meeting process efficiencies or performance specifications is not applicable.	This alternative will effectively isolate the liners and subsurface soils from the atmosphere and surface runoff. Contaminants remain in place and have the potential to be a source of groundwater contamination.	There is little operational control and quality control for many *in situ* treatment processes which could result in non-uniform treatment of contaminated material. Contaminants remain in place and have the potential to be a source of groundwater contamination if the *in situ* treatment is not completely successful. The engineered cover aspect of this alternative will effectively isolate the liners and subsurface soils from the atmosphere and surface runoff waters.	There is little operational control and quality control for many *in situ* treatment processes which could result in non-uniform treatment of contaminated material. This alternative is dependent on identification of all "hot spots," and RFI/RI is not all inclusive. The potential exists that some contaminants may remain in place and have the potential to be a source of groundwater contamination. The engineered cover aspect of this alternative will effectively isolate the liners and subsurface soils from the atmosphere and surface runoff waters.	Depending on the alternative scenario, the identification of all "hot spots" is critical to removing contaminated soils. The potential exists that some soil contaminants may remain in-place and be a source of groundwater contamination. The engineered cover aspect of this alternative will effectively isolate the liners and subsurface soils from the atmosphere and surface runoff waters. Removing the soils and liners will eliminate any risk of the media contaminating the groundwater. There is also excellent operational and quality control for many *ex situ* treatment processes which will result in uniform treatment of contaminated material.
	What type and degree of long-term management is required?	Long term management could include: providing an alternative residential water supply, access restrictions, surface water runoff interception/treatment/ discharge and monitoring (see below).	Long-term management could include: providing an alternative residential water supply, access restrictions, surface water runoff interception/treatment/ discharge and monitoring (see below).	Long-term management could include: providing an alternative residential water supply, access restrictions, surface water runoff interception/treatment/ discharge and monitoring (see below).	Long-term management could include: providing an alternative residential water supply, access restrictions, surface water runoff interception/treatment/ discharge and monitoring (see below).	Long-term management could include: access restrictions, surface water runoff interception/treatment/ discharge and monitoring (see below).

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LONG-TERM EFFECTIVENESS AND PERMANENCE

Analysis Factor	Basis for Evaluation During Detailed Analysis	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Adequacy and reliability of controls (continued)	What are the requirements for long-term monitoring?	This alternative potentially requires monitoring/sampling of vadose zone and groundwater. This would be required to demonstrate that the contaminants are immobile and confined with the soil matrix.	This alternative potentially requires monitoring/sampling of vadose zone and groundwater. This would be required to demonstrate that the contaminants are immobile and confined within the soil matrix.	This alternative potentially requires monitoring/sampling of vadose zone and groundwater. This would be required to demonstrate that the contaminants are immobile and confined within the soil matrix. A case could be made to reduce or eliminate monitoring if evidence indicate it is no longer required based upon previous years' data.	This alternative potentially requires monitoring/sampling of vadose zone and groundwater. This would be required to demonstrate that the contaminants are immobile and confined within the soil matrix. A case could be made to reduce or eliminate monitoring if evidence indicates it is no longer required based upon previous years' data.	This alternative potentially requires monitoring/sampling of vadose zone and groundwater. This would be required to demonstrate that the contaminants are immobile and confined within the soil matrix. Since the liner and contaminated media are removed, a less complex monitoring strategy may be acceptable. A case could be made to reduce or eliminate monitoring if evidence indicates it is no longer required based upon previous years' data.
	What operations and maintenance functions must be performed?	The following operation and maintenance functions must be performed: the maintenance of institutional actions which include the Interceptor Trench Pump House (ITPH) system, cover inspections, erosion control, and maintenance of vegetation cover.	The following operation and maintenance functions must be performed: the maintenance of institutional actions which include the ITPH system, cover inspections, erosion control, and maintenance of vegetation cover.	The following operation and maintenance functions must be performed; the maintenance of institution actions which include the ITPH system, cover inspections, erosion control, and maintenance of vegetation cover. Operation and maintenance of the soil treatment equipment must be performed until *in situ* soil treatment is complete.	The following operating and maintenance functions must be performed: the maintenance of institutional actions which include the ITPH system, cover inspections, erosion control, and maintenance of vegetation cover. Operation of waste storage facilities for soils and liners would be required if offsite disposal is not possible. If treatment of soils is required, then operation and maintenance of the equipment must be performed until *in situ* soil treatment is complete.	The following operating and maintenance functions must be performed: the maintenance of institutional actions which include the ITPH system, cover inspections, erosion control, and maintenance of vegetation cover. Operation of waste storage facilities for soils and liners would be required if offsite disposal is not possible. If treatment of soils is required, then operation and maintenance of the equipment must be performed until *ex situ* soil treatment is complete.

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LONG-TERM EFFECTIVENESS AND PERMANENCE

Analysis Factor	Basis for Evaluation During Detailed Analysis	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Adequacy and reliability of controls (continued)	What difficulties and uncertainties may be associated with long-term operation and maintenance?	Few difficulties and uncertainties can be foreseen with long-term operation and maintenance.	Few difficulties and uncertainties can be foreseen with long-term operation and maintenance.	Few difficulties and uncertainties can be foreseen with long-term operation and maintenance.	Few difficulties and uncertainties can be foreseen with long-term operation and maintenance.	Few difficulties and uncertainties can be foreseen with long-term operation and maintenance.
	What is the potential need for replacement of technical components?	There will be a periodic need to replace components of the ITPH system and monitoring systems as they break down.	There will be a periodic need to replace components of the ITPH system and monitoring system as they break down. In addition, the engineered cover will need to be repaired as required to maintain integrity of the barrier.	There will be a periodic need to replace components of the ITPH system and monitoring system as they break down. In addition, the engineered cover will need to be repaired as required to maintain integrity of the barrier.	There will be a periodic need to replace components of the ITPH system and monitoring system as they break down. In addition, the engineered cover will need to be repaired as required to maintain integrity of the barrier.	There will be a periodic need to replace components of the ITPH system and monitoring system as they break down. In addition, the cover will need to be maintained.
	What is the magnitude of the threats or risks should the remedial action need replacement?	The magnitude of the risk should this remedial action need replacing will be no higher than they currently are. There is the possibility that the associated risks will be less than they are now due to natural attenuation. This alternative has the highest potential for requiring replacement.	The magnitude of the risk should this remedial action need replacing will be no higher than they currently are. There is the possibility that the associated risks will be less than they are now due to natural attenuation.	The magnitude of the risk should this remedial action need replacing will be less than they currently are if the contaminated soil is treated *in situ*.	The magnitude of the risk should this remedial action need replacing will be less than they currently are if the liners are removed and the soils are treated *in situ*.	The magnitude of the risk should this remedial action need replacing will be less than they currently are if the liners and soils are removed. This alternative has a low potential for needing replacement.
	What is the degree of confidence that controls can adequately handle potential problems?	There is a high degree of confidence that controls can adequately handle most problems. Primarily controls will consist of maintaining the required institutional actions. For cases of catastrophic events (earthquake, flood, etc.) the degree of confidence is related to the remaining risk.	There is a high degree of confidence that controls can adequately handle most problems. Primarily controls will consist of maintaining the required institutional actions. For cases of catastrophic events (earthquake, flood, etc.) the degree of confidence is related to the remaining risk.	There is a high degree of confidence that controls can adequately handle most problems. Primarily controls will consist of maintaining the required institutional actions. For cases of catastrophic events (earthquake, flood, etc.) the degree of confidence is related to the remaining risk.	There is a high degree of confidence that controls can adequately handle most problems. Primarily controls will consist of maintaining the required institutional actions. For cases of catastrophic events (earthquake, flood, etc.) the degree of confidence is related to the remaining risk.	There is a high degree of confidence that controls can adequately handle most problems. Primarily controls will consist of maintaining the required institutional actions. For cases of catastrophic events (earthquake, flood, etc.) the degree of confidence is related to the remaining risk.

LONG-TERM EFFECTIVENESS AND PERMANENCE

Analysis Factor	Basis for Evaluation During Detailed Analysis	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Adequacy and reliability of controls (continued)	What are the uncertainties associated with land disposal of residuals and untreated wastes?	Land disposal will not be required for this alternative.	Land disposal will not be required for this alternative.	Approval from the Regional Administrator would be needed to utilize the CAMU and TU options. Should approval be denied and onsite disposal/ storage be impossible, identification of an offsite disposal facility would be required. At this time, only Envirocare of Utah, Inc. is capable of accepting RFP wastes.	Approval from the Regional Administrator would be needed to utilize the CAMU and TU options. Should approval be denied and onsite disposal/ storage be impossible, identification of an offsite disposal facility would be required. At this time, only Envirocare of Utah, Inc. is capable of accepting RFP wastes.	Approval from the Regional Administrator would be needed to utilize the CAMU and TU options. Should approval be denied and onsite disposal/ storage be impossible, identification of an offsite disposal facility would be required. At this time, only Envirocare of Utah, Inc. is capable of accepting RFP wastes.
SCORE		Low	Low	Medium	High	High

REDUCTION OF TOXICITY, MOBILITY, AND VOLUME THROUGH TREATMENT

Analysis Factor	Basis for Evaluation During Detailed Analysis	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Reduction of Toxicity	To what extent is the mass of toxic contaminants reduced?	No reduction of toxicity.	Eliminates the pathway for surface water and airborne exposure. Minimizes the infiltration of precipitation for groundwater leaching.	Eliminates the pathway for surface water and airborne exposure. May minimize the leachability of media via *in situ* treatment. An engineered cover would minimize the infiltration of precipitation.	Eliminates the pathway for surface water and airborne exposure. Liner removal would eliminate a partial source of groundwater contamination. *In situ* soil treatment may minimize the leachability of media.	Eliminates the pathway for surface water and airborne exposure. Eliminates the source for groundwater contamination.
Reduction of Mobility	To what extent is the mobility of toxic contaminants reduced?	No reduction of mobility.	Mobility is reduced by minimizing the amount of infiltration.	Mobility is reduced by minimizing the amount of infiltration and reducing the media's leachability.	Mobility is reduced by reducing the amount of infiltration and partial removal of the source. Some reduction in leachability may be achieved.	Mobility is eliminated by the removal of media that poses a significant threat.
Reduction of Volume	To what extent is the volume of toxic contaminants reduced?	No reduction of volume.	No reduction of volume.	No reduction of volume.	Partial reduction of volume as liners are removed.	Volume reduction as liners and contaminated media are removed.
Amount of hazardous material	What portion of contaminated material is treated?	None.	None.	Liner hot spots may be removed. Soils may be treated *in situ*.	Liners are removed. Soils may be treated *in situ*.	Liners and soil will be removed.
Adverse impacts	Potential of the alternative to generate other hazardous by-products after treatment.	Contaminated leachate could be produced as infiltrating precipitation contacts contaminated media.	Groundwater could become contaminated if the water level would rise such that contaminated media were below the water table.	*In situ* treatment should not produce hazardous by-products. Groundwater could become contaminated if the water level would rise such that contaminated media were below the water table.	*In situ* treatment should not produce hazardous by-products. Groundwater could become contaminated if the water level would rise such that contaminated media were below the water table.	No hazardous by-products would be produced if materials were shipped for offsite disposal. Treatment of contaminated soils would produce a concentrated waste stream that would require additional treatment.
SCORE		LOW	LOW	MEDIUM	MEDIUM	HIGH

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SHORT-TERM EFFECTIVENESS

Analysis Factor	Basis for Evaluation During Detailed Analysis	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Protection of community during remedial actions	What are the risks to the community during remedial actions that must be addressed?	Minimal risk.	Some contaminants may be exposed to wind and surface water.	Some contaminants may be exposed to wind and surface water.	• There is an increased risk of having contaminants exposed to wind and surface water due to liner and soils removal. • The communities risk of being exposed to contaminants may be increased due to removing liners and transporting them to a TSD facility.	• There is an increased risk of having contaminants exposed to wind and surface water due to liner and soils removal. • The communities risk of being exposed to contaminants may be increased due to removing liners and contaminated soils and transporting them to a TSD facility. • Contaminants may also be released into the atmosphere during soil treatment thus increasing the communities risk of being exposed to contaminants.
	How will the risks to the community be addressed and mitigated?	Not required	Not required	Dust control	Dust control	Dust control
	What risks remain that cannot be readily controlled?	None	None	None	Risks associated with transporting liners for disposal.	Risks associated with transporting liners and soils for disposal.

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SHORT-TERM EFFECTIVENESS

Analysis Factor	Basis for Evaluation During Detailed Analysis	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Protection of workers during remedial actions	What are the risks to the workers that must be addressed?	• Minimal risk for contaminant exposure • Construction risks	• Risks from ingestion and inhalation of dust during grading, backfilling and seeding. • Construction risks.	• Risks from absorption, direct contact, ingestion, and inhalation associated with implementing *in situ* soil treatment and dust during backfilling, and grading. These risks would be greater than the associated risks of Alternative II, but less than those of Alternative IV. • Construction risks.	• Risks from absorption, direct contact, ingestion and inhalation from dust while removing, and packaging the soils and liners, and during installation of the engineered cover. These risks are less than the risks associated with Alternative V because less contaminated media is being removed and treatment will be *in situ*. • Risks from transporting the contaminated soils and liners if offsite disposal is used. • Risks from absorption, direct contact, ingestion, and inhalation associated with implementing *in situ* soil treatment and dust during backfilling, and grading. • Construction risks	• Risks from absorption, direct contact, ingestion and inhalation while removing, packaging and treating the soils and liners. • Risks from transporting the contaminated soils and liners. • Construction risks

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SHORT-TERM EFFECTIVENESS

Analysis Factor	Basis for Evaluation During Detailed Analysis	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Protection of workers during remedial actions (continued)	How will the risks to the workers be addressed and mitigated?	None required	Risks to the workers can be addressed and mitigated by; • using PPE, • using dust control, • alternating job positions among the workers, • limiting the time the workers spend in the field, • implementing and adhering to OSHA requirements, • complying with the occupational worker protection criteria of 29 Code of Federal Regulations (CFR) 1926, • using remote handling as appropriate, • and, determining where utilities are located.	Risks to the workers can be addressed and mitigated by; • using PPE, • using dust control, • alternating job positions among the workers, • limiting the time the workers spend in the field, • implementing and adhering to OSHA requirements, • complying with the occupational worker protection criteria of 29 CFR 1926, • using remote handling as appropriate, • and, determining where utilities are located.	Risks to the workers can be addressed and mitigated by; • using PPE, • using dust control, • alternating job positions among the workers, • limiting the time the workers spend in the field, • implementing and adhering to OSHA requirements, • complying with the occupational worker protection criteria of 29 CFR 1926, • using remote handling as appropriate, • and, determining where utilities are located.	Risks to the workers can be addressed and mitigated by; • using PPE, • using dust control, • alternating job positions among the workers, • limiting the time the workers spend in the field, • implementing and adhering to OSHA requirements, • complying with the occupational worker protection criteria of 29 CFR 1926, • using remote handling as appropriate, • and, determining where utilities are located.
	What risks remain to the workers that cannot be readily controlled?	• Construction risks	• Construction risks • Some radiological risks • Encounter unknown utility lines	• Construction risks • Some radiological risks • Encounter unknown utility lines	• Construction risks • Some radiological risks • Encounter unknown utility lines	• Construction risks • Some radiological risks • Encounter unknown utility lines
Environmental impacts	What environmental impacts are expected with the construction and implementation of the alternative?	• The wildlife, surface water, and groundwater, in the area will potentially be impacted by contaminants.	• The wildlife, surface water, and groundwater, in the area where the backfill is taken from may be impacted from traffic, dust, changing drainage patterns, and problems with erosion. • The cover system may impact groundwater and surface water flows, as well as the groundwater table. • Backfilling and installing an engineered cover over the SEPs will reduce the opportunity of wildlife coming into contact with contaminants.	• The wildlife, surface water, and groundwater, in the area where the backfill is taken from may be impacted from traffic, dust, changing drainage patterns, and problems with erosion. • The cover system may impact groundwater and surface water flows, as well as the groundwater table. • Backfilling and installing an engineered cover over the SEPs will reduce the opportunity of wildlife coming into contact with contaminants.	• The wildlife, surface water, and groundwater, in the area where the backfill is taken from may be impacted from traffic, dust, changing drainage patterns, and problems with erosion. • The cover system may impact groundwater and surface water flows, as well as the groundwater table. • Backfilling and installing and engineered cover over the SEPs will reduce the opportunity of wildlife coming into contact with contaminants.	• The wildlife, surface water, and groundwater, in the area where the backfill is taken from may be impacted from traffic, dust, changing drainage patterns, and problems with erosion. • Removing the soils and liners, and backfilling the SEPs will reduce the opportunity of wildlife coming into contact with contaminants.

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SHORT-TERM EFFECTIVENESS

Analysis Factor	Basis for Evaluation During Detailed Analysis	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Environmental impacts (continued)	What are the available mitigation measures to be used and what is their reliability to minimize potential impacts?	• Regrading/backfilling and seeding would reduce problems with erosion from air and wind, control dust, and help restore the area to its original condition.	• Installing an engineered cover will reduce problems with erosion from air and wind, control dust and help restore the area to its original condition. • Surface water will be collected and discharged to an approved drainage point without requiring treatment.	• Installing an engineered cover will reduce problems with erosion from air and wind, control dust and help restore the area to its original condition. • Surface water will be collected and discharged to an approved drainage point without requiring treatment.	• Installing and engineered cover will reduce problems with erosion from air and wind, control dust, and help restore the area to its original condition. • Surface water will be collected and discharged to an approved drainage point without requiring treatment.	• Backfilling and seeding will reduce problems with erosion from air and wind, control dust, and help restore the area to its original condition.
	What are the impacts that cannot be avoided should the alternative be implemented?	Groundwater concerns	Groundwater concerns	Groundwater concerns	Groundwater concerns	Groundwater concerns
Time until remedial response objectives are achieved	How long until protection against the threats being addressed by the specific action is achieved?	This alternative could be selected if there were no environmental threats. Therefore, the time period would not be applicable.	Upon completion of backfill.	Upon completion of *in situ* treatment.	Upon completion of either the first layer of the engineered cover or *in situ* treatment.	Upon completion of excavation of the soils and liners or the first layer of the engineered cover.
	How long until any remaining site threats will be addressed?	Upon completion of assessment and implementation of groundwater remediation.	Upon completion of assessment and implementation of groundwater remediation.	Upon completion of assessment and implementation of groundwater remediation.	Upon completion of assessment and implementation of groundwater remediation.	Upon completion of assessment and implementation of groundwater remediation.
	How long until remedial response objectives are achieved?	Not applicable	Approximately 7-12 months	Approximately 12 months	Approximately 14 months	Approximately 10-16 months
SCORE		HIGH	HIGH	MEDIUM	LOW	LOW

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IMPLEMENTABILITY

Analysis Factor	Basis For Evaluation During Detailed Analysis	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Technical Feasibility						
Ability to construct and operate technology	What difficulties may be associated with construction?	None	If large amounts of backfill and other materials are required it may be difficult and costly to get them into the Protected Area.	If large amounts of backfill and other materials are required it may be difficult and costly to get them into the Protected Area.	If large amounts of backfill and other materials are required it may be difficult and costly to get them into the Protected Area.	If large amounts of backfill and other materials are required it may be difficult and costly to get them into the Protected Area.
	What uncertainties are related to construction?	None	None	Quality control is difficult for *in situ* treatment processes.	Quality control is difficult for *in situ* treatment processes.	None
Reliability of technology	What is the likelihood that technical problems will lead to schedule delays?	None	None	There is not much control with in-situ treatment processes. There may be delays associated with this.	There is not much control with in-situ treatment processes. There may be delays associated with this.	There may be delays associated with treating the soils if problems arise with the process. Less problems should arise with *ex situ* treatment than with *in situ* treatment.
Ease of undertaking additional remedial action	What likely future remedial actions may be anticipated?	Groundwater monitoring and remediation.	Groundwater monitoring and potential remediation.	Groundwater monitoring and potential remediation.	Groundwater monitoring and a lower potential for groundwater remediation.	Groundwater monitoring. Groundwater remediation is least likely.
	How difficult would it be to implement the additional remedial actions, if required?	Easy - there will not be an engineered cover to restrict access to media.	Difficult - it may be difficult to implement additional remedial actions if they require excavation of the engineered cover to remove contaminated media.	Some difficulty - if *in situ* treatment processes are not sufficient to remove all the contaminants from the soils there may be difficulty in removing contaminated media.	Difficult - it may be difficult to implement additional remedial actions if they require excavation of the engineered cover to remove contaminated media.	Easy - further remediation of media should not be required since soils and liners are removed. However, if rework is necessary, it should be easy.
Monitoring considerations	Do migration or exposure pathways exist that cannot be monitored adequately?	Not applicable	Ingestion, dermal, and inhalation	Ingestion, dermal, and inhalation	Ingestion, dermal, and inhalation	Ingestion, dermal, and inhalation

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IMPLEMENTABILITY (CONTINUED)

Analysis Factor	Basis For Evaluation During Detailed Analysis	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Monitoring considerations (continued)	What risks of exposure exist should monitoring be insufficient to detect failure?	Not applicable	Workers might be exposed to contaminants. Exposure during post-closure groundwater monitoring.	Workers might be exposed to contaminants. Exposure during post-closure groundwater monitoring.	Workers might be exposed to contaminants. Wind transport to nearby offsite receptors. Exposure during post-closure groundwater monitoring.	Workers might be exposed to contaminants. Wind transport to nearby offsite receptors. Exposure during post-closure groundwater monitoring.
Administrative Feasibility						
Coordination with other agencies	What steps are required to coordinate with other agencies?	Not Applicable.	• Need closure designation.	• Need closure designation.	• Need closure designation. • Management of waste at an offsite facility will be done in accordance with Waste Acceptance Criteria (WAC). • Need to meet Department of Transportation (DOT) requirements for shipping waste.	• Need closure designation. • Management of waste at an offsite facility will be done in accordance with Waste Acceptance Criteria (WAC). • Need to meet Department of Transportation (DOT) requirements for shipping waste. • Potential NPDES permit modification required for secondary waste produced during *ex situ* soil treatment.
	What steps are required to set up long-term or future coordination among agencies?	Not Applicable.	Post closure care provisions and maintenance. This would include a Five year review as stated in the IAG Part 40. Under the IAG the DOE would be required to conduct a review and submit the results to the EPA.	Post closure care provisions and maintenance. This would include a Five year review as stated in the IAG Part 40. Under the IAG the DOE would be required to conduct a review and submit the results to the EPA.	Post closure care provisions and maintenance. This would include a Five year review as stated in the IAG Part 40. Under the IAG the DOE would be required to conduct a review and submit the results to the EPA.	• If any liners and/or soils are left in place post closure care provisions and maintenance would be required. This would include a Five year review as stated in the IAG Part 40. Under the IAG the DOE would be required to conduct a review and submit the results to the EPA. • If contaminated media is removed then post closure care provisions and maintenance are not required.

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IMPLEMENTABILITY (CONTINUED)

Analysis Factor	Basis For Evaluation During Detailed Analysis	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Coordination with other agencies (continued)	Can permits for offsite activities be obtained if required?	None required	None required	None required	Yes	Yes
ADMINISTRATIVE FEASIBILITY						
Availability of treatment, storage capacity, and disposal services	Are adequate treatment, storage capacity, and disposal services available?	None required	None required	• *In situ* treatment may be required for soils.	• Disposal will be required for liners and "hot spots" removed from the soils. • *In situ* treatment may be required for soils.	• Disposal will be required for liners and possibly soils. • *Ex situ* treatment may be required for soils.
	How much additional capacity is necessary?	None	None	None	Approximate volumes which may require storage: Liners ~ 317,000 cf Hot spots ~ 100,000 cf	Approximate volumes which may require storage: Liners ~ 317,000 cf Soils ~ 774,000 cf Hot spots in soils ~ 100,000 cf
	Does the lack of capacity prevent implementation?	Not Applicable	Not Applicable	No	No	No
	What additional provisions are required to ensure the needed additional capacity?	None	None	None	• Approval to transport any removed "hot spots" to a disposal facility.	• Approval to transport liners and contaminated media to a disposal facility.
Availability of necessary equipment and specialists	Are the necessary equipment and specialists available?	Yes	Yes	Yes	Yes	Yes
	What additional equipment and specialists are required?	None	None	*In situ* treatment equipment	*In situ* treatment equipment	Treatment equipment
	Does the lack of equipment and specialists prevent implementation?	No	No	No	No	No
	What additional provisions are required to ensure the needed equipment and specialists?	None	None	None	None	None
Availability of prospective technologies	Are the technologies under consideration generally available and sufficiently demonstrated for the specific application?	Yes	Yes	Yes	Yes	Yes
	Will technologies require further development before they can be applied full-scale to the type of waste at the site?	No	• Tests to determine chemical attack on clays and liners will be required.	• Treatability tests • Tests to determine chemical attack on clays and liners will be required.	• Treatability studies • Tests to determine chemical attack on clays and liners will be required.	• Treatability studies.

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IMPLEMENTABILITY (CONTINUED)

Analysis Factor	Basis For Evaluation During Detailed Analysis	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Availability of prospective technologies (continued)	When should the technology be available for full-scale use?	Immediately	The chemical attack tests should be completed during design. Unless there are problems with the tests, the technologies should be available immediately.	The treatability and chemical attack tests should be completed during design. Unless there are problems with the tests, the technologies should be available immediately.	The treatability and chemical attack tests should be completed during design. Unless there are problems with the tests, the technologies should be available immediately.	The treatability studies should be completed during design. Unless there are problems with the tests, the technologies should be available immediately.
	Will more than one vendor be available to provide a competitive bid?	Yes	Yes	Yes	Yes	Yes
SCORE		HIGH	HIGH	LOW	LOW	LOW

COSTS

Analysis Factor	Evaluation During Detailed Analysis	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Capital Costs	Direct and indirect capital costs.	1.4 M	3.0 M to 15 M	20 M to 44 M	53 M to 82 M	57 M to 122 M
Operating Costs	Costs associated with the operation of the closure/remediation option	The only operating costs would be for post closure	Operating costs would include post closure care and engineered cover maintenance.	Operating costs may include the cost of *in situ* soil treatment. Operating costs would include post-closure care and maintenance of an engineered cover.	Operating costs may include the cost of *in situ* treatment. Operating costs would include post-closure care and maintenance of an engineered cover.	Operating costs may include the cost of material packaging and shipping for disposal or the costs associated with exsitu treatment. Operating costs would also include post-closure care and cover maintenance.
SCORE		HIGH	HIGH	MEDIUM	LOW	LOW

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ES ENGINEERING-SCIENCE, INC.

Client: EG & G Job # DE3072202 Date: _____ By: C. Montes_____ Checked By:_____

SUBJECT: **SOLAR EVAPORATION PONDS: PREPARE PROCEDURE AND COST ESTIMATE FOR THE FOLLOWING:**

- Liner: Remove, pack, and transport liner and base for five ponds (207C; 207A; 207B, North; 207B, Center; 207B, South).
- Soil Treatment: Ponds (207C; 207A; 207B, North; 207B, Center; 207B, South) and surrounding areas.
- Engineered Cover: Ponds (207C; 207A; 207B, North; 207B, Center; 207B, South).
- Backfill Cover: Ponds (207C; 207A; 207B, North; 207B, Center; 207B, South) &/or surrounding areas.

ATTACHMENTS:

- A, Ponds Layout;
- B, Liner Data;
- C, Health & Safety Data;
- D, Waste Containers; and
- E, Maximum Boundary for contaminated ponds area.

REFERENCE: Draft OU4 SOLAR EVAPORATION POND IM/IRA-EA DECISION DOCUMENT REMEDIAL ALTERNATIVE DESCRIPTIONS.

ASSUMPTIONS:

1. The total liner and base volume for the five ponds = **317,000 ft^3** (Based on one foot depth).

2. The Maximum boundary for contaminated ponds area = **774,000 ft^3** (Based on one foot depth; includes ponds).

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3. **Burial Boxes:**

- Container (half-size) box capacity: (2')(4')(7') = 43 ft^3.
- Maximum load rating = 5,000 lbs. The estimated weight of liner and base is 94#/ft^3.
- Therefore, (43 ft3)*(94#/ft^3) = 4042 lbs (maximum amount of liner & base debris/box capacity).
- And, (317,000 ft^3)/(43 ft^3/box) = 7400 (container boxes required).

Note: The total number of container (half-size) boxes (4'X 2'X 7') required to store the recovered liner and base = 7400 boxes. Because it will be difficult to segregate the liner from the base completely, the assumption to collect both, liner and base, has been made for this phase. Further, since there will be some void (space loss) in filling the boxes to capacity, a factor of 10% shall be added to the total # of boxes.

- Therefore, 7400 boxes(10%) = 740 + 7400 = 8100 (boxes required). Use total # of **8100 boxes**.
- Cost for half-size container box (2' X 4' X 7') = $260
- Therefore, ($260)(8100 boxes) = **$2,106,000** (labor & material to build boxes; includes delivery).

4. **Remove liner and base**: {including loose debris (LD)}, and transport to crusher. Equipment, methodology, etc., by demolition sub-contractor.

- Therefore, (317,000 ft^3)(1 yd^3/27 ft^3) ($4/$yd^3$) = $46,964. Use **$47,000**

5. **Load liner and base** - Portable crusher: Demolition sub-contractor shall: Load from stockpile, feed, and discharge; Load boxes; and provide dust collection and control.

- Crusher capacity: 200 ton/day (Industry standard)
- Working capacity: 100 ton/day (utilization; Industry standard)
- Construction/Operating cost = $400/hour (Industry standard)
- Total weight = 317,000 ft^3 (94#/ft^3)(1 ton/2000#) = 14,899 tons; use 15,000 tons.
- Total cost = ($400/hr)(8hr/day)(1 day/100 tons)(15,000 tons) = **$480,000**
- Total working days: (15,000 tons)/(100 tons/day) = 150 Days.

Note: The first ten days will be required for stock pile build up to feed the crusher. Therefore, the total days for project = 160 Days. A 25% factor will be added for unseen problems, such as, equipment repairs, weather conditions, etc.,. Therefore, (.25)(160) = 40; And, (40 + 160) = 200 Days. Use 200 Days.

6. **Health & Safety Requirements**: Nonintrusive survey of pond areas to collect background ambient data (Prior to start of construction). The estimated cost for two OSHA trained people to perform on site monitoring for the project at the ponds is **$1056 per day**. This includes monitoring equipment.

7. **Transportation for liner and base**: (data source - Fritz Rahr; (713) 223-6759): Rail Shipment to Envirocare - per Southern Pacific who controls spurs @ Rocky Flats and Envirocare.

- Limitations: 150,000#/flatcar.
- Cost: $2,210/flatcar.
- Therefore, (8100 boxes)(4042#/box)(flatcar/150,000#)($2,210/flatcar) = **$482,372** (shipment cost).

8. **Soil Treatment Alternatives**: (Note, per field data, use 120#/ft^3 for dry compacted soil conditions).

- A Soil Washing: Soils are excavated and returned clean to site. Cost = $200/ton (maximum; includes excavation). Therefore,

  (774,000 ft^3)(120#/ft^3)(1 ton/2,000#)($200/ton) = **$9,288,000**.

- B Solvent Extraction: Soils are excavated and stored. Cost = $300/ton (includes excavation; does not include storage cost). Therefore,

  (774,000 ft^3)(120#/ft^3)(1 ton/2,000#)($300/ton) = **$13,932,000**.

- C Degradation: Bioremediation. Cost = $450/ton (ex situ); Cost = $350/ton (maximum; in situ). Therefore,

  - C_1 (774,000 ft^3)(120#/ft^3)(1 ton/2,000#)($450/ton) = **$20,900,000**.
  - C_2 (774,000 ft^3)(120#/ft^3)(1 ton/2,000#)($350/ton) = **$16,254,500**.

- D Thermal Desorption: Soils are excavated and returned clean to site. Cost = $350/ton (maximum; includes excavation).

(774,000 ft^3)(120#/ft^3)(1 ton/2,000#)($350/ton) = **$16,254,500**.

Soil Treatment Cost: The average cost of A, B, C_1, C_2, & D = **$15,325,200**.

9. **In Situ Soil Stabilization**: (28,700 cu yd)*($80/cu yd) = **$2,300,000**.

10. **Soil Removal**: Remove and box soil. Base on removal of 774,00 Ft^3 @ $2.50/$yd^3$ (Industry standard).

- A Therefore, (774,000 Ft^3)(1 yd^3/27 ft^3) ($2.50/$yd^3$) = $72,000.
- B (774,000 ft^3)/(43 ft^3/box) = 18,000 + 10% = 19,800 (boxes required); (19,800 boxes)($260/box) = $5,148,000.
- C Therefore, (19,800 * 3,600 lbs / 150,000) = 480 rail cars (shipment). 480 railcars * $2,210/car = **$ 1,060,800**

The total cost of A, B, & C, to remove, box and transport soil = $6,280,800. Use **$6,281,000**.

11. **Remove Hot spots:** From the liners and put in boxes. Base on removal of 32,000 ft^3 (approximately 10 % of total pond area, which is 317,000 ft^3, @ $2.50/$yd^3$ (Industry standard).

- A Therefore, (32,000 Ft^3)(1 yd^3/27 ft^3) ($2.50/$yd^3$) = $ 2962.
- B (32,000 ft^3)/(43 ft^3/box) = 744 + 10% = 820 (boxes required); (820 boxes)($260/box) = $ 213,200.
- C Therefore, (820 boxes)(4042#/box)(flatcar/150,000#)($2,210/flatcar) = $48,832 (shipment).

The total cost of A, B, & C, to remove, box and transport soil = $264,994 Use **$ 265,000**.

12. **Final Site Preparation** - includes the following:

- A Cleanup; setup; = $75,000
- B Well installations = $80,000

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•C Abandonment = $66,000

*D Vadose zone monitoring installations = $370,000

The total cost of A, B, C, & D to prepare final site = **$591,000**

13. Based on construction company experience and industry standards:

- Assumption for construction labor and operator rates: $40/hour.

  - Note: Operator and equipment costs; $55 and $65/hour include the $40/hour labor charge.

- Engineering design shall be assumed as 10% of total construction cost.

14. This phase does not include future maintenance or monitoring of the ponds or operating cost.

15. This phase does not include obtaining construction permits or associated fees.

16. This phase does not include duration (project hours, days, etc.) schedule for Soil Treatment work, installation of Engineered Cover, or Backfill Cover work.

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ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 1 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
1	NON-INTRUSIVE SURVEY	Health & Safety	Monitoring	651 Man-Day	5 Man-Days	4,000
2	PURCHASE WASTE BOXES	Contractor		260 Each	0 Boxes	0
3	OFFLOAD WASTE BOXES	Contractor	Fork Truck	55 Hour	0 Hour	0
4	MONITOR REMEDIATION	Health & Safety	Monitoring	651 Man-Day	0 Man-Days	0
5	EXCAVATE LINERS	Contractor	Pay Loader	4 CY	0 CY	0
6	CRUSH LINERS/LOAD WASTE BOXES	Contractor	Crusher	400 Hour	0 Hours	0
7	EXCAVATE SOIL/LOAD WASTE BOXES	Contractor	Pay Loader	2.5 CY	0 CY	0
8	TREAT SOIL/LOAD WASTE BOXES	Contractor		16,255,000	0 LS	0
9	INSTALL WASTE BOX LIDS	Contractor		40 Hour	0 Manhours	0
10	MOVE WASTE BOXES TO ASSAY	Contractor	Fork Truck, Flatbed	65 Hour	0 Manhours	0
11	ASSAY WASTE BOXES	EG&G		84 Manhour	0 Manhours	0
12	MOVE WASTE BOXES TO RAILCARS	Contractor	Fork Truck, Flatbed	65 Hour	0 Manhours	0
13	TRANSPORT TO DISPOSAL FACILITY	Southern Pacific	Railcars	2,210 Railcar	0 Railcars	0
14	DISPOSAL	EnviroCare		32 CF	0 CF	0
15	BLACKFILL COVER SITE	Contractor		1,800,000	0 LS	0
16	ENGINEERED COVER SITE	Contractor		6,300,000	0 LS	0
17	FINAL SITE SURVEY	Contractor	Monitoring	651 Man-Day	21 Man-Days	14,000
18	FINAL SITE PREPARATION	Contractor/EG&G	Drilling rig/Equip Decon	591,000	1 LS	591,000
19	SECURITY/ESCORTS/TRAINING	EG&G				
20	SUBTOTAL CONSTRUCTION					609,000

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ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 1 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
21	ENGINEERING	A/E		10 Percent		60,900
22	CONTRACTOR G&A PLUS ITEM 19			10.7 Percent		296,998
23	PROCUREMENT	EG&G		3 Percent		9,285
24	PROJECT & CONSTRUCTION MGMT (P&CM)	EG&G/CM		16 Percent		107,184
25	SUBTOTAL					1,083,367
26	ESCALATION			3.6 Percent		39,001
27	SUBTOTAL					1,122,368
28	CONTINGENCY			30 Percent		336,710
29	TOTAL ESTIMATED COST					$1,459,079

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ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 2 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
1	NON-INTRUSIVE SURVEY	Health & Safety	Monitoring	651 Man-Day	5 Man-Days	4,000
2	PURCHASE WASTE BOXES	Contractor		260 Each	0 Boxes	0
3	OFFLOAD WASTE BOXES	Contractor	Fork Truck	55 Hour	0 Hours	0
4	MONITOR REMEDIATION	Health & Safety	Monitoring	651 Man-Day	400 Man-Days	261,000
5	EXCAVATE LINERS	Contractor	Pay Loader	4 CY	0 CY	0
6	CRUSH LINERS/LOAD WASTE BOXES	Contractor	Crusher	400 Hour	0 Hours	0
7	EXCAVATE SOIL/LOAD WASTE BOXES	Contractor	Pay Loader	2.5 CY	0 CY	0
8	TREAT SOIL/LOAD WASTE BOXES	Contractor		16,255,000	0 LS	0
9	INSTALL WASTE BOX LIDS	Contractor		40 Hour	0 Manhours	0
10	MOVE WASTE BOXES TO ASSAY	Contractor	Fork Truck, Flatbed	65 Hour	0 Manhours	0
11	ASSAY WASTE BOXES	EG&G		84 Manhour	0 Manhours	0
12	MOVE WASTE BOXES TO RAILCARS	Contractor	Fork Truck, Flatbed	65 Hour	0 Manhours	0
13	TRANSPORT TO DISPOSAL FACILITY	Southern Pacific	Railcars	2,210 Railcar	0 Railcars	0
14	DISPOSAL	EnviroCare		32 CF	0 CF	0
15	BLACKFILL COVER SITE	Contractor		1,800,000	1 LS	1,800,000
16	ENGINEERED COVER SITE	Contractor		6,300,000	0 LS	0
17	FINAL SITE SURVEY	Contractor	Monitoring	651 Man-Day	21 Man-Days	14,000
18	FINAL SITE PREPARATION	Contractor/EG&G	Drilling rig/Equip Decon	591,000	1 LS	591,000
19	SECURITY/ESCORTS/TRAINING	EG&G		40 Hour	9,600 Hours	384,000
20	SUBTOTAL CONSTRUCTION					3,054,000

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ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 2 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
21	ENGINEERING	A/E		10 Percent		305,400
22	CONTRACTOR G&A PLUS ITEM 19			10.7 Percent		530,686
23	PROCUREMENT	EG&G		3 Percent		63,285
24	PROJECT & CONSTRUCTION MGMT (P&CM)	EG&G/CM		16 Percent		537,504
25	SUBTOTAL					4,490,875
26	ESCALATION			3.6 Percent		161,672
27	SUBTOTAL			30 Percent		4,652,547
28	CONTINGENCY					1,395,764
29	TOTAL ESTIMATED COST					$6,048,310

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ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 3 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
1	NON-INTRUSIVE SURVEY	Health & Safety	Monitoring	651 Man-Day	5 Man-Days	4,000
2	PURCHASE WASTE BOXES	Contractor		260 Each	0 Boxes	0
3	OFFLOAD WASTE BOXES	Contractor	Fork Truck	55 Hour	0 Hours	0
4	MONITOR REMEDIATION	Health & Safety	Monitoring	651 Man-Day	400 Man-Days	261,000
5	EXCAVATE LINERS	Contractor	Pay Loader	4 CY	0 CY	0
6	CRUSH LINERS/LOAD WASTE BOXES	Contractor	Crusher	400 Hour	0 Hours	0
7	EXCAVATE SOIL/LOAD WASTE BOXES	Contractor	Pay Loader	2.5 CY	0 CY	0
8	TREAT SOIL/LOAD WASTE BOXES	Contractor		16,255,000	0 LS	0
9	INSTALL WASTE BOX LIDS	Contractor		40 Hour	0 Manhours	0
10	MOVE WASTE BOXES TO ASSAY	Contractor	Fork Truck, Flatbed	65 Hour	0 Manhours	0
11	ASSAY WASTE BOXES	EG&G		84 Manhour	0 Manhours	0
12	MOVE WASTE BOXES TO RAILCARS	Contractor	Fork Truck, Flatbed	65 Hour	0 Manhours	0
13	TRANSPORT TO DISPOSAL FACILITY	Southern Pacific	Railcars	2,210 Railcar	0 Railcars	0
14	DISPOSAL	EnviroCare		32 CF	0 CF	0
15	BLACKFILL COVER SITE	Contractor		1,800,000	0 LS	0
16	ENGINEERED COVER SITE	Contractor		236,000	1 LS	236,000
17	FINAL SITE SURVEY	Contractor	Monitoring	651 Man-Day	21 Man-Days	14,000
18	FINAL SITE PREPARATION	Contractor/EG&G	Drilling rig/Equip Decon	591,000	1 LS	591,000
19	SECURITY/ESCORTS/TRAINING	EG&G		40 Hour	9,600 Hours	384,000
20	SUBTOTAL CONSTRUCTION					1,490,000

OU4 PHASE I IM/IRA – ALTERNATIVES SELECTION

ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 3 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
21	ENGINEERING	A/E		10 Percent		149,000
22	CONTRACTOR G&A PLUS ITEM 19			10.7 Percent		363,338
23	PROCUREMENT	EG&G		3 Percent		16,365
24	PROJECT & CONSTRUCTION MGMT (P&CM)	EG&G/CM		16 Percent		262,240
25	SUBTOTAL					2,280,943
26	ESCALATION			3.6 Percent		82,114
27	SUBTOTAL					2,363,057
28	CONTINGENCY			30 Percent		708,917
29	TOTAL ESTIMATED COST					$3,071,974

5.4 acre x 43,560 ft^2/ acre x $1.00/$ft^2$ (40 mil HDPE under 6" soil)

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ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 4 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
1	NON-INTRUSIVE SURVEY	Health & Safety	Monitoring	651 Man-Day	5 Man-Days	4,000
2	PURCHASE WASTE BOXES	Contractor		260 Each	0 Boxes	0
3	OFFLOAD WASTE BOXES	Contractor	Fork Truck	55 Hour	0 Hours	0
4	MONITOR REMEDIATION	Health & Safety	Monitoring	651 Man-Day	400 Man-Days	261,000
5	EXCAVATE LINERS	Contractor	Pay Loader	4 CY	0 CY	0
6	CRUSH LINERS/LOAD WASTE BOXES	Contractor	Crusher	400 Hour	0 Hours	0
7	EXCAVATE SOIL/LOAD WASTE BOXES	Contractor	Pay Loader	2.5 CY	0 CY	0
8	TREAT SOIL/LOAD WASTE BOXES	Contractor		16,255,000	0 LS	0
9	INSTALL WASTE BOX LIDS	Contractor		40 Hour	0 Manhours	0
10	MOVE WASTE BOXES TO ASSAY	Contractor	Fork Truck, Flatbed	65 Hour	0 Manhours	0
11	ASSAY WASTE BOXES	EG&G		84 Manhour	0 Manhours	0
12	MOVE WASTE BOXES TO RAILCARS	Contractor	Fork Truck, Flatbed	65 Hour	0 Manhours	0
13	TRANSPORT TO DISPOSAL FACILITY	Southern Pacific	Railcars	2,210 Railcar	0 Railcars	0
14	DISPOSAL	EnviroCare		32 CF	0 CF	0
15	BLACKFILL COVER SITE	Contractor		1,800,000	0 LS	0
16	ENGINEERED COVER SITE	Contractor		6,300,000	1 LS	6,300,000
17	FINAL SITE SURVEY	Contractor	Monitoring	651 Man-Day	21 Man-Days	14,000
18	FINAL SITE PREPARATION	Contractor/EG&G	Drilling rig/Equip Decon	591,000	1 LS	591,000
19	SECURITY/ESCORT/TRAINING	EG&G		40 Hours	19,200 Hours	768,000
20	SUBTOTAL CONSTRUCTION					7,938,000

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ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 4 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
21	ENGINEERING	A/E		10 Percent		793,800
22	CONTRACTOR G&A PLUS ITEM 19			10.7 Percent		1,053,274
23	PROCUREMENT	EG&G		3 Percent		198,285
24	PROJECT & CONSTRUCTION MGMT (P&CM)	EG&G/CM		16 Percent		1,397,088
25	SUBTOTAL					11,380,447
26	ESCALATION			3.6 Percent		409,696
27	SUBTOTAL					11,790,143
28	CONTINGENCY			30 Percent		3,537,043
29	TOTAL ESTIMATED COST					$15,327,186

In–Situ biodegradation – Remove liner hot spots 10%

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ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 5 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
1	NON–INTRUSIVE SURVEY	Health & Safety	Monitoring	651 Man–Day	5 Man–Days	4,000
2	PURCHASE WASTE BOXES	Contractor		260 Each	0 Boxes	0
3	OFFLOAD WASTE BOXES	Contractor	Fork Truck	55 Hour	0 Hours	0
4	MONITOR REMEDIATION	Health & Safety	Monitoring	651 Man–Day	0 Man–Days	0
5	EXCAVATE LINERS	Contractor	Pay Loader	4 CY	0 CY	0
6	CRUSH LINERS/LOAD WASTE BOXES	Contractor	Crusher	400 Hour	0 Hours	0
7	EXCAVATE SOIL/LOAD WASTE BOXES	Contractor	Pay Loader	2.5 CY	0 CY	0
8	TREAT SOIL/LOAD WASTE BOXES	Contractor		2,300,000	1 LS	2,300,000
9	INSTALL WASTE BOX LIDS	Contractor		40 Hour	0 Manhours	0
10	MOVE WASTE BOXES TO ASSAY	Contractor	Fork Truck, Flatbed	65 Hour	0 Manhours	0
11	ASSAY WASTE BOXES	EG&G		84 Manhour	0 Manhours	0
12	MOVE WASTE BOXES TO RAILCARS	Contractor	Fork Truck, Flatbed	65 Hour	0 Manhours	0
13	TRANSPORT TO DISPOSAL FACILITY	Southern Pacific	Railcars	2,210 Railcar	0 Railcars	0
14	DISPOSAL	EnviroCare		32 CF	0 CF	0
15	BLACKFILL COVER SITE	Contractor		1,800,000	0 LS	0
16	ENGINEERED COVER SITE	Contractor		6,300,000	1 LS	6,300,000
17	FINAL SITE SURVEY	Contractor	Monitoring	651 Man–Day	21 Man–Days	14,000
18	FINAL SITE PREPARATION	Contractor/EG&G	Drilling rig/Equip Decon	591,000	1 LS	591,000
19	SECURITY/ESCORTS/TRAINING	EG&G		40 Hour	32,000 Hours	1,280,000
20	SUBTOTAL CONSTRUCTION					10,489,000

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ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 5 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
21	ENGINEERING	A/E		10 Percent		1,048,900
22	CONTRACTOR G&A PLUS ITEM 19			10.7 Percent		1,108,058
23	PROCUREMENT	EG&G		3 Percent		267,285
24	PROJECT & CONSTRUCTION MGMT (P&CM)	EG&G/CM		16 Percent		1,846,064
25	SUBTOTAL					14,759,307
26	ESCALATION			3.6 Percent		531,335
27	SUBTOTAL					15,290,642
28	CONTINGENCY			30 Percent		4,587,193
29	TOTAL ESTIMATED COST					$19,877,835

In–Situ solidification – Remove liner hot spots 10%

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ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 6 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
1	NON–INTRUSIVE SURVEY	Health & Safety	Monitoring	651 Man–Day	5 Man–Days	4,000
2	PURCHASE WASTE BOXES	Contractor		260 Each	8,100 Boxes	2,107,000
3	OFFLOAD WASTE BOXES	Contractor	Fork Truck	55 Hour	675 Hours	38,000
4	MONITOR REMEDIATION	Health & Safety	Monitoring	651 Man–Day	400 Man–Days	261,000
5	EXCAVATE LINERS	Contractor	Pay Loader	4 CY	11,740 CY	47,000
6	CRUSH LINERS/LOAD WASTE BOXES	Contractor	Crusher	400 Hour	1,200 Hours	481,000
7	EXCAVATE SOIL/LOAD WASTE BOXES	Contractor	Pay Loader	2.5 CY	0 CY	0
8	TREAT SOIL/LOAD WASTE BOXES	Contractor		16,255,000	0 LS	0
9	INSTALL WASTE BOX LIDS	Contractor		40 Hour	1,350 Manhours	55,000
10	MOVE WASTE BOXES TO ASSAY	Contractor	Fork Truck, Flatbed	65 Hour	810 Manhours	53,000
11	ASSAY WASTE BOXES	EG&G		84 Manhour	36,450 Manhours	3,062,000
12	MOVE WASTE BOXES TO RAILCARS	Contractor	Fork Truck, Flatbed	65 Hour	810 Manhours	53,000
13	TRANSPORT TO DISPOSAL FACILITY	Southern Pacific	Railcars	2,210 Railcar	218 Railcars	482,000
14	DISPOSAL	EnviroCare		32 CF	453,600 CF	14,516,000
15	BLACKFILL COVER SITE	Contractor		1,800,000	0 LS	0
16	ENGINEERED COVER SITE	Contractor		6,300,000	1 LS	6,300,000
17	FINAL SITE SURVEY	Contractor	Monitoring	651 Man–Day	21 Man–Days	14,000
18	FINAL SITE PREPARATION	Contractor/EG&G	Drilling rig/Equip Decon	591,000	1 LS	591,000
19	SECURITY/ESCORTS/TRAINING	EG&G		40 Hour	32,000 Hours	1,280,000
20	SUBTOTAL CONSTRUCTION					29,344,000

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ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 6 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
21	ENGINEERING	A/E		10 Percent		2,934,400
22	CONTRACTOR G&A PLUS ITEM 19			10.7 Percent		1,185,847
23	PROCUREMENT	EG&G		3 Percent		733,245
24	PROJECT & CONSTRUCTION MGMT (P&CM)	EG&G/CM		16 Percent		5,164,544
25	SUBTOTAL					39,362,036
26	ESCALATION			3.6 Percent		1,417,033
27	SUBTOTAL					40,779,069
28	CONTINGENCY			30 Percent		12,233,721
29	TOTAL ESTIMATED COST					$53,012,790

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OU4 PHASE I IM/IRA – ALTERNATIVES SELECTION

ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 7 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
1	NON–INTRUSIVE SURVEY	Health & Safety	Monitoring	651 Man–Day	5 Man–Days	4,000
2	PURCHASE WASTE BOXES	Contractor		260 Each	8,100 Boxes	2,107,000
3	OFFLOAD WASTE BOXES	Contractor	Fork Truck	55 Hour	675 Hours	38,000
4	MONITOR REMEDIATION	Health & Safety	Monitoring	651 Man–Day	400 Man–Days	261,000
5	EXCAVATE LINERS	Contractor	Pay Loader	4 CY	11,740 CY	47,000
6	CRUSH LINERS/LOAD WASTE BOXES	Contractor	Crusher	400 Hour	1,200 Hours	481,000
7	EXCAVATE SOIL/LOAD WASTE BOXES	Contractor	Pay Loader	2.5 CY	0 CY	0
8	TREAT SOIL/LOAD WASTE BOXES	Contractor		16,255,000	1 LS	16,255,000
9	INSTALL WASTE BOX LIDS	Contractor		40 Hour	1,350 Manhours	55,000
10	MOVE WASTE BOXES TO ASSAY	Contractor	Fork Truck, Flatbed	65 Hour	810 Manhours	53,000
11	ASSAY WASTE BOXES	EG&G		84 Manhour	36,450 Manhours	3,062,000
12	MOVE WASTE BOXES TO RAILCARS	Contractor	Fork Truck, Flatbed	65 Hour	810 Manhours	53,000
13	TRANSPORT TO DISPOSAL FACILITY	Southern Pacific	Railcars	2,210 Railcar	218 Railcars	482,000
14	DISPOSAL	EnviroCare		32 CF	453,600 CF	14,516,000
15	BLACKFILL COVER SITE	Contractor		1,800,000	0 LS	0
16	ENGINEERED COVER SITE	Contractor		6,300,000	1 LS	6,300,000
17	FINAL SITE SURVEY	Contractor	Monitoring	651 Man–Day	21 Man–Days	14,000
18	FINAL SITE PREPARATION	Contractor/EG&G	Drilling rig/Equip Decon	591,000	1 LS	591,000
19	SECURITY/ESCORTS/TRAINING	EG&G		40 Hour	38,400 Hours	1,536,000
20	SUBTOTAL CONSTRUCTION					45,855,000

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ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 7 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
21	ENGINEERING	A/E		10 Percent		4,585,500
22	CONTRACTOR G&A PLUS ITEM 19			10.7 Percent		1,213,239
23	PROCUREMENT	EG&G		3 Percent		1,220,895
24	PROJECT & CONSTRUCTION MGMT (P&CM)	EG&G/CM		16 Percent		8,070,480
25	SUBTOTAL					60,945,114
26	ESCALATION			3.6 Percent		2,194,024
27	SUBTOTAL					63,139,138
28	CONTINGENCY			30 Percent		18,941,741
29	TOTAL ESTIMATED COST					$82,080,880

In–Situ biodegradation

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OU4 PHASE I IM/IRA – ALTERNATIVES SELECTION

ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 8 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
1	NON-INTRUSIVE SURVEY	Health & Safety	Monitoring	651 Man-Day	5 Man-Days	4,000
2	PURCHASE WASTE BOXES	Contractor		260 Each	0 Boxes	0
3	OFFLOAD WASTE BOXES	Contractor	Fork Truck	55 Hour	0 Hours	0
4	MONITOR REMEDIATION	Health & Safety	Monitoring	651 Man-Day	400 Man-Days	261,000
5	EXCAVATE LINERS	Contractor	Pay Loader	4 CY	0 CY	0
6	CRUSH LINERS/LOAD WASTE BOXES	Contractor	Crusher	400 Hour	0 Hours	0
7	EXCAVATE SOIL/LOAD WASTE BOXES	Contractor	Pay Loader	2.5 CY	0 CY	0
8	TREAT SOIL/LOAD WASTE BOXES	Contractor		16,255,000	1 LS	16,255,000
9	INSTALL WASTE BOX LIDS	Contractor		40 Hour	0 Manhours	0
10	MOVE WASTE BOXES TO ASSAY	Contractor	Fork Truck, Flatbed	65 Hour	0 Manhours	0
11	ASSAY WASTE BOXES	EG&G		84 Manhour	0 Manhours	0
12	MOVE WASTE BOXES TO RAILCARS	Contractor	Fork Truck, Flatbed	65 Hour	0 Manhours	0
13	TRANSPORT TO DISPOSAL FACILITY	Southern Pacific	Railcars	2,210 Railcar	0 Railcars	0
14	DISPOSAL	EnviroCare		32 CF	0 CF	0
15	BLACKFILL COVER SITE	Contractor		1,800,000	0 LS	0
16	ENGINEERED COVER SITE	Contractor		6,300,000	1 LS	6,300,000
17	FINAL SITE SURVEY	Contractor	Monitoring	651 Man-Day	21 Man-Days	14,000
18	FINAL SITE PREPARATION	Contractor/EG&G	Drilling rig/Equip Decon	591,000	1 LS	591,000
19	SECURITY/ESCORTS/TRAINING	EG&G		40 Hour	32,000 Hours	1,280,000
20	SUBTOTAL CONSTRUCTION					24,705,000

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ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 8 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
21	ENGINEERING	A/E		10 Percent		2,470,500
22	CONTRACTOR G&A PLUS ITEM 19			10.7 Percent		1,108,058
23	PROCUREMENT	EG&G		3 Percent		685,935
24	PROJECT & CONSTRUCTION MGMT (P&CM)	EG&G/CM		16 Percent		4,348,080
25	SUBTOTAL					33,317,573
26	ESCALATION			3.6 Percent		1,199,433
27	SUBTOTAL					34,517,006
28	CONTINGENCY			30 Percent		10,355,102
29	TOTAL ESTIMATED COST					$44,872,107

In-Situ biodegradation

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OU4 PHASE I IM/IRA – ALTERNATIVES SELECTION

ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 9 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
1	NON-INTRUSIVE SURVEY	Health & Safety	Monitoring	651 Man-Day	5 Man-Days	4,000
2	PURCHASE WASTE BOXES	Contractor		260 Each	8,920 Boxes	2,320,000
3	OFFLOAD WASTE BOXES	Contractor	Fork Truck	55 Hour	745 Hours	41,000
4	MONITOR REMEDIATION	Health & Safety	Monitoring	651 Man-Day	400 Man-Days	261,000
5	EXCAVATE LINERS	Contractor	Pay Loader	4 CY	11,740 CY	47,000
6	CRUSH LINERS/LOAD WASTE BOXES	Contractor	Crusher	400 Hour	1,200 Hours	481,000
7	EXCAVATE SOIL/LOAD WASTE BOXES	Contractor	Pay Loader	2.5 CY	2,870 CY	8,000
8	TREAT SOIL/LOAD WASTE BOXES	Contractor			1 LS	0
9	INSTALL WASTE BOX LIDS	Contractor		40 Hour	1,486 Manhours	60,000
10	MOVE WASTE BOXES TO ASSAY	Contractor	Fork Truck, Flatbed	65 Hour	1,008 Manhours	66,000
11	ASSAY WASTE BOXES	EG&G		84 Manhour	40,140 Manhours	3,372,000
12	MOVE WASTE BOXES TO RAILCARS	Contractor	Fork Truck, Flatbed	65 Hour	892 Manhours	58,000
13	TRANSPORT TO DISPOSAL FACILITY	Southern Pacific	Railcars	2,210 Railcar	240 Railcars	531,000
14	DISPOSAL	EnviroCare		32 CF	499,520 CF	15,985,000
15	BLACKFILL COVER SITE	Contractor		1,800,000	0 LS	0
16	ENGINEERED COVER SITE	Contractor		6,300,000	1 LS	6,300,000
17	FINAL SITE SURVEY	Contractor	Monitoring	651 Man-Day	21 Man-Days	14,000
18	FINAL SITE PREPARATION	Contractor/EG&G	Drilling rig/Equip Decon	591,000	1 LS	591,000
19	SECURITY/ESCORTS/TRAINING	EG&G		40 Hour	38,400 Hours	1,536,000
20	SUBTOTAL CONSTRUCTION					31,675,000

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OU4 PHASE I IM/IRA – ALTERNATIVES SELECTION

ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 9 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
21	ENGINEERING	A/E		10 Percent		3,167,500
22	CONTRACTOR G&A PLUS ITEM 19			10.7 Percent		1,216,877
23	PROCUREMENT	EG&G		3 Percent		786,195
24	PROJECT & CONSTRUCTION MGMT (P&CM)	EG&G/CM		16 Percent		5,574,800
25	SUBTOTAL					42,420,372
26	ESCALATION			3.6 Percent		1,527,133
27	SUBTOTAL					43,947,505
28	CONTINGENCY			30 Percent		13,184,252
29	TOTAL ESTIMATED COST					$57,131,757

Excavate and ship 10% of soil "hot spots"

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ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 10 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
1	NON-INTRUSIVE SURVEY	Health & Safety	Monitoring	651 Man-Day	5 Man-Days	4,000
2	PURCHASE WASTE BOXES	Contractor		260 Each	27,900 Boxes	7,255,000
3	OFFLOAD WASTE BOXES	Contractor	Fork Truck	55 Hour	2,325 Hours	128,000
4	MONITOR REMEDIATION	Health & Safety	Monitoring	651 Man-Day	400 Man-Days	261,000
5	EXCAVATE LINERS	Contractor	Pay Loader	4 CY	11,740 CY	47,000
6	CRUSH LINERS/LOAD WASTE BOXES	Contractor	Crusher	400 Hour	1,200 Hours	481,000
7	EXCAVATE SOIL/LOAD WASTE BOXES	Contractor	Pay Loader	2.5 CY	28,700 CY	72,000
8	TREAT SOIL/LOAD WASTE BOXES	Contractor			1 LS	0
9	INSTALL WASTE BOX LIDS	Contractor		40 Hour	4,650 Manhours	187,000
10	MOVE WASTE BOXES TO ASSAY	Contractor	Fork Truck, Flatbed	65 Hour	2,790 Manhours	182,000
11	ASSAY WASTE BOXES	EG&G		84 Manhour	125,550 Manhours	10,547,000
12	MOVE WASTE BOXES TO RAILCARS	Contractor	Fork Truck, Flatbed	65 Hour	2,790 Manhours	182,000
13	TRANSPORT TO DISPOSAL FACILITY	Southern Pacific	Railcars	2,210 Railcar	698 Railcars	1,543,000
14	DISPOSAL	EnviroCare		32 CF	1,562,400 CF	49,997,000
15	BLACKFILL COVER SITE	Contractor		1,800,000	1 LS	1,800,000
16	ENGINEERED COVER SITE	Contractor		6,300,000	0 LS	0
17	FINAL SITE SURVEY	Contractor	Monitoring	651 Man-Day	21 Man-Day	14,000
18	FINAL SITE PREPARATION	Contractor/EG&G	Drilling rig/Equip Decon	591,000	1 LS	591,000
19	SECURITY/ESCORTS/TRAINING	EG&G		40 Hour	38,400 Hours	1,536,000
20	SUBTOTAL CONSTRUCTION					74,827,000

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OU4 PHASE I IM/IRA – ALTERNATIVES SELECTION

ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 10 DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
21	ENGINEERING	A/E		10 Percent		7,482,700
22	CONTRACTOR G&A PLUS ITEM 19			10.7 Percent		790,803
23	PROCUREMENT	EG&G		3 Percent		1,865,505
24	PROJECT & CONSTRUCTION MGMT (P&CM)	EG&G/CM		16 Percent		13,169,552
25	SUBTOTAL					90,652,860
26	ESCALATION			3.6 Percent		3,263,503
27	SUBTOTAL					93,916,363
28	CONTINGENCY			30 Percent		28,174,909
29	TOTAL ESTIMATED COST					$122,091,272

Excavate and ship soil to burial

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OU4 PHASE I IM/IRA – ALTERNATIVES SELECTION

ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 11 (LOW SPOT) DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
1	NON-INTRUSIVE SURVEY	Health & Safety	Monitoring	651 Man-Day	5 Man-Days	4,000
2	PURCHASE WASTE BOXES	Contractor		260 Each	12,060 Boxes	3,136,000
3	OFFLOAD WASTE BOXES	Contractor	Fork Truck	55 Hour	1,005 Hours	56,000
4	MONITOR REMEDIATION	Health & Safety	Monitoring	651 Man-Day	400 Man-Days	261,000
5	EXCAVATE LINERS	Contractor	Pay Loader	4 CY	11,740 CY	47,000
6	CRUSH LINERS/LOAD WASTE BOXES	Contractor	Crusher	400 Hour	1,200 Hours	481,000
7	EXCAVATE SOIL/LOAD WASTE BOXES	Contractor	Pay Loader	2.5 CY	0 CY	
8	TREAT SOIL/LOAD WASTE BOXES	Contractor		9,288,000	1 LS	9,288,000
9	INSTALL WASTE BOX LIDS	Contractor		40 Hour	2,010 Manhours	81,000
10	MOVE WASTE BOXES TO ASSAY	Contractor	Fork Truck, Flatbed	65 Hour	1,200 Manhours	79,000
11	ASSAY WASTE BOXES	EG&G		84 Manhour	17,820 Manhours	1,497,000
12	MOVE WASTE BOXES TO RAILCARS	Contractor	Fork Truck, Flatbed	65 Hour	1,200 Manhours	79,000
13	TRANSPORT TO DISPOSAL FACILITY	Southern Pacific	Railcars	2,210 Railcar	314 Railcars	694,000
14	DISPOSAL	EnviroCare		32 CF	675,360 CF	21,612,000
15	BLACKFILL COVER SITE	Contractor		1,800,000	1 LS	1,800,000
16	ENGINEERED COVER SITE	Contractor		6,300,000	0 LS	0
17	FINAL SITE SURVEY	Contractor	Monitoring	651 Man-Day	21 Man-Days	14,000
18	FINAL SITE PREPARATION	Contractor/EG&G	Drilling rig/Equip Decon	591,000	1 LS	591,000
19	SECURITY/ESCORTS/TRAINING	EG&G		40 Hour	38,400 Hours	1,536,000
20	SUBTOTAL CONSTRUCTION					41,256,000

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ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 11 (LOW SPOT) DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
21	ENGINEERING	A/E		10 Percent		4,125,600
22	CONTRACTOR G&A PLUS ITEM 19			10.7 Percent		742,011
23	PROCUREMENT	EG&G		3 Percent		1,129,875
24	PROJECT & CONSTRUCTION MGMT (P&CM)	EG&G/CM		16 Percent		7,261,056
25	SUBTOTAL					54,514,542
26	ESCALATION			3.6 Percent		1,962,524
27	SUBTOTAL					56,477,066
28	CONTINGENCY			30 Percent		16,943,120
29	TOTAL ESTIMATED COST					$73,420,185

Ex situ soil washing return 80% to site disposal 20% – 3960 boxes soil to waste – 3 assay operators 1.5 hr/box

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OU4 PHASE I IM/IRA – ALTERNATIVES SELECTION

ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 11 (HIGH SPOT) DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
1	NON–INTRUSIVE SURVEY	Health & Safety	Monitoring	651 Man–Day	5 Man–Days	4,000
2	PURCHASE WASTE BOXES	Contractor		260 Each	8,100 Boxes	2,107,000
3	OFFLOAD WASTE BOXES	Contractor	Fork Truck	55 Hour	675 Hours	38,000
4	MONITOR REMEDIATION	Health & Safety	Monitoring	651 Man–Day	400 Man–Days	261,000
5	EXCAVATE LINERS	Contractor	Pay Loader	4 CY	11,740 CY	47,000
6	CRUSH LINERS/LOAD WASTE BOXES	Contractor	Crusher	400 Hour	1,200 Hours	481,000
7	EXCAVATE SOIL/LOAD WASTE BOXES	Contractor	Pay Loader	2.5 CY	0 CY	
8	TREAT SOIL/LOAD WASTE BOXES	Contractor		20,900,000	1 LS	20,900,000
9	INSTALL WASTE BOX LIDS	Contractor		40 Hour	1,350 Manhours	55,000
10	MOVE WASTE BOXES TO ASSAY	Contractor	Fork Truck, Flatbed	65 Hour	810 Manhours	53,000
11	ASSAY WASTE BOXES	EG&G		84 Manhour	36,450 Manhours	3,062,000
12	MOVE WASTE BOXES TO RAILCARS	Contractor	Fork Truck, Flatbed	65 Hour	810 Manhours	53,000
13	TRANSPORT TO DISPOSAL FACILITY	Southern Pacific	Railcars	2,210 Railcar	219 Railcars	484,000
14	DISPOSAL	EnviroCare		32 CF	453,600 CF	14,516,000
15	BACKFILL COVER SITE (PN 11/24/93)	Contractor		1,800,000	1 LS	1,800,000
16	ENGINEERED COVER SITE	Contractor		6,300,000	1 LS	~~6,300,000~~ PM 11/29/93
17	FINAL SITE SURVEY	Contractor	Monitoring	651 Man–Day	21 Man–Days	14,000
18	FINAL SITE PREPARATION	Contractor/EG&G	Drilling rig/Equip Decon	591,000	1 LS	591,000
19	SECURITY/ESCORT/TRAINING	EG&G		40 Hour	38,400 Hours	1,536,000
20	SUBTOTAL CONSTRUCTION					52,302,000

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OU4 PHASE I IM/IRA – ALTERNATIVES SELECTION

ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE

ALTERNATIVE 11 (HIGH SPOT) DATE:

ITEM	TASK	RESPONSIBILITY	EQUIPMENT	UNIT COST ($/UNIT)	QUANTITY	TOTAL COST
21	ENGINEERING	A/E		10 Percent		5,230,200
22	CONTRACTOR G&A PLUS ITEM 19			10.7 Percent		1,405,839
23	PROCUREMENT	EG&G		3 Percent		1,414,305
24	PROJECT & CONSTRUCTION MGMT (P&CM)	EG&G/CM		16 Percent		9,205,152
25	SUBTOTAL					69,557,496
26	ESCALATION			3.6 Percent		2,504,070
27	SUBTOTAL					72,061,566
28	CONTINGENCY			30 Percent		21,618,470
29	TOTAL ESTIMATED COST					$93,680,036

Ex situ biodegradation

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TABLE 3.4 PRELIMINARY SCENARIOS			
No Further Action	*In Situ* Action	Hybrid Action	*Ex Situ* Action
(1) Post-closure monitoring[a/]	(2) Backfilling and seeding (3) Placement of a temporary cover[b/] (4) Leave liners and soils in place (no treatment), and an engineered cover (5) *In situ* treatment of liners and soil, and an engineered cover	6) Remove liners, leave soils in place (no treatment) and an engineered cover (7) Remove liners (no treatment), *in situ* soil treatment, and an engineered cover (8) Leave liners in place (no treatment), *in situ* soil treatment, and an engineered cover (9) Remove liners (no treatment), remove some soils (no treatment), and an engineered cover	(10) Remove liners and soils (no treatment), with backfill cover (11) Remove liners and soils (*ex situ* treatment), with backfill cover

NOTES:

a/ This alternative is provided as a baseline to measure the effectiveness of other alternatives.
b/ This alternative is provided to address the situation where there is little or no anticipated risk to human health and the environment. Final action is deferred until the results of the additional hydrogeological investigations are obtained.

Remedial Alternatives

I. No Further Action (1)
   A. Regrade and seed
   B. Post-closure monitoring

II. Containment of Contaminated Materials without Treatment
   A. Cover systems
      - Backfill and seed (2)
      - Temporary cover (3)
      - Engineered cover (4)
         - Cover alternatives 1-4
   B. Post-closure monitoring

III. Containment of Liners with Insitu Soil Treatment (5 & 8)
   A. Liners
      - No Treatment
      - Partial Dismantling and removal (hot spots)
   B. Insitu Soil Treatment
      - Solidification
   C. Cover system
      - Backfill and seed
      - Engineered cover
         - Cover alternatives 1&2
   D. Post-closure monitoring

IV. Removal of Contaminated Liners (Partial or Total) (6 & 7)
   A. Liners (total or hot spots)
      - Containerization
      - Size reduce and containerization
   B. Soils (total or hot spots)
      - No treatment
      - InSitu treatment
         - solidification/stabilization
         - thermal desorption
   C. Cover systems
      - Backfill and seed
      - Engineered Cover
         - cover alternatives 1&2
   D. Post-closure monitoring
   E. Liner Disposition
      - Disposal
      - Storage

V. Removal of Contaminated Materials (Partial or Total) With Exsitu treatment (9, 10, and 11)

   A. Liners (total or hot spots)
      - Containerization
      - Size reduce and containerization

   B. Soils (total or hot spots)
      - Containerization
      - Exsitu treatment

- solidification/stabilization
- soil washing
- solvent extraction
- degradation
- thermal desorption

C. Cover systems
- Backfill and seed

D. Post-closure monitoring

E. Liner Disposition
- Disposal
- Storage

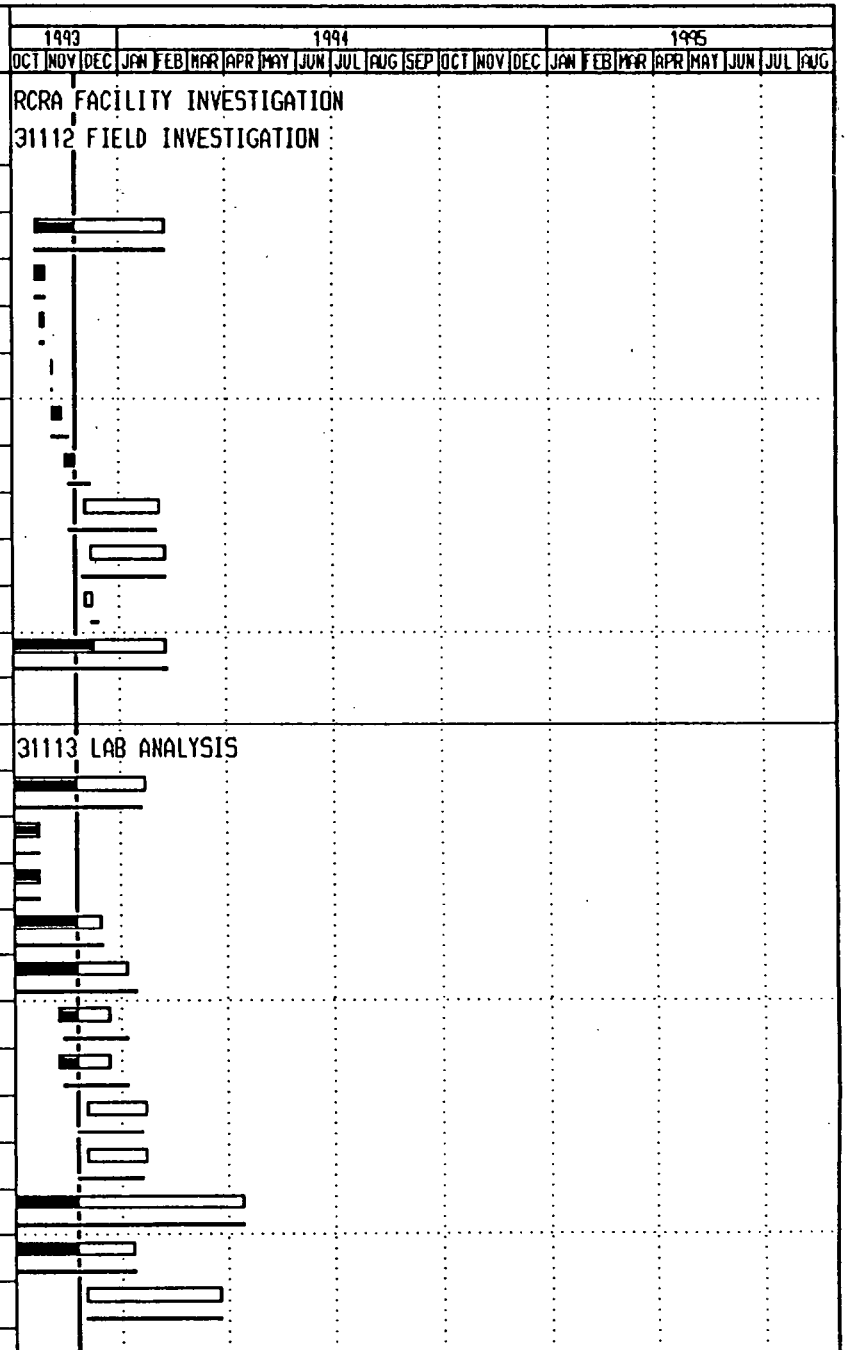
F. Soil Disposition
- Disposal
- Storage

Notes:

The (#) indicate the preliminary scenarios from Table 3-5.

The cover alternatives 1-4 are described in Section 3.3.2.12

ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH	ORIG DUR	REM DUR	TOTL FLT
	RCRA FACILITY INVESTIGATION					
	31112 FIELD INVESTIGATION					
40121100	EXCUTED VERTICAL DRILLING	14DEC92A	21APR93A	45	0	
40121200	207B NORTH & CENTER DRILLING	21OCT93A	8FEB94	76	52	62
40121211	PRE-MOBILIZATION (207BN & CNTR)	21OCT93A	29OCT93A	5	0	
40121212	P.A. MOBILIZE (207BN & CNTR)	26OCT93A	28OCT93A	1	0	
40121213	CRANE SUPPORT (207BN & CNTR)	4NOV93A	4NOV93A	1	0	
40121221	DRILLING (207B NORTH)	5NOV93A	12NOV93A	10	0	
40121222	DRILLING (207B CENTER)	16NOV93A	23NOV93A	9	0	
40121231	CORE LOGGING (207B NORTH)	2DEC93	3FEB94	40	40	65
40121232	CORE LOGGING (207B CENTER)	7DEC93	8FEB94	40	40	62
40121241	DEMOBILIZATION (207BN & CNTR)	2DEC93	8DEC93	5	5	105
40121400	CONSTRUCTION MANAGEMENT	14DEC92A	8FEB94	280	37	62
40121500	VADOSE ZONE INVESTIGATION	26APR93A	30SEP93A	80	0	
	31113 LAB ANALYSIS					
40131000	LAB ANALYSIS TURNAROUND	12DEC92A	21JAN94	272	35	27
40131100	RAD (EXECUTED DRILLING)	12DEC92A	22OCT93A	45	0	
40131200	NON RAD (EXCECUTED DRILLINGS)	21DEC92A	22OCT93A	61	0	
40131300	RAD (VADOSE)	3MAY93A	14DEC93	61	13	28
40131400	NON RAD (VADOSE)	3MAY93A	5JAN94	76	23	33
40131500	RAD (207B NORTH)	8NOV93A	21DEC93	31	18	33
40131600	NON RAD (207B NORTH)	8NOV93A	21DEC93	31	18	38
40131700	RAD (207B CENTER)	2DEC93	21JAN94	31	31	23
40131800	NON RAD (207B CENTER)	2DEC93	21JAN94	31	31	27
40132000	DATA VALIDATION	21DEC92A	13APR94	324	92	17
40132100	EXECUTED VERTICAL DRILLING (VALIDATION)	21DEC92A	10JAN94	90	26	83
40132200	207B NORTH (VALIDATION)	1DEC93	24MAR94	76	76	30



Target Date 5NOV93
Plot Date 29NOV93
Data Date 24NOV93
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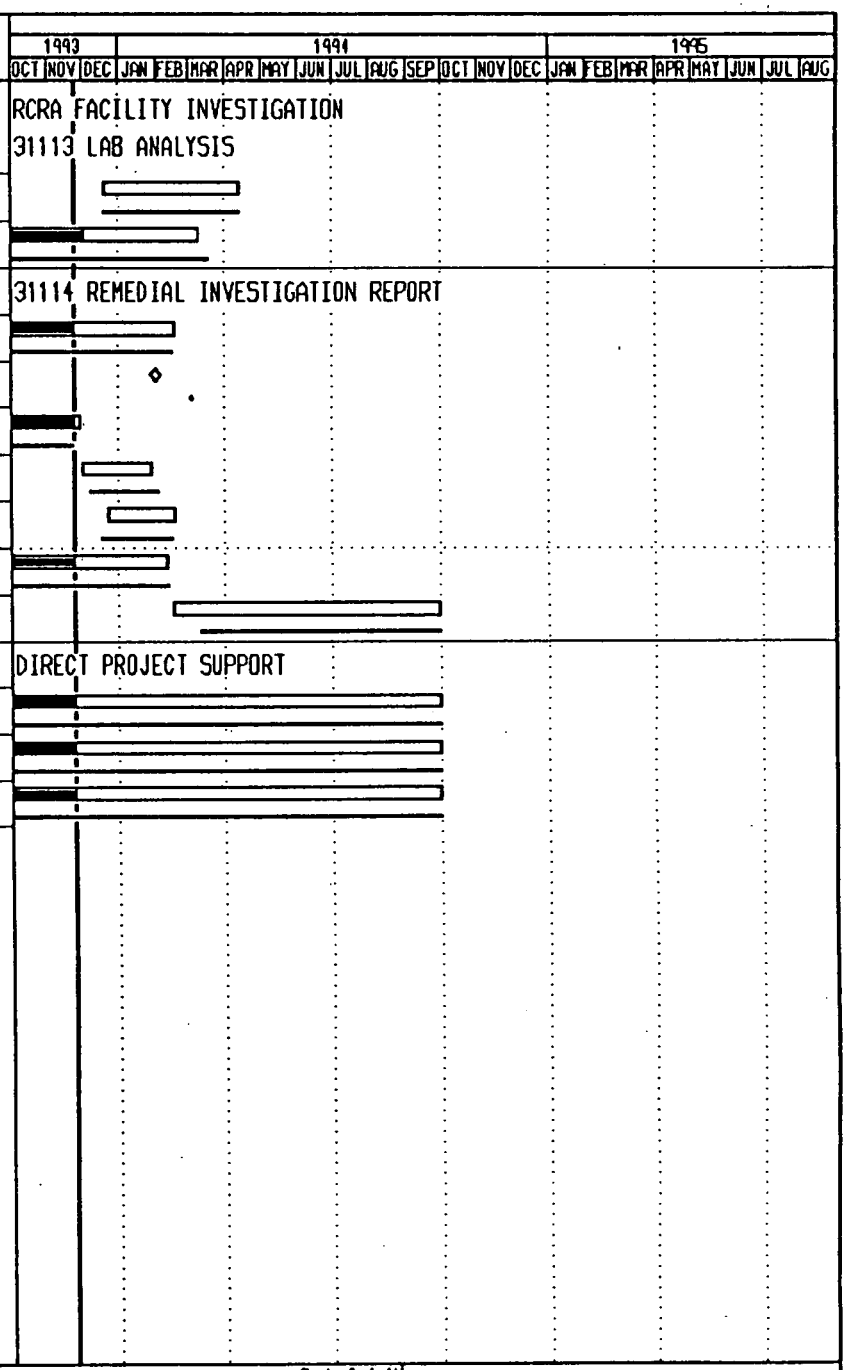
	RCRA FACILITY INVESTIGATION					
	31113 LAB ANALYSIS					
40132300	207B CENTER (VALIDATION)	20DEC93	13APR94	76	76	17
40132400	VADOSE ZONE SAMPLING (VALIDATION)	7SEP93A	9MAR94	106	63	41
	31114 REMEDIAL INVESTIGATION REPORT					
40141000	DATA EVALUATION	20FEB93A	17FEB94	247	54	23
40141009	PHASE I RFI/RI REPORT COMPLETE		31JAN94	0	0	6
40141100	EXECUTED VERTICAL DRILLING (EVAL)	20FEB93A	29NOV93	187	2	45
40141200	207B NORTH (EVAL)	1DEC93	28JAN94	37	37	37
40141300	207B CENTER (EVAL)	23DEC93	17FEB94	35	35	23
40141400	VADOSE ZONE SAMPLING (EVAL)	5JUL93A	10FEB94	76	49	28
40142000	INCORPORATE IM/IRA REVIEW COMMENTS	16FEB94	30SEP94	159	159	66
	DIRECT PROJECT SUPPORT					
40151000	PROGRAM/PROJECT MANAGEMENT SUPPORT	10CT93A	30SEP94	249	211	245
40152000	PROJECT GEOLOGIST	10CT93A	30SEP94	249	211	245
40153000	QA/QC	10CT93A	30SEP94	249	211	245



Target Date 5NOV93
Plot Date 24NOV93
Data Date 24NOV93
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Activity Bar/Early Dates
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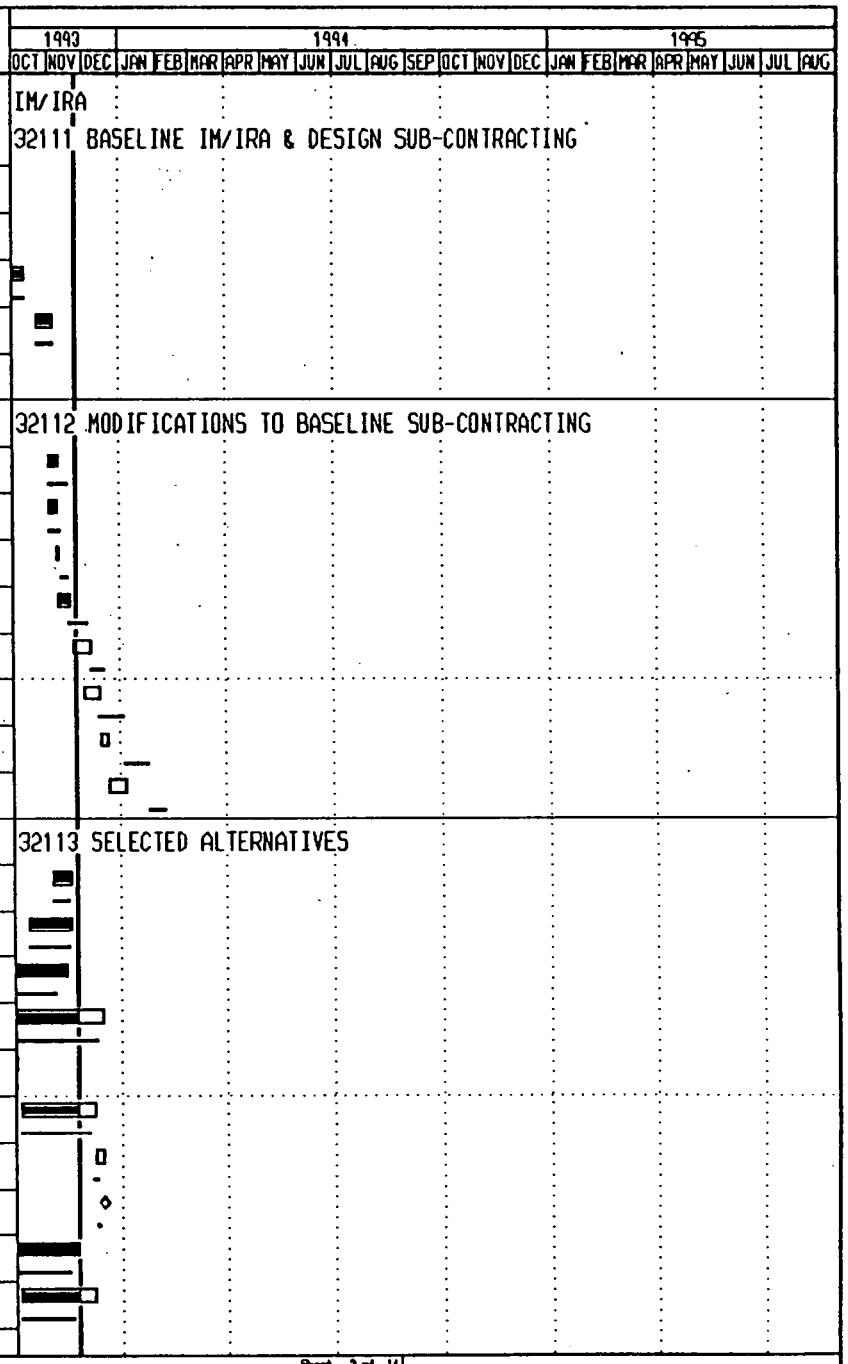
	IM/IRA					
	32111 BASELINE IM/IRA & DESIGN SUB-CONTRACTING					
40211000	REQUEST FOR PROPOSAL (BASELINE)	21JUN93A	1JUL93A	10	0	
40212000	PROPOSAL (BASELINE)	1JUL93A	19AUG93A	35	0	
40213000	TECH EVAL (BASELINE)	20AUG93A	11OCT93A	35	0	
40214000	COST EVAL (BASELINE)	22OCT93A	5NOV93A	10	0	
40215000	LETTER CONTRACT (BASELINE)	23AUG93A		0	0	
	32112 MODIFICATIONS TO BASELINE SUB-CONTRACTING					
40221000	REQUEST FOR PROPOSAL (MOD)	1NOV93A	9NOV93A	7	0	
40221100	SOW PKG (MOD)	1NOV93A	8NOV93A	10	0	
40221200	PROCUREMENT INCLUSIONS (MOD)	8NOV93A	9NOV93A	5	0	
40222000	PROPOSAL (MOD)	9NOV93A	19NOV93A	10	0	
40223000	TECH EVAL (MOD)	22NOV93A	6DEC93	10	7	6
40224000	COST EVAL (MOD)	1DEC93	14DEC93	10	10	6
40225000	NEGOTIATIONS (MOD)	15DEC93	21DEC93	5	5	6
40226000	AWARD (MOD)	22DEC93	5JAN94	5	5	6
	32113 SELECTED ALTERNATIVES					
40231000	RISK ANALYSIS	3NOV93A	19NOV93A	10	0	
40232000	PRELIMINARY REMEDIATION GOALS	13OCT93A	19NOV93A	21	0	
40233000	COC'S	23AUG93A	15NOV93A	21	0	
40234000	OPTIONS ANALYSIS	23AUG93A	15DEC93	80	14	7
40234100	TECHNOLOGY LITERATURE RESEACH	23AUG93A	10CT93A	29	0	
40234200	OPTIONS DEVELOPMENT & ANALYSIS	6OCT93A	8DEC93	60	9	7
40234300	SELECTION OF ALTERNATIVE	9DEC93	15DEC93	5	5	7
40234309	EPA/CDH REMEDIAL ALT CONCURRENCE		15DEC93	0	0	7
40236000	ARAR DEVELOPMENT	23AUG93A	23NOV93A	30	0	
40238000	DOE RESOLUTION OF LINER DISPOSITION	5OCT93A	7DEC93	35	8	8



Target Date 5NOV93
Plot Date 29NOV93
Data Date 24NOV93
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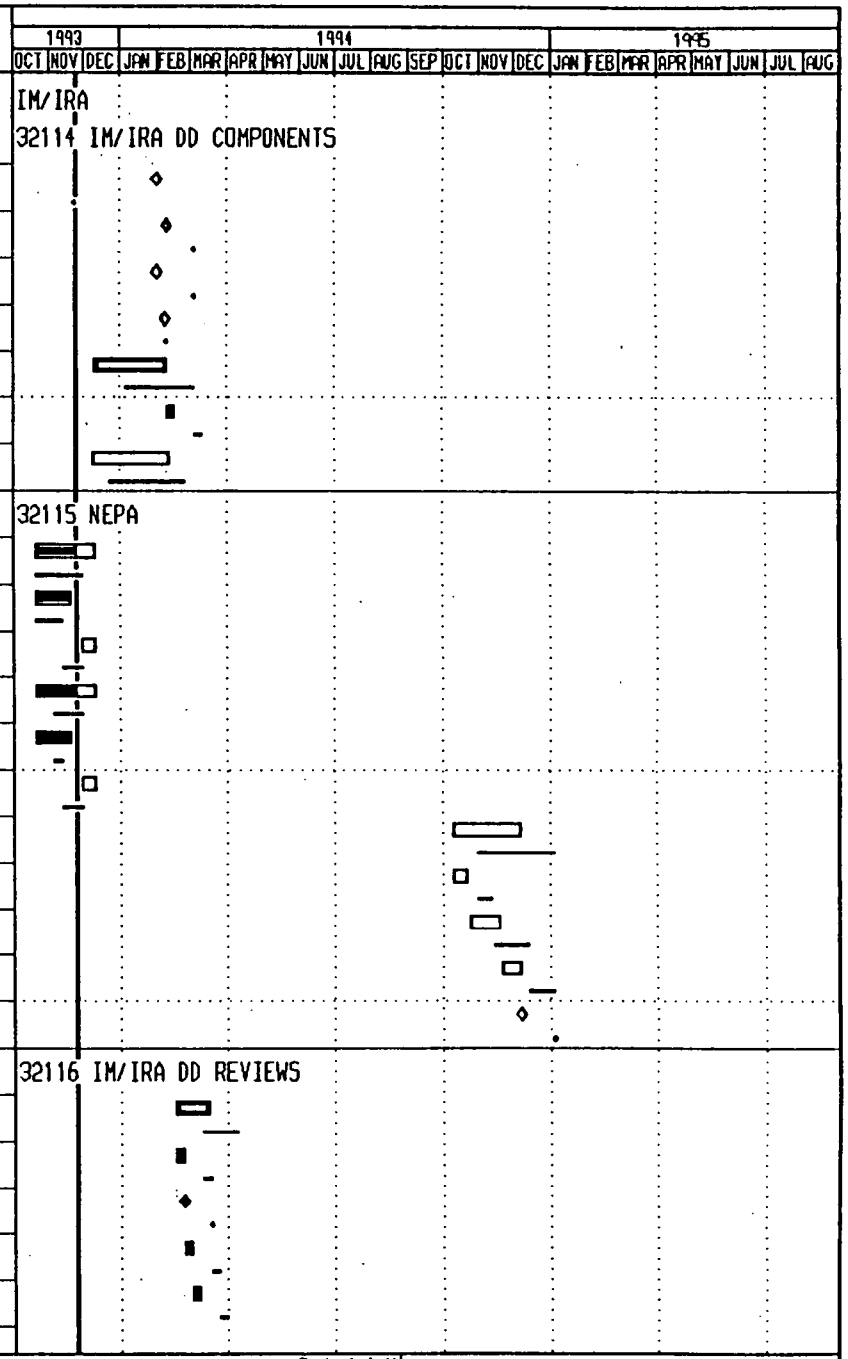
	IM/IRA					
	32114 IM/IRA DD COMPONENTS					
40241000	PHASE I RFI/RI REPORT		31JAN94	0	0	6
40242000	PHASE II RFI/RI WORK PLAN	9FEB94		0	0	0
40243000	CONCEPTUAL DESIGN COMPLETE	1FEB94		0	0	6
40244000	POST CLOSURE PLAN	8FEB94		0	0	1
40245000	IM/IRA EA REPORT	10DEC93	8FEB94	37	37	0
40245100	IM/IRA EA REPORT COMPILATION	9FEB94	15FEB94	5	5	0
40246000	MODELING SUPPORT	9DEC93	10FEB94	40	40	81
	32115 NEPA					
40251000	ACTION DECRIPTION MEMORANDUM	20OCT93A	10DEC93	36	11	41
40251100	PREPARE (ADM)	20OCT93A	19NOV93A	10	0	
40251200	DOE/EGG REVIEW (ADM)	29NOV93	10DEC93	10	10	41
40252000	ENVIRONMENTAL CHECKLIST	20OCT93A	10DEC93	36	11	36
40252100	PREPARE (EC)	20OCT93A	19NOV93A	5	0	
40252200	EGG/NEPA COMMITTEE REVIEW (EC)	29NOV93	10DEC93	10	10	36
40254000	FONSI	10OCT94	6DEC94	40	40	129
40254100	PREPARE (FONSI)	10OCT94	21OCT94	10	10	129
40254200	DOE/EGG REVIEW (FONSI)	24OCT94	18NOV94	20	20	129
40254300	COMMENT RESOLUTION (FONSI)	21NOV94	6DEC94	10	10	129
40254400	ISSUE FONSI		6DEC94	0	0	129
	32116 IM/IRA DD REVIEWS					
40261100	ROUND TABLE (PH I DRAFT)	16FEB94	15MAR94	20	20	0
40261110	TRANSMITTAL (PH I DRAFT RT)	16FEB94	22FEB94	5	5	0
40261119	TRANSMITTAL (PH I DRAFT RT)	23FEB94		0	0	0
40261120	REVIEW & COMMENT (PH I DRAFT RT)	23FEB94	1MAR94	5	5	0
40261130	COMMENT RESOLUTION (PH I DRAFT RT)	2MAR94	8MAR94	5	5	0



Target Date 5NOV93
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Data Date 24NOV93
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Activity Bar/Early Dates
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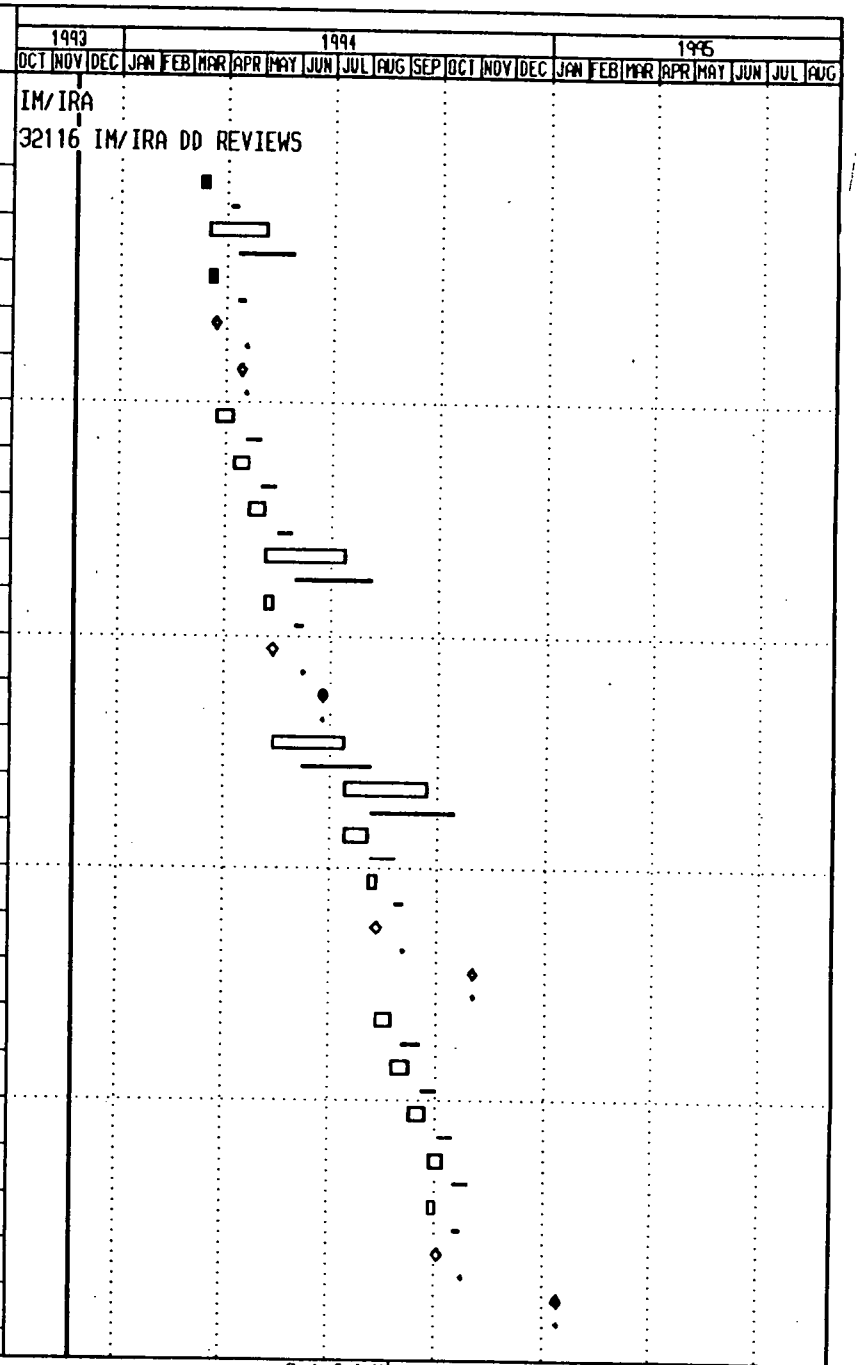
40261140	INCORPORATE COMMENTS (PH I DRAFT RT)	9MAR94	15MAR94	5	5	0
40261200	REVIEW CYCLE (PH I DRAFT)	16MAR94	4MAY94	35	35	2
40261210	TRANSMITTAL (PH I DRAFT REVIEW)	16MAR94	22MAR94	5	5	0
40261218	TRANSMITTAL (PH I DRAFT REVIEW) (IAG #1)	23MAR94		0	0	0
40261219	(IAG #1 COMMITMENT)	14APR94		0	0	0
40261220	REVIEW & COMMENT PERIOD (PH I DRAFT REVIEW)	23MAR94	6APR94	10	10	2
40261230	COMMENT RESOLUTION (PH I DRAFT REVIEW)	7APR94	20APR94	10	10	2
40261240	INCORPORATE COMMENTS (PH I DRAFT REVIEW)	21APR94	4MAY94	10	10	2
40262000	PHASE I PROPOSED DD	5MAY94	12JUL94	47	47	18
40262110	TRANSMITTAL (PH I PROPOSED REVIEW)	5MAY94	11MAY94	5	5	2
40262118	TRANSMITTAL (PH I REVIEW) (IAG #2)	12MAY94		0	0	2
40262119	(IAG #2 COMMITMENT)	24JUN94		0	0	0
40262150	PUBLIC COMMENT PERIOD (PH I REVIEW)	12MAY94	12JUL94	42	42	18
40263000	DRAFT RESPONSIVENESS SUMMARY	13JUL94	21SEP94	50	50	68
40263100	REPORT PREPARATION (DRAFT RESP SUMM)	13JUL94	26AUG94	15	15	18
40263210	TRANSMITTAL (DRAFT RESP SUMM REVIEW)	30AUG94	9AUG94	5	5	18
40263218	TRANSMITTAL (DRAFT RESP SUMM REVIEW) (IAG #3)	10AUG94		0	0	18
40263219	(IAG #3 COMMITMENT)	1NOV94		0	0	0
40263220	REVIEW & COMMENT PERIOD (DRAFT RESP SUMM RVW)	10AUG94	23AUG94	10	10	68
40263230	COMMENT RESOLUTION (DRAFT RESP SUMM REVIEW)	24AUG94	7SEP94	10	10	68
40263240	INCORPORATE COMMENTS (DRAFT RESP SUMM REVIEW)	8SEP94	21SEP94	10	10	68
40264000	FINAL IM/IRA DD & RESPONSIVENESS SUMMARY	26SEP94	7OCT94	10	10	240
40264110	TRANSMITTAL (FINAL DD & RESP SUMM RVW)	26SEP94	30SEP94	5	5	66
40264118	TRANSMITTAL (FINAL DD & RESP SUMM RVW X IAG #4)	30CT94		0	0	66
40264119	(IAG #4 COMMITMENT)	13JAN95		0	0	0



Target Date 5NOV93
Plot Date 29NOV93
Data Date 24NOV93
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Activity Bar/Early Dates
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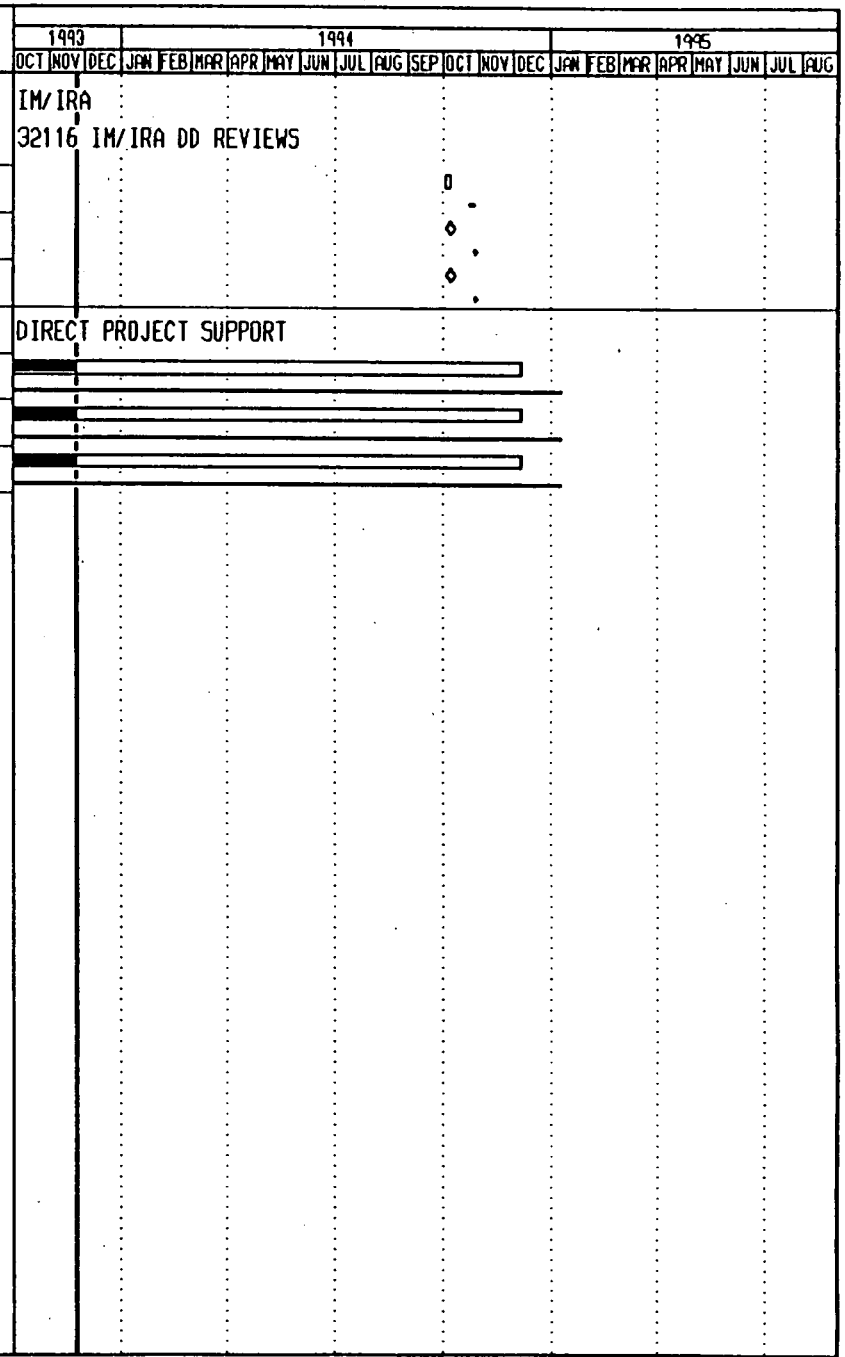
	IM/IRA					
	32116 IM/IRA DD REVIEWS					
40261140	EPA/CDH APPROVAL (FINAL DD & RESP SUMM RVW)	30CT94	7OCT94	5	5	122
40261149	EPA/CDH APPROVAL (FINAL DD & RESP SUMM RVW)		7OCT94	0	0	122
40261200	PUBLIC READING		7OCT94	0	0	240
	DIRECT PROJECT SUPPORT					
40271000	PROGRAM/PROJECT MANAGEMENT	21JUN93A	6DEC94	495	256	200
40272000	PROJECT ENGINEER	21JUN93A	6DEC94	495	256	200
40273000	REGULATORY SUPPORT	21JUN93A	6DEC94	495	256	200



Target Date 5NOV93
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Data Date 24NOV93
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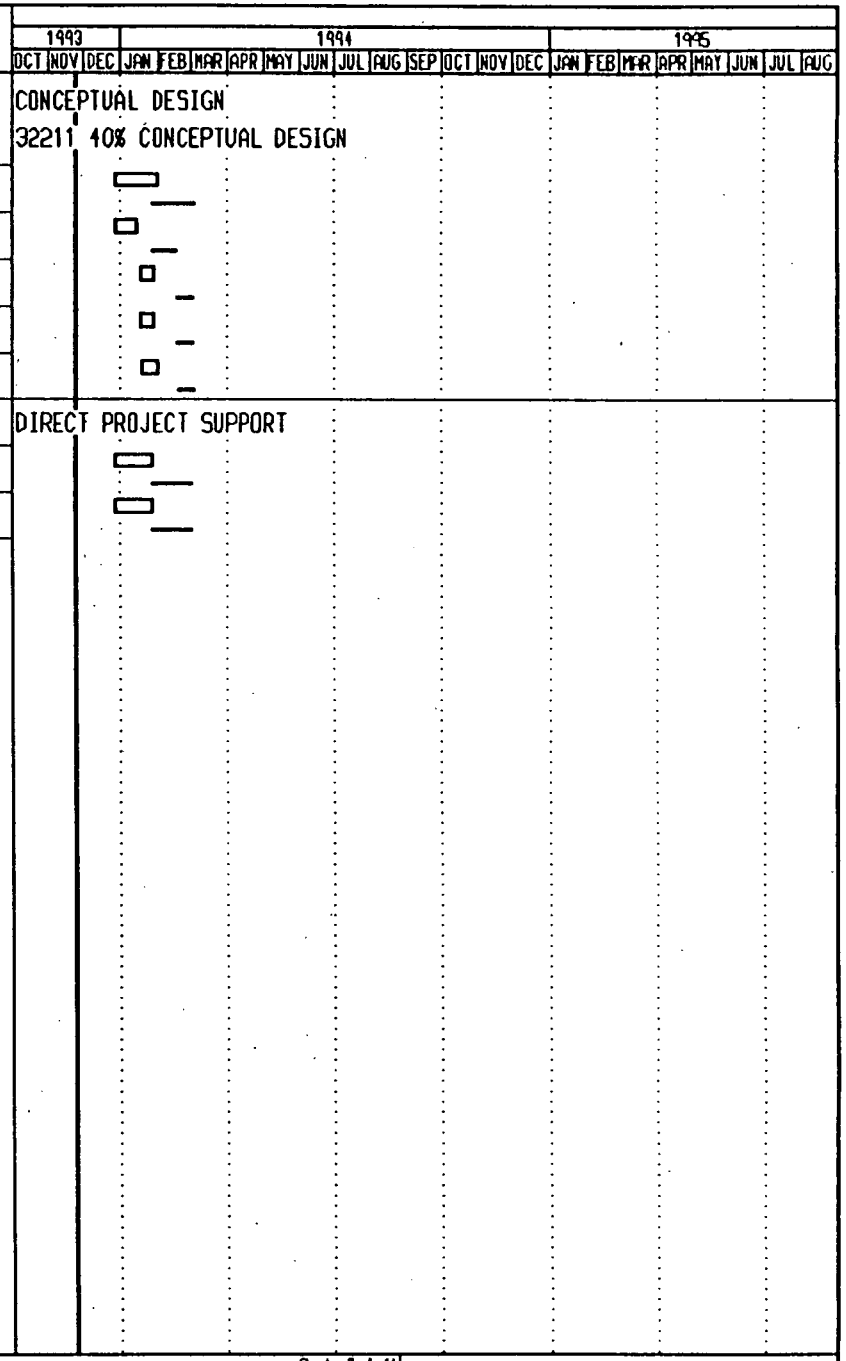
ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH	ORIG DUR	REM DUR	TOTL FLT
	CONCEPTUAL DESIGN					
32211	40% CONCEPTUAL DESIGN					
40310000	CONCEPTUAL DESIGN 40%	27DEC93	31JAN94	26	26	6
40311000	40 % DRAWINGS	27DEC93	14JAN94	15	15	6
40312000	40 % SPECIFICATIONS	17JAN94	28JAN94	10	10	6
40313000	40% SCHEDULE	17JAN94	28JAN94	10	10	7
40314000	40% COST ESTIMATE	18JAN94	31JAN94	10	10	6
	DIRECT PROJECT SUPPORT					
40331000	CD PROGRAM/PROJECT MANAGEMENT SUPPORT	27DEC93	27JAN94	24	24	8
40332000	CD PROJECT ENGINEER	27DEC93	27JAN94	24	24	8



Target Date 5NOV93
Plot Date 29NOV93
Data Date 24NOV93
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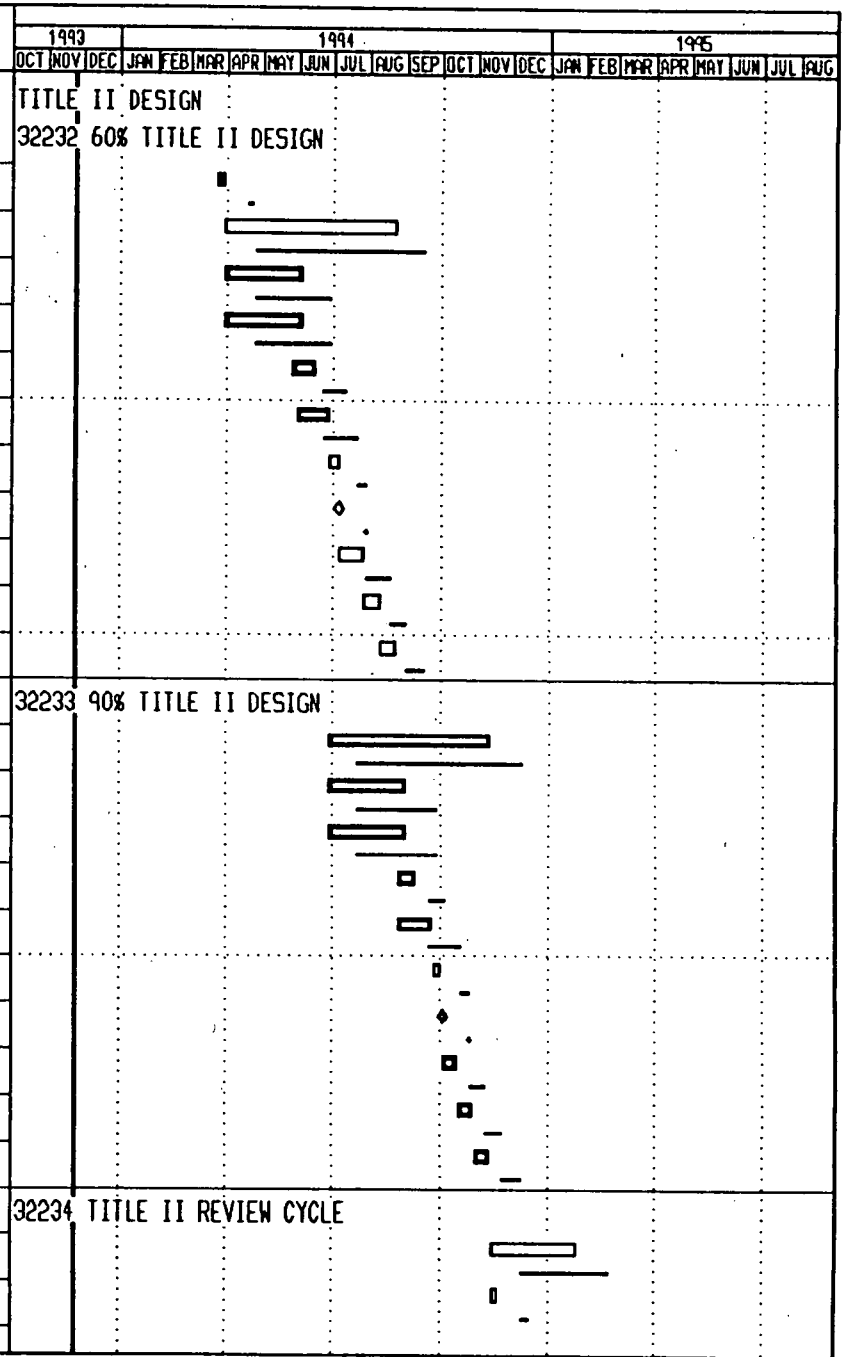
ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH	ORIG DUR	REM DUR	TOTL FLT
40411000	KEY DECISIONS #1 & 2	23MAR94	29MAR94	5	5	0
40420000	60% TITLE II DESIGN	30MAR94	23AUG94	102	102	22
40421000	60% DRAWINGS	30MAR94	3JUN94	46	46	0
40422000	60% SPECIFICATIONS	30MAR94	3JUN94	46	46	0
40423000	60% SCHEDULE	27MAY94	15JUN94	13	13	0
40424000	60% COST ESTIMATE	31MAY94	27JUN94	20	20	0
40425000	60% TRANSMITAL	28JUN94	5JUL94	5	5	22
40425009	60% TRANSMITAL (TITLE II)	6JUL94		0	0	22
40426000	60% REVIEW & COMMENT	6JUL94	26JUL94	15	15	22
40427000	60% COMMENT RESOLUTION	27JUL94	9AUG94	10	10	22
40428000	60% INCORPORATE COMMENTS	10AUG94	23AUG94	10	10	22
40430000	90% TITLE II DESIGN	28JUN94	11NOV94	97	97	0
40431000	90% DRAWINGS	28JUN94	15SEP94	47	47	0
40432000	90% SPECIFICATIONS	28JUN94	15SEP94	47	47	0
40433000	90% SCHEDULE	26AUG94	8SEP94	9	9	0
40434000	90% COST ESTIMATE	26AUG94	23SEP94	20	20	0
40435000	90% TRANSMITTAL	26SEP94	30SEP94	5	5	0
40435009	90% TRANSMITTAL (TITLE II)	3OCT94		0	0	0
40436000	90% REVIEW & COMMENT	3OCT94	14OCT94	10	10	0
40437000	90% COMMENT RESOLUTION	17OCT94	28OCT94	10	10	0
40438000	90% INCORPORATE COMMENTS	31OCT94	11NOV94	10	10	0
40440000	TITLE II IMPLEMENTATION	14NOV94	25JAN95	45	45	52
40441000	TRANSMITTAL (TITLE II)	14NOV94	18NOV94	5	5	0



Target Date 5NOV93
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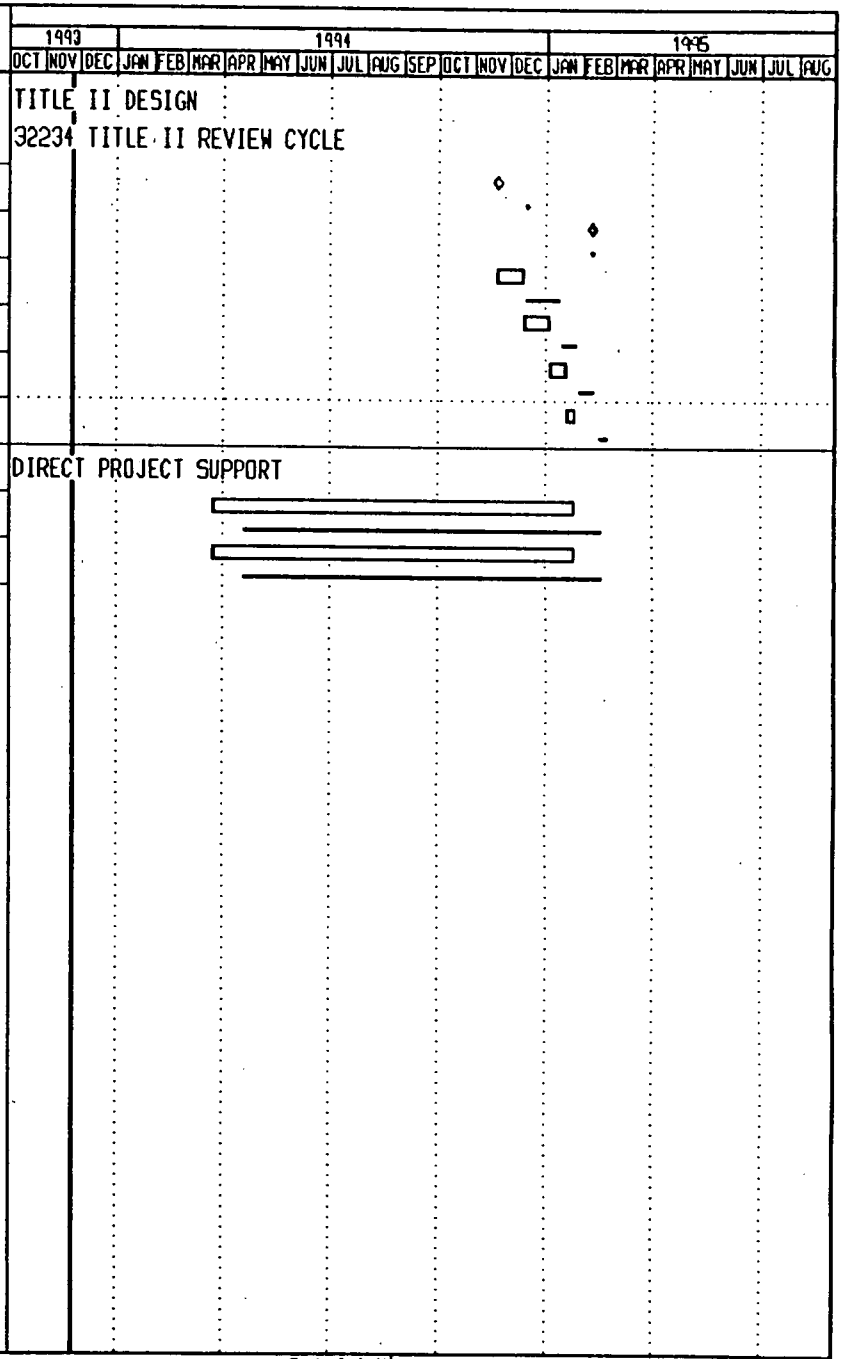
	TITLE II DESIGN					
32234	TITLE II REVIEW CYCLE					
40441008	TRANMITTAL (IMPLEMENTATION DOCUMENT IAG #5)	21NOV94		0	0	51
40441009	(IAG #5 COMMITMENT)	10FEB95		0	0	0
40442000	REVIEW & COMMENT (TITLE II)	21NOV94	13DEC94	15	15	52
40443000	COMMENT RESOLUTION (TITLE II)	14DEC94	4JAN95	10	10	52
40444000	INCORPORATE COMMENTS (TITLE II)	5JAN95	18JAN95	10	10	52
40445000	APPROVAL (TITLE II)	19JAN95	25JAN95	5	5	52
	DIRECT PROJECT SUPPORT					
40461000	PROGRAM/PROJECT MANAGEMENT	23MAR94	25JAN95	209	209	52
40462000	PROJECT ENGINEER	23MAR94	25JAN95	209	209	52



Target Date 5NOV93
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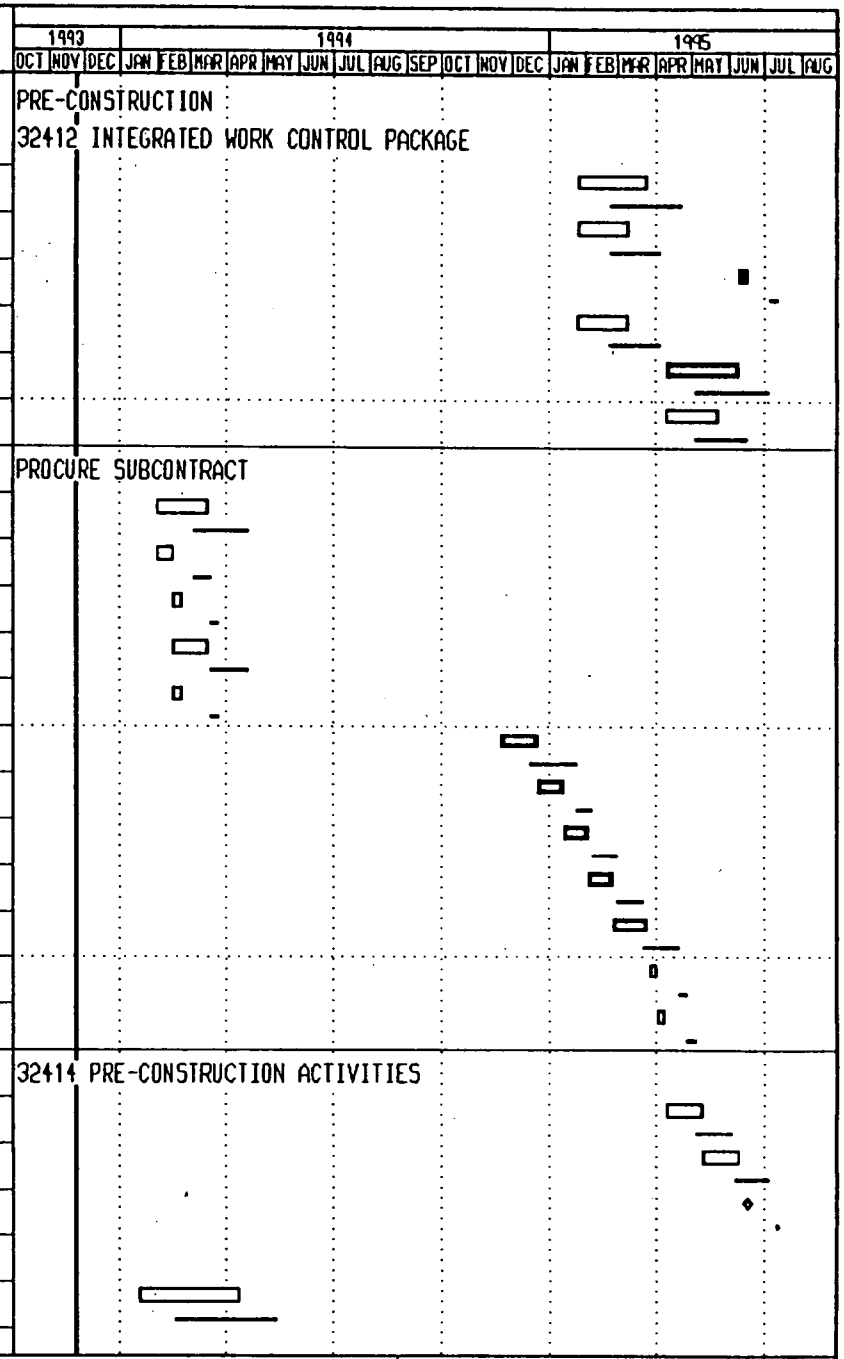
	PRE-CONSTRUCTION					
	32412 INTEGRATED WORK CONTROL PACKAGE					
40521000	WASTE DISPOSAL PLAN	26JAN95	24MAR95	42	42	52
40522000	EXCAVATION PERMIT	26JAN95	8MAR95	30	30	64
40523000	IWCP ROUNDTABLE	9JUN95	15JUN95	5	5	0
40524000	SECURITY PLAN	26JAN95	8MAR95	30	30	64
40525000	SITE SPECIFIC H & S PLAN	10APR95	8JUN95	42	42	0
40526000	JOB SAFETY ANALYSIS	10APR95	22MAY95	30	30	12
	PROCURE SUBCONTRACT					
40531000	REQUEST FOR PROPOSAL	1FEB94	15MAR94	31	31	174
40531100	BID PACKAGE	1FEB94	14FEB94	10	10	174
40531200	DAVIS BACON	15FEB94	21FEB94	5	5	190
40531300	SHORT LIST OF BIDDERS	15FEB94	15MAR94	21	21	174
40531400	KEY DECISION #3	15FEB94	21FEB94	5	5	190
40532000	PROPOSAL	21NOV94	21DEC94	21	21	0
40533000	DOE HQ PROCUREMENT COORDINATION	22DEC94	12JAN95	10	10	0
40534000	TECHNICAL EVALUATION	13JAN95	2FEB95	15	15	0
40535000	COST EVALUATION	3FEB95	23FEB95	15	15	0
40536000	NEGOTIATIONS	24FEB95	24MAR95	21	21	0
40537000	RECOMMENDATION TO DOE HQ	27MAR95	31MAR95	5	5	0
40538000	DOE HQ APPROVAL	3APR95	7APR95	5	5	0
	32414 PRE-CONSTRUCTION ACTIVITIES					
40541000	TRAINING	10APR95	9MAY95	21	21	5
40542000	MOBILIZATION	10MAY95	8JUN95	21	21	5
40543000	START CONSTRUCTION (IAG #6)	16JUN95		0	0	0
40543009	(IAG #6 COMMITMENT)	27SEP95		0	0	0
40544000	SAFETY ASSESSMENT DOCUMENT	17JAN94	11APR94	60	60	253



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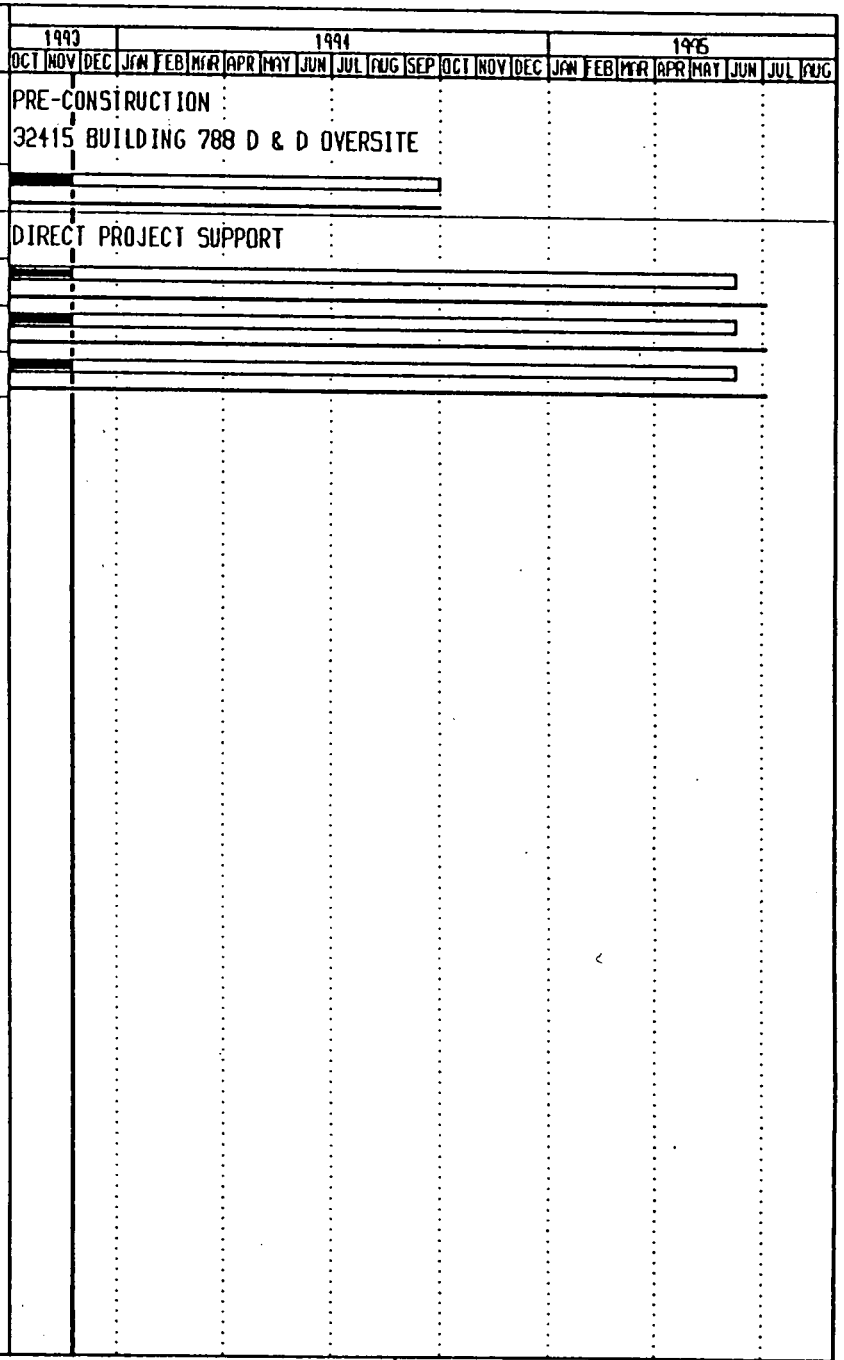
	PRE-CONSTRUCTION					
	32415 BUILDING 788 D & D OVERSITE					
40551000	BUILDING 788 D & D OVERSITE	10CT93A	30SEP94	249	211	174
	DIRECT PROJECT SUPPORT					
40581000	PROGRAM/PROJECT MANAGEMENT	10CT93A	8JUN95	418	380	5
40583000	QA/QS	10CT93A	8JUN95	418	380	5
40581000	PROJECT ENGINEER	10CT93A	8JUN95	418	380	5



Target Date 5NOV93
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Activity Bar/Early Dates
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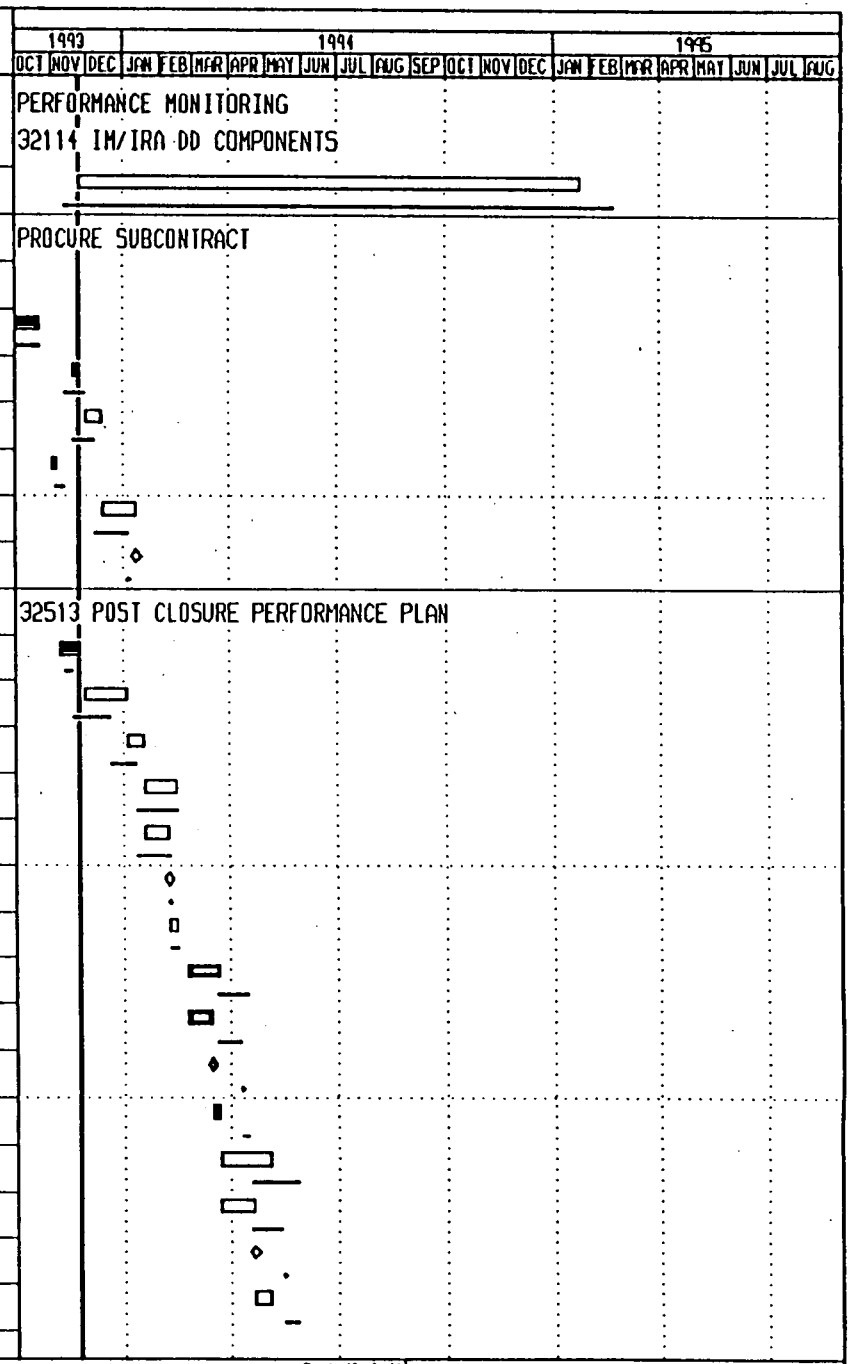
ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH	ORIG DUR	REM DUR	TOTL FLT
40620000	IM/IRA/DD TECHNICAL CONSULTATION	24NOV93	24JAN95	285	285	53
40611000	REQUEST FOR PROPOSAL	19AUG93A	17SEP93A	20	0	
40612000	PROPOSAL	17SEP93A	21OCT93A	10	0	
40613000	TECHNICAL EVALUATION	19NOV93A	24NOV93A	10	0	
40614000	COST EVALUATION	30NOV93	13DEC93	10	10	25
40615000	LETTER CONTRACT	1NOV93A	5NOV93A	5	0	
40616000	NEGOTIATIONS	14DEC93	11JAN94	15	15	25
40617000	AWARD	12JAN94		0	0	25
40631000	IDENTIFICATION OF PERFORMANCE CRITERIA	8NOV93A	24NOV93	5	1	1
40632000	EVAL ALTERNATIVES TO MEASURE PERFRMNCE PARAMETER	29NOV93	3JAN94	20	20	1
40633000	CONCEPTUAL DESIGN OF PERFRMNCE MONITORING SYSTEM	4JAN94	17JAN94	10	10	1
40634100	INTERNAL PST CLSRE PRFRMNCE & ASSESSMENT DOC *	18JAN94	14FEB94	20	20	1
40634110	PREP INTERNAL DRFT PST CLSR PREFRMNCE & ASSMNT	18JAN94	7FEB94	15	15	1
40634120	SUBMT INTRNAL DRFT PST CLSR PREFRMNCE & ASSMNT	8FEB94		0	0	1
40634130	TRNSMT INTRNL DRFT PST CLSR PREFRMNCE & ASSMNT	8FEB94	14FEB94	5	5	1
40634200	DRAFT PROPOSED PST CLSRE PERFMNCE ASSESSMENT *	24FEB94	22MAR94	19	19	0
40634210	PREP DRFT PROPOSED PST CLSR PRFRMNCE & ASESMNT	24FEB94	15MAR94	14	14	0
40634220	SUBMT DRFT PROPOSED PST CLSR PRFRMNCE & ASESMN	16MAR94		0	0	0
40634230	TRNSMT DRFT PROPOSED PST CLSR PRFMNCE & ASESMN	16MAR94	22MAR94	5	5	0
40634300	PROPOSED POST CLOSURE PERFORMANCE ASSESSMENT *	23MAR94	4MAY94	30	30	7
40634310	PREP PROPOSED PST CLSR PRFRMNCE & ASSESSMENT	23MAR94	20APR94	20	20	7
40634320	SUBMT PROPOSED POST CLSR PRFRMNCE & ASSESSMENT	21APR94		0	0	7
40634330	TRNSMT PROPOSED PST CLSR PRFRMNCE & ASSESSMENT	21APR94	4MAY94	10	10	7



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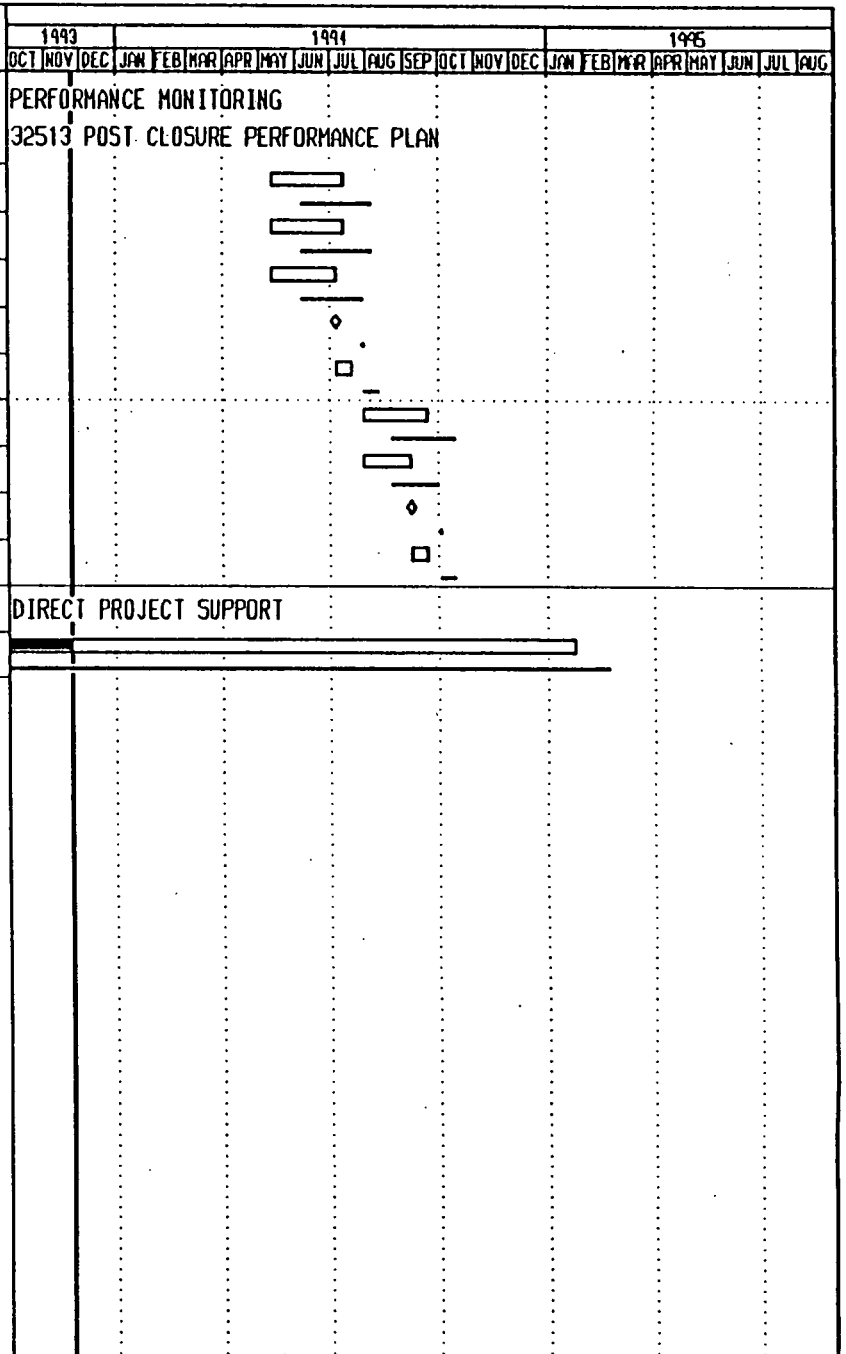
ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH	ORIG DUR	REM DUR	TOTL FLT
	PERFORMANCE MONITORING					
	32513 POST CLOSURE PERFORMANCE PLAN					
40631340	PUBLIC COMMENT OF PST CLSR PRFRMNC & ASSESSMEN	12MAY94	12JUL94	42	42	179
40631400	DRAFT FINAL POST CLOSURE PRFORMANCE ASSESSMENT	12MAY94	12JUL94	42	42	179
40631410	PREP FINL DRFT PST CLSR PRFRMNCE & ASSESSMENT	12MAY94	5JUL94	37	37	33
40631420	SUBMT DRFT FINL PST CLSR PRFRMNC & ASSESSMENT	6JUL94	5JUL94	0	0	33
40631430	TRNSMT DRFT FINL PST PRFRMNCE & ASSESSMENT	6JUL94	19JUL94	10	10	33
40631500	FINAL POST CLOSURE PERFORMANCE ASSESSMENT	29JUL94	21SEP94	38	38	73
40631510	PREP FINAL POST CLOSURE PRFRMNCE & ASSESSMANT	29JUL94	7SEP94	28	28	73
40631520	SUBMIT FINAL POST CLOSURE PRFRMNCE & ASSESSMEN	8SEP94	7SEP94	0	0	73
40631530	TRNSMIT FINAL PST CLOSURE PRFRMNCE & ASSESSMEN	8SEP94	21SEP94	10	10	73
	DIRECT PROJECT SUPPORT					
40660000	PROGRAM/PROJECT MANAGEMENT SUPPORT	19AUG93A	24JAN95	353	285	53



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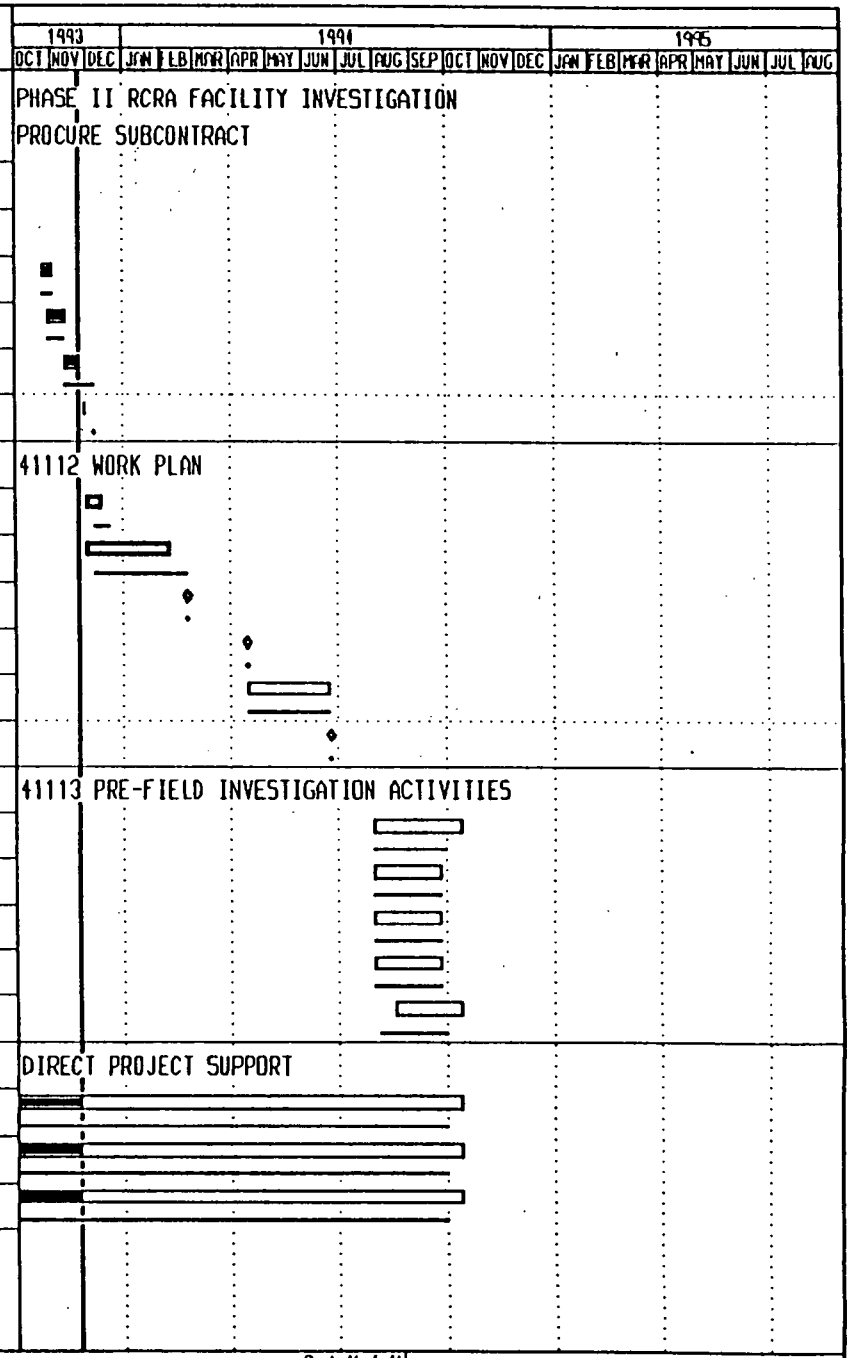
ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH	ORIG DUR	REM DUR	TOTL FLT
	PHASE II RCRA FACILITY INVESTIGATION					
	PROCURE SUBCONTRACT					
40711000	REQUEST FOR PROPOSAL	28JUL93A	27AUG93A	20	0	
40712000	PROPOSAL	27AUG93A	28SEP93A	15	0	
40713000	TECHNICAL EVALUATION	25OCT93A	1NOV93A	10	0	
40714000	COST EVALUATION	29OCT93A	12NOV93A	10	0	
40716000	NEGOTIATIONS	12NOV93A	24NOV93	15	1	0
40717000	AWARD	29NOV93	29NOV93	1	1	0
	41112 WORK PLAN					
40721000	PROJECT SCOPING	30NOV93	13DEC93	10	10	0
40722000	WORK PLAN DEVELOPMENT	30NOV93	8FEB94	45	45	0
40722109	SUBMIT PHASE II DRAFT WORK PLAN (IAG #7 INTERNL)		23FEB94	0	0	0
40722209	SUBMIT PHASE II DRAFT WORK PLAN (IAG #7 EXTERNL)		14APR94	0	0	0
40722210	INCORPORATE COMMENTS PH II PLAN	15APR94	23JUN94	49	49	1
40722309	SUBMIT PHASE II FINAL WORK PLAN (IAG #8 EXTERNL)		24JUN94	0	0	0
	41113 PRE-FIELD INVESTIGATION ACTIVITIES					
40730000	MOBILIZATION	1AUG94	13OCT94	53	53	236
40731000	PERMITS	1AUG94	26SEP94	40	40	249
40732000	HEALTH & SAFETY PLAN	1AUG94	26SEP94	40	40	249
40733000	TRAINING	1AUG94	26SEP94	40	40	249
40734000	QA/QC	18AUG94	13OCT94	40	40	236
	DIRECT PROJECT SUPPORT					
40741000	PROJECT MANAGEMENT SUPPORT	10CT93A	13OCT94	291	220	236
40742000	GEOSCIENCES	10CT93A	13OCT94	291	220	236
40743000	QA/QC	28JUL93A	13OCT94	291	220	236



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