

MEETING NOTES MN:WMTSP(SP):97-0048

SUBJECT: Silos Project Path Forward Decision
MEETING DATE: January 21, 22 and 23, 1997
LOCATION: Fluor Daniel Fernald Office
Project File 40000 - Independent Review Team
ISSUE DATE: January 31, 1997 File Record Storage Copy 104.(35).5

DISTRIBUTION: Please refer to attached Distribution List

1.0 PURPOSE

The meeting was the third in a series of working sessions to review and evaluate the path forward alternatives for the FEMP Silos Project. The meeting involved the Silos Project Independent Review Team (IRT) along with representatives of the FEMP Stakeholder groups, regulatory agencies, the Department of Energy and Fluor Daniel Fernald.

As a means of gathering and documenting comments and input to the decision making process, the method of reflecting these comments has changed from previous meeting minutes. This will be described further under the discussion section.

2.0 DISCUSSION

Tuesday, January 21

Review of Objectives Bob Heck opened the meeting by reviewing the objectives and the IRT and the path forward evaluation. These objectives are attached.

Silos Project/VITPP Update Don Paine gave an description of the VITPP Melter bottom drain incident that had occurred since the last meeting. He followed this by giving a status of Campaign 4 and the impact of the incident on this test series. He then described the approach to the incident investigation that included the formation of three teams to address different aspects of the investigation. He concluded with an update on the status of the Silo 3 Stabilization/Solidification Project. His notes are attached to these minutes.

Ray Reinhart presented the VITPP Incident Analysis Review Team activities and status. It was noted that IRT Team member Gail Bingham was a member of the Incident Analysis Team.

Lou Bogar followed with a summary and status of the Safety Review Team.

MEETING NOTES - Continued

Nina Akgündüz completed the reports of the incident analysis by presenting the activities and status of the Data Analysis Review Team. IRT member Dr. John Plodinec was noted as being a member of this team.

The notes from all three incident teams are attached to the minutes.

Decision Analysis Process Update Lee Merkhofer of Applied Decision Analysis presented a summary of the progress towards establishing the logic tree and the risks and uncertainties for each path. He emphasized that each of the committees would present, in more details, the activities that resulted in the progress and that the merits of changes to the logic would be presented at that time. His presentation material is attached.

Alternatives to be Evaluated Mark Dehring presented a summary comparison of the technical basis and assumptions for each of the three alternatives being evaluated. He followed this with a list of preliminary IRT recommendations from the December meeting. Discussion from these issues resulted in the decision to add two items to the agenda for Thursday, January 23. These were:

Recommended path for melter technology development; and
Review and adjustment of the base cases.

(Sequence, priority and completeness of activities)

The agenda attached to these minutes reflect this revision and other changes that evolved through the three days.

Method of Capturing IRT Input Due to the intensive and wide ranging discussions that result from each topic introduced during the meetings, it was decided to structure the committee sessions in a manner that more completely captured these issues. Each committee presented their approach and this was followed by a brainstorming session during which all issues were listed. Following the brainstorming (during which no judgments were allowed to be made with respect to the issues listed) the total list was screened by the meeting participants to establish a short list. To pass the screening and become short listed, an issue or concern needed to meet three criteria, namely:

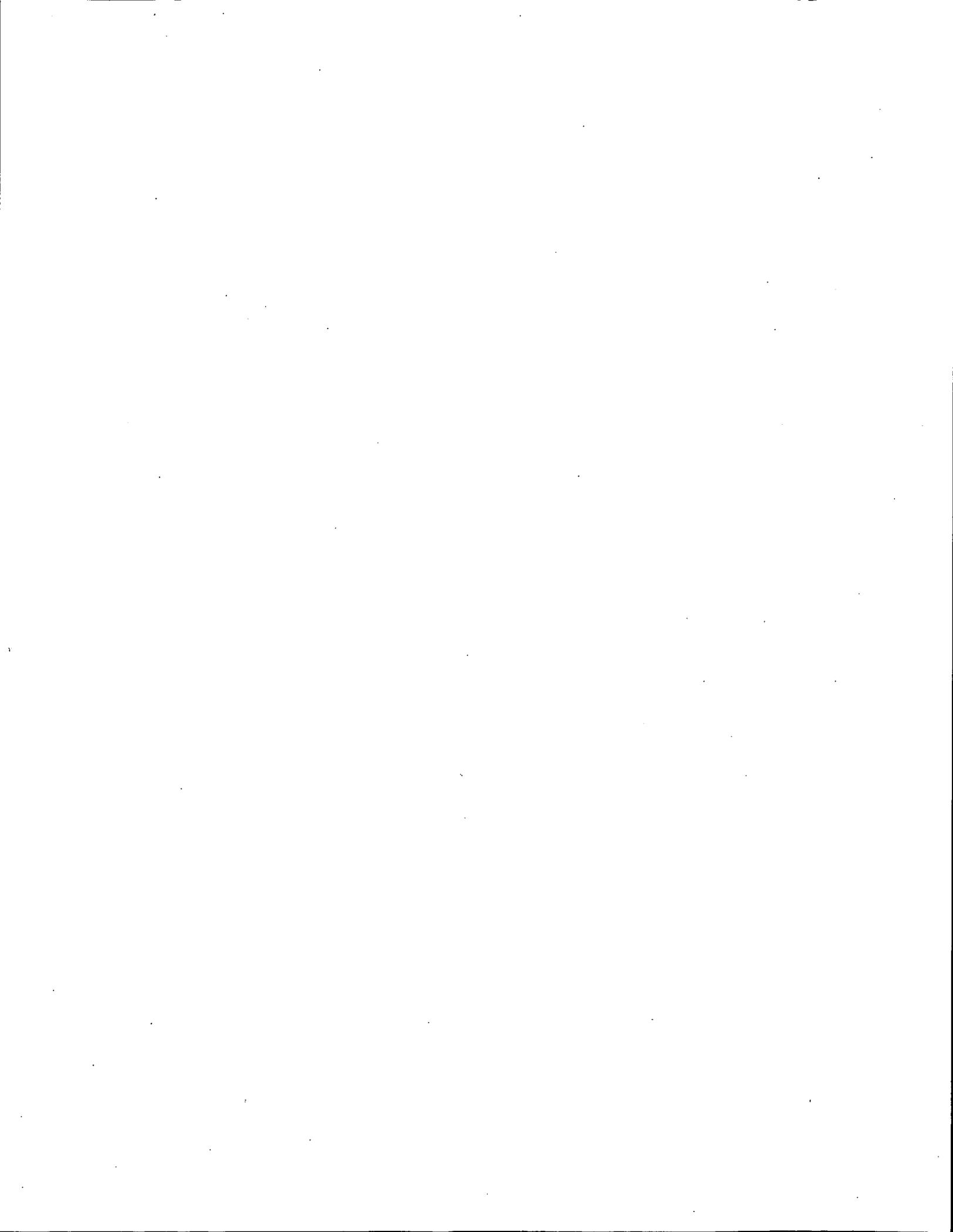
- It differentiated between alternatives; and
- It had significant impact on cost, schedule or health and safety (the performance measures); and
- It had significant risk or uncertainty that could cause a deviation from the base case assumptions.

The individual committees would use this short list to develop estimates of impact (on the cost, schedule and health and safety performance measures). These estimates would be reviewed at the February meetings.

725

725

4-406.



MEETING NOTES - Continued

Technical Committee Harry Robertson presented the objectives and the approach to technical issues. The lists of issues and influencing factors that was generated at the December meeting was presented. Following this a brainstorming session generated List A attached. The screening of this list resulted in short list of ten items (List B), which included the consolidation of several similar issues into the requirement for melter design development. An assessment of the development necessary was carried over to Thursday, January 23.

The short list was then ranked by the IRT and a rough assessment of likelihood performed. The results of the ranking and probability assessment are given in List B.

Regulatory Committee Terry Hagen presented the schedules for preparing an ESD or a ROD Amendment. Following discussion on the time frame involved in the various steps and the fact that there was no regulatory impact for Alternative 1 it was agreed by the IRT members that the regulatory issues that had caused the logic tree to be constructed with different paths no longer applied.

Variations in schedule durations could be accommodated as parallel paths to the necessary technology development activities and would not impact the project schedule. This conclusion simplified the evaluation of alternatives and rendered the Regulatory Committee unnecessary.

Waste Site Availability Committee Terry Hagen presented the status of the investigation into this issue and reported that based on advice from legal counsel, NTS Waste Site Availability would not be jeopardized by the need to proceed with a ROD Amendment. The IRT discussed the impact of the NTS Waste Site being closed due to other factors. It was agreed that this could discriminate between alternatives if interim storage at Fernald resulted and treated waste quantities were significantly different between alternatives. As the closure of the NTS Waste Site was considered unlikely this issue was removed from the logic tree but would be retained as a comment and possible adverse consequence to any alternative chosen.

Health and Safety Committee Pat Fisk discussed objectives and progress to date in gathering base case data for dose rates, injuries and fatalities as formulas, ready to be quantified, when schedules for the various branches in the logic tree are established. Discussion on the assumption that total dose for container handling of either vitrification or cementation of Silos 1 and 2 only varied by 10 percent followed. There was additional discussion on the radon issue with respect to stabilization of Silos 1 and 2 and the base case assumptions of container type and handling and shipping. These and other issues were captured in a brainstorming session on Thursday, January 23 and are reflected in List D.

Wednesday, January 22

Path Forward for Silo 3 Bob Heck started the meeting with a request for the IRT to recommend a path forward for treatment of Silo 3 residues. The IRT proceeded to

MEETING NOTES - Continued

discuss, at length, the technical difficulties associated with vitrifying Silo 3 material either mixed with Silos 1 and 2 (Alternative 1) or alone (not currently an alternative under consideration). Issues discussed covered:

Selection of Melter Design including:

- High versus low intensity melter
- Materials of construction
- Operating Temperature
- Electrode material selection
- Redox condition
- Batch versus continuous processes
- Electrical paths
- Temperature monitoring
- Physical and chemical properties of glass
- Failure modes and effects

Problems in Melter Operation including:

- Uncertainty in content/homogeneity of feed
- Complications in handling high lead and high sulfates together
- Problems with electric (high intensity) melters and electrode materials
- High moisture content and volatile off gases with cold cap melter

The IRT concluded and jointly agreed that their recommendation should be stated as follows:

Alternative 1 (vitrification of Silos 1, 2 and 3 together) should be eliminated from further consideration. Further, the vitrification of Silo 3 material should also be eliminated from further consideration.

This recommendation was based on two primary conclusions which are:

The vitrification of Silo 3 material either singly or mixed with Silos 1 and 2 material is technically more difficult and uncertain than Silos 1 and 2 alone.

Worker and public health and safety can be adequately protected by stabilization of Silo 3.

Cost and Schedule Committee Mike Connors presented the assumptions that were used in the development of the base cases. He described the development of the expected values and ranges of cost using judgment of the uncertainty of each of the major elements of cost. He noted that the range for Alternative 3 was larger than the others as very little engineering development had been carried out on stabilization of Silos 1 & 2. He then showed the comparison between alternatives of the expected cost values by major element.

MEETING NOTES - Continued

He then presented a summary level schedule for each alternative with the agreement to distribute, to the IRT, a lower level of detail before the first February meeting. Discussion of issues concerning the costs and the schedule were captured on List E which was the outcome of a brainstorming session held on Thursday.

Thursday, January 23

Technology Development Path Forward Bob Heck opened the meeting with the request to address the issues and concerns associated with the Technology Development for Vitrification with a view to recommending a path forward. Consideration was to be given to the status of the VITPP and if there was an appropriate role for this facility in the development cycle. The brainstorming session that followed is captured in List C attached. At the request of the IRT, John Plodinec gave a summary of the sequence of steps necessary for the vitrification development cycle with ROM costs and time frames. Fluor Daniel Fernald agreed to develop this concept in more detail and distribute it before the next meeting. This is reflected in the attachment titled Silo 1 & 2 Melter Development.

Health Safety and Regulatory Concerns In order to more adequately gather IRT input a brainstorming session covering health, safety and regulatory issues was carried out. Issues identified are shown in List D attached. Screening was started but not completed. The screening will be completed by Fluor Daniel Fernald and presented to the IRT at the next meeting.

Review of Base Case Schedules In a similar fashion a brainstorming of the schedule for the base cases was carried out. The IRT comments are reflected in List E. No screening was attempted. Fluor Daniel Fernald will prepare a screening for review by the IRT at the next meeting.

Meeting Assessment

MEETING NOTES - Continued

LIST OF ATTACHMENTS

- **Agenda**
- **Lower Level Schedules (Alternate 2 and 3)**
- **Silo 1 and 2 Melter Development Schedule**
- **Draft Statement of Recommendation for Alternative 1**
- **Information needed regarding Alternative 2 and Alternative 3 to reach decision**
- **Presentation Notes**
 - Objectives**
 - VITPP Update**
 - Incident Analysis Team**
 - Safety Review Team**
 - Data Analysis and Path Forward Team**
 - Decision Analysis Process Update**
 - Alternatives to be Evaluated**
 - Technical Committee**
 - Regulatory Committee and Waste Site Availability Report**
 - Health and Safety Committee**
 - Cost and Schedule Committee**
 - Funding Availability Committee**
- **List A**
- **List B**
- **List C**
- **List D**
- **List E**

AGENDA

SUBJECT: FEMP Silos Project, Path Forward Decision
DATE: January 21, 22 and 23, 1997
LOCATION: FEMP Alpha Bldg., Fernald OH

Tuesday, January 21

8:00	Opening	R Heck
8:30	Silos Project / VITPP Update	D Paine
	• Incident Analysis Team	R Reinhart
	• Safety Review Team	L Bogard
	• Data Analysis and Path Forward Team	N Akgunduz
10:30	Decision Analysis Process Update	L Merkhofer
11:00	Alternatives to be Evaluated	M Dehring
11:30	Lunch	
12:00	Technical Issues Committee Report	H Robertson
	• Risk Identification / Consequence Assessment	
2:30	Regulatory Committee & Waste Site Availability Report	T Hagen
3:30	Health & Safety Committee Report	P Fisk
4:30	Meeting Concludes	

Wednesday, January 22

8:00	Opening	R Heck
8:30	Path Forward for Silo 3	IRT
11:30	Lunch	
12:00	Cost and Schedule Committee	M. Connors
2:00	Funding Availability Committee	M. Connors

3:00 Technical Committee

H. Robertson

Thursday, January 23

8:00 Opening

R Heck

8:30 Recommended Path for Technology
Development for Vitrification

IRT

10:30 Health, Safety and Regulatory Concerns

IRT

11:30 Review of base Case Schedules

IRT

Working Lunch

1:30 Meeting Concludes

Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Float	Activity Bar																
						FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13
4AAF7004	PROCURE EQUIPMENT & MATERIAL FOR OFF-GAS	22	01OCT96A	30DEC96	3,348	PROCURE EQUIPMENT & MATERIAL FOR OFF-GAS UPGRADE																
4AAF7040	PROCUREMENT OF EQUIPMENT/GLOVE BAGS	40	16DEC96	12FEB97	3,317	PROCUREMENT OF EQUIPMENT/GLOVE BAGS																
4AAF2586	DELIVER PERSONNEL RADON MONITOR	1	20JAN97	20JAN97	3,334	DELIVER PERSONNEL RADON MONITOR																
4AAF2600	PHASE II PROCUREMENTS SUPPORT	67	21MAR97*	25JUN97	67	PHASE II PROCUREMENTS SUPPORT																
4AAF2581	PHASE II B PROCUREMENT	270	23FEB98	22MAR99	1,252	PHASE II B PROCUREMENT																
4AAF2601	PHASE II PROCUREMENTS SUPPORT	270	16JUL98*	12AUG99	2,892	PHASE II PROCUREMENTS SUPPORT																
4AAF7005	PHASE II OPERATIONS SPARE PARTS	1,015	27APR00	05FEB03	1,829	PHASE II OPERATIONS SPARE PARTS																
CONSTRUCTION																						
4AAF0261	PHASE II A CONSTRUCTION - STAVERS (EQ ADJ)	33	01OCT96A	15JAN97	9	PHASE II A CONSTRUCTION - STAVERS (EQ ADJ)																
4AAF2405	INSTALLATION OF SURVEILLANCE CAMERAS	42	03MAR97*	30APR97	3,264	INSTALLATION OF SURVEILLANCE CAMERAS																
4AAF7021	TRAILER PARK, LIFT STATION & ROAD UPGRADE	186	03MAR97*	24NOV97	3,120	TRAILER PARK, LIFT STATION & ROAD UPGRADE																
4AAF1507	VITPP - UPGRADE CONSTRUCTION	249	24MAR98	22MAR99	1,252	VITPP - UPGRADE CONSTRUCTION																
PROCEDURES																						
4AAF5602	PILOT PLANT PHASE II SOP PROCEDURES	181	25NOV96	15AUG97	3,189	PILOT PLANT PHASE II SOP PROCEDURES																
4AAF0309	WASTE PKG LESSON PLAN SUMMARY	50	21MAR97	02JUN97	3,242	WASTE PKG LESSON PLAN SUMMARY																
4AAF0402	PHASE II FSAR	114	21NOV97	08MAY98	3,008	PHASE II FSAR																
4AAF7060	PHASE II WORK PLAN	102	24MAR98	17AUG98	1,252	PHASE II WORK PLAN																
4AAF7450	PILOT PLANT PHASE II SOT PROCEDURES	124	18AUG98*	17FEB99	1,310	PILOT PLANT PHASE II SOT PROCEDURES																
4AAF7451	PILOT PLANT PHASE II SOP PROCEDURES	182	18AUG98*	11MAY99	1,252	PILOT PLANT PHASE II SOP PROCEDURES																
OPERATIONS																						
4AAF0001	COMPLETE VITPP PHASE II SOT	0		17FEB99	1,430	COMPLETE VITPP PHASE II SOT																
4AAF5000	PHASE 2 SOT TESTING	60	23MAR99	21MAY99	2,084	PHASE 2 SOT TESTING																
4AAF0051	COMPLETE VITPP PHASE II SOP	0		11MAY99	1,372	COMPLETE VITPP PHASE II SOP																
4AAF0271	PHASE II OPERATIONS TRAINING/READINESS PREP	120	12MAY99	29OCT99	1,252	PHASE II OPERATIONS TRAINING/READINESS PREP																
4AAF1520	PHASE II PROJECT MANAGEMENT	151	12MAY99	18DEC99	2,806	PHASE II PROJECT MANAGEMENT																
4AAF0427	OPERATIONAL READINESS REVIEW (FERMCO) POF	60	01NOV99	31JAN00	1,252	OPERATIONAL READINESS REVIEW (FERMCO) POF																
4AAF0430	OPERATIONAL READINESS REVIEW (DOE-FN)	60	01FEB00	26APR00	1,252	OPERATIONAL READINESS REVIEW (DOE-FN)																
4AAF042	PHASE II ORR COMPLETE	0		26APR00	1,288	PHASE II ORR COMPLETE																
4AAF5010	MELTER START-UP & SURROGATE TESTING	50	27APR00	15JUN00	1,829	MELTER START-UP & SURROGATE TESTING																
4AAF2090	PLANT SAFE SHUTDOWN PROCEDURE	50	27APR00	07JUL00	2,445	PLANT SAFE SHUTDOWN PROCEDURE																

DRAFT

205

Project Start: 01OCT96
 Project Finish: 31MAY16
 Issue Date: 28NOV96
 Print Date: 31JAN97

ALTS-4401

SILOS PROJECT
 ALTERNATIVE STUDY 2
 DETAIL SCHEDULE

Sheet 1 of 10



Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Float	FY07 FY08 FY09 FY00 FY01 FY02 FY03 FY04 FY05 FY06 FY07 FY08 FY09 FY10 FY11 FY12 FY13 FY14 FY15 FY16 FY17																
						Gantt Chart Area																
4AAF0270	SILO 2 WASTE RETRIEVAL	20	10AUG01	07SEP01	943	SILO 2 WASTE RETRIEVAL																
4AAF0272	MELTER TEST CAMPAIGN #1 PHASE 2	50	08SEP01	27OCT01	1,380	MELTER TEST CAMPAIGN #1 PHASE 2																
4AAF7415	PHASE II OPERATIONS ENGINEERING SUPPORT	965	08SEP01	29APR04	1,380	PHASE II OPERATIONS ENGINEERING SUPPORT																
4AAF0290	MELTER TEST CAMPAIGN #2 PHASE 2	50	28OCT01	16DEC01	1,380	MELTER TEST CAMPAIGN #2 PHASE 2																
4AAF0294	MELTER TEST CAMPAIGN #3 PHASE 2	50	17DEC01	04FEB02	1,380	MELTER TEST CAMPAIGN #3 PHASE 2																
4AAF5020	PILOT PLANT REMEDIATION OPERATION	815	05FEB02	29APR04	1,380	PILOT PLANT REMEDIATION OPERATION																
4AAF0445	PHASE II TEST REPORT	60	18MAR02	11JUN02	1,986	PHASE II TEST REPORT																
4AAF0555	ISSUE PHASE II FINAL REPORT	0		11JUN02	1,986	ISSUE PHASE II FINAL REPORT																
4AAF0438	PILOT PLANT PHASE II SHUTDOWN	30	30APR04	29MAY04	2,183	PILOT PLANT PHASE II SHUTDOWN																
WASTE SHIPMENTS																						
4AAF2440	CONTAINER PURCHASE	120	02OCT00*	27MAR01	2,097	CONTAINER PURCHASE																
4AAF2445	FABRICATE 24 FEMP CONTAINERS FOR USE	40	28MAR01	23MAY01	2,097	FABRICATE 24 FEMP CONTAINERS FOR USE																
4AAF2450	CERTIFY CONTAINERS	90	24MAY01	01OCT01	2,097	CERTIFY CONTAINERS																
4AAF2471	48 ADDITIONAL WASTE CONTAINERS	61	02NOV01	04FEB02	2,074	48 ADDITIONAL WASTE CONTAINERS																
4AAFH010	VITPP PHASE II WASTE SHIPMENTS	875	05FEB02	03AUG05	947	VITPP PHASE II WASTE SHIPMENTS																
PROJECT MANAGEMENT																						
CONSTRUCTION																						
4AEE1997	SILO PROJECT CONSTRUCTION MANAGEMENT - FY97	212*	01OCT96A	30SEP97	0	SILO PROJECT CONSTRUCTION MANAGEMENT - FY97																
OPERATIONS																						
4AAC1510	PHASE 1 PROJECT MANAGEMENT	36	28MAY96A	20JAN97	176	PHASE 1 PROJECT MANAGEMENT																
4AAC7430	PROJECT MANAGEMENT PHASE I SUPPORT	38	28MAY96A	22JAN97	174	PROJECT MANAGEMENT PHASE I SUPPORT																
1.1.1.4.3 REMEDIAL ACTIONS																						
SILO SUPERSTRUCTURE																						
AREA SURVEY & GEOTECHNICAL PHASE I																						
4AEEH03	FRVP SILO SUPERSTRUCTURE	874*	05DEC95A	25MAY00	110	FRVP SILO SUPERSTRUCTURE																
DESIGN																						
4AEE0302	SILO SUPERSTRUCTURE DESIGN CLOSE OUT	1	01OCT96A	25NOV96	3,329	SILO SUPERSTRUCTURE DESIGN CLOSE OUT																
4AEE0304	Revise/Implement Silo Sup. Proc. Plan	40	15MAY97*	11JUL97	3,214	Revise/Implement Silo Sup. Proc. Plan																
4AEE0090	SITE PREPARATION PROCUREMENT	120	15MAY97*	03NOV97	529	SITE PREPARATION PROCUREMENT																
4AEEH200	TITLE II - SILO SUPERSTRUCTURE	189	07OCT97	10JUL98	549	TITLE II - SILO SUPERSTRUCTURE																
PROCUREMENT																						

Project Start: 01OCT96
 Project Finish: 21MAY98
 Data Date: 28NOV98
 Plot Date: 21JAN97

ALYD-0001

Sheet 6 of 15

SILOS PROJECT ALTERNATIVE STUDY 2 DETAIL SCHEDULE



Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Float	FY07 FY08 FY09 FY00 FY01 FY02 FY03 FY04 FY05 FY06 FY07 FY08 FY09 FY10 FY11 FY12 FY13 FY14 FY15 FY16 FY17																
						Gantt Chart Area																
4AEE0100	Prepare Bid Package - S/S Fabrication	40	15MAY97*	11JUL97	547	▲ Prepare Bid Package - S/S Fabrication																
4AEEH001	S/S FABRICATION PROCUREMENT	100	15MAY97	06OCT97	547	■ S/S FABRICATION PROCUREMENT																
4AEE0105	Bid Period - S/S Fabrication	30	14JUL97	22AUG97	547	▨ Bid Period - S/S Fabrication																
4AEE0110	Bid Review - S/S Fabrication	30	25AUG97	06OCT97	547	▨ Bid Review - S/S Fabrication																
4AEE0002	Award S/S Fabrication (EPA MS 11/13/96)	0		06OCT97	547	◆ Award S/S Fabrication (EPA MS 11/13/96)																
CONSTRUCTION																						
4AEEH100	S/S FABRICATION & DELIVERY	121	07OCT97	18MAY98	437	■ S/S FABRICATION & DELIVERY																
4AEE0120	SITE PREPARATION & FOUNDATION CONSTRUCTION-S/S	120	04NOV97	15JUN98	422	■ SITE PREPARATION & FOUNDATION CONSTRUCTION-S/S																
4AEEH150	SILO SUPERSTRUCTURE CONSTRUCTION	510*	04NOV97	25MAY00	87	■ SILO SUPERSTRUCTURE CONSTRUCTION																
4AEE0130	ASSEMBLE S/S BRIDGES	15	08JUN99	01JUL99	227	▲ ASSEMBLE S/S BRIDGES																
4AEE0140	ERECT STEEL - S/S	40	18MAR00	25MAY00	87	▲ ERECT STEEL - S/S																
WASTE RETRIEVAL SYSTEM																						
DESIGN																						
4ADF0521	WRS Pre-Treatment Evaluation	120	06JAN97*	25JUN97	109	■ WRS Pre-Treatment Evaluation																
4ADF0522	Modify WRS Concept Design	40	26JUN97	21AUG97	109	▨ Modify WRS Concept Design																
4ADF0523	WRS Preliminary Design (Title I)	80	22AUG97	17DEC97	109	■ WRS Preliminary Design (Title I)																
4ADF0524	Complete WRS Preliminary Design (Title I)	15	18DEC97	12JAN98	109	▨ Complete WRS Preliminary Design (Title I)																
4ADF0515	Waste Retrieval System (WRS) for Design P.O.P.	30	13JAN98	24FEB98	109	▨ Waste Retrieval System (WRS) for Design P.O.P.																
4ADF0500	WRS Pre-Final Design (Title II)	180	25FEB98	12OCT98	109	■ WRS Pre-Final Design (Title II)																
4ADF0005	Submit WRS Prefinal Design to EPA	0		12OCT98	109	◆ Submit WRS Prefinal Design to EPA																
4ADF0510	EPA Review/Commnt incorp for WRS Prefinal Design	91	13OCT98	25FEB99	109	■ EPA Review/Commnt incorp for WRS Prefinal Design																
4ADFH530	TITLE III - WASTE RETRIEVAL SYSTEM	330	10MAY99	30AUG00	410	■ TITLE III - WASTE RETRIEVAL SYSTEM																
PROCUREMENT																						
4AEE0155	Prepare Bid Package - WRS & S/S Erection	35	07JAN99	25FEB99	109	▨ Prepare Bid Package - WRS & S/S Erection																
4AEEH02	WRS & S/S Erection Contract Procurement	91	07JAN99	17MAY99	2,753	■ WRS & S/S Erection Contract Procurement																
4AEE0160	Bid Period - WRS & S/S Erection	30	26FEB99	08APR99	109	▨ Bid Period - WRS & S/S Erection																
4AEE0165	Bid Review - WRS & S/S Erection	20	12APR99	07MAY99	109	▨ Bid Review - WRS & S/S Erection																
CONSTRUCTION																						
4ADF0520	Mobilize WRS & S/S Erection Contractor	16	10MAY99	07JUN99	87	▨ Mobilize WRS & S/S Erection Contractor																
4ADF0525	Order/Deliver WRS MEP	85	08JUN99	04NOV99	87	▨ Order/Deliver WRS MEP																

DRAFT

225

Project Start	11OCT96	Early Bar	AL72-4401
Project End	31MAY99	Progress Bar	
Date Date	29NOV96	Critical Activity	
Print Date	11JAN97		

SILOS PROJECT
ALTERNATIVE STUDY 2
DETAIL SCHEDULE

Sheet 7 of 10



Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Float
4ADF1525	WRS CONSTRUCTION	145	08NOV88	31JUL00	344
4ADF1002	WRS Complete	0		13NOV01	109
SILOS PROJECT					
REMEDIAL ACTION WORK PLAN					
4ACC1200	PREPARE DRAFT PHASE II RAWP INCL DOE REVIEW	70	05NOV88	19FEB89	981
4ACC1009	K-55 SILO REMEDIAL ACTION WORK PLAN	133	05NOV88	20MAY89	981
4ACC1020	SUBMIT DRAFT PHASE II RAWP TO USEPA	0		19FEB89	981
4ACC1207	PUBLISH NOTICE OF AVAILABILITY PHASE II RAWP	10	22FEB89	05MAR89	1,034
4ACC1205	EPA REVIEW DRAFT PHASE II RAWP & INCORP COMMENTS	63	22FEB89	20MAY89	981
4ACC1052	RECEIVE EPA APPROVAL OF FINAL PHASE II RAWP	0		20MAY89	981
PRELIMINARY STUDY					
4ACC2010	MELTER SPECIFICATION / SOW	36	01OCT87*	24NOV87	96
4ACC2005	MELTER CONFIGURATION STUDY	36	24MAR88	15MAY88	0
4ACC2031	PRELIMINARY EQUIPMENT LIST CONTINUE	120	18MAY88	04NOV88	0
4ACC2036	PRELIMINARY FACILITY LAYOUT CONTINUE	120	18MAY88	04NOV88	0
4ACC2045	WASTE RETRIEVAL SYSTEM INTERFACE/DEFINITION	120	18MAY88	04NOV88	0
4ACC2055	DCP UPDATE - PREFINAL	120	18MAY88	04NOV88	0
4ACC2071	PRELIMINARY P&ID CONTINUE	120	18MAY88	04NOV88	0
4ACC1004	ADVANCED CONCEPTUAL DESIGN (ACD)	120	18MAY88	04NOV88	0
4ACC1017	SUBMIT PREFINAL DESIGN CRITERIA PACKAGE TO EPA	0		04NOV88	2,863
4ACC2065	GLASS FORMING EQUIPMENT SPECIFICATION	60	05NOV88	04FEB89	0
VITPP UPGRADE					
4ACC4070	DOE REVIEW	9	30SEP88A	08DEC88	320
4ACC4004	VITPP Upgrade / Evaluation Revisions	76	01OCT88A	20MAR87	67
4ACC4080	COMMENT RESOLUTION & UPDATE	12	10DEC88	27DEC88	320
4ACC4008	ISSUE FINAL REPORT	0		27DEC88	320
4ACC4045	DECISION ON FEASIBILITY ON VITPP UPGRADE	0		06JAN87	320
4ACC4004	VITPP Upgrade Decision Point	0		02JUN87	213
MELTER SOW					
4ACC4031	PREPARE MELTER RFP	52	25NOV87	11FEB88	96

DRAFT

**SILOS PROJECT
ALTERNATIVE STUDY 2
DRAFT SCHEDULE**

Project Start: 01OCT88
 Project Finish: 11MAY16
 Date Draw: 28NOV88
 Plot Date: 21JAN89

Legend:
 ■ Early Start
 ■ Project Finish
 ■ Date Draw
 ■ Plot Date

Legend:
 ■ Early Bar
 ■ Progress Bar
 ■ Critical Activity

ALT:001

Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Float
4ACC5002	ISSUE MELTER RFP TO DOE	1	12FEB98	12FEB98	96
4ACC5025	VENDORS EVALUATE RFP	9	12FEB98	25FEB98	96
4ACC5034	DOE REVIEW & APPROVE MELTER RFP	10	12FEB98	26FEB98	96
4ACC4005	MELTER PROCUREMENT	103	12FEB98	10JUL98	96
4ACC4007	SUBMIT/EVALUATE MELTER BIDS	103*	12FEB98	10JUL98	96
4ACC5029	PRE-BID MEETING	1	26FEB98	26FEB98	96
4ACC5032	AMEND RFP	5	27FEB98	05MAR98	96
4ACC5035	VENDOR PROPOSALS TO FERMO	20	06MAR98	02APR98	96
4ACC5038	DISCUSSION WITH VENDORS	10	03APR98	17APR98	96
4ACC5041	VENDORS PREPARE BAFO's	9	11MAY98	21MAY98	81
4ACC5044	EVALUATE BAFO's AND SELECT MELTER VENDOR	10	22MAY98	05JUN98	81
4ACC5047	MELTER CONCENT PKG/CRB/SUBMIT TO DOE FOR APPROVAL	10	08JUN98	18JUN98	81
4ACC5027	DOE REVIEW & APPROVE MELTER PROCUREMENT	28	22JUN98	31JUL98	81
4ACC-M012	AWARD MELTER DESIGN	0	03AUG98		81
4ACC-H011	MELTER DESIGN	200	03AUG98	20MAY99	81
4ACC5118	PREPARE GLASS FORMING EQUIPMENT RFP	31	12NOV98	30DEC98	0
4ACC5121	DOE REVIEW & APPROVE GLASS FORMING EQUIP RFP	10	31DEC98	14JAN99	0
4ACC-M016	ISSUE GLASS FORMING EQUIPMENT RFP	0	15JAN99		0
4ACC-H100	GLASS FORMING EQUIP PROCUREMENT	106	15JAN99	16JUN99	0
4ACC5124	RECEIVE/EVALUATE GLASS FORMING EQUIPMENT BIDS	76	18JAN99	05MAY99	0
4ACC5127	DOE REVIEW & APPROVE GLASS FORM EQUIP PROCURE	28	06MAY99	16JUN99	0
4ACC-H008	MELTER FABRICATION DRAWINGS	59	21MAY99	13AUG99	402
4ACC-H101	GLASS FORMING EQUIP DESIGN	125	17JUN99	15DEC99	0
4ACC-H010	MELTER FABRICATION	400	18AUG99	22MAR01	402
4ACC-H102	GLASS FORMING EQUIP FABRICATION & INSTALLATION	168	18DEC99	18AUG00	0
4ACC-H021	REPLACEMENT MELTER FABRICATION	250	19JAN05	18JAN06	1,088
ACTIVITY SUMMARY					
4ACC6004	PREPARE, DRAFT, & REVIEW 30% PSAR	99	15JUL98	04DEC98	475
4ACC-H022	PSAR DEVELOPMENT - RESTART	239*	15JUL98	28JUN99	475

DRAFT

723

Sheet 1 of 11



**SILOS PROJECT
ALTERNATIVE STUDY 2
OFTAIL SCHEDULE**

ALT-0481

Project Start: 9/10/98
 Project End: 11/11/00
 Prepared By: [Signature]
 Checked By: [Signature]
 Approved By: [Signature]

Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Float	FY07 FY08 FY09 FY10 FY11 FY12 FY13 FY14 FY15 FY16 FY17																
						Gantt Chart Area																
4ACC6005	PREPARE, DRAFT, & REVIEW 60% PSAR	70	07DEC98	18MAR99	475	PREPARE, DRAFT, & REVIEW 60% PSAR																
4ACC6008	PREPARE, REVIEW & DRAFT 90% PSAR	70	19MAR99	28JUN99	475	PREPARE, REVIEW & DRAFT 90% PSAR																
4ACC6010	PREPARE, REV & REVISE REV.0A PSAR WITH ISRC COMM	44	29JUN99	30AUG99	475	PREPARE, REV & REVISE REV.0A PSAR WITH ISRC COMM																
4ACCH012	PSAR REVIEW & APPROVAL	135*	29JUN99	13JAN00	475	PSAR REVIEW & APPROVAL																
4ACC6012	PREPARE, REVIEW & REVISE REV.0B PSAR - DOE APP	91	31AUG99	13JAN00	475	PREPARE, REVIEW & REVISE REV.0B PSAR - DOE APP																
4ACCM015	DOE APPROVAL OF K-65 SILO PSAR	0		13JAN00	475	DOE APPROVAL OF K-65 SILO PSAR																
4ACC6015	PREPARE, DRAFT & REVISE 30% FSAR	54	14JAN00	30MAR00	475	PREPARE, DRAFT & REVISE 30% FSAR																
4ACCH003	FSAR DEVELOPMENT, REVIEW & APPROVAL	315*	14JAN00	17APR01	475	FSAR DEVELOPMENT, REVIEW & APPROVAL																
4ACC6018	PREPARE, DRAFT & REVISE 60% FSAR	107	31MAR00	31AUG00	475	PREPARE, DRAFT & REVISE 60% FSAR																
4ACC6021	ISRC REVIEW 90% FSAR INCORP ISRC COMMENTS	44	01SEP00	02NOV00	475	ISRC REVIEW 90% FSAR INCORP ISRC COMMENTS																
4ACC6024	FSAR REV.0B & DOE APPROVAL	110	03NOV00	17APR01	475	FSAR REV.0B & DOE APPROVAL																
4ACCM022	DOE APPROVAL OF K-65 SILO FSAR	0		17APR01	475	DOE APPROVAL OF K-65 SILO FSAR																
4ACC6027	FERMCO REPRODUCES & DISTRIBUTES FSAR	30	18APR01	30MAY01	475	FERMCO REPRODUCES & DISTRIBUTES FSAR																
DESIGN																						
4ACCH000	K-65 PLANT TITLE I	175	05NOV98	21JUL99	39	K-65 PLANT TITLE I																
4ACCM018	SUBMIT PRELIMINARY K-65 SILO DESIGN TO EPA	0		21JUL99	206	SUBMIT PRELIMINARY K-65 SILO DESIGN TO EPA																
4ACC7R00	EPA REVIEW & COMMENT INCORP - TITLE I	63	22JUL99	19OCT99	206	EPA REVIEW & COMMENT INCORP - TITLE I																
4ACCH008	K-65 SILO PLANT TITLE II	230	22JUL99	21JUN00	39	K-65 SILO PLANT TITLE II																
4ACCM050	EPA APPROVE K-65 SILO PRELIMINARY DESIGN	0		19OCT99	206	EPA APPROVE K-65 SILO PRELIMINARY DESIGN																
4ACCM021	SUBMIT K-65 SILO PREFINAL DESIGN TO EPA	0		21JUN00	2,415	SUBMIT K-65 SILO PREFINAL DESIGN TO EPA																
4ACC7001	EPA REVIEW & COMMENT INCORP - TITLE II	63	22JUN00	20SEP00	2,415	EPA REVIEW & COMMENT INCORP - TITLE II																
PROCUREMENT																						
4ACCH600	BID & AWARD FACILITY CONSTRUCTION PACKAGES	120	03FEB00	25JUL00	48	BID & AWARD FACILITY CONSTRUCTION PACKAGES																
CONSTRUCTION																						
4ACCH700	K-65 SILO PLANT CONSTRUCTION	550	17AUG00	28OCT02	0	K-65 SILO PLANT CONSTRUCTION																
4ACCH800	K-65 SILO PLANT TITLE III	550	17AUG00	28OCT02	120	K-65 SILO PLANT TITLE III																
OPERATIONS																						
4ACCH500	K-65 SILO PRE-OP/START-UP ACTIVITIES	250	25APR02	24APR03	0	K-65 SILO PRE-OP/START-UP ACTIVITIES																
4ACC8000	K-65 SILO ORR	180	25APR03	14JAN04	0	K-65 SILO ORR																
4ACC8100	K-65 SILO SURROGATE TESTING	90	15JAN04	13APR04	0	K-65 SILO SURROGATE TESTING																

DRAFT

Project Start	01OCT98	Early Bar	ALTBADP
Project Finish	31MAY18	Progress Bar	
Date Data	28NOV98	Critical Activity	
Plot Date	31MAY97		

SILOS PROJECT
ALTERNATIVE STUDY 2
DETAIL SCHEDULE



Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Float	FY07 FY08 FY09 FY00 FY01 FY02 FY03 FY04 FY05 FY06 FY07 FY08 FY09 FY10 FY11 FY12 FY13 FY14 FY15 FY16 FY17																
						Gantt Chart Area																
4ACJM001	START SOIL REMOVAL AROUND BERM	0	14APR04		1,216	START SOIL REMOVAL AROUND BERM																
4ACCH202	ONGOING FURNACE MAINTENANCE	750	14APR04	12APR07	777	ONGOING FURNACE MAINTENANCE																
4ACCH203	SPARE PARTS	750	14APR04	12APR07	777	SPARE PARTS																
4ACCH200	K-65 SILO OPERATIONS	1,547	14APR04	08JUL08	0	K-65 SILO OPERATIONS																
4ACCH300	K-65 SILO WASTE MANAGEMENT	1,547	14APR04	08JUL08	682	K-65 SILO WASTE MANAGEMENT																
4ACJM002	SOIL REMOVAL AROUND BERM	0	07MAR05		1,038	SOIL REMOVAL AROUND BERM																
4ACJM003	SOIL REMOVAL AROUND BERM	0	21FEB06		647	SOIL REMOVAL AROUND BERM																
DECOMMISSION																						
4ACCH400	K-65 SILO PLANT DECOMMISSION	189	09JUL08	09APR09	0	K-65 SILO PLANT DECOMMISSION																
4ACJM006	COMPLETE K-65 SILO PLANT DECOMMISSION	0		09APR09	278	COMPLETE K-65 SILO PLANT DECOMMISSION																
NEW RADON TREATMENT SYSTEM																						
4ADC0101	Modify NRTS Concept Design	30	22MAY97*	03JUL97	425	Modify NRTS Concept Design																
4ADCH000	NRTS Preliminary Design	100	07JUL97	25NOV97	425	NRTS Preliminary Design																
4ADCM001	Submt Preliminary NRTS Design to EPA (9/30/96)	0		25NOV97	494	Submt Preliminary NRTS Design to EPA (9/30/96)																
4ADC0102	NRTS POP Prep & Approval	30	26NOV97	13JAN98	425	NRTS POP Prep & Approval																
4ADC0106	EPA Review NRTS Preliminary Design	40	26NOV97	27JAN98	494	EPA Review NRTS Preliminary Design																
4ADC0107	NRTS Prefinal Design	100	14JAN98	05JUN98	425	NRTS Prefinal Design																
4ADC0104	EPA Preliminary Comment Incorp. and Response	20	28JAN98	25FEB98	494	EPA Preliminary Comment Incorp. and Response																
4ADCM002	Submt Prefinal NRTS Design to EPA (1/2/97)	0		05JUN98	425	Submt Prefinal NRTS Design to EPA (1/2/97)																
4ADC0R00	EPA REVIEW NRTS PREFINAL & INCORPORATE COMMENTS	42	08JUN98	05AUG98	425	EPA REVIEW NRTS PREFINAL & INCORPORATE COMMENTS																
4ADCH003	PROCURE NRTS CONSTRUCTION SUBCONTRACTOR	42	08JUN98	19AUG98	340	PROCURE NRTS CONSTRUCTION SUBCONTRACTOR																
4ADC0150	NRTS/WR SAFETY BASIS	90	08JUN98	13OCT98	513	NRTS/WR SAFETY BASIS																
4ADCM003	Award NRTS Construction (EPA MS 7/21/97)	0	20AUG98		425	Award NRTS Construction (EPA MS 7/21/97)																
4ADCH006	NRTS TITLE III	120	20AUG98	12FEB99	928	NRTS TITLE III																
4ADCH005	NRTS CONSTRUCTION & CAT	100	20AUG98	22FEB99	340	NRTS CONSTRUCTION & CAT																
4ADC0160	COMPLETE NRTS START-UP & READINESS PREP	180	30MAY00	24APR01	87	COMPLETE NRTS START-UP & READINESS PREP																
4ADC0165	NRTS/WR ORR	60	25APR01	09AUG01	751	NRTS/WR ORR																
SITE PREP / UG UTILITIES																						
4ADJH001	K-65 SILO SITE PREP / UG UTILITIES	14*	02OCT95A	18DEC96	173	K-65 SILO SITE PREP / UG UTILITIES																
4ADJH01	FRVP SITE PREP / UG UTILITIES	14*	02OCT95A	18DEC96	173	FRVP SITE PREP / UG UTILITIES																

DRAFT

Project Start: 01OCT96
 01MAY98
 01NOV98
 01JAN97

Legend:
 [Solid Bar] Early Bar
 [Hatched Bar] Progress Bar
 [Dashed Bar] Critical Activity

ALTS-0001

SILOS PROJECT
 ALTERNATIVE STUDY 2
 DETAIL SCHEDULE



225

Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Float	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	
4ADJH000	SP/UU CONSTRUCTION	8	04MAR98A	06DEC98	172																						
4ADJH002	SP/UU TITLE III	15	08APR98A	23JAN97	173																						
4ADJ3030	UNDERGROUND UTILITIES	7	26JUN98A	18DEC98	137																						
4ADJ3025	ABOVE GROUND UTILITIES - ELECTRIC	12	12AUG98A	06DEC98	289																						
4ADJ3020	ELECTRICAL HOOK-UP FOR TRAILERS	15	07OCT98A	19DEC98	137																						
SILO 3 STABILIZATION																											
SILO 3 STABILIZATION																											
4ACCH350	SILO 3 STABILIZATION	1,135*	16OCT98A	12JUN01	58																						
PRELIMINARY STUDIES/INVESTIGATION																											
4ACC3125	FERMCO REVISE DRAFT FINAL REPORT	13	16OCT98A	13DEC98	38																						
4ACC3128	EPA REVIEW / APPROVE FINAL REPORT	22	18DEC98	17JAN97	90																						
SILO 3 REPORT																											
4ACC3090	CONTINUE DEVELOPMENT OF EVAL. OF SILO 3 ALT's	13*	29APR98A	13DEC98	38																						
4ACC3152	ISSUE NOA FOR SILO 3 / REPORT & WORKSHOP	3	18DEC98	18DEC98	198																						
EXPLANATION OF NON-COUNT DATES																											
4ACCH138	ESD PROCESS	117*	24JUN98A	15MAY97	38																						
4ACC3151	FERMCO REVISE DRAFT ESD	15	18DEC98	08JAN97	38																						
4ACC3143	DOE APPROVE DRAFT FINAL ESD	10	08JAN97	22JAN97	38																						
4ACC3144	DOE SUBMIT DRAFT FINAL ESD TO EPA / STAKEHOLDERS	2	23JAN97	24JAN97	38																						
4ACC3149	CONDUCT SILO 3 ESD WORKSHOP	1	27JAN97*	27JAN97	84																						
4ACC3145	EPA / STAKEHOLDERS REVIEW DRAFT FINAL ESD	39	27JAN97	21MAR97	38																						
4ACC3146	FERMCO REVISE FINAL ESD	10	24MAR97*	04APR97	38																						
4ACC3147	EPA APPROVE FINAL ESD	22	07APR97	07MAY97	38																						
4ACC3148	PUBLISH NOTICE OF AVAILABILITY	8	08MAY97	15MAY97	38																						
CBD ANNOUNCEMENT																											
4ACC3487	PUBLISH CBD ANNOUNCEMENT	5	22NOV98A	03DEC98	175																						
4ACC3490	RECEIVE VENDOR INTEREST INFORMATION/QUALIFICATIO	25	04DEC98	10JAN97	175																						
4ACC3492	Evaluate/Develop Vendor Lists	15	13JAN97	31JAN97	175																						
REQUEST FOR PROPOSAL																											
4ACC3200	SILO 3 STABILIZATION RFP DEVELOPMENT	184*	24JUN98A	23JUL97	58																						
4ACC3405	REVISE PRELIMINARY DRAFT SOW/RFP	65	12NOV98A	03MAR97	58																						

DRAFT

Project Start 01OCT98
 Project Finish 21MAY10
 Data Date 23NOV98
 Print Date 31JAN99

Legend:
 ■ Early Bar
 ■ Progress Bar
 ■ Critical Activity

SILOS PROJECT
 ALTERNATIVE STUDY 2
 DETAIL SCHEDULE



Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Float	FY97 FY98 FY99 FY00 FY01 FY02 FY03 FY04 FY05 FY06 FY07 FY08 FY09 FY10 FY11 FY12 FY13 FY14 FY15 FY16 FY17																
						Gantt Chart Area																
4ACC3286	DISCUSSION BAFO's	16	23OCT97	14NOV97	56	DISCUSSION BAFO's																
4ACC3288	PREPARE AWARD DOCUMENTATION/ INTERNAL	18	17NOV97	12DEC97	58	PREPARE AWARD DOCUMENTATION/ INTERNAL REVIEW																
4ACC3290	DOE-FN/HQ REVIEWS/APPROVES CONTRACT AWARD	32	15DEC97	30JAN98	58	DOE-FN/HQ REVIEWS/APPROVES CONTRACT AWARD																
4ACC3295	FERMCO ISSUES AWARD DOCUMENT TO VENDOR	5	02FEB98	06FEB98	58	FERMCO ISSUES AWARD DOCUMENT TO VENDOR																
SILO 3 TREATABILITY STUDY																						
4ACC3360	SILO 3 TREATABILITY STUDY	84*	14NOV98A	28MAR97	106	SILO 3 TREATABILITY STUDY																
4ACC3361	NFS PREPARE DRAFT WORK PLAN	8	15NOV98A	06DEC98	106	NFS PREPARE DRAFT WORK PLAN																
4ACC3362	FDF REVIEW DRAFT WORK PLAN	5	09DEC98	13DEC98	106	FDF REVIEW DRAFT WORK PLAN																
4ACC3363	NFS FINALIZE WORK PLAN	10	16DEC98	31DEC98	106	NFS FINALIZE WORK PLAN																
4ACC3365	FDF APPROVE WORK PLAN	7	02JAN97	10JAN97	131	FDF APPROVE WORK PLAN																
4ACC3368	NFS PERFORM TREATABILITY STUDY TESTS	32	02JAN97	14FEB97	106	NFS PERFORM TREATABILITY STUDY TESTS																
4ACC3370	NFS PREPARE DRAFT TREATABILITY STUDY REPORT	9	18FEB97	28FEB97	106	NFS PREPARE DRAFT TREATABILITY STUDY REPORT																
4ACC3372	FDF REVIEW DRAFT TREATABILITY STUDY REPORT	8	03MAR97	12MAR97	106	FDF REVIEW DRAFT TREATABILITY STUDY REPORT																
4ACC3374	NFS PREPARE FINAL TREATABILITY STUDY REPORT	7	13MAR97	21MAR97	106	NFS PREPARE FINAL TREATABILITY STUDY REPORT																
4ACC3376	FDF APPROVE FINAL TREATABILITY STUDY REPORT	5	24MAR97	26MAR97	106	FDF APPROVE FINAL TREATABILITY STUDY REPORT																
4ACC3378	CLOSE OUT TASK ORDER / RETURN WASTE	22	31MAR97	30APR97	106	CLOSE OUT TASK ORDER / RETURN WASTE																
DESIGN																						
4ACC3201	FERMCO ISSUES NOTICE TO PROCEED WORK PKG #2	0	03SEP98		56	FERMCO ISSUES NOTICE TO PROCEED WORK PKG #2																
4ACC3202	VENDOR SUBMITS WORK PKG #2 SCHEDULE	10	03SEP98	17SEP98	529	VENDOR SUBMITS WORK PKG #2 SCHEDULE																
4ACC3203	VENDOR SUBMITS PROCUREMENT DOCUMENTS	10	03SEP98	17SEP98	56	VENDOR SUBMITS PROCUREMENT DOCUMENTS																
4ACC3204	VENDOR PREPARES / SUBMITS 50% DESIGN PKG	49	03SEP98	12NOV98	56	VENDOR PREPARES / SUBMITS 50% DESIGN PKG																
4ACC4230	SILO 3 STABILIZATION DETAIL DESIGN & PROCURE	186*	03SEP98	03JUN99	56	SILO 3 STABILIZATION DETAIL DESIGN & PROCURE																
4ACC3205	FERMCO / DOE REVIEWS 50% DESIGN PKG	15	13NOV98	07DEC98	56	FERMCO / DOE REVIEWS 50% DESIGN PKG																
4ACC3208	VENDOR(FERMCO/DOE) ISSUES COMMENT RESOLUTION DOC	10	06DEC98	21DEC98	56	VENDOR(FERMCO/DOE) ISSUES COMMENT RESOLUTION DOC																
4ACC3207	FERMCO/DOE APPROVES COMMENT RESOLUTION DOC	4	22DEC98	29DEC98	461	FERMCO/DOE APPROVES COMMENT RESOLUTION DOC																
4ACC3208	VENDOR PREPARES/SUBMITS 90/100% DESIGN PKG	43	22DEC98	24FEB99	56	VENDOR PREPARES/SUBMITS 90/100% DESIGN PKG																
4ACC3209	FERMCO/DOE REVIEWS 90/100% DESIGN PKG	15	25FEB99	17MAR99	56	FERMCO/DOE REVIEWS 90/100% DESIGN PKG																
4ACC3211	VENDOR(FERMCO/DOE) ISSUES COMMENT RESOLUTION DOC	10	16MAR99	31MAR99	289	VENDOR(FERMCO/DOE) ISSUES COMMENT RESOLUTION DOC																
4ACC3218	FERMCO REVIEWS/CONCURS LONG LEAD PROCUREMENT	10	16MAR99	31MAR99	56	FERMCO REVIEWS/CONCURS LONG LEAD PROCUREMENT																
4ACC3212	VENDOR PREPARES/SUBMITS 90/100% DESIGN PKG	14	01APR99	21APR99	289	VENDOR PREPARES/SUBMITS 90/100% DESIGN PKG																

DRAFT

Project Start: 01OCT98
 Project Finish: 31MAY00
 Data Date: 28NOV98
 Plot Date: 31JAN97

Legend:
 ■ Early Bar
 ■ Progress Bar
 ■ Critical Activity

SILOS PROJECT
ALTERNATIVE STUDY 2
DETAIL SCHEDULE

Sheet 14 of 10



DRAFT

Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Float
4ACC3219	VENDOR PROCURES LONG LEAD ITEMS	44	01APR89	03JUN89	56
4ACC3213	FERMCO/DOE TRANSMITS 90/100% DESIGN PKG TO EPA	5	22APR89	28APR89	289
4ACC3214	EPA/DOE REVIEWS 90/100% DESIGN PKG	44	29APR89	30JUN89	289
4ACC3215	VENDOR ISSUES CFC DESIGN PKG (w/COMMENT RESPONSE)	19	01JUL89	28JUL89	289
4ACC3216	FERMCO/DOE ISSUES CFC DESIGN PKG TO EPA	4	29JUL89	03AUG89	289
4ACC3217	EPA APPROVES CFC DESIGN PKG	22	04AUG89	02SEP89	289
CONSTRUCTION					
4ACC3550	AWARD SITE PREP CONTRACT FOR SILO 3 STABILIZATION	1	15SEP87*	15SEP87	399
4ACC3513	FERMCO NEGOTIATES UTILITY PKG/SITE PREP	81	21JAN88	15MAY88	399
4ACC3514	UTILITY CONSTRUCTION MOBILIZATION	29	18MAY88	26JUN88	399
4ACC3515	FERMCO PERFORMS UTILITIES CONSTRUCTION	85	28JUN88	27OCT88	399
4ACC3501	FERMCO ISSUES NOTICE TO PROCEED ON WORK PKG #3	0	04JUN89		153
4ACC3502	VENDOR MOBILIZES AT FEMP	43	04JUN89	04AUG89	56
4ACC3508	VENDOR SUBMITS STANDARD OPERATING PROCEDURES	93	04JUN89	14OCT89	153
4ACC3509	SILO 3 STABILIZATION CONSTRUCTION	244*	04JUN89	24MAY00	56
4ACC3503	VENDOR CONSTRUCTION OF TREATMENT FACILITY	127	05AUG89	08FEB00	56
4ACC3509	FERMCO REVIEWS VENDORS SOP'S	18	15OCT89	08NOV89	153
4ACC3510	VENDOR REVISES SOP'S & RESUBMITS TO FERMCO	21	10NOV89	13DEC89	153
4ACC3511	FERMCO REVIEWS/APPROVES SOP'S	15	14DEC89	06JAN00	153
4ACC3504	VENDOR PERFORMS SYSTEM OPERABILITY TESTING	44	16MAR00	17MAY00	56
4ACC3505	VENDOR DECLARES READINESS	5	18MAY00	24MAY00	56
OPERATIONS					
4ACC3512	FERMCO TRAINS SUPPORT PERSONNEL	53	07JAN00	22MAR00	153
4ACC3506	SILO 3 STABILIZATION OMR	150*	07JAN00	09AUG00	56
4ACC3507	FERMCO/DOE PERFORMS READINESS REVIEW	43	25MAY00	26JUL00	56
4ACC3516	VENDOR CORRECTS DEFICIENCIES/READINESS	10	27JUL00	09AUG00	56
4ACC3517	FERMCO ISSUES NOTICE TO PROCEED WORK PKG #4	0	10AUG00		56
4ACC3518	VENDOR SUBMITS SCHEDULE FOR WORK PKG #4 & #5	4	10AUG00	15AUG00	56
4ACC3519	SILO 3 STABILIZATION OPERATIONS	131*	10AUG00	20FEB01	56
4ACC3518	VENDOR PERFORMS SILO 3 STABILIZATION OPERATIONS	127	16AUG00	20FEB01	56



Environmental Management Project

SILOS PROJECT
ALTERNATIVE STUDY 2
NETAII - SCHEDULE E

Project Start: 91OCT88
Project End: 31MAY10
Date Date: 28NOV88
11AUG87

Legend:
 Early Bar
 Progress Bar
 Critical Activity

Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Float	FY07 FY08 FY09 FY10 FY11 FY12 FY13 FY14 FY15 FY16 FY17																
						Gantt Chart Area																
4ACC3560	FERMCO ISSUES NOTICE TO PROCEED WORK PKG #6	2	21FEB01	22FEB01	56	FERMCO ISSUES NOTICE TO PROCEED WORK PKG #6																
4ACCH270	SILO 3 STABILIZATION DEMOBILIZATION	78*	21FEB01	12JUN01	56	SILO 3 STABILIZATION DEMOBILIZATION																
4ACC3561	VENDOR PERFORMS D&D OF FACILITIES, EQUIPMENT	54	23FEB01	10MAY01	56	VENDOR PERFORMS D&D OF FACILITIES, EQUIPMENT																
4ACC3562	VENDOR DEMOBILIZES	22	11MAY01	12JUN01	56	VENDOR DEMOBILIZES																
4ACC3563	PROJECT CLOSEOUT	20	13JUN01	11JUL01	56	PROJECT CLOSEOUT																
DECOMMISSION																						
4ACJ2000	SILO 3 DECOMMISSION	40	13JUN01	08AUG01	1,293	SILO 3 DECOMMISSION																
D&D																						
4ACC9650	SILO 3 / SILO SUPERSTRUCTURE D&D	88	09AUG01	14DEC01	1,293	SILO 3 / SILO SUPERSTRUCTURE D&D																
FINAL SITE REMEDIATION																						
D&D																						
4ACJM004	START VITPP D&D	0	19MAY05		1,000	START VITPP D&D																
4ACC9500	VITPP D&D	252	04AUG05	07AUG06	947	VITPP D&D																
4ACCM123	START SILO 1 & 2 / SILO SUPERSTRUCTURE D&D	0	11APR07		779	START SILO 1 & 2 / SILO SUPERSTRUCTURE D&D																
4ACJM008	START K-65 SILO / NRTS D&D	0	11APR07		779	START K-65 SILO / NRTS D&D																
4ACC9600	SILO 1 & 2 / SILO SUPERSTRUCTURE D&D	164	11APR07	05DEC07	376	SILO 1 & 2 / SILO SUPERSTRUCTURE D&D																
4ACC9800	K-65 SILO / NRTS D&D	237	11APR07	21MAR08	303	K-65 SILO / NRTS D&D																
SOILS																						
4ACJM127	START AREA 7 SOILS REMEDIATION	0	17DEC01		2,107	START AREA 7 SOILS REMEDIATION																
4ACJ1330	AREA 7, 1-II, 2-II - PROCURE SUBCONTRACTOR	212	01JUN04	05APR05	1,282	AREA 7, 1-II, 2-II - PROCURE SUBCONTRACTOR																
4ACJ1335	AREA 7 SOILS EXCAVATION (INCL SILOS)	614	06APR05	08JUL08	468	AREA 7 SOILS EXCAVATION (INCL SILOS)																
4ACJ1340	K-65 SILO PLANT D&D & SOIL REMEDIATION	279	13APR09	21MAY10	0	K-65 SILO PLANT D&D & SOIL REMEDIATION																
PROJECT MANAGEMENT																						
ENGINEERING MANAGEMENT																						
4AEE1002	Engineering Project Management FY97	212	01OCT96A	30SEP97	0	Engineering Project Management FY97																
4AEE1003	K-65 SILO Engineering Project Management FY98	250	01OCT97	30SEP98	0	K-65 SILO Engineering Project Management FY98																
4AEE1004	K-65 SILO Engineering Project Management FY99	250	01OCT98	30SEP99	0	K-65 SILO Engineering Project Management FY99																
4AEE1005	K-65 SILO Engineering Project Management FY00	250	01OCT99	29SEP00	0	K-65 SILO Engineering Project Management FY00																
4AEE1006	K-65 SILO Engineering Project Management FY01	249	02OCT00	28SEP01	0	K-65 SILO Engineering Project Management FY01																
4AEE1007	K-65 SILO Engineering Project Management FY02	250	01OCT01	30SEP02	0	K-65 SILO Engineering Project Management FY02																
4AEE1010	K-65 SILO Engineering Project Management FY03	250	01OCT02	30SEP03	0	K-65 SILO Engineering Project Management FY03																

DRAFT

Project Start	01OCT96	Early Bar
Project Finish	31MAY10	Progress Bar
Data Date	29NOV99	Critical Activity
Print Date	21JAN07	

ACT:AMN

SILOS PROJECT
ALTERNATIVE STUDY 2
DETAIL SCHEDULE

Sheet 10 of 10



Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Float	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17
4ADN0040	PRE-OP REVIEW - SSR	10	25JUL97*	07AUG97	660											
4ADN0049	RECEIVE HOUDINI AT FEMP	1	08AUG97	08AUG97	660											
4ADN0051	INSTALL HOUDINI	10	04SEP97	17SEP97	643											
4ADN0060	S.O.T. (HOUDINI)	5	18SEP97	24SEP97	643											
4ADN0054	HOUDINI DEMONSTRATION	30	25SEP97	05NOV97	643											
4ADN0057	PROJECT CLOSEOUT	50	06NOV97	22JAN98	643											
RADON REMOVAL TEST PROGRAM																
4ADPX009	TEST PLAN - RRTU	6	27FEB96A	24JAN97	3,330											
4ADPX002	PREPARE SPEC - RRTU	9	06JAN97*	16JAN97	3,330											
WASTE CONTAINER DEVELOPMENT																
4ADPX050	RUST GEOTECH - RADON/ZEOLITE	90	16OCT96A	07APR97	277											
SILO 4 DEMONSTRATION																
4ADS0050	PREPARE SILO 4 DEMO WORK PLAN	35	02JAN96A	17JAN97	181											
4ADSH005	SILO 4 DEMONSTRATION	183*	02JAN96A	03SEP97	181											
4ADS0059	SILO 4 DEMO SOT PLAN/PROCEDURE	20	20JAN97	14FEB97	181											
4ADS0015	PREPARE DESIGN FOR DEMONSTRATION	30	18FEB97	31MAR97	181											
4ADS0018	DESIGN REVIEW	10	01APR97	15APR97	181											
4ADS0053	Davis Bacon Determinations	20	01APR97	29APR97	189											
4ADS0009	Procurement Activity	50	01APR97	11JUN97	183											
4ADS0021	INCORPORATE COMMENTS	10	16APR97	29APR97	181											
4ADS0027	PREPARE H&S PLAN (CONST)	20	16APR97	13MAY97	192											
4ADS0024	ISSUE SILO 4 DEMONSTRATION CFC DESIGN	1	30APR97	30APR97	181											
4ADS0030	PREPARE BID PACKAGE - Dome Cut	10	01MAY97	14MAY97	181											
4ADS0033	Pre-Op Rev. SSR	10	14MAY97	28MAY97	192											
4ADS0034	BID PERIOD	20	15MAY97	12JUN97	181											
4ADS0036	AWARD SILO 4 DEMONSTRATION CONSTRUCTION	1	13JUN97	13JUN97	181											
4ADS0039	MOBILIZE/ CONSTRUCTION TRAINING	10	16JUN97	01JUL97	144											
4ADS0042	CONSTRUCTION (INCLUDES DOME CUTTING)	20	02JUL97	06AUG97	144											
4ADS0045	AIRFLOW CONTROL - HYDRAULIC MOCK-UP TESTING	15	07AUG97	03SEP97	144											
11.14.5. OUCR MANAGEMENT																

DRAFT

object Start 01OCT96
 object Finish 21MAY98
 sta Date 25NOV98
 of Date 21JAN97

ALTE-001

**SILOS PROJECT
 ALTERNATIVE STUDY 2
 DETAIL SCHEDULE**

Sheet 10 of 10



SILOS PROJECT
 ALTERNATIVE STUDY 3
 DETAIL SCHEDULE



Activity ID	Activity Description	Rem	Early Start	Early Finish	Total
1.1.1.4.1-RUPS-PILOT PLANT					
PILOT PLANT PHASE I					
RADON DATA ACQUISITION					
4AAC/162	FINAL ACCEPTANCE TEST	14	22NOV86A	16DEC86	2,985
DESIGN					
4AAC6381	PHASE I OPERATIONS ENGINEERING SUPPORT - FY87	40	01OCT96A	24JAN97	147
4AAC6385	ENGINEERING SUPPORT - FY87	90	01OCT96A	07APR97	122
4AAC6382	TEST REPORT SUPPORT	25	27JAN87	03MAR97	147
CONSTRUCTION					
4AAC250	PHASE I CONSTRUCTION PK 4 DEBRA EQUITABLE ADJ	41	30APR96A	27JAN97	4
4AAF7036	CAMERA INSTALLATION WORK PLAN - SILOS 1/2	10	02DEC86*	13DEC86	2,986
PROCEDURES					
4AAC6229	PILOT PLANT PHASE I PROCEDURES REVISIONS	45	03NOV86A	31JAN97	2,954
4AAC6375	PROCEDURES WRITING SUPPORT OF PHASE I OPS	45	30SEP96A	31JAN97	2,954
HIS UPGRADE					
4AAC2000	RADON TREATMENT SYSTEM DISMANTLE (RSO)	129	25NOV86	03JUN97	2,870
SILOS 1 & 2 WASTE REMOVAL					
4AAC8051	PRELIMINARY DESIGN - SILOS 1/2	13	01OCT96A	13OCT96	2,988
SILOS WASTE REMOVAL					
4AAC9001	WR PRELIMINARY DESIGN - SILO 3	20	06JAN97*	31JAN97	96
4AAC9010	WR DETAIL DESIGN 80W - SILO 3	10	03FEB97	14FEB97	96
4AAC9040	WR DETAILED DESIGN - SILO 3	20	10FEB97	10MAR97	134
4AAC9065	TRAMP REVIEW - SILO 3	5	18FEB97	24FEB97	221
4AAC9060	ALMA REVIEW - SILO 3	20	18FEB97	17MAR97	206
4AAC9130	DAVIS BACON - SILO 3	20	18FEB97	17MAR97	206
4AAC9020	WR SAFETY BASIS REVISION - SILO 3	50	18FEB97	28APR97	96
4AAC9070	CONSTR TRAVELER PKG (WSE) - SILO 3	10	11MAR97	24MAR97	902
4AAC9100	PREPARE WRB SOP - SILO 3	20	11MAR97	07APR97	2,909
4AAC9090	PROCURE WRB COMPONENTS - SILO 3	50	11MAR97	20MAY97	134
4AAC9021	WR SAFETY ASSESSMENT - SILO 3	20	30APR97	28MAY97	96
4AAC9110	INSTALL WRB SUBCOMPONENTS - SILO 3	20	21MAY97	18JUN97	134
4AAC9120	WRB CAT - SILO 3	2	19JUN97	20JUN97	134
DESIGN					
4AAC9021	WR SAFETY ASSESSMENT - SILO 3	20	30APR97	28MAY97	96
4AAC9090	PROCURE WRB COMPONENTS - SILO 3	50	11MAR97	20MAY97	134
4AAC9100	PREPARE WRB SOP - SILO 3	20	11MAR97	07APR97	2,909
4AAC9070	CONSTR TRAVELER PKG (WSE) - SILO 3	10	11MAR97	24MAR97	902
4AAC9020	WR SAFETY BASIS REVISION - SILO 3	50	18FEB97	28APR97	96
4AAC9130	DAVIS BACON - SILO 3	20	18FEB97	17MAR97	206
4AAC9060	ALMA REVIEW - SILO 3	20	18FEB97	17MAR97	206
4AAC9065	TRAMP REVIEW - SILO 3	5	18FEB97	24FEB97	221
4AAC9040	WR DETAILED DESIGN - SILO 3	20	10FEB97	10MAR97	134
4AAC9010	WR DETAIL DESIGN 80W - SILO 3	10	03FEB97	14FEB97	96
4AAC9001	WR PRELIMINARY DESIGN - SILO 3	20	06JAN97*	31JAN97	96
DESIGN					
4AAC9001	WR PRELIMINARY DESIGN - SILO 3	20	06JAN97*	31JAN97	96
4AAC9010	WR DETAIL DESIGN 80W - SILO 3	10	03FEB97	14FEB97	96
4AAC9040	WR DETAILED DESIGN - SILO 3	20	10FEB97	10MAR97	134
4AAC9065	TRAMP REVIEW - SILO 3	5	18FEB97	24FEB97	221
4AAC9060	ALMA REVIEW - SILO 3	20	18FEB97	17MAR97	206
4AAC9130	DAVIS BACON - SILO 3	20	18FEB97	17MAR97	206
4AAC9020	WR SAFETY BASIS REVISION - SILO 3	50	18FEB97	28APR97	96
4AAC9070	CONSTR TRAVELER PKG (WSE) - SILO 3	10	11MAR97	24MAR97	902
4AAC9100	PREPARE WRB SOP - SILO 3	20	11MAR97	07APR97	2,909
4AAC9090	PROCURE WRB COMPONENTS - SILO 3	50	11MAR97	20MAY97	134
4AAC9021	WR SAFETY ASSESSMENT - SILO 3	20	30APR97	28MAY97	96
4AAC9110	INSTALL WRB SUBCOMPONENTS - SILO 3	20	21MAY97	18JUN97	134
4AAC9120	WRB CAT - SILO 3	2	19JUN97	20JUN97	134

DRAFT

FY97EY96 FY99EY00 FY81EY02 FY03EY04 FY05EY06 FY07EY08 FY09EY10 FY11EY12 FY13EY14 FY16EY18

Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Cost	FY97 FY98 FY99 FY00 FY01 FY02 FY03 FY04 FY05 FY06 FY07 FY08 FY09 FY10 FY11 FY12 FY13 FY14 FY15 FY16															
						Gantt Chart Area															
4AEE0105	Bid Period - S/S Fabrication	30	14JUL97	22AUG97	574	Bid Period - S/S Fabrication															
4AEE0110	Bid Review - S/S Fabrication	30	25AUG97	06OCT97	574	Bid Review - S/S Fabrication															
4AEM002	Award S/S Fabrication (EPA MS 11/13/98)	0		06OCT97	574	Award S/S Fabrication (EPA MS 11/13/98)															
CONSTRUCTION																					
4AEEH100	S/S FABRICATION & DELIVERY	121	07OCT97	18MAY98	459	S/S FABRICATION & DELIVERY															
4AEE0120	SITE PREPARATION & FOUNDATION CONSTRUCTION-S/S	120	04NOV97	15JUN98	444	SITE PREPARATION & FOUNDATION CONSTRUCTION-S/S															
4AEEH150	SILO SUPERSTRUCTURE CONSTRUCTION	510*	04NOV97	25MAY00	109	SILO SUPERSTRUCTURE CONSTRUCTION															
4AEE0130	ASSEMBLE S/S BRIDGES	15	08JUN99	01JUL99	249	ASSEMBLE S/S BRIDGES															
4AEE0140	ERECT STEEL - S/S	40	16MAR00	25MAY00	109	ERECT STEEL - S/S															
WASTE RETRIEVAL SYSTEM																					
DESIGN																					
4ADF0521	WRS Pre-Treatment Evaluation	120	06JAN97*	25JUN97	129	WRS Pre-Treatment Evaluation															
4ADF0522	Modify WRS Concept Design	40	26JUN97	21AUG97	129	Modify WRS Concept Design															
4ADF0523	WRS Preliminary Design (Title I)	80	22AUG97	17DEC97	129	WRS Preliminary Design (Title I)															
4ADF0524	Complete WRS Preliminary Design (Title I)	15	18DEC97	12JAN98	129	Complete WRS Preliminary Design (Title I)															
4ADF0515	Waste Retrieval System (WRS) for Design P.O.P.	30	13JAN98	24FEB98	129	Waste Retrieval System (WRS) for Design P.O.P.															
4ADF0500	WRS Pre-Final Design (Title II)	160	25FEB98	12OCT98	129	WRS Pre-Final Design (Title II)															
4ADFM005	Submit WRS Prefinal Design to EPA	0		12OCT98	129	Submit WRS Prefinal Design to EPA															
4ADF0510	EPA Review/Commnt Incorp for WRS Prefinal Design	91	13OCT98	25FEB99	129	EPA Review/Commnt Incorp for WRS Prefinal Design															
4ADFH530	TITLE III - WASTE RETRIEVAL SYSTEM	330	10MAY99	30AUG00	2,058	TITLE III - WASTE RETRIEVAL SYSTEM															
PROCUREMENT																					
4AEE0155	Prepare Bid Package - WRS & S/S Erection	35	07JAN99	25FEB99	129	Prepare Bid Package - WRS & S/S Erection															
4AEEH02	WRS & S/S Erection Contract Procurement	91	07JAN99	17MAY99	2,382	WRS & S/S Erection Contract Procurement															
4AEE0160	Bid Period - WRS & S/S Erection	30	26FEB99	08APR99	129	Bid Period - WRS & S/S Erection															
4AEE0165	Bid Review - WRS & S/S Erection	20	12APR99	07MAY99	129	Bid Review - WRS & S/S Erection															
CONSTRUCTION																					
4ADF0520	Mobilize WRS & S/S Erection Contractor	16	10MAY99	07JUN99	103	Mobilize WRS & S/S Erection Contractor															
4ADF0525	Order/Deliver WRS MEP	85	08JUN99	04NOV99	103	Order/Deliver WRS MEP															
4ADFH525	WRS CONSTRUCTION	145	08NOV99	31JUL00	103	WRS CONSTRUCTION															
4ADFM002	WRS Complete	0		19JUL01	1,838	WRS Complete															
SILOS PROJECT																					

DRAFT

225

Project Start	01OCT95	Early Bar
Project Finish	30NOV98	Progress Bar
Data Date	29NOV98	Critical Activity
Plot Date	21JAN97	

ALT3.AA1

**SILOS PROJECT
ALTERNATIVE STUDY 3
DETAIL SCHEDULE**

Sheet 3 of 13



Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Post
4ACC1185	PREPARE SILO 1&2 STABILIZATION FEASIBILITY STUDY	250	15MAY87	14MAY88	2,633
4ACC1180	PREPARE O&U ROD AMENDMENT	500	15MAY87*	14MAY88	2
REMEDIAL ACTION WORK PLAN					
4ACC1200	PREPARE DRAFT PHASE II RAWP INCL. DOE REVIEW	70	17MAY88	24AUG89	549
4ACC009	K-66 SILO REMEDIAL ACTION WORK PLAN	133*	17MAY88	23NOV88	549
4ACCM020	SUBMIT DRAFT PHASE II RAWP TO USEPA	0		24AUG89	549
4ACC1207	PUBLISH NOTICE OF AVAILABILITY PHASE II RAWP	10	25AUG89	08SEP89	602
4ACC1205	EPA REVIEW DRAFT PHASE II RAWP & INCOMP COMMENTS	63	25AUG89	23NOV89	549
4ACCM052	RECEIVE EPA APPROVAL OF FINAL PHASE II RAWP	0		23NOV89	549
DESIGN					
4ACC000	K66 PLANT TITLE I	120	17MAY89	03NOV89	2
4ACCM018	SUBMIT PRELIMINARY K-66 SILO DESIGN TO EPA	0		03NOV89	119
4ACC700	EPA REVIEW & COMMENT INCOMP - TITLE I	63	04NOV89	08FEB00	119
4ACC008	K-66 SILO PLANT TITLE II	180	04NOV89	26JUL00	2
4ACCM050	EPA APPROVE K-66 SILO PRELIMINARY DESIGN	0		08FEB00	119
4ACCM021	SUBMIT K-66 SILO PRELIMINARY DESIGN TO EPA	0		26JUL00	2,020
4ACC7001	EPA REVIEW & COMMENT INCOMP - TITLE II	63	27JUL00	24OCT00	2,020
CONSTRUCTION					
4ACC600	BID & AWARD FACILITY CONSTRUCTION PACKAGES	120	09MAR00	28AUG00	9
CONSTRUCTION					
4ACC700	K-66 SILO PLANT CONSTRUCTION	260	27JUL00	09AUG01	2
4ACC800	K-66 SILO PLANT TITLE III	260	27JUL00	09AUG01	62
OPERATORS					
4ACC500	K-66 SILO PRE-OP/START-UP ACTIVITIES	250	05FEB01	04FEB02	2
4ACC8000	K-66 SILO OMR	180	05FEB02	21OCT02	2
4ACC8100	K-66 SILO SURROGATE TESTING	90	22OCT02	19JAN03	2
4ACJM001	START SOIL REMOVAL AROUND BERM	0	20JAN03		1,168
4ACC4200	K-66 SILO OPERATIONS	1,510	20JAN03	09MAR07	2
4ACC300	K-66 SILO WASTE MANAGEMENT	1,510	20JAN03	09MAR07	626
4ACJM002	SOIL REMOVAL AROUND BERM	0	11DEC03		986

DRAFT



Sheet 4 of 13

SILOS PROJECT
ALTERNATIVE STUDY 3
DETAIL SCHEDULE

ALTJAM1

Project Start: 61OCT86
 Project Finish: 24NOV88
 Date Date: 25NOV88
 Pre Date: 21JAN87

Legend:
 ■ Early Bar
 ■ Progress Bar
 ■ Critical Activity

Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Cost	FY07	FY08	FY09	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16
4ACJM003	SOIL REMOVAL AROUND BERM	0	29NOV04		453																				
DECOMMISSION																									
4ACCH400	K-66 SILO PLANT DECOMMISSION	180	12MAR07	27NOV07	0																				
4ACJM006	COMPLETE K-66 SILO PLANT DECOMMISSION	0		27NOV07	250																				
NEW RADON TREATMENT SYSTEM																									
4ADC0101	Modify NRTS Concept Design	30	22MAY97*	03JUL97	433																				
4ADCH000	NRTS Preliminary Design	50	07JUL97	15SEP97	433																				
4ADCM001	Submit Preliminary NRTS Design to EPA (9/30/96)	0		15SEP97	572																				
4ADC0106	EPA Review NRTS Preliminary Design	40	16SEP97	10NOV97	572																				
4ADC0102	NRTS POP Prep & Approval	100	16SEP97	10FEB98	433																				
4ADC0104	EPA Preliminary Comment Incorp. and Response	20	12NOV97	11DEC97	572																				
4ADC0107	NRTS Prefinal Design	100	11FEB98	06JUL98	433																				
4ADCM002	Submit Prefinal NRTS Design to EPA (1/2/97)	0		06JUL98	433																				
4ADC0R00	EPA REVIEW NRTS PREFINAL & INCORPORATE COMMENTS	42	07JUL98	02SEP98	433																				
4ADCH003	PROCURE NRTS CONSTRUCTION SUBCONTRACTOR	42	07JUL98	17SEP98	346																				
4ADC0109	NRTS/WR SAFETY BASIS	90	07JUL98	10NOV98	520																				
4ADCM003	Award NRTS Construction (EPA MS 7/21/97)	0	18SEP98		433																				
4ADCH006	NRTS TITLE III	120	21SEP98	16MAR99	604																				
4ADCH005	NRTS CONSTRUCTION & CAT	100	21SEP98	22MAR99	346																				
4ADC0160	Complete NRTS/WR Start-up/Readiness Prep	180	30MAY00	24APR01	109																				
SITE PREP / UG UTILITIES																									
4ADJH001	K-66 SILO SITE PREP / UG UTILITIES	14*	02OCT95A	16DEC96	173																				
4ADJH01	FRVP SITE PREP / UG UTILITIES	14*	02OCT95A	16DEC96	173																				
4ADJH000	SP/UU CONSTRUCTION	8	04MAR98A	06DEC96	172																				
4ADJH002	SP/UU TITLE III	15	08APR98A	23JAN97	173																				
4ADJ3030	UNDERGROUND UTILITIES	7	26JUN98A	16DEC96	137																				
4ADJ3025	ABOVE GROUND UTILITIES - ELECTRIC	12	12AUG98A	06DEC96	289																				
4ADJ3020	ELECTRICAL HOOK-UP FOR TRAILERS	15	07OCT98A	19DEC96	137																				
SILO 3 STABILIZATION																									
SILO 3 STABILIZATION																									

DRAFT

Project Start 01OCT88
 Project Finish 24NOV08
 Data Date 25NOV98
 Plot Date 21JAN97

Legend:
 [Solid Bar] Early Bar
 [Dashed Bar] Progress Bar
 [Dotted Bar] Critical Activity

ALTS-001



SILOS PROJECT
 ALTERNATIVE STUDY 3
 DETAIL SCHEDULE

Sheet 6 of 13



22
20
57

**SILOS PROJECT
ALTERNATIVE STUDY 3
DETAIL SCHEDULE**

Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Post
4ACC350	SILO 3 STABILIZATION	1,117*	16OCT98A	18MAY01	74
PRELIMINARY STUDIES AND REGULATIONS					
4ACC3125	FERMCO REVISE DRAFT FINAL REPORT	13	16OCT98A	13DEC98	36
4ACC3128	EPA REVIEW / APPROVE FINAL REPORT	22	18DEC98	17JAN97	80
SILO 3 REPORT					
4ACC3090	CONTINUE DEVELOPMENT OF EVAL OF SILO 3 ALT'S	13*	29APR98A	13DEC98	36
4ACC3152	ISSUE NOA FOR SILO 3 / REPORT & WORKSHOP	3	18DEC98	18DEC98	186
EXPLANATION OF SCHEDULE					
4ACC3138	ESD PROCESS	117*	24JUN98A	15MAY97	36
4ACC3151	FERMCO REVISE DRAFT ESD	15	18DEC98	08JAN97	36
4ACC3143	DOE APPROVE DRAFT FINAL ESD	10	08JAN97	22JAN97	36
4ACC3144	DOE SUBMIT DRAFT FINAL ESD TO EPA / STAKEHOLDERS	2	23JAN97	24JAN97	36
4ACC3149	CONDUCT SILO 3 ESD WORKSHOP	1	27JAN97*	27JAN97	84
4ACC3145	EPA / STAKEHOLDERS REVIEW DRAFT FINAL ESD	39	27JAN97	21MAR97	36
4ACC3146	FERMCO REVISE FINAL ESD	10	24MAR97*	04APR97	36
4ACC3147	EPA APPROVE FINAL ESD	22	07APR97	07MAY97	36
4ACC3148	PUBLISH NOTICE OF AVAILABILITY	6	08MAY97	15MAY97	36
CBA ANNOUNCEMENT					
4ACC3487	PUBLISH CBD ANNOUNCEMENT	5	22NOV98A	03DEC98	175
4ACC3490	RECEIVE VENDOR INTEREST INFORMATION/QUALIFCATO	25	04DEC98	10JAN97	175
4ACC3492	Evaluate/Develop Vendor Lists	15	13JAN97	31JAN97	175
REQUEST FOR PROPOSALS					
4ACC3200	SILO 3 STABILIZATION RFP DEVELOPMENT	148*	24JUN98A	28JUN97	74
4ACC3405	REVISE PRELIMINARY DRAFT SOW/RFP	65	12NOV98A	03MAR97	74
4ACC3201	SILO 3 STABILIZATION RFP DEVELOPMENT	146*	12NOV98A	28JUN97	74
4ACC3420	DOE REVIEW DRAFT FINAL SOW/RFP	12	04MAR97	19MAR97	74
4ACC3425	FERMCO REVISE DRAFT FINAL SOW/RFP	10	20MAR97	02APR97	74
4ACC3430	FERMCO CONTRACT BOARD REVIEW FINAL SOW/RFP	10	03APR97	17APR97	74
4ACC3431	FERMCO REVISE FINAL SOW/RFP	5	19APR97	24APR97	74
4ACC3435	DOE-F/DOE-OH REVIEW FINAL SOW/RFP	5	25APR97	01MAY97	89

DRAFT

ALT34401

Project Start: 01OCT98
 Project Finish: 28NOV98
 Data Date: 29NOV98
 Print Date: 21JAN97

Legend:
 ■ Early Bar
 ■ Progress Bar
 ■ Critical Activity

Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Rank
4ACC3381	NFS PREPARE DRAFT WORK PLAN	8	15NOV98A	08DEC98	108
4ACC3382	fdf REVIEW DRAFT WORK PLAN	5	09DEC98	13DEC98	108
4ACC3383	NFS FINALIZE WORK PLAN	10	18DEC98	31DEC98	108
4ACC3385	fdf APPROVE WORK PLAN	7	02JAN97	10JAN97	131
4ACC3386	NFS PERFORM TREATABILITY STUDY TESTS	32	02JAN97	14FEB97	108
4ACC3370	NFS PREPARE DRAFT TREATABILITY STUDY REPORT	9	18FEB97	28FEB97	108
4ACC3372	fdf REVIEW DRAFT TREATABILITY STUDY REPORT	8	03MAR97	12MAR97	108
4ACC3374	NFS PREPARE FINAL TREATABILITY STUDY REPORT	7	13MAR97	21MAR97	108
4ACC3376	fdf APPROVE FINAL TREATABILITY STUDY REPORT	5	24MAR97	28MAR97	108
4ACC3378	CLOSE OUT TASK ORDER / RETURN WASTE	22	31MAR97	30APR97	108
DESIGN					
4ACC3201	FERMCO ISSUES NOTICE TO PROCEED WORK PKG #2	0	10AUG98		74
4ACC3202	VENDOR SUBMITS WORK PKG #2 SCHEDULE	10	10AUG98	21AUG98	547
4ACC3203	VENDOR SUBMITS PROCUREMENT DOCUMENTS	10	10AUG98	21AUG98	74
4ACC3204	VENDOR PREPARES / SUBMITS 60% DESIGN PKG	49	10AUG98	18OCT98	74
4ACC3230	SILCO 3 STABILIZATION DETAIL DESIGN & PROCURE	186*	10AUG98	07MAY99	74
4ACC3205	FERMCO / DOE REVIEWS 60% DESIGN PKG	15	18OCT98	08NOV98	74
4ACC3206	VENDOR(FERMCO/DOE) ISSUES COMMENT RESOLUTION DOC	10	08NOV98	23NOV98	74
4ACC3207	FERMCO/DOE APPROVES COMMENT RESOLUTION DOC	4	24NOV98	01DEC98	478
4ACC3208	VENDOR PREPARES/SUBMITS 90/100% DESIGN PKG	43	24NOV98	28JAN99	74
4ACC3209	FERMCO/DOE REVIEWS 90/100% DESIGN PKG	15	28JAN99	19FEB99	74
4ACC3211	VENDOR(FERMCO/DOE) ISSUES COMMENT RESOLUTION DOC	10	22FEB99	05MAR99	307
4ACC3218	FERMCO REVIEWS/CONCURS LONG LEAD PROCUREMENT	10	22FEB99	05MAR99	74
4ACC3212	VENDOR PREPARES/SUBMITS 90/100% DESIGN PKG	14	08MAR99	25MAR99	307
4ACC3219	VENDOR PROCURES LONG LEAD ITEMS	44	08MAR99	07MAY99	74
4ACC3213	FERMCO/DOE TRANSMITS 90/100% DESIGN PKG TO EPA	5	28MAR99	01APR99	307
4ACC3214	EPA/DOE REVIEWS 90/100% DESIGN PKG	44	02APR99	04JUN99	307
4ACC3215	VENDOR ISSUES CFC DESIGN PKG (w/COMMENT RESPONSE	19	07JUN99	01JUL99	307
4ACC3216	FERMCO/DOE ISSUES CFC DESIGN PKG TO EPA	4	02JUL99	08JUL99	307

DRAFT

**SILOS PROJECT
ALTERNATIVE STUDY 3
DETAIL SCHEDULE**

ALT3A01

Project Start	9/10/98
Project Finish	2/10/99
Issue Date	2/10/99
Print Date	2/11/99

Early Bar
 Progress Bar
 Critical Activity

**SILOS PROJECT
ALTERNATIVE STUDY 3
DETAIL SCHEDULE**



522

Activity ID	Activity	Rem	Early Start	Early Finish	Total
4ACC3550	AWARD SITE PREP CONTRACT FOR SILOS STABILIZATION	1	15SEP97*	15SEP97*	398
4ACC3513	FERMCO NEGOTIATES UTILITY	81	21JAN98	15MAY98	399
4ACC3514	UTILITY CONSTRUCTION MOBILIZATION	29	18MAY98	28JUN98	399
4ACC3515	FERMCO PERFORMS UTILITIES CONSTRUCTION	85	29JUN98	27OCT98	399
4ACC3501	FERMCO ISSUES NOTICE TO PROCEED ON WORK PKG #3	0	10MAY98	10MAY98	171
4ACC3502	VENDOR MOBILIZES AT FEMP	43	10MAY98	08JUL98	74
4ACC3508	VENDOR SUBMITS STANDARD OPERATING PROCEDURES	83	10MAY98	20SEP98	171
4ACC240	SILOS STABILIZATION CONSTRUCTION	244*	10MAY98	28APR00	74
4ACC3503	VENDOR CONSTRUCTION OF TREATMENT FACILITY	127	12JUL98	13JAN00	74
4ACC3509	FERMCO REVIEWS VENDORS SOP'S	18	21SEP98	14OCT98	171
4ACC3510	VENDOR REVISES SOP'S & RESUBMITS TO FERMCO	21	15OCT98	15NOV98	171
4ACC3511	FERMCO REVIEWS/APPROVES SOP'S	15	18NOV98	08DEC98	171
4ACC3504	VENDOR PERFORMS SYSTEM OPERABILITY TESTING	44	18FEB00	21APR00	74
4ACC3505	VENDOR DECLARES READINESS	5	24APR00	28APR00	74
4ACC3512	FERMCO TRAINS SUPPORT PERSONNEL	53	09DEC99	25FEB00	171
4ACH250	SILOS STABILIZATION ORR	150*	09DEC99	14JUL00	74
4ACC3506	FERMCO/DDE PERFORMS READINESS REVIEW	43	01MAY00	28JUN00	74
4ACC3507	VENDOR CORRECTS DEFICIENCIES/READINESS APPROVED	10	30JUN00	14JUL00	74
4ACC3516	FERMCO ISSUES NOTICE TO PROCEED WORK PKG #4	0	17JUL00	17JUL00	74
4ACC3517	VENDOR SUBMITS SCHEDULE FOR WORK PKG #4 & #5	4	17JUL00	20JUL00	74
4ACH260	SILOS STABILIZATION OPERATIONS	131*	17JUL00	24JAN01	74
4ACC3518	STABILIZATION OPERATIONS	127	21JUL00	24JAN01	74
4ACC3560	FERMCO ISSUES NOTICE TO PROCEED WORK PKG #6	2	25JAN01	28JAN01	74
4ACH270	SILOS STABILIZATION DEMOBILIZATION	78*	25JAN01	16MAY01	74
4ACC3561	VENDOR PERFORMS D&D OF FACILITIES, EQUIPMENT	54	28JAN01	16APR01	74
4ACC3562	VENDOR DEMOBILIZES	22	17APR01	16MAY01	74
4ACC3563	PROJECT CLOSEOUT	20	17MAY01	14JUN01	74

DRAFT

Activity ID	Activity	Rem	Early Start	Early Finish	Total
4ACC3217	EPA APPROVES CFC DESIGN PKG	22	09JUL99	09AUG99	307



**SILOS PROJECT
ALTERNATIVE STUDY 3**

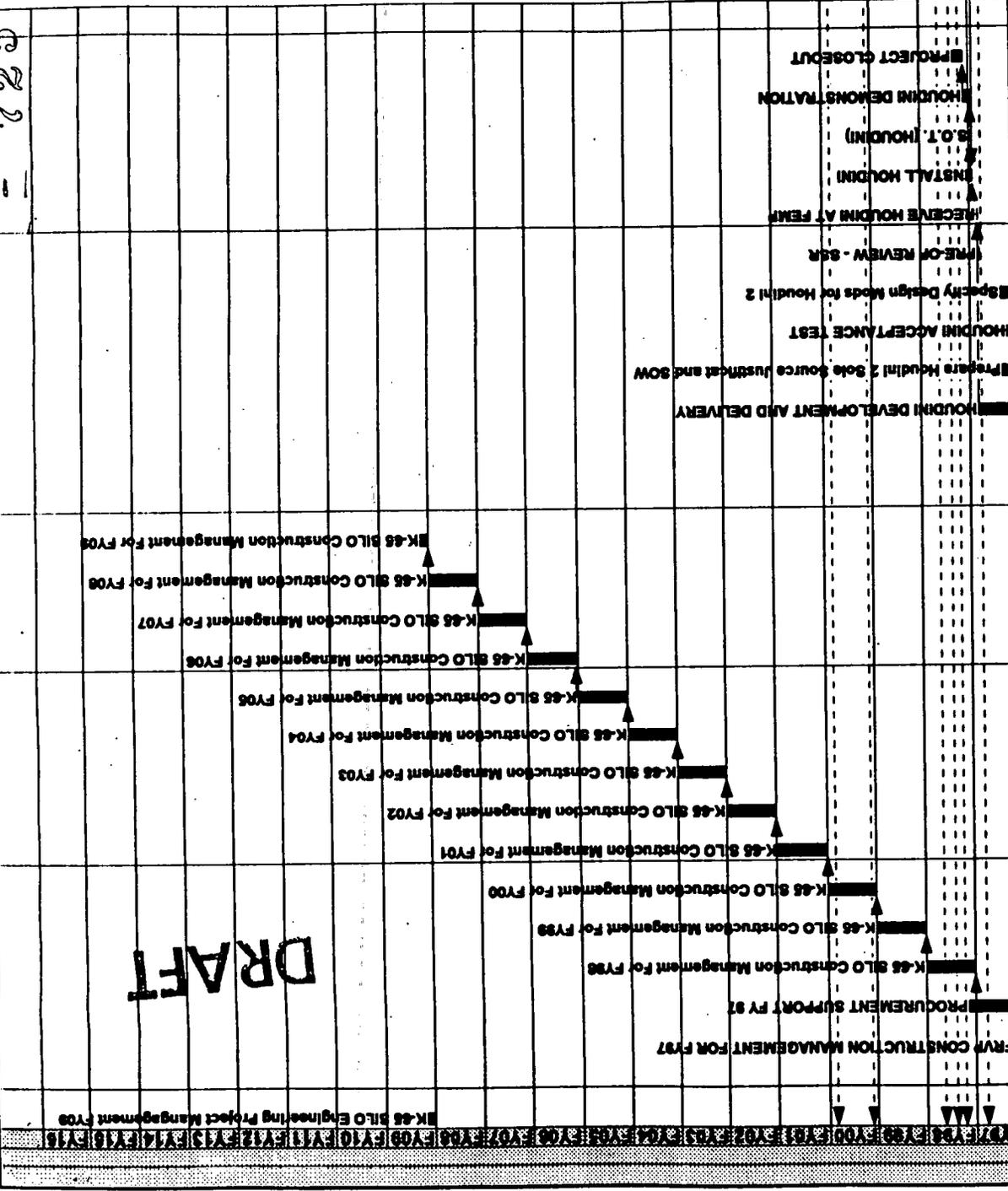
AT33A01

Early Bar	_____
Progress Bar	_____
Critical Activity	_____

01 OCT88
24 NOV88
25 NOV88

Project Start
Project Finish
Data Date

225



Activity ID	Activity Description	Rem	Earl	Earl	Finish	Earl	Total
4AEE1016	K-65 SILO Engineering Project Management FY08	38	01OCT08	24NOV08		0	
4AEE0301	PROCUREMENT SUPPORT FY 97	250	25NOV98	24NOV97		2,749	
4AEEFY97	FRVP CONSTRUCTION MANAGEMENT FOR FY97	18	01OCT96A	23DEC96		2	
4AEEFY98	K-65 SILO CONSTRUCTION Management For FY98	250	01OCT97	30SEP98		0	
4AEEFY99	K-65 SILO CONSTRUCTION Management For FY99	250	01OCT98	30SEP99		0	
4AEEFY00	K-65 SILO CONSTRUCTION Management For FY00	250	01OCT99	29SEP00		0	
4AEEFY01	K-65 SILO CONSTRUCTION Management For FY01	249	02OCT00	28SEP01		0	
4AEEFY02	K-65 SILO CONSTRUCTION Management For FY02	250	01OCT01	30SEP02		0	
4AEEFY03	K-65 SILO CONSTRUCTION Management For FY03	250	01OCT02	30SEP03		0	
4AEEFY04	K-65 SILO CONSTRUCTION Management For FY04	251	01OCT03	30SEP04		0	
4AEEFY05	K-65 SILO CONSTRUCTION Management For FY05	250	01OCT04	30SEP05		0	
4AEEFY06	K-65 SILO CONSTRUCTION Management For FY06	249	03OCT05	29SEP06		0	
4AEEFY07	K-65 SILO CONSTRUCTION Management For FY07	249	02OCT06	28SEP07		0	
4AEEFY08	K-65 SILO CONSTRUCTION Management For FY08	251	01OCT07	30SEP08		0	
4AEEFY09	K-65 SILO CONSTRUCTION Management For FY09	38	01OCT08	24NOV08		0	
4ADNH100	HOUDINI DEVELOPMENT AND DELIVERY	176	02OCT95A	08AUG97		647	
4ADN100	Justicat and SOW	50	17JUN98A	07FEB97		2,940	
4ADN102	HOUDINI ACCEPTANCE TEST	23	18AUG98A	31DEC98		800	
4ADN140	Specify Design Mods for Houdini 2	59	26AUG98A	21FEB97		2,940	
4ADN040	PRE-OP REVIEW - SSR	10	25JUL97*	07AUG97		647	
4ADN049	RECEIVE HOUDINI AT FEMP	1	08AUG97	08AUG97		647	
4ADN051	INSTALL HOUDINI	10	04SEP97	17SEP97		630	
4ADN060	S.O.T. (HOUDINI)	5	18SEP97	24SEP97		630	
4ADN054	HOUDINI DEMONSTRATION	30	25SEP97	05NOV97		630	
4ADN057	PROJECT CLOSEOUT	50	06NOV97	22JAN98		630	

1.1.1.4. SUPPORT PROJECTS

CONSTRUCTION

4ADNH100 HOUDINI DEVELOPMENT AND DELIVERY

4ADN100 Justicat and SOW

4ADN102 HOUDINI ACCEPTANCE TEST

4ADN140 Specify Design Mods for Houdini 2

4ADN040 PRE-OP REVIEW - SSR

4ADN049 RECEIVE HOUDINI AT FEMP

4ADN051 INSTALL HOUDINI

4ADN060 S.O.T. (HOUDINI)

4ADN054 HOUDINI DEMONSTRATION

4ADN057 PROJECT CLOSEOUT

DRAFT

Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Cost
4ADPX009	TEST PLAN - RTU	6	27FEB86A	28APR87	2,894
4ADPX002	PREPARE SPEC - RTU	9	08APR87	21APR87	2,894
WASTE CONTAINER DEVELOPMENT					
4ADPX050	RUST GEOTECH - RADONIZED/LITE	80	16OCT86A	07APR87	494
SILO 4 DEMONSTRATION					
4ADS0050	PREPARE SILO 4 DEMO WORK PLAN	35	02JAN86A	17JAN87	201
4ADS0055	SILO 4 DEMONSTRATION	183	02JAN86A	03SEP87	201
4ADS0059	SILO 4 DEMO BOT PLAN/PROCEDURE	20	20JAN87	14FEB87	201
4ADS0015	PREPARE DESIGN FOR DEMONSTRATION	30	18FEB87	31MAR87	201
4ADS0018	DESIGN REVIEW	10	01APR87	15APR87	201
4ADS0053	Davis Bacon Determinations	20	01APR87	20APR87	209
4ADS0009	Procurement Activity	50	01APR87	11JAN87	203
4ADS0021	INCORPORATE COMMENTS	10	16APR87	29APR87	201
4ADS0027	PREPARE H&S PLAN (CONST)	20	16APR87	13MAY87	212
4ADS0024	ISSUE SILO 4 DEMONSTRATION CFC DESIGN	1	30APR87	30APR87	201
4ADS0030	PREPARE BID PACKAGE - Dome Cut	10	01MAY87	14MAY87	201
4ADS0033	Pre-Op Rev. SSR	10	14MAY87	28MAY87	212
4ADS0034	BID PERIOD	20	15MAY87	12JUN87	201
4ADS0036	AWARD SILO 4 DEMONSTRATION CONSTRUCTION	1	13JUN87	13JUN87	201
4ADS0039	MOBILIZE/ CONSTRUCTION TRAINING	10	18JUN87	01JUL87	160
4ADS0042	CONSTRUCTION (INCLUDES DOME CUTTING)	20	02JUL87	08AUG87	160
4ADS0045	AIRFLOW CONTROL - HYDRAULIC MOCK-UP TESTING	15	07AUG87	03SEP87	160
OU/CRU MANAGEMENT					
4AFC0001	OU / CRU MANAGEMENT	2,999	02OCT85A	24NOV08	0
4AFC0100	SITE HOTEL COSTS - FY06	249	03OCT05*	28SEP06	0
4AFC0110	SITE HOTEL COSTS - FY07	249	02OCT06*	28SEP07	0
4AFC0120	SITE HOTEL COSTS - FY08	251	01OCT07*	30SEP08	0
4AFC0130	SITE HOTEL COSTS - FY09	38	01OCT08*	24NOV08	0



Sheet 12 of 13

SILOS PROJECT
ALTERNATIVE STUDY 3
DETAIL SCHEDULE

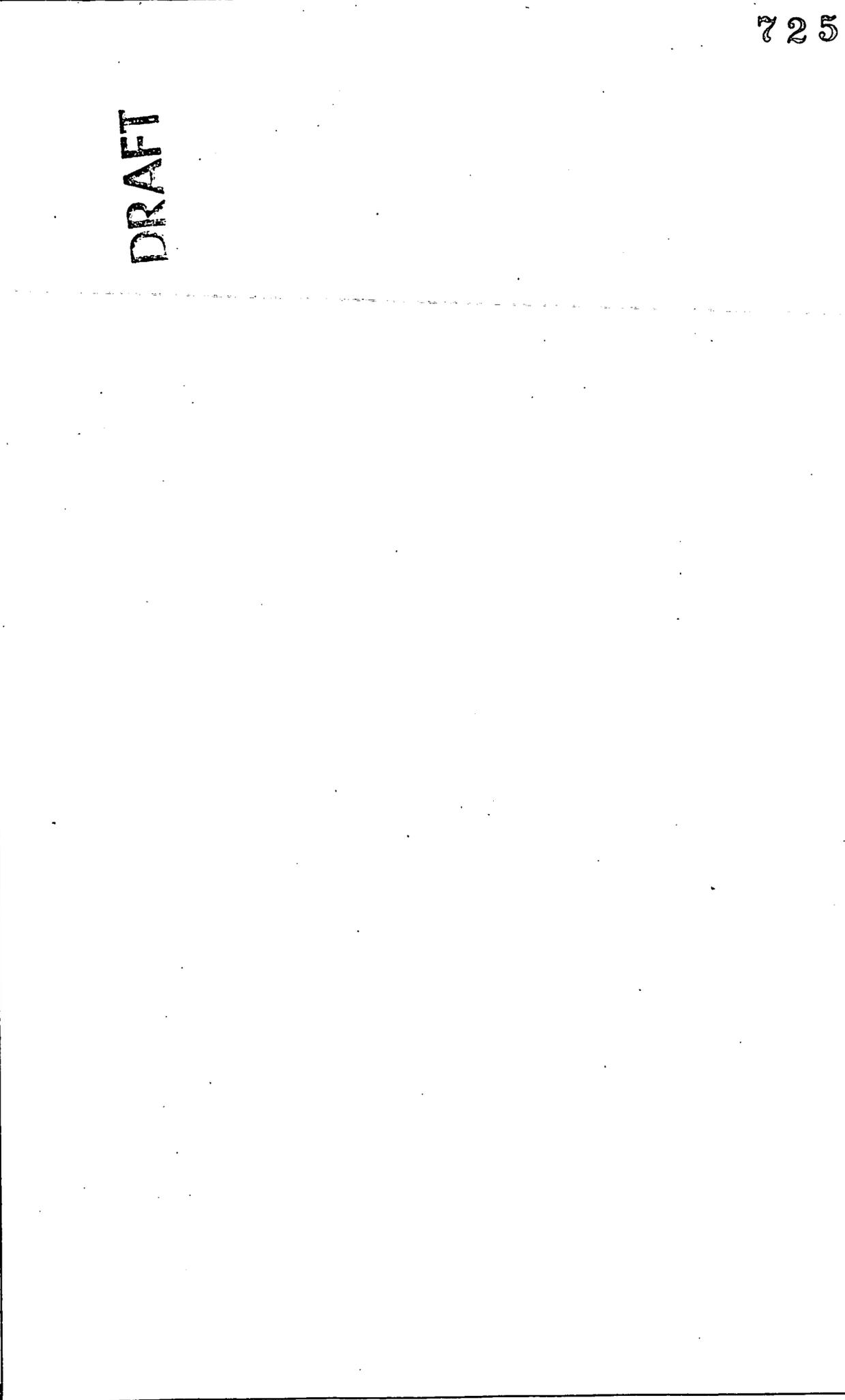
ALT3A05

Project Start: 01OCT85
 Project Finish: 24NOV08
 Data Date: 28NOV08
 Print Date: 21JAN87

Legend:
 ■ Early Start
 ■ Progress Bar
 ■ Critical Activity

DRAFT

Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	Total Cost
4AFC0002	ENVIRONMENTAL MONITORING & COMPLIANCE	1,999	02OCT85A	23NOV04	1,000



SILOS PROJECT
ALTERNATIVE STUDY 3
DETAIL SCHEDULE

Sheet 13 of 13

Project Start: 01OCT85
Project Finish: 24NOV08
Date Date: 25NOV08
Plat Date: 21JAN87

Legend:
 Early Bar
 Progress Bar
 Critical Activity

AL73461

DRAFT

ALTERNATIVE 2 (Cost are de-escalated)

Component	\$ Million	Range	Probability of Being Within Range	Notes
VITPP -Phase 1	12	11-14	80%	
VITPP - Phase 2	65	19-29	80%	
	19 Cap	35-53	80%	
	35 Ops			
Silo 3 Stabilization	25	22-29	80%	
Waste Retrieval	16	13-20	80%	
Engineering (Title I & II)	47	42-55	80%	Pre ACD has been added.
Construction	115	97-146	80%	
Operation Prep	12	10-15	80%	Assumes that all development of operations is in VITPP Phase 2.
labor	35	29-44		
material	13	11-17		
Packaging, Shipping, Disposal	80	72-94	80%	Surcharge is not included.
D&D	63	53-80	80%	Based on assumed volume.
Project Management	48	46-51	80%	
TOTAL:	531	460-647	80%	

DRAFT

ALTERNATIVE 3
(Cost are de-escalated)

Component	\$ Million	Range	Probability of Being Within Range	Notes
VITPP	9	8-10	80%	
Silo 3 Stabilization	25	22-29	80%	
Waste Retrieval	12	10-15	80%	
Engineering	20	18-23	80%	Pre ACD has been added.
Construction	68	57-86	80%	
Operation Prep	6	5-8	80%	Assumes that all development of operations is in VITPP Phase 2.
labor	13	11-17		
material	10	9-13		
Packaging, Shipping, Disposal	135	80-227	80%	Surcharge is not included.
D&D	36	30-45	80%	Based on assumed volume.
Project Management	46	43-50	80%	
TOTAL:	383	293 -523	80%	

Activity ID	Activity description	Orig Dur	Early Start	Early Finish	Year					
					1997	1998	1999	2000	2001	2002
AC2100	MATERIAL ANALYSIS	85	03MAR97*	01JUL97	MATERIAL ANALYSIS					
AC2110	ASSESS PRETREATMENT	85	03MAR97*	01JUL97	ASSESS PRETREATMENT					
AC2105	ASSESS SURROGATE PERFORMANCE	45	02JUL97	04SEP97	ASSESS SURROGATE PERFORMANCE					
AC2120	EVALUATE MELTER TYPE	45	02JUL97	04SEP97	EVALUATE MELTER TYPE					
AC2130	PERFORM MINI-MELTER TEST	160	14JUL97	04MAR98	PERFORM MINI-MELTER TEST					
AC2140	EVALUATE OPERATING ENVELOPE	65	05MAR98	05JUN98	EVALUATE OPERATING ENVELOPE					
AC2150	PILOT SCALE TESTING WITH SURROGATE	65	05MAR98	05JUN98	PILOT SCALE TESTING WITH SURROGATE					
AC2160	FULL SCALE TESTING DEVELOP SPEC	129	05MAR98	04SEP98	FULL SCALE TESTING DEVELOP SPEC					
AC2170	PROCURE FULL SCALE MELTER	186	08SEP98	07JUN99	PROCURE FULL SCALE MELTER					
AC2210	VITPP UPGRADE DESIGN	250	08SEP98	07SEP99	VITPP UPGRADE DESIGN					
AC2180	DESIGN / FAB MELTER	250	08JUN99	06JUN00	DESIGN / FAB MELTER					
AC2220	VITPP UPGRADE CONSTRUCTION	250	08SEP99	06SEP00	VITPP UPGRADE CONSTRUCTION					
AC2190	INSTALL MELTER	125	07JUN00	05DEC00	INSTALL MELTER					
AC2200	START-UP	250	06DEC00	05DEC01	START-UP					

DRAFT

SILO 1 & 2 MELTER DEVELOPMENT

Project Start	01OCT95	Early Bar	ALTS
Project Finish	05DEC01	Progress Bar	
As Date	26JAN97	Critical Activity	
4 Date	31JAN97		

SILO PROJECT
PATH FORWARD

Sheet 1 of 1



86

**INDEPENDENT REVIEW TEAM
RECOMMENDATION FOR EXCLUDING
VITRIFICATION OF SILOS 1,2 &3 TOGETHER**

The Silos Project Independent Review Team recommends that Alternative 1 (Vitrification of Silos 1,2, &3 together) should be eliminated from further consideration. Further, the Vitrification of Silo 3 material by itself should also be eliminated from further consideration.

The basis of the recommendation is as follows:

Technical Complexity

The design of the melter of a combination of Silos 1, 2, &3 material must accommodate two specific glass chemistry requirements. These are:

The high sulfate concentration which requires a high temperature melter

and

The high lead content which requires an oxidizing environment to avoid the production of a metallic lead phase.

The combination of high temperature, oxidizing conditions and danger of metallic lead formation result in the need for a complicated and unique melter/electrode design configuration. This three chamber, molybdenum electrode design was used in the Vitrification Pilot Plant and has proved difficult to control.

A more practical approach is to focus on a less complex glass chemistry to allow usage of commercially available proven techniques and materials of construction for the melter design. This approach can be accomplished by eliminating the high sulfate Silo 3 waste from the vitrification program and insuring an oxidizing environment. In summary, the three-chamber design should be abandoned.

On the other hand the FEMP has demonstrated, as part of the mixed waste stabilization program, that the implementation of the stabilization/solidification technology (i.e. cementation) would be an effective treatment of the Silo 3 residues through the successful treatment of similar, thorium bearing residues.

The technical simplicity of the stabilization/solidification process would allow the treatment of the Silo 3 residues by a more predictable process and therefore, with a more predictable schedule and cost.

Health and Safety

The stabilized waste form (cementation) for Silo 3 material meets all applicable, relevant and appropriate requirements and is protective of human health and the environment.

**INFORMATION NEEDED
REGARDING ALTERNATIVE II
AND ALTERNATIVE III TO REACH DECISION**

1. **Analysis of Alternative II that is more efficient with respect to pilot plant (Develop an optimized approach to Alternative II [Base Case] with respect to technology development/utilization of Pilot Plant)**
2. **Literature search on waste loading relative to sensitivity analysis (Address request for a) literature search for experience with cementation of materials similar to Silo wastes [yardstick for validation of waste loading assumptions], and b) perform sensitivity analysis addressing variation in waste loading**
3. **Address requirement for operations, transportation, and disposal with respect to radon (Health & Safety issue)**
4. **Have stabilization specialist(s) available for next meeting**
5. **Look at Alternative II without gems (Development Program)**
6. **Analysis of Silo 3 and Pit 5/Waste Mix Option**
7. **Alternative stabilization approaches beside Portland cement [Literature search/Stabilization specialist(s)]**
 - **Survey of what's been used and impact on radon emissions**
 - **Clarify criteria used for identifying**
8. **Evaluation of how alternatives perform with respect to major constituents**

Overview of Objectives

Independent Technical Review Team

- The Independent Technical Review Team (IRT) will be providing advice/recommendations to Fluor-Daniel Fernald (FDF) and the Department of Energy (DOE) as aid in an internal decision making process. FDF and DOE will evaluate this input internally in determining what, if any, modifications to our current path forward (i.e. vitrification of Silos waste) should be formally proposed to the regulators and other stakeholders. Stakeholders are being asked for input during the internal decision making process in firm recognition of the vital importance of their acceptance if any path forward modifications are proposed formally.

- The IRT will aid in decision making by:
 - Reviewing current FDF and DOE recommendations to cement solidify Silo 3 and reach consensus to agree with or suggest modifications to this direction.

 - Assist with optimization of vitrification by:
 - * Reviewing, commenting and providing advice on the upgrade plans for the Pilot Plant and evaluating the results from the existing Pilot Plant.
 - * Providing reviews, comment, and providing advice on current technical approach to vitrification using lessons learned.

Overview of Objectives

Independent Technical Review Team

- In light of significant uncertainties in vitrification process reliability observed to date and associated impacts on project schedule and like issues, FDF and DOE would like advice/recommendations on whether to formally re-evaluate the selected OU4 remedy. FDF and DOE would like the IRT to evaluate issues associated with vitrification implementation and identify and evaluate any potentially viable options to vitrification. In light of these evaluations, FDF and DOE would like input on the appropriateness of re-evaluating, through a formal public process, the current OU4 path forward. It is not expected that the IRT will advance a sole recommendation for a single alternative, but rather to return evaluation and advice based on their experiences for each alternative as an aid to our path forward evaluation.

The alternatives to be considered at a minimum include:

Alternative 1. Vitrify all three silos

Alternative 2. Vitrify Silos 1 and 2 and cement solidify Silo 3

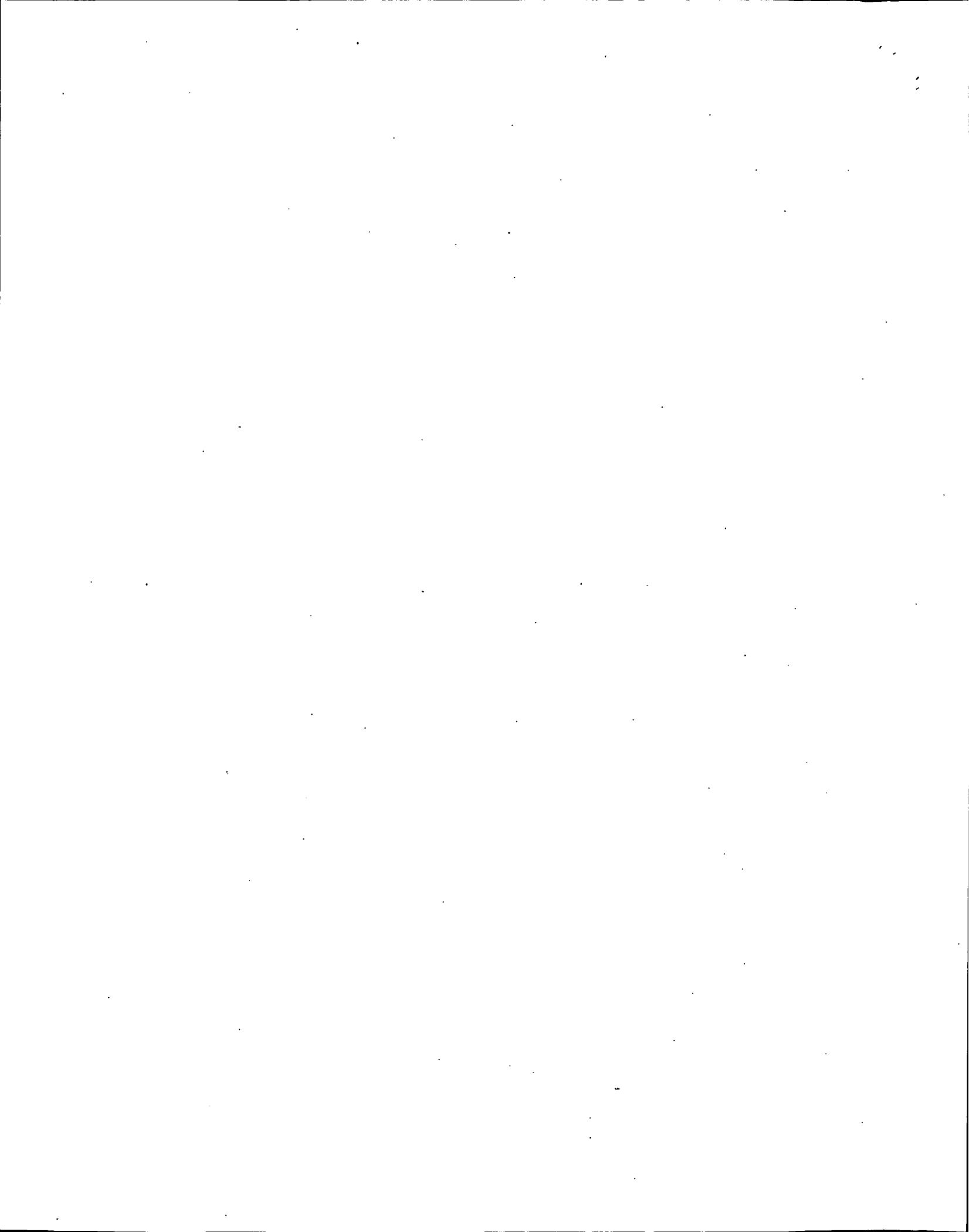
Alternative 3. Use stabilization in the form of some viable option(s) for all three silos.

Silos Project/VITPP Update

SILOS PROJECT/VITPP UPDATE

DON PAINE

JANUARY 21, 1997



Silos Project/VITPP Update

- VITPP Event Scenario
- Incident Evaluation Teams
- Silo 3 Stabilization/Solidification Project

Silos Project/VITPP Update

Vitrification Pilot Plant Melter Bottom Drain Incident

- At 10:22 p.m. on December 26, 1996 molten glass discharged through the #3 bubbler tube assembly to the bottom drain container.
- The event concluded at approximately 10:38 p.m. when the total glass volume of the melter drained to the bottom drain container.
- During the event, the glass stream enlarged and separated into two streams resulting in some glass migrating outside the bottom drain container onto the floor causing minor damage to the concrete floor and a small fire from the floor epoxy paint.
- The Vitrification Pilot Plant operation staff followed defined safety precautions and no one was injured.

sh

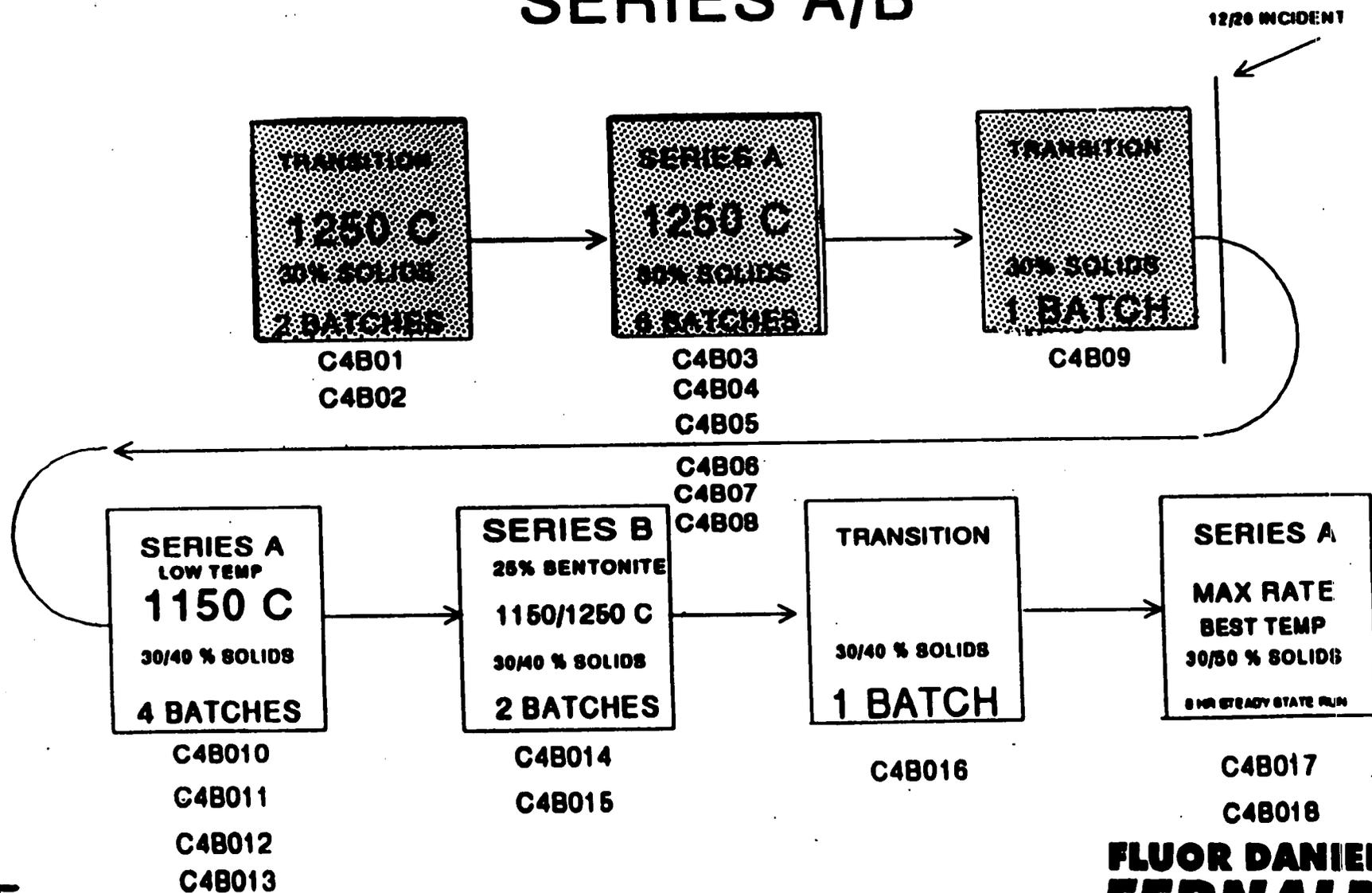
Silos Project/VITPP Update

GLASS PRODUCTION

- Campaign 1
21,000 pounds - 11 batches
- Campaign 2
24,000 pounds - 11 batches
- Campaign 4
22,600 pounds - 9 batches
- Campaign 4 (Planned)
45,200 pounds - 18 batches

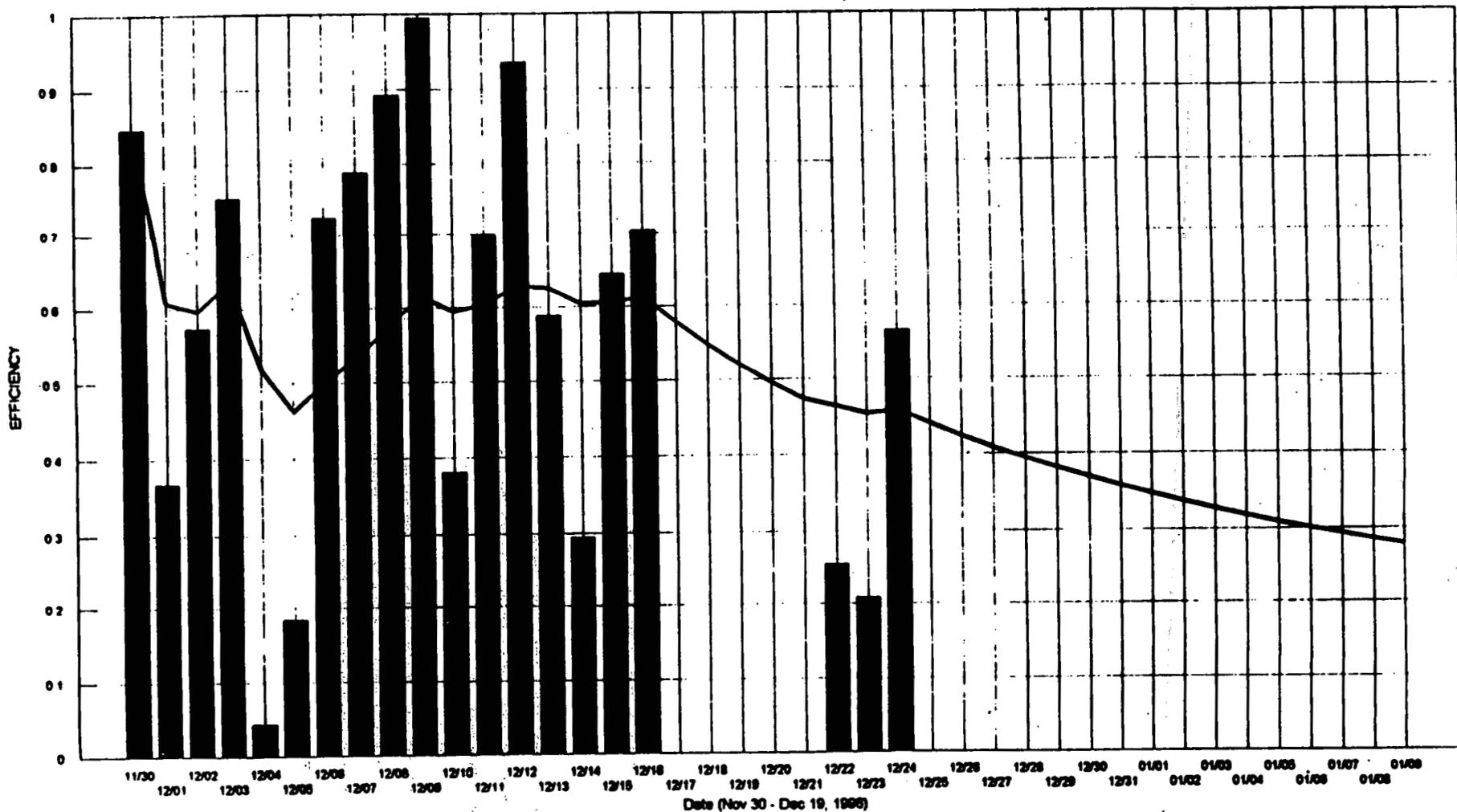
Silos Project

CAMPAIGN 4 SERIES A/B



Silos Project

Campaign 4 Uptime
(Percent of Time Feed Pump is Operating)



Silos Project/VITPP Update

INCIDENT EVALUATION TEAMS

- Initiated Team Evaluations January 6, 1997
- Safety Review
- Data Analysis and Path Forward
- Incident Analysis Team

Silos Project/VITPP Update

Safety Review Team

Charter:

1. Evaluate appropriateness of the responses to the incidents in terms of safety and procedures.
2. Determine adequacy of Engineering controls with regard to promoting safety during the event.

Deliverables:

1. Final report including Lessons Learned and recommendations for further safeguards.

Silos Project/VITPP Update

Data Analysis and Path Forward Team

Charter:

1. Evaluate data and determine deficiencies for final remediation detail design and operation.
2. Determine need for low temperature melter and alternatives to VITPP restart.
3. Determine melter "post incident" data needs.
4. Determine "Path Forward" for VITPP Phase I testing.

Deliverables:

1. Develop database of outstanding data requirements and operations experience that would have been gained from the balance of Campaign 4 to support full scale detailed design.
2. Provide recommendations for acquiring outstanding Phase I data and operating experience.
3. Provide options for the path forward for the VITPP Phase I Test Program.
4. Cost/Benefit analysis for path forward options.

Silos Project/VITPP Update

Incident Analysis Team

Charter:

1. Evaluate the root cause for the melter incident, and develop Lessons Learned from melter operation.

Deliverables:

1. Prepare Melter Inspection Plan.
2. Perform Failure Modes Analysis for root cause determination.
3. Develop Lessons Learned.
4. Prepare Final Report.

Silos Project/VITPP Update

Silo 3 Stabilization/Solidification Project

- The CBD announcement issued December 10, 1996.
- Vendors expressions of interest received January 10, 1997.
- Qualified bidder list developed by January 31, 1997.
- Draft SOW/RFP issued for internal review January 31, 1997.

Silos Project/VITPP Update

LIST OF RESPONDENTS TO CBD ANNOUNCEMENT FOR SILO 3 STABILIZATION

ALLIED TECHNOLOGY GROUP, INC - FREMONT, CA

CHEM-NUCLEAR SYSTEM - COLUMBIA, SC

ENSR - IRVINE, CA

ENVIROCARE OF UTAH, INC.

FLUID TECH, INC. - LAS VEGAS, NV

FOSTER WHEELER - RICHLAND, WA

IT CORPORATION - KNOXVILLE, TN

M4 ENVIRONMENTAL - OAK RIDGE, TN

MOLTEN METAL TECHNOLOGY, INC. - OAK RIDGE, TN

OHM CORPORATION - FINDLAY, OH

PERMA-FIX ENVIRONMENTAL SERVICES, INC. - ALBUQUERQUE, NM

R. M. WEBSTER AND ASSOCIATES, INC. - ST. PETERS, MO

ROCKY MOUNTAIN REMEDIATION SERVICES - GOLDEN, CO

SCIENTIFIC ECOLOGY GROUP - KINGSTON, TN

SEVENSON ENVIRONMENTAL SERVICES - NIAGARA FALLS, NY

SPAR ENVIRONMENTAL SYSTEMS - BRAMPTON; ONTARIO, CANADA

WEST CENTRAL ENVIRONMENTAL CONSULTANTS - MORRIS, MN

Silos Project/VITPP Update

Silo 3 Treatability

- Silo 3 compound analysis - February 28, 1997.
- Silo 3 test analysis - February 28, 1997.

**Melter Incident
Incident Analysis Review Team**

INCIDENT ANALYSIS REVIEW TEAM

RAY REINHART

JANUARY 21, 1997

**FLUOR DANIEL
FERNALD** 

56

525

Melter Incident Incident Analysis Review Team

Charter

To evaluate the root cause for the melter to empty its contents, and develop Lessons Learned from melter operation and disassembly.

Deliverables

1. Prepare Melter Inspection Plan.
2. Perform Failure Modes Analysis for root cause determination.
3. Develop Lessons Learned.
4. Prepare Final Report.

Melter Incident Incident Analysis Review Team

Team Members:

Ray Reinhart, Team Leader
Gail Bingham
Brad Bowan
Joel Bradburne
Hamid Hojaji
Vijay Jain
Ron Joseph
Xing Mao
Jill Olige
Don Paine
Kareld Solomon
Ron Worsley

FDF Security
Consultant
GTS Duratek
FDF Silos Project
GTS Duratek
West Valley Nuclear Services
FDF Emergency Preparedness
GTS Duratek
FDF Silos Project
FDF Silos Project
FDF Silos Project
FDF Engineering

DOE Oversight:

Joe Desormeau
Joe Neyer

DOE-FEMP
DOE-FEMP

**FLUOR DANIEL
FERNALD** 

225

58

Melter Incident

Incident Analysis Review Team

DELIVERABLE #1 (Melter Inspection)

- Completed and transmitted to Project on January 14, 1997
 - During the process, the Project was given permission by the team to:
 - * Remove bottom drain container
 - * Remove cage around bottom of melter
 - * Clean-up material on floor
 - * Remove lid from melter
- Established listing of samples needed for analysis to aid in root cause determination (Complete)
- Project is preparing OWI's and Sampling Plans to conduct the inspection (In Progress)
- Project needs to obtain and supply requested information and data from samples (In Progress)

Melter Incident Incident Analysis Review Team

INCIDENT ANALYSIS SAMPLING AND ANALYTICAL MINIMUM REQUIREMENTS

SAMPLE	ANALYSIS	PROPOSED LAB	QUANTITY	PURPOSE	PRIORITY
Glass attached to bottom exterior at Bubbler #3	SEM/EDX Bulk Chemical Analysis	Vitreous State Lab Fluor Daniel Fernald	Total Available	Evaluate element presence and dispersion	HIGH
Material located on Bottom Drains 1, 2 & 3	SEM/EDX Bulk Chemical Analysis	University of Cincinnati Fluor Daniel Fernald	Total Available	Evaluate element presence and dispersion	HIGH
MoSi ₂ Level Indicators	SEM/EDX Interface	University of Cincinnati	Total Available	Evaluate erosion, corrosion, chemical attack	HIGH
Glass from Bottom Drain Container	SEM/EDX Bulk Chemical Analysis Container X-Ray	University of Cincinnati Fluor Daniel Fernald Fluor Daniel Fernald	4 Core Borings	Evaluate erosion, corrosion, chemical attack	HIGH
Air lift tube	Visual Inspection	Fluor Daniel Fernald	None	Verify erosion	MEDIUM
Migration materials located on the interstitial layer of the melt roof assembly	SEM/EDX Interface	University of Cincinnati		Evaluate Material Defect Evaluation	LOW
Feed Tube	SEM/EDX	University of Cincinnati	Small section of weld failure	Defect Identification	LOW
Scrape Top 3 West Electrodes; Scrape Top 2 East Electrodes	SEM/EDX Bulk	University of Cincinnati	5 grams each electrode	Evaluate element presence and dispersion	MEDIUM
Surface Drain	Visual SEM/EDX if visual is not sufficient	Fluor Daniel Fernald University of Cincinnati	Total unit small section	Defect Identification	LOW
Melter Center Chamber Floor	XRF, Ultra Sound Conductivity	Fluor Daniel Fernald	None	Verify metal present in refractory and electrical current path	HIGH
Melter penetrations	Borescope	Fluor Daniel Fernald	None	Visual Inspection of existing condition	HIGH
Bubbler Assemblies	SEM/EDX Interface SEM/EDX Bulk	University of Cincinnati University of Cincinnati	Total Assembly	Defect Identification Material Identification	HIGH
Bottom Drains 1, 2, Spare & 3	SEM/EDX Interface SEM/EDX Bulk	University of Cincinnati University of Cincinnati	Total Assembly	Defect Identification Material Identification	HIGH
Molten Metallic Substance located on the exterior of Melter around bubblers and bottom drains			Total Available		HIGH

**FLUOR DANIEL
FERNALD** 

Melter Incident Incident Analysis Review Team

TABLE 2 GLASS ANALYSIS

ADDITIONAL INFORMATION NEEDED BY MELTER INCIDENT ANALYSIS TEAM WHICH MAY AID IN THE DETERMINATION OF THE ROOT CAUSE. THIS ANALYSIS WILL BE PERFORMED ON SAMPLES THAT WERE PREVIOUSLY COLLECTED DURING PHASE I TESTING.

Type of Sample	Campaign 1	Campaign 2				Campaign 4	
	Run 1	Run 1	T	Run 2	Post Campaign 2 Requested Slurry	Run 1	T
Redox	N/A	B,E	B	M,E	E	B,M,E	E
SEM/EDX	E	E		E	E	E	E
Chem. Anal	E	E		E	E	E	E
Samples from sides chambers when possible							

Explanation of abbreviations:

- B = Beginning of run
- M = Middle of run
- E = End of run
- N/A = Not Applicable

Melter Incident

Incident Analysis Review Team

DELIVERABLE #2 (Perform Failure Modes Analysis for Root Cause Determination)

- Preliminary Cause Chart Established (Complete)
- Project supplied a chronological listing of events (Complete)
- Perform a review of event listing for additional conditions or causal factors for inclusion (In Progress)
- Perform and determine Root Cause Analysis (Data and Information needed from requested samples)
- Develop findings and recommendations (Pending analysis above)

Melter Incident Incident Analysis Review Team

INSERT CAUSAL EFFECT CHART

Melter Incident Incident Analysis Review Team

DELIVERABLE #3 (Develop Lessons Learned)

- Preliminary list has been established
- Additional Lessons Learned should be generated by going through root cause

Melter Incident Incident Analysis Review Team

DELIVERABLE #4 (Prepare Final Report)

- **Table of Contents**
 - I. **Executive Summary**
 - A. **Event Scenario**
 - B. **Root Cause**
 - II. **Team Scope**
 - III. **Team**
 - IV. **Background Information**
 - V. **Statement of Facts**
 - A. **Chronological listing of events**
 - B. **Conditions**
 - VI. **Root Cause Analysis**
 - A. **Barrier Analysis**
 - B. **Change Analysis**
 - C. **Critical Human Actions Profile (CHAP)**
 - VII. **Findings & Recommendations**
 - VIII. **Lessons Learned**
 - IX. **Signatures**
 - X. **Attachments**

Melter Incident

Incident Analysis Review Team

DIRECTION OF INVESTIGATION

CONTRIBUTING FACTORS TO THE FAILURE OF BUBBLER #3

- Redox Conditions (Foaming)
 - Cracks/Fractures in E-Block (Allowing increased communication of glass pool)
 - Erosion/Corrosion of Materials (Bubbler tubes and refractory)
 - Electrical Path (Molten glass conductivity and the fall out of lead and/or metals established an electrical circuit)
- ** Samples requested should provide information needed to make final determination.

**Melter Incident
Data Analysis Team**

DATA ANALYSIS REVIEW TEAM

NINA AKGÜNDÜZ

JANUARY 21, 1997

**FLUOR DANIEL
FERNALD** 

Melter Incident Data Analysis Team

Charter

1. Evaluate data and determine deficiency for detailed design and operations.
2. Determine data needed from melter inspection.
3. Determine options for acquiring outstanding data.

Melter Incident Data Analysis Team

Deliverables

1. Develop database of outstanding data requirements and operations experience that would have been gained from the balance of Campaign 4 to support full-scale detailed design.
2. Provide recommendations for acquiring outstanding Phase I data and operating experience.
3. Provide options for the path forward for the VITPP Phase I Test Program.
4. A comparison of cost, schedule and risk analysis for path forward options.

Melter Incident Data Analysis Team

Facility Requirements	Options
A. Laboratory Scale - Crucible	<ol style="list-style-type: none">1. FDF - laboratory2. Catholic University3. Clemson University4. PNL5. SRS
B. Mini-melter ~ 10 kg - 100 kg/day	<ol style="list-style-type: none">1. Clemson University 200 lbs/day2. Catholic University 10-100 kg/day3. West Valley pilot melter4. PNL5. Commercial facilities

**Melter Incident
Safety Review Team**

SAFETY REVIEW TEAM

LOUIS C. BOGAR

JANUARY 21, 1997.

**FLUOR DANIEL
FERNALD** 

Melter Incident Safety Review Team

Charter

Determine the adequacy of implementing controls for normal operations and emergency response within the safety basis. Evaluate the appropriateness of the incident response in terms of procedures and processes used.

Deliverables

Final Report will include:

- Evaluate appropriateness of incident response
- Recommendations regarding safety controls
- Evaluate safety and health impacts on and off site
- Lessons learned

Melter Incident Safety Review Team

Team Members:

Lou Bogar
Ray Crawford
Doug Daniels
Don Norquist
Bill Previty
Bob Tabor

DOE Oversight:

Pete Darnell

Melter Incident Safety Review Team

OU4 INTEGRATED HAZARD ANALYSIS EVALUATION

Hazard: Leak or spill of molten glass or heavy metals from furnace

Consequence: Fire; potential worker death/serious injury

Consequence Class: Moderate

Frequency Class: Unlikely

Cause: Material defect; installation error

Mitigators: Bottom Container, Acceptance Testing

Ref: Final Hazard Analysis, September 1995

**FLUOR DANIEL
FERNALD** 

Melter Incident Safety Review Team

REVIEWS COMPLETED

- Safety documents
- Vitrification Plant procedures
- Phase I Test Plan
- Incident Response

Decision Analysis Process Update

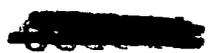
January 21, 1996



Applied Decision Analysis, Inc.
2710 Sand Hill Road
Menlo Park, CA 94025-7065

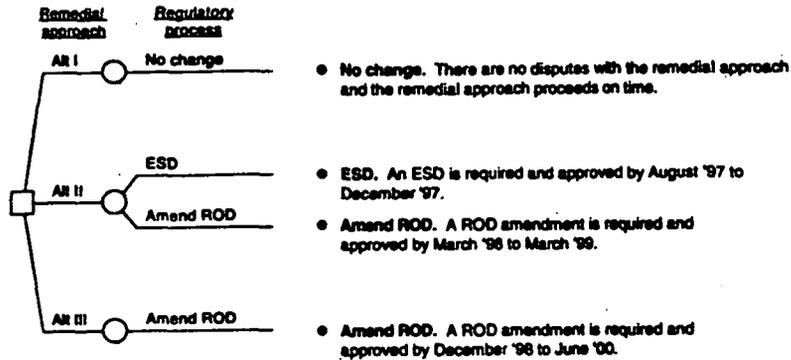
Goal: Provide framework for facilitating the comparative evaluation of alternatives

1. Promote deliberate, systematic consideration of factors relevant to reaching a decision
 - clarify logical elements for decision making
 - » what we want (objectives and tradeoff weights)
 - » what we can do (options and how they differ)
 - » what we know and believe (about the likelihood and extent to which each alternative would achieve each objective)
 - focus attention on what matters most
2. Provide a quantitative model
 - to serve as an aid to decision making
 - to provide what if/sensitivity analysis



Regulatory process

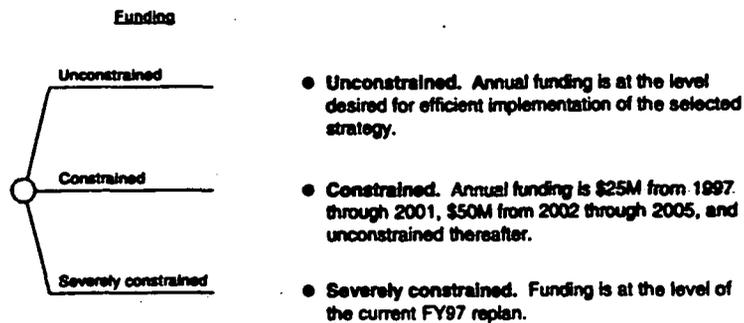
Accounts for uncertainty over the outcome of the regulatory process.



EOB
 Applied Systems Analysis, Inc.
 2140 WASHINGTON BLVD, SUITE 100
 WASHINGTON, DC 20037-4141

Funding scenarios

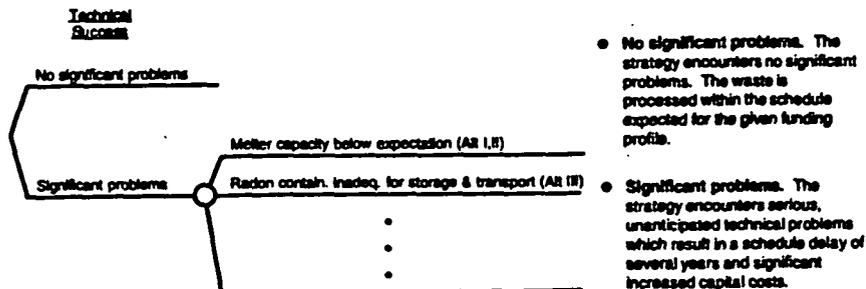
Accounts for uncertainty over available funding level.



EOB
 Applied Systems Analysis, Inc.
 2140 WASHINGTON BLVD, SUITE 100
 WASHINGTON, DC 20037-4141

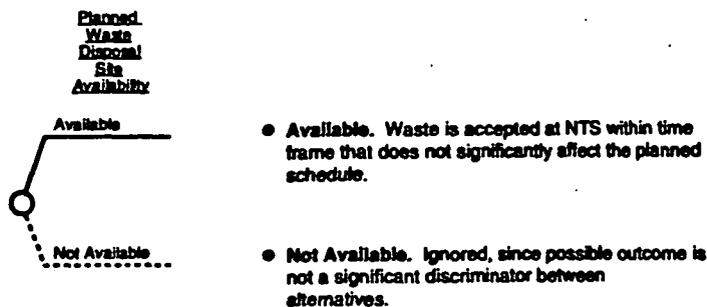
Technical Success

Accounts for unanticipated technical problems that may cause significant delays or major cost increases. ("Significant" means beyond the range of uncertainty that would be reflected in a Monte Carlo analysis of cost and schedule.)



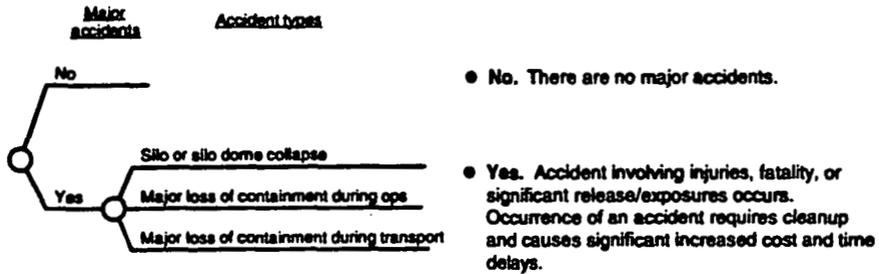
Planned waste disposal site availability

Accounts for the uncertainty over timing and availability of necessary offsite disposal.



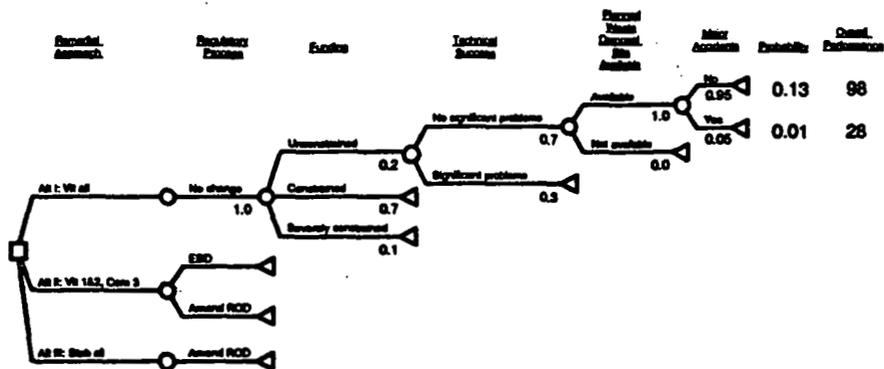
Major accidents

Accounts for the possibility of a major accident that results in a public or worker injury, fatality, or exposure.



Applied Systems Analysis, Inc.
8147 PINEBROOK DRIVE, FORT LAUDERDALE, FL 33404

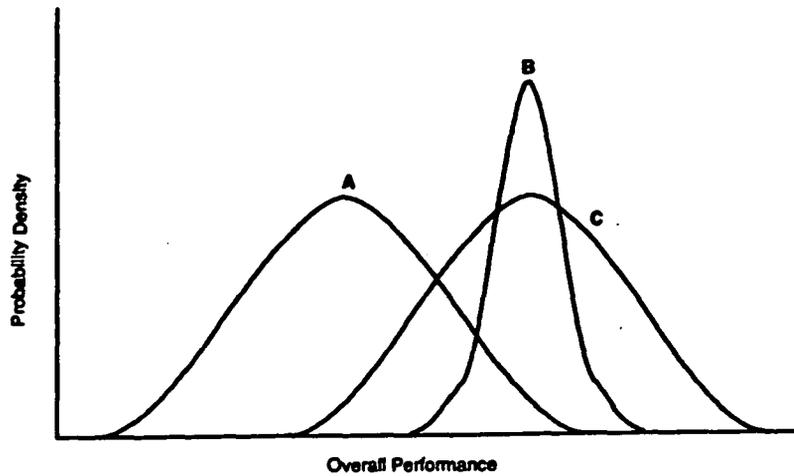
Each path in the decision tree receives a probability and performance score



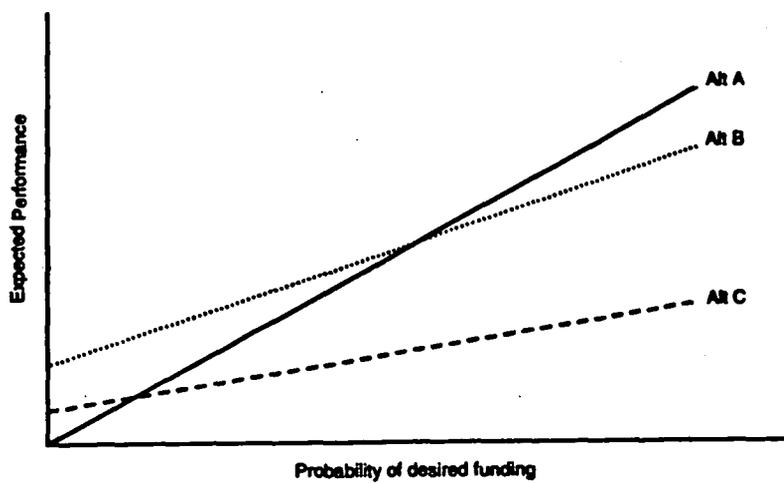
Overall performance = weight₁ x public risk +
weight₂ x worker risk +
weight₃ x cost +
weight₄ x months to completion

Applied Systems Analysis, Inc.
8147 PINEBROOK DRIVE, FORT LAUDERDALE, FL 33404

SAMPLE OUTPUT: A "risk profile" displays the uncertainty over the performance of each alternative

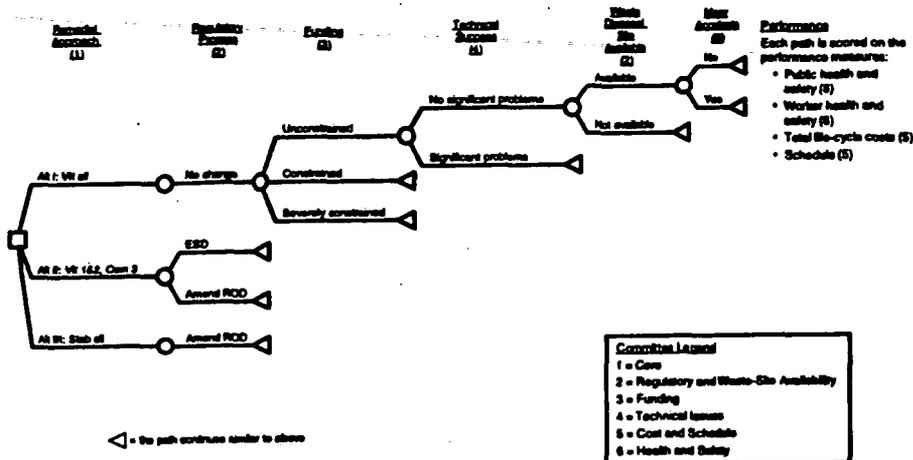


SAMPLE OUTPUT: Sensitivity analysis shows how assumptions affect performance



81

Technical committees have been established to provide required estimates



Proposed process

1. Refine decision tree
2. Estimate performance for "base-case" path
3. Estimate performance for other paths
4. Estimate probabilities for tree
5. Assign value weights
6. Evaluate and compare alternatives and conduct sensitivity analyses

Alternatives to be Evaluated

ALTERNATIVES TO BE EVALUATED

MARK DEHRING

JANUARY 21, 1997

Alternatives to be Evaluated

TECHNICAL BASIS & ASSUMPTIONS

	Alternative 1 Vitrify 1, 2 & 3	Alternative 2 Vitrify 1 & 2, Cement 3		Alternative 3 Cement 1, 2 & 3	
	Vitrification	Vitrification	Cementation	Cement	Cement
Feed Basis	Silo 1, 2, 3 mixture	Silo 1 & 2 mixture	Silo 3	Silo 1 & 2 mixture	Silo 3
Plant Capacity	18 MT/day + 2 MT/day(VITPP)	12 MT/day + 2 MT/day(VITPP)	119 MT/day	85 MT/day	119 MT/day
Melter Capacity	6 MT/day	6 MT/day	-	-	-
Melter Temperature	1350°C	1150°C	-	-	-
No. of Trains	4	3	1	1	1
Operating Basis	24 hrs/day 7 days/week	24 hrs/day 7 days/week	8 hrs/day 5 days/week	8 hrs/day 5 days/week	8 hrs/day 5 days/week
Operating Period ¹	3 years	3 years	4 months	3 years	4 months
Availability	80%	90%	100%	80%	100%

Notes: 1 Excludes treatment of OU4 soils

Alternatives to be Evaluated

TECHNICAL BASIS & ASSUMPTIONS

	Alternative 1 Vitrify 1,2 & 3	Alternative 2 Vitrify 1 & 2, Cement 3		Alternative 3 Cement 1, 2 & 3	
	Vitrification	Vitrification	Cementation	Cement	Cement
Waste Loading	60% (dry weight)	60% (dry weight)	45% (dry weight)	20% (dry weight)	45% (dry weight)
Waste Form	Gems	Gems	Monolith	Monolith	Monolith
Waste Packaging	SEG Concrete Boxes	SEG Concrete Boxes	Half Height White Metal Boxes	SEG Concrete Boxes	Half Height White Metal Boxes
Volume of Treated Waste	11,800 yd ³	8,600 yd ³	6088 yd ³	30,300 yd ³	6088 yd ³
Disposal Volume (with container)	25,400 yd ³	18,500 yd ³	8960 yd ³	73,600 yd ³	8,960 yd ³
No. of Waste Containers	5,200	3,800	2160	15,200	2,160
No. of Waste Shipments	2,600	1,900	540	7,600	540
Transportation	Truck	Truck	Truck	Truck	Truck
Disposition of Silo Residues	NTS	NTS	NTS	NTS	NTS
Disposition of D&D Materials	Onsite Cell	Onsite Cell	Onsite Cell	Onsite Cell	Onsite Cell

Alternatives to be Evaluated

Preliminary IRT Recommendations	Included in Base Cases	Not Included In Base Cases
PROJECT ORGANIZATION / PROJECT EXECUTION		
<ul style="list-style-type: none"> • To assure continuity of talent necessary to capture lessons learned from the vitrification pilot plant, dedicate additional design resources to the project. 		✓
<ul style="list-style-type: none"> • Devote resources to specialized outside consultation and design peer review, taking advantage of active vitrification projects within the DOE Complex. 	✓	
<ul style="list-style-type: none"> • Re-baseline to reflect a higher priority for retrieval design and process testing 	✓ Could be improved	
<ul style="list-style-type: none"> • Reflect a realistic scheduling assumptions for all activities (design, regulatory processes, construction, etc.). 	✓	
VITRIFICATION PILOT PLANT		
<ul style="list-style-type: none"> • Scope of pilot plant program <ul style="list-style-type: none"> - Process and product development - Equipment selection and development - Integrated demonstration of operability - Process support - troubleshooting, testing feeds, additional capacity 		

Alternatives to be Evaluated

Preliminary IRT Recommendations	Included in Base Cases	Not Included In Base Cases
<ul style="list-style-type: none"> • Modify pilot plant for modularization to facilitate testing and development 		✓
<ul style="list-style-type: none"> • Evaluate / determine materials of construction for replacement melter 		
<ul style="list-style-type: none"> • Conduct and independent review of the design of the pilot plant 	✓	
<ul style="list-style-type: none"> • Do not upgrade the VITPP for radioactive service. Use for surrogate testing only 		✓
<ul style="list-style-type: none"> • Upgrade VITPP for radioactive service and demonstrate at current capacity prior to upgrading capacity to 6 MT/day 		✓
<ul style="list-style-type: none"> • Do not upgrade VITPP for radioactive service. Conduct glass formulation testing at a smaller scale. (e.g. Catholic University VSL 10 Kg/day). Test full-scale system with surrogate feed only. 		✓
WASTE FORM		
<ul style="list-style-type: none"> • Revise baseline technology for waste form from gems to monolith. Proceed with development of monolith. Use gems a backup. 		✓

Alternatives to be Evaluated

Preliminary IRT Recommendations	Included in Base Cases	Not Included In Base Cases
WASTE RETRIEVAL SYSTEM		
<ul style="list-style-type: none"> Remove bentonite and dispose of separately 		✓
MELTER SYSTEM		
<ul style="list-style-type: none"> Avoid use of a high temperature melter (at the expense of waste loading) 	✓ Alt. 1	✓ Alt. 2
<ul style="list-style-type: none"> Utilize a different type of melter for vitrification of Silo 3 materials (in lieu of joule heated) 		✓
<ul style="list-style-type: none"> Plan on additional development of the current (one-of-a-kind) melter prior to production application 		✓
ACQUISITION STRATEGY		
<ul style="list-style-type: none"> Award multiple (reimbursable cost) contracts for the design / development of the melter. Award a fixed price contract to the best design. (Only applicable if Silo 3 material is to be vitrified). 		✓
<ul style="list-style-type: none"> WVNS approach - Initial design by melter vendor. Design development by project. Compete final design on a fixed price basis. 		✓

Alternatives to be Evaluated

Preliminary IRT Recommendations	Included in Base Cases	Not Included In Base Cases
SLURRY FEED SYSTEM		
<ul style="list-style-type: none"> • As part of VITPP and Silo 4 Demo test programs, test several candidate equipment components (pumps, valves, instruments, etc.) 	✓	
<ul style="list-style-type: none"> • Set up a separate test loop to enable testing of several candidate equipment components both with surrogate material and silo residues. 	✓	

Technical Committee

TECHNICAL COMMITTEE

HARRY ROBERTSON

JANUARY 21, 1997



16

225

Technical Committee

- **BASIS & SUMMARY OF UNDERSTANDING**

Technical success is:

- **SCOPE OF EFFORT**

Define key parameters and relevant factors

Develop risks and uncertainties

Assess the probability of technical success

Provide information needed to other committees

Technical Committee

- APPROACH

Assess significant factors impacting key parameters

Develop a probability of attaining success (professional judgment)

Estimate impact on performance measures of non-attainment

- STATUS

Developed issues and influencing factors

Conducted screening to identify significant factors

- Design issues
- Project management issues
- Remaining technical uncertainties

Further screening based on uncertainty and sensitivity

Choose major impacting issues

Estimate probability of extreme outcomes

Estimate differential cost and schedule for each extreme outcome

ISSUES & INFLUENCING FACTORS

VITRIFICATION

DESIGN	PROCUREMENT	CONSTRUCTION	STARTUP	RETRIEVAL	TREATMENT	PACKAGING STORAGE TRANSPORTATION	DISPOSAL	D & D
<ul style="list-style-type: none"> •Melter Design •Waste Form Equipment •Feed System & Off Gas Design •SIAM Analysis 	<ul style="list-style-type: none"> •Qualified Vendors Melter Waste Form Equipment 	<ul style="list-style-type: none"> •Subcontractor Performance •System Turnover (CAT) 	<ul style="list-style-type: none"> •Preparation for Readness Assessment 	<ul style="list-style-type: none"> •Variability of Site 1 & 2 Material •Boronate retrieval & transport •Radon containment •Hourly Effectiveness •Berm Management 	<ul style="list-style-type: none"> <u>Slurry Feed Preparation and Treatment</u> •Feed Variability •Plugging/Clearing •Corrosion/Erosion <u>Off Gas System</u> •Plugging/Clearing •Maintain Vacuum •Moisture Removal •Radon Removal •Corrosion <u>Melter Design Life</u> •Operating Temp •Ceramic Integrity •Sulfate Problems •Lead Problems <u>Melter Operations</u> •Cooling Systems •Bottom Drains <u>Melter Throughput</u> •Waste Loading •Availability •Control Problems <u>Analytical Capability</u> •Real time analysis/results 		<ul style="list-style-type: none"> •Meeting WAC •NITS •OSDF 	<ul style="list-style-type: none"> •Soil contamination under site

STABILIZATION (CEMENTATION)

DESIGN	PROCUREMENT	CONSTRUCTION	STARTUP	RETRIEVAL	TREATMENT	PACKAGING STORAGE TRANSPORTATION	DISPOSAL	D & D
<ul style="list-style-type: none"> •Treatability •Radon Handling In-treatment Containment •Waste Loading •Final Product Reliability 	<ul style="list-style-type: none"> •Qualified System Suppliers •Multiple suppliers of Container Vessels 	Same as Vitrification	Same as Vitrification	Same as Vitrification	<ul style="list-style-type: none"> <u>Slurry Feed Preparation and Treatment</u> <u>Radon Handling</u> •Treatment •Exposure <u>Waste Loading</u> •Chemistry Sensitive •Slurry/Water Impacts •Process Control •Feed Variability <u>Ventilation</u> •Dust •Radon •Extent of Coverage •Moisture Removal <u>Analytical Capability</u> •Real time analysis/results 	<ul style="list-style-type: none"> •Ventilation & radon treatment of interim storage •Container Integrity (Radon sealing) •Supply & handling of container vessels 	Same as Vitrification	Same as Vitrification

Technical Committee

TECHNICAL ISSUES

- DESIGN ISSUES

Issues or influencing factors that professional judgment has determined can be adequately addressed through proper and sufficient design

- i.e. Slurry Feed Preparation and Treatment
- Off-Gas System (Vitrification)
- RAM Analysis
- Melter Design
- Process Plant Ventilation

Technical Committee

TECHNICAL ISSUES

- PROJECT MANAGEMENT ISSUES

Issues that can be adequately addressed through proper and sufficient project planning.

i.e. Procurement of Melters

Subcontractor performance and system turnover

Preparation for Readiness Assessment

Berm Management

Real time analytical results

D & D

Technical Committee

TECHNICAL ISSUES

- REMAINING ISSUES

Issue	Impact	Alt I	Alt II	Alt III
Variability of Silo Material	Goes beyond current design basis process envelope.	X	X	X
Bentonite Retrieval & Transport	Inability to control impacts variability of silo material.	X	X	X
Houdini Effectiveness	Nonperformance requires alternate means of "heel" and object removal.	X	X	X
Slurry/Water Content	Water content higher than design basis impacts plant throughput and extends operating time.	X	X	X
Individual Melter Capacity	Nonattainment of design basis impacts plant throughput and extends operating time.	X	X	

Technical Committee

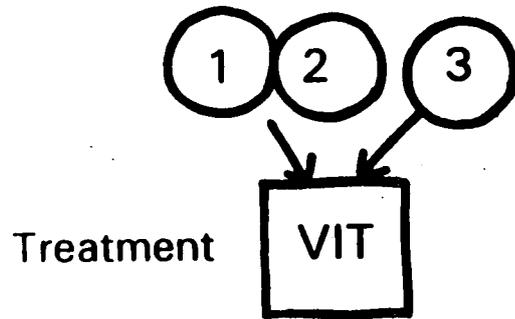
TECHNICAL ISSUES

Issue	Impact	Alt I	Alt II	Alt III
Melter Operating Life	Nonattainment of design basis requires melter replacement and extends operating time.	X	X	
Waste Loading	Nonattainment of design basis impacts plant throughput and extends operating time.	X	X	X
Plant Availability	Same as above.	X	X	X
Process Chemistry	Nonattainment of design assumption could cause nonachievement of WAC (TCLP).			X
Radon Handling Processing Interim Storage Shipping	Radon emanation from all steps through the process.			X
Contain Suitability	Radon emanation from concrete container during interim storage and shipment.			X

Technical Committee

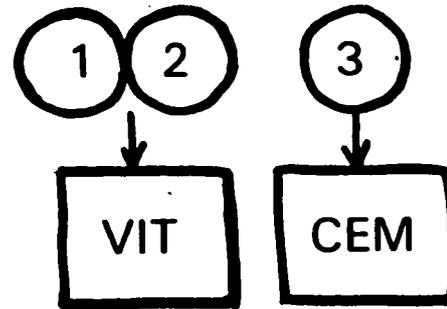
TECHNICAL BASIS FOR ALTERNATIVES

Alternative I



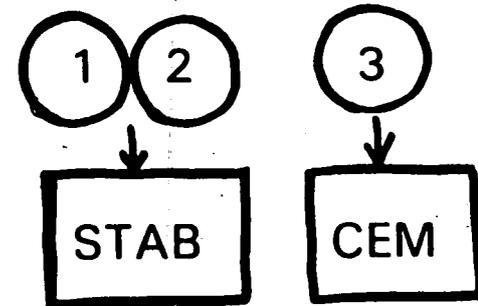
High Temp
1350°C

Alternative II



Low Temp
1150°C

Alternative III



Technical Committee

COMMON TECHNICAL ISSUES

RETRIEVAL & FEED

Variability of Silos Material

Bentonite Retrieval & Transport

Houdini Effectiveness

- These are common to all three alternatives
- Their impact on technical success would be largest on Alternative I since the single plant is affected (Alternatives II and III have a separate plant unaffected by the three issues)
- Engineering or design solutions can be applied to overcome the impact

Technical Committee

VITRIFICATION TECHNICAL ISSUES

MELTER

Design

Alternative I

High Temp (1350°)
High Sulfates
High Lead
3 Chamber Design

Alternative II

Low Temp (1150°)
Lower Sulfates
High Lead
Single Chamber Design

Operation

Melter Life

Individual Melter Capacity
Waste Loading
Plant Availability

All have a great impact on
plant throughput and technical
success

Technical Committee

CEMENTATION TECHNICAL ISSUES

Alternative II Silo 3 Only

Alternative III Silos 1 & 2

Design

Treatability
Radon Handling
Waste Loading

Operation

Radon Exposure
Process Chemistry Control
Radon Handling

- Interim Storage
- Packaging/Shipping
- Container Integrity

Waste Loading

TECHNICAL ISSUES - IMPACT ASSESSMENT
(Example)

Significant Technical Risk Factor	Success Assumption			Extreme Outcome			Cost from extreme outcome			Delay from extreme outcome		
	Alt I	Alt II	Alt III	Alt I	Alt II	Alt III	Alt I	Alt II	Alt III	Alt I	Alt II	Alt III
Individual melter capacity fails to meet design basis	6 M/t day	6 M/t day	---	Only achieves 3 M/t day p = 25%	Only achieves 3 M/t day p = 10%	---	\$50 million	\$30 million	---	3 years	2 years	---

**REGULATORY COMMITTEE &
WASTE SITE AVAILABILITY REPORT**

TERRY HAGEN

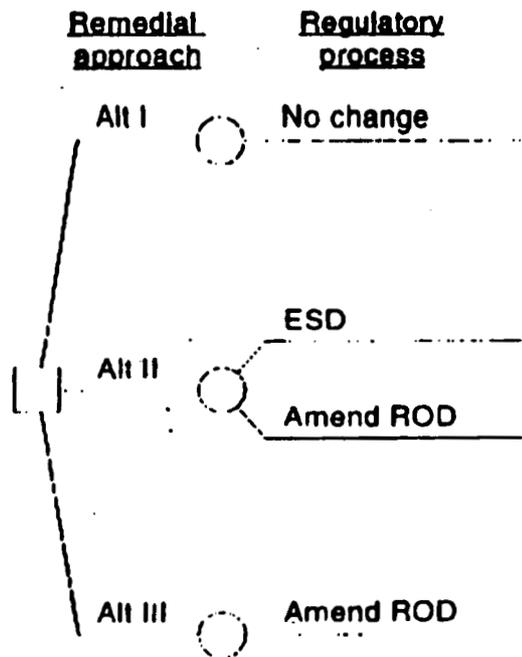
JANUARY 21, 1997

**FLUOR DANIEL
FERNALD** 

104

Regulatory process

Accounts for uncertainty over the outcome of the regulatory process.



- **No change.** There are no disputes with the remedial approach and the remedial approach proceeds on time.
- **ESD.** An ESD is required and approved by August '97 to December '97..
- **Amend ROD.** A ROD amendment is required and approved by March '98 to March '99.
- **Amend ROD.** A ROD amendment is required and approved by December '98 to June '00.

105
0015 531 6233
A.D.A. Inc.

Activity ID	Activity Description	Start	End	Duration	Predecessor	Start	End
100	AGE REVIEW OF SILO 3 REPORT	30	16	0	26DEC96A	24JAN97	
200	NOA ISSUED FOR SILO 3 REPORT	0	0	100		08JAN97A	
300	STAKEHOLDER REVIEW OF SILO 3 REPORT	30	30	0	08JAN97A	07FEB97	
400	REVISION OF SILO 3 REPORT BASED ON EPA COMMENTS	45	45	0	25JAN97	10MAR97	
500	DECISION TO STABILIZE SILO 3, VITRIFY SILOS 1&2	0	0	0	18MAY97		
600	PREP (ESD) EXPLANATION OF SIGNIFICANT DIFFERENCES	30	30	0	11MAR97	09APR97	
700	DOE REVIEW	30	30	0	10APR97	09MAY97	
800	REVISION OF ESD	30	30	0	25APR97	24MAY97	
900	AGENCY & PUBLIC REVIEW ESD	30	30	0	25MAY97	23JUN97	
950	PUBLIC MEETING	0	0	0	06JUN97		
1000	REVISION OF ESD	30	30	0	24JUN97	23JUL97	
1100	REVIEW & APPROVAL OF ESD	30	30	0	24JUL97	22AUG97	
1200	APPROVAL SIGNATURE OF ESD	7	7	0	23AUG97	29AUG97	
1300	NOA FOR ESD FOR PUBLIC AVAILABILITY	0	0	0		29AUG97	

FLUOR DANIEL FERNALD, INC.
ESD TO STABILIZE SILO 3 RESIDUES
DRAFT TIMELINE

Sheet 1 of 1		PREPARED BY: ESD	
NO	REVISION	Checked	Approved

Project Start	01/24/97	Start Bar	
Project Finish	08/29/97	Progress Bar	
Start Date	01/24/97		
End Date	08/29/97		

106

1
c 22

Regulatory Committee

ASSUMPTIONS FOR DRAFT SCHEDULE FOR PREPARATION OF EXPLANATION OF SIGNIFICANT DIFFERENCES FOR STABILIZATION OF SILO 3 RESIDUES

- * The dates in the schedule are for discussion only and are subject to change.
- 1) Schedule assumes that final decision on path forward for remediation of Silos 1 and 2 residues can be made by May 15, 1997.
- 2) Schedule is based on calendar days.
- 3) Preparation of Silo 3 ESD would begin in March after issuance of the Final Silo 3 Report and prior to the final decision on the path forward for remediation of Silos 1 and 2 residues is reached.
- 4) In an effort to streamline, there would be concurrent revision of all documentation during DOE review to the extent possible.
- 5) In an effort to streamline, there would be concurrent review of the ESD by the Agency and stakeholders.

Regulatory Committee

ASSUMPTIONS FOR DRAFT SCHEDULE FOR PREPARATION OF ROD AMENDMENT FOR STABILIZATION OF SILO 3 RESIDUES

- * The dates in the schedule are for discussion only and are subject to change.
- 1) Schedule assumes that final decision on path forward for remediation of Silos 1 and 2 residues can be made by May 15, 1997.
- 2) Schedule is based on calendar days.
- 3) Preparation of Silo 3 Proposed Plan would begin in March after issuance of the Final Silo 3 Report and prior to the final decision on the path forward for remediation of Silos 1 and 2 residues is reached.
- 4) In an effort to streamline, there would be concurrent revision of all documentation during DOE review to the extent possible.
- 5) It should be notes that historically requests for extensions have been made by stakeholders during the public review process. This could potentially add another 30 days to the schedule.

Regulatory Committee

ASSUMPTIONS FOR DRAFT SCHEDULE FOR PREPARATION OF ROD AMENDMENT FOR STABILIZATION OF SILOS 1, 2, & 3 RESIDUES

- * The dates in the schedule are for discussion only and are subject to change.
- 1) Schedule assumes that final decision on path forward for remediation of Silos 1 and 2 residues can be made by May 15, 1997.
- 2) Schedule is based on calendar days.
- 3) Schedule assumes that NEPA evaluations can be incorporated into the CERCLA schedule.
- 4) Initiation of work to prepare the FS/PP would have to wait until final decision on path forward for Silos 1 and 2 remediation was reached.
- 5) Treatability study time frame assumes that Silo material is available without entering the Silos.

Activity ID	Activity Description	Orig Dur	Rem Dur	%	Early Start	Early Finish
600	DECISION TO STABILIZE ALL 3 SILOS	0	0	0	15MAY97	
650	TREATABILITY STUDY	90	90	0	15MAY97	12AUG97
600	PREP (F&P) FEASIBILITY STUDY (FP) PROPOSED PLAN-ES	180	180	0	15MAY97	10NOV97
700	DOE REVIEW	30	30	0	11NOV97	10DEC97
800	REVISION OF F&PP	31	31	0	28NOV97	26DEC97
900	AGENCY REVIEW F&PP	40	40	0	27DEC97	04FEB98
1000	REVISION OF F&PP	60	60	0	06FEB98	06APR98
1100	AGENCY REVIEW & APPROVAL OF F&PP	30	30	0	06APR98	05MAY98
1200	NOA-NOTICE OF AVAILABILITY ISSD FOR STAKEHOLDERS	0	0	0		05MAY98
1300	PUBLIC COMMENT (CERCLA)	30	30	0	06MAY98	04JUN98
1400	PUBLIC MEETING	0	0	0	20MAY98	
1500	PREP OF ROD AMENDMENT & RESPONSIVENESS SUMMARY	75	75	0	06MAY98	19JUL98
1600	DOE REVIEW	45	45	0	20JUL98	02SEP98
1700	REVISE ROD AMENDMENT & RESPONSIVENESS SUMMARY	30	30	0	16AUG98	17SEP98
1800	NOA ISSUED FOR RESPONSIVENESS SUMMARY	0	0	0		17SEP98
1900	AGENCY/STAKEHOLDER REVIEW-RESP SUMM & ROD	30	30	0	16SEP98	17OCT98
2000	REVISION OF ROD AMEND & RESPONSIVENESS SUMMARY	30	30	0	18OCT98	16NOV98
2100	AGENCY REVIEW & APPROVAL RESPON SUMM & ROD AMEND	30	30	0	17NOV98	18DEC98
2200	APPROVAL SIGNATURE OF ROD AMENDMENT	7	7	0	17DEC98	23DEC98
2300	NOTICE OF AVAILABILITY ISSUED FOR ROD AMENDMENT	0	0	0		23DEC98

FLUOR DANIEL FERNALD, INC.
ROD AMEND TO STABILIZE ALL 3 SILOS
DRAFT TIMELINE

Project Start	05/15/97	Early Bar	
Project Finish	12/23/98	Progress Bar	
Start Date	05/15/97		
Plot Date	12/15/97		

Sheet 1 of 1

PREPARED (12/15/97 - 198)	Checked	Approved

Regulatory Committee

ASSUMPTIONS FOR DRAFT SCHEDULE FOR PREPARATION OF ROD AMENDMENT FOR STABILIZATION OF SILOS 1, 2, & 3 RESIDUES CONTINUED

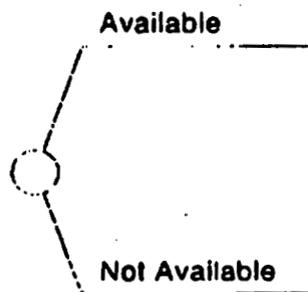
- 6) In an effort to streamline, there would be concurrent revision of all documentation during DOE review to the extent possible.

- 7) It should be noted that historically requests for extensions have been made by stakeholders during the public review process. This could potentially add another 30 days to the schedule.

Planned waste disposal site availability

Accounts for the uncertainty over timing and availability of necessary offsite disposal.

Planned
Waste
Disposal
Site
Availability



- **Available.** Waste is accepted at NTS within time frame that does not significantly affect the planned schedule.
- **Not Available.** Ignored. Possible outcome but not a significant discriminator between alternatives.

**SUMMARY
ESD AND ROD AMENDMENT DEFINITIONS**

Once a CERCLA Record of Decision (ROD) has been approved, new information may be generated during the Remedial Design (RD)/Remedial Action (RA) process that could affect the remedy selected in the ROD. Three types of changes could occur: (1) non-significant changes; (2) significant changes; and (3) fundamental changes. If non-significant or minor changes occur, they should be recorded in the post-decision document file and no further documentation is required. If significant changes are proposed to a component of the remedy in the ROD, these changes must be documented in an Explanation of Significant Differences (ESD) as discussed below. Lastly, if fundamental changes to the overall remedy are proposed, these changes should be documented in a ROD Amendment.

A copy of the latest guidance related to the preparation of ESD and ROD Amendments is attached for your information. The U.S. EPA issued guidance on Post-ROD changes in April of 1991. In addition, more detailed guidance on the ESD and ROD Amendment processes can be found in OSWER Directive 9355.3-02. Please note that in some cases the guidance does portray EPA as the lead agency and in the case of Fernald, the DOE-FEMP is the lead agency.

Explanation of Significant Differences:

Significant changes to a component of the remedy are generally incremental changes related to timing, cost and implementability and do not fundamentally alter the overall approach of a remedy. Examples as provide in the aforementioned OSWER Directive would include a requirement to treat a greater waste volume than was originally anticipated, a delay in a certain aspect of the remedy or a change in the treatment technology proposed for a particular waste stream (as long as the performance level specified in the ROD remains unchanged). A significant change to a component of the remedy may occur as a result of information submitted by the public, regulatory agencies and other stakeholders or as a result of information generated by the lead agency (e.g., DOE/FDF) through its own design or pilot scale activities.

When it is agreed that a significant change to a component of the remedy will occur, an Explanation of Significant Differences (ESD) should be prepared and issued to document the change. During the period when the ESD is being prepared and made available to the public, the lead agency (i.e., DOE) is permitted to continue pre-design, design, construction and operation activities associated with the remedy. The remedy may continue to be implemented because the ESD represents only a notice of a change and is typically not a formal opportunity for public comment since the overall remedy is not being altered.



If it is determined that an ESD is the appropriate regulatory vehicle to document changes to the Silos Project, the following key elements must be part of the process:

- The Regulatory Agencies must be provided a reasonable opportunity to comment on the ESD (at least 15 working days is recommended);
- The ESD should summarize the Regulatory Agencies comments at a minimum;
- DOE must publish a Notice of Availability, including a brief description of the ESD, in a local newspaper of general circulation (as required by CERCLA 117);
- DOE must make the ESD available to the public by placing it in the administrative record file and information repository; and
- DOE must place the information supporting the change in the AR file, as well as any responses to comments.

The general components of the ESD should include an introduction; summary of site history; a description of the significant differences and the basis for those differences; regulatory agency comments; affirmation of statutory determination and a summary of public participation activities.

ROD Amendment:

In limited cases, new information submitted by the public, regulatory agencies or developed by the a lead agency (such as DOE) may cause the lead agency to reconsider the approach selected in the ROD. An example of this may be that an innovative technology originally selected in the ROD did not perform satisfactorily during the pilot scale testing. In a case such as this, the lead agency may completely abandon the innovative technology and propose an alternate technology which would represent a fundamental change to the remedy. When such fundamental changes are proposed to the remedy, the lead agency must issue a revised Proposed Plan and issue an amendment to the original ROD.

The process for amending a ROD requires that the lead agency implement the following steps:

- The proposed amendment to the ROD and any information supporting the amendment to the ROD (e.g., revised PP) must be made available for public comment by issuance of a notice of availability in a major local newspaper of general circulation;
- The focus of the ROD Amendment should be on documenting the reasons for the ROD Amendment, evaluating the existing and proposed remedies in terms of the CERCLA nine criteria, and providing assurances that the proposed remedy satisfies all statutory requirements;
- Provide a reasonable opportunity, not less than 30 calendar days, for submission of written or oral comments on the amendment to the ROD;
- Provide the opportunity for a public meeting to be held during the public comment period at or near the facility at issue, and a transcript of comments received at the public meeting must be kept; and
- Make the amended ROD and supporting information available to the public in the AR file and information repository prior to the commencement of the remedial action.



Guide to Addressing Pre-ROD and Post-ROD Changes

OPTIONAL FORM 99 (7-90)

Quick Reference Fact Sheet

Section 117(b) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) contains provisions for addressing and documenting changes to an alternative that occur between the time the alternative is proposed as the preferred cleanup approach for a site and the final selection of a remedy in a Record of Decision (ROD). In addition, sections 117(c) and (d) of CERCLA contain provisions for addressing changes to the remedy that occur after the ROD is signed. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (55 FR 8666-8865, March 8, 1990) includes requirements for public information and community relations (§300.155), and the preparation and documentation requirements for remedial investigation/feasibility studies (RI/FSs) and remedy-selection documents (§300.430(c) and (f)(3)). It also addresses post-ROD information and public comment in sections 300.435(c)(2) and 300.825(b) and (c). This guide outlines the methods for categorizing pre- and post-ROD changes and the ways in which changes should be documented. More detailed guidance for pre-ROD changes and both significant and fundamental post-ROD changes (i.e., Explanations of Significant Differences (ESDs) and ROD amendments) can be found in Chapters 5 and 8, respectively, of the *Interim Final Guidance on Preparing Superfund Decision Documents* (OSWER Directive 9355.3-02).

I. PRE-ROD CHANGES

When a selected remedial action reflects a significant change(s) from the preferred alternative presented in the Proposed Plan for the remedial action, Section 117(b) of CERCLA requires that these changes be documented. A site-specific determination of what constitutes a significant (as opposed to minor) change, and, therefore, the extent of documentation required, is made after taking the following factors into consideration: (1) the information previously made available to the public; (2) the original description of the alternatives presented in the Proposed Plan (and outlined in detail in the RI/FS Report); and (3) the impact that the changes may have on the alternative's scope, performance, or cost. (See NCP preamble, 55 FR 8772.)

Minor changes are those that have little or no impact on the overall scope, performance, or cost of the alternative originally presented in the Proposed Plan as the preferred remedy for the site or operable unit. (See Highlight 1 for examples of minor changes).

In contrast to minor changes, significant changes have a significant or fundamental effect on

HIGHLIGHT 1 EXAMPLES OF MINOR CHANGES

- Based on information received during the public comment period, the lead agency determines that the capital cost estimate in the Proposed Plan was 10 percent too low. Instead of a cost of \$4.7 million the actual capital cost of the remedy is \$5.1 million.
- It was determined that a remedy will require eight ground-water extraction wells, rather than six wells as estimated originally in the Proposed Plan, to achieve cleanup objectives within the desired time period.
- The volume of material to be excavated and treated is actually 120,000 cubic yards, rather than the 110,000 cubic yards estimated originally in the Proposed Plan.

the scope, performance, and/or cost of the preferred alternative. They generally involve either (1) selecting as the remedy an RI/FS alternative other than the preferred alternative identified in the Proposed Plan; or (2) substantially modifying

a component of the previously identified preferred alternative (e.g., addressing a substantially greater or lesser volume of waste, addressing a new exposure pathway, or by encompassing a substantially greater physical area of the site). Changes in treatment technologies or processes that substantially alter the long-term effectiveness or the short-term effectiveness of the alternative constitute significant changes of the performance of the preferred alternative. If the capital or operation and maintenance costs for the final alternative are considerably different from the original estimates, this is considered a significant change in the cost of the preferred alternative.

DOCUMENTING PRE-ROD CHANGES

Minor changes to the Proposed Plan should be discussed in the Description of Alternatives section of the ROD Decision Summary and should be documented in the Administrative Record File.

The type of documentation required for significant changes depends on whether or not the change is a logical outgrowth of the information available to the public for comment in the Proposed Plan and the RI/FS Report. A logical outgrowth occurs where the public could have reasonably anticipated the change, based on information available during the public comment period and the comments submitted. A significant change would be considered to be a logical outgrowth where, based on the comments received during the public comment period, the Agency selects, from among the alternatives discussed in the FS and/or Proposed Plan, an alternative (or parts of alternatives) that differs from the preferred alternative in the Proposed Plan. A significant change that is a logical outgrowth of information available to the public in the Proposed Plan and RI/FS Report should be documented at the end of the Decision Summary of the ROD in the Documentation of Significant Changes section. Additional public notice or comment on this type of change is not necessary. Examples of types of significant changes that are logical outgrowths are presented in Highlight 2.

In those limited situations in which a significant change is not a logical outgrowth of the Proposed Plan and its supporting information (i.e., the public could not reasonably have anticipated the

HIGHLIGHT 2 TYPES OF SIGNIFICANT CHANGES THAT ARE LOGICAL OUTGROWTHS

- Changing a Component -- In response to a commenter, a change in the preferred alternative's cost, timing, level of performance, or applicability of relevant and appropriate requirements (ARARs) that could have been anticipated by other members of the public.
- Combining Components of Alternatives -- In response to comments, the final remedy combines one component of the preferred alternative (e.g., for ground-water remediation) and a component of a different alternative (e.g., soil remediation) presented in the RI/FS Report.
- Selecting a Different Alternative -- An alternative evaluated in the FS, other than the preferred alternative in the Proposed Plan, is determined to provide the most appropriate balance of tradeoffs among alternatives, with respect to the nine criteria, in light of public comments.

change that is made) a revised Proposed Plan that presents the new preferred alternative should be issued for public comment (NCP section 300.430(f)(3)(ii)(B)). The revised Proposed Plan must be prepared in accordance with the requirements of both CERCLA section 117 and the NCP. Appropriate supporting material that provides the necessary engineering, cost, and risk information for the new alternative(s), and discusses how the new alternative(s) compares to the other alternatives with respect to the nine evaluation criteria, should be provided in the revised Proposed Plan. (It may be appropriate to provide this information as a supplement to the RI/FS Report.) In addition, significant changes to the revised Proposed Plan must be documented at the end of the Decision Summary of the ROD in the Documentation of Significant Changes section. Examples of types of significant changes that require a new Proposed Plan, additional public comment, and documentation in the ROD are presented in Highlight 3.

HIGHLIGHT 3
TYPES OF SIGNIFICANT CHANGES THAT
ARE NOT LOGICAL OUTGROWTHS

- Selection of a new alternative that was not previously considered and discussed and is not a logical outgrowth (e.g., combination) of considered alternatives
- Significant change to a component of the selected alternative resulting in fundamental changes to the remedy -- A previously unidentified ARAR now requires altering the remedy design, thus substantially altering the feasibility or performance of the alternative.

II. POST-ROD CHANGES

After a ROD is signed, new information may be received or generated during the ROD/RA that could affect how the Agency believes the remedy selected in the ROD should be implemented. Where information is submitted by a PRP, the public, or the support agency after a ROD is signed, the lead agency should consider this information when each of the following criteria are met (NCP section 300.825(c)):

- The comments contain significant information;
- The information is not contained elsewhere in the Administrative Record File;
- The information could not have been submitted during the public comment period; and
- The information substantially supports the need to alter significantly the response action.

The lead agency may also evaluate whether a change to the remedy is warranted on its initiative, even where the requirements of NCP section 300.825(c) are not met.

The lead agency's categorization of a change, which will ultimately affect the documentation procedure required, is a site-specific determination and should consider the following factors:

- Does the change significantly alter the scope of the remedy (e.g., the physical area of the response, remediation goals, type and volume of wastes)?
- Would the change alter the performance (e.g., treatment levels to be attained) and thus raise concerns about the protectiveness or long-term effectiveness of the remedy that could not have been anticipated based on information in the ROD?
- Are the changes in costs of such a nature that they could not have been anticipated based on the estimates in the ROD and the recognized uncertainties associated with the hazardous waste engineering process selected?

Based on this evaluation and depending on the extent or scope of modification being considered, the lead agency determines that the post-ROD change is (1) non-significant or minor; (2) significant; or (3) fundamental. Examples of these three types of post-ROD changes are presented in Highlight 4 (see also NCP preamble, 55 FR 8772). Each category is associated with a different documentation procedure, as discussed below.

DOCUMENTING POST-ROD CHANGES

If non-significant or minor changes are made, they should be recorded in the post-decision document file. If the lead agency chooses, non-significant changes can be documented for the public in an optional Remedial Design Fact Sheet. If significant changes are made to a component of the remedy in the ROD, these changes should be documented in an Explanation of Significant Differences (ESD), as required by Section 117(c) of CERCLA. If fundamental changes are made to the overall remedy, they should be documented in a ROD amendment.

EXPLANATION OF SIGNIFICANT DIFFERENCES (ESDs)

When documenting significant changes made to a remedy, the lead agency must comply with the procedures specified in NCP section 300.435(c)(2)(i). An ESD should be prepared to provide the public with an explanation of the

HIGHLIGHT 4
EXAMPLES OF POST-ROD CHANGES

- 1) **Minor.** Testing during remedial design shows that the volume of soil requiring treatment is 75,000 cubic yards rather than the 60,000 estimated in the ROD. However, the cost of the remedy will only increase by 5 percent because of economies of scale that can be realized.
- 2) **Significant.** Residuals from a treatment operation were not expected to be hazardous and it was planned to dispose of them on site in a Subtitle D unit. However, testing after treatment determines that the residuals are hazardous wastes, and off-site disposal at a Subtitle C facility is required.
- 3) **Fundamental.** The in-situ soil washing remedy selected in the ROD proves to be infeasible to implement after testing during remedial design. A decision is made to excavate and thermally treat the waste instead.

nature of the changes made to the remedy, to summarize the information that led to making that change, and to affirm that the revised remedy complies with the statutory requirements of CERCLA section 121. Generally, a new nine criteria analysis is not required; however, the ESD should include a statement that the ROD meets ARARs identified at the time the original ROD was signed (NCP section 300.430(f)(1)(ii)(B)(1) and (2)).

It may also be appropriate to prepare an ESD document when the lead agency decides to exercise a contingency remedy that was not sufficiently described in the ROD (see Guide to Developing Superfund No Action, Interim Action, and Contingency Remedy RODs, Directive #9335.3-02FS-3, March 1991).

During the period when the ESD is being prepared and made available to the public, the lead agency may proceed with the pre-design, design, construction, or operation activities associated with the remedy. The remedy can continue to be implemented in this case because the ESD represents only a notice of change, and the Agency

is not reconsidering the overall remedy. The lead agency should consult with the support agency, as appropriate, prior to issuing an ESD (see NCP section 300.435(c)(2)). Although not specifically required by CERCLA section 121(f), it is also recommended for the lead agency to provide the support agency the opportunity to comment and to summarize the support agency's comments in the ESD. The agency also should publish a notice of availability and a brief description of the ESD in a local newspaper of general circulation (as required by CERCLA Section 117(c)), and make the ESD available to the public by placing it in the administrative record file and information repository. A formal public comment period is not required when issuing an ESD. The Office of Emergency and Remedial Response (OERR) recommends issuing the ESD in a fact sheet format as outlined in Highlight 5. The appropriate Regional Manager may sign an ESD. (NOTE: In some cases, an additional public comment period or public meeting may be held voluntarily on a planned ESD (see NCP section 300.825(b)). This may be useful where there is considerable public or PRP interest in the matter.)

ROD AMENDMENT

In a few cases, new information submitted by the public post-ROD or developed by the lead agency during the remedial design/remedial action leads to the reconsideration of the hazardous waste management approach selected in the ROD. Such reconsideration of the remedy constitutes a fundamental change. When fundamental changes are made to the remedy selected in a ROD, the lead agency should conduct the public participation and documentation procedures specified in NCP section 300.435(c)(2)(ii).

In general, the introductory sections of the ROD do not need to be readdressed in the amended ROD. The focus of the amendment should be on:

- Documenting the rationale for the amendment;
- Evaluating the original selected remedy and the new proposed remedy using the nine evaluation criteria; and

HIGHLIGHT 5
SAMPLE FORMAT FOR ESD

Introduction. Begin with an introduction to the site and a statement of purpose for the ESD, including:

- Site name and location.
- Identification of lead and support agencies.
- Citation of CERCLA section 117(c) and NCP section 301.435(c)(2)(i).
- Summary of the circumstances that gave rise to the need for an ESD.
- Statement that the ESD will become part of the Administrative Record File (NCP 300.425(a)(2)), and
- Address of location where the file is available and hours of availability of the file.

Summary of Site History, Contamination Problems, and Selected Remedy. Summarize the following aspects of the site or operable unit:

- The contamination problems and site history, including the date on which the ROD was signed; and
- The selected remedy, as originally described in the ROD.

Description of the Significant Differences and the Basis for those Differences. Summarize the significant changes to the remedy and the basis for making those changes, including:

- Information that gave rise to significant differences from the selected remedy as it was originally specified which could include the following: (1) the results of treatability studies; or (2) other information developed or provided during the remedial design process that supports the change. Reference any information in the Administrative Record File that supports the need for the change.
- Description of the significant differences between the remedy as presented in the ROD and the action now proposed. As appropriate, this description should summarize the differences in scope, performance, or cost between the original and modified remedies, as necessary. For example:

Original Remedy	Modified Remedy
Excavation and incineration of 7,500 cubic yards of contaminated soil.	Excavation and incineration of 11,500 cubic yards of contaminated soil.
Air stripping and ground-water restoration.	Carbon adsorption for ground-water restoration.

Support Agency Comments: Include a summary of support agency comments on the ESD.

Affirmation of the Statutory Determinations. Affirm that the modified remedy continues to satisfy the requirements of CERCLA section 121 by including a statement such as the following:

"Considering the new information that has been developed and the changes that have been made to the selected remedy, the [lead and support agencies] believe that the remedy remains protective of human health and the environment, complies with federal and state requirements that were identified [(1) in the ROD/(2) in this ESD] as applicable or relevant and appropriate to this remedial action [at the time [(1) the original ROD/(2) this ESD] was signed), and is cost-effective. In addition, the revised remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable for this site."

Public Participation Activities: Document compliance with the appropriate public participation requirements:

- That notice has been issued that the contents of the Administrative Record File are available for public review and comment; and
- The date of planned public information meetings, if applicable. (EPA is not required to hold public meetings on ESDs but may choose to do so if warranted by public interest.)

- Providing assurances that the proposed remedy satisfies the statutory requirements.

The format for a ROD amendment is presented in **Highlight 6**

If the ROD to be amended addresses the entire response action for the site or a series of operable units (e.g., soil, surface water, and ground water), only that portion of the remedy being changed (e.g., ground water) requires an amendment. Under SARA §121, for the portion of the ROD being amended, a new nine criteria analysis, including a new ARARs analysis, will be necessary. Portions of the analysis in the original ROD can be cross-referenced, where appropriate. Therefore, the amount of information included in a ROD amendment is a function of the type of change made to the remedy and the rationale for that change. RD/RA activities being conducted on other portions of the site or operable units not proposed for changes may continue during the amendment process.

When there are fundamental changes proposed to the ROD, the lead agency should conduct the public participation and documentation procedures conducted for the original ROD (e.g., Proposed Plan, public comment period, Responsiveness Summary). (See NCP section 300.435(c)(2)(ii)(A)-(H).) When a fundamental change is proposed as a result of negotiations with a PRP, the Proposed Plan for the ROD amendment should be released for public comment concurrently with the consent decree. (If a change is made after a consent decree has been entered, involvement of the court may be required. Site managers should check with their regional counsel on how this may be accomplished.) ROD amendments should be signed by the Regional Administrator.

**HIGHLIGHT 6
SAMPLE FORMAT FOR ROD AMENDMENT**

Introduction

- Site Name and Location.
- Identify lead and support agencies.
- Cite CERCLA §117 and NCP 300.435(c)(2)(ii).
- Date of ROD signature.
- Summarize circumstances that led to the need for a ROD amendment.
- State that ROD amendment will become part of the Administrative Record File (NCP section 300.825(f)(2)(i)) and
- Provide address where File is available for public review and hours of availability.

Reasons for Issuing the ROD Amendment

- Identify remedy selected in ROD; and
- Summarize rationale for changing remedy selected in the ROD.

Description of the New Alternatives

- Describe the original selected remedy and the new proposed remedies in the same manner requested in a standard ROD, highlighting the
- Treatment components;
- Containment or storage components;
- Ground-water components;
- General components; and
- Major ARARs.

Evaluation of Alternatives

- Profile the original selected remedy and the new proposed remedies against the nine criteria

Statutory Determinations

- Provide a statement that the modified remedy satisfies CERCLA §121

NOTE: See guidance on preparing RODs for scope and detail of subjects to be addressed under each point.

NOTICE: The policies set out in this memorandum are intended solely as guidance. They are not intended, nor can they be relied upon, to create any rights enforceable by any party in litigation with the United States. EPA officials may decide to follow the guidance provided in this memorandum, or to act at variance with the guidance, based on an analysis of specific site circumstances. The Agency also reserves the right to change this guidance any time without public notice.

Safety & Health Committee

SAFETY & HEALTH COMMITTEE

PAT FISK

JANUARY 21, 1997



122

Safety & Health Committee

SCOPE

- Baseline Risks in Units of Impact/Unit Time
- Accident Risks in Units Impact (one time event)

Safety & Health Committee

APPROACH

- Baseline Cases Being Developed As Formulas, Ready To Be Quantified When Schedule Information Is Fixed
- Accident Cases Are Being Quantified Directly-Based On Existing Safety Analyses

11
22
55

124

Safety & Health Committee

ASSUMPTIONS SPECIFIC TO SAFETY & HEALTH

■ Baseline Cases

- Vitrification Off-gas Treatment Produces More Dose/Hazard Than Stabilization
- Silo 1 & 2 Shipping Containers are the Same Regardless of Alternative
- Total Dose for Container Handling is within 10% for Silos 1 & 2 Vitrification vs. Cementation

■ Accident Cases

- Degradation of Silo Structures Is Time Dependent

Safety & Health Committee

RISK ESTIMATES TO DATE

■ Baseline Cases For Non Exposure Impacts

	Worker	Public
Remediation-	1 Fatality/2 Million Work Hours 1 Injury/29,000 Work Hours	Not Complete
Transportation-	1 Fatality/263,000 Shipments 1 Injury/12,000 Shipments	1 Fatality/45,000 Shipments 1 Injury/4500 Shipments
Disposal-	Not Complete	Not Complete
D&D-	1 Fatality/2 Million Work Hours 1 Injury/29,000 Work Hour	Not Complete

Safety & Health Committee

RISK ESTIMATES TO DATE

■ Accident Cases

	Worker*	Public**
Silo or Silo Dome Collapse	840 mem.	100 mem.
Major Loss of Processing Containment	2.1 rem for vitrification 700 mem. for solidification	250 mem. 50 mem.
Major Loss of Containment During Transportation	Not Complete	Not Complete

* At 100 meters

** At 330 meters (Site Boundary)

Cost and Schedule Committee

DRAFT

COST AND SCHEDULE COMMITTEE

MIKE CONNORS

JANUARY 21, 1997



Cost and Schedule Committee

DRAFT

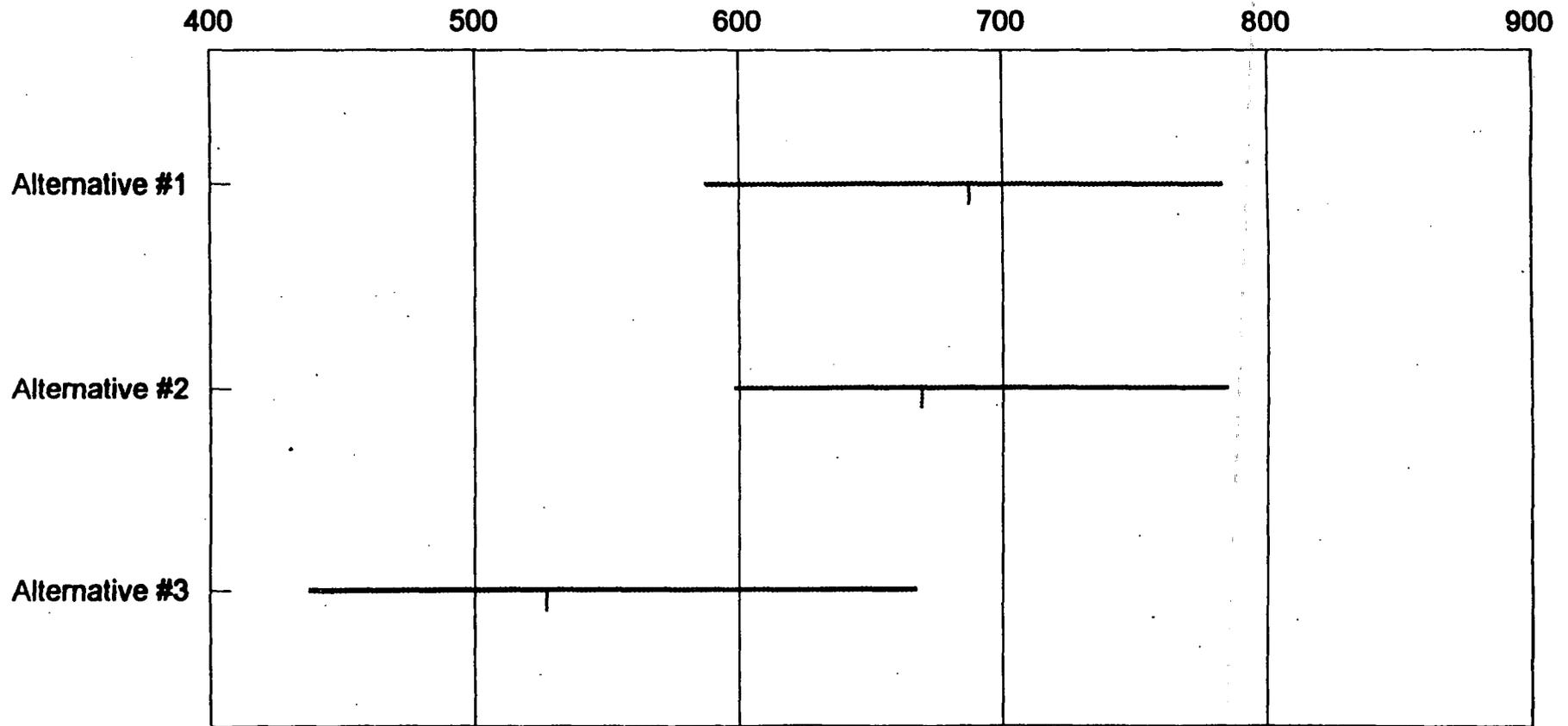
Cost and Schedule basic assumption:

- Base case schedules are based on logical sequences of events.
- Base case cost are based on resource loading major activities (No consideration for resource limitation or continuity of resources)
- Base case life cycle cost are escalated dollars from FY97 - end of project. (Historical costs from Project Initiation through FY96 are not included)
- Site "Hotel" Cost (Administration, utility, landlord services, safety, and security) for the years past FY05 is assumed at \$25 million unescalated. The 25 million is based on 1/5 of FY96 actual cost for these landlord services.
- Soil under the Silos will be remediated in the same process as the Silos content.

DRAFT

Alternative Life Cycle Cost FY97 Through Completion

Cost in Millions



G:\VERN\PAINE\ALTCOMP.WK4

130

225

Base case Cost and Schedule summary

(Expected Cost are in millions)

DRAFT

	Alternative #1	Alternative #2	Alternative #3
Schedule Completion Date	May 2010	May 2010	November 2008
Vitrification Pilot Plant Cost	77	77	9
Silo #3 Stabilization Cost	0.00	25	25
Final Remediation Engineering Cost	49	47	20
Final Remediation Construction Cost	132	115	68
Final Remediation Operation Cost	79	60	29
Waste Pkg/Shipping/Disposal Cost	83	80	135
D&D/Soils Remediation Cost	63	63	36
Project Management Cost	49	48	48
Waste Retrieval Cost	21	16	12
Total Direct Cost	653	531	383
Escalation Cost	132	138	144
Total Project Cost	685	669	527
Site "Hotel" Cost	116	116	80
Site "Hotel" Escalation	60	60	38

Activity ID	Activity Description	Plan Dur	Early Start	Early Finish	
PILOT PLANT PHASE 1					
4AAL1399	PHASE 1 PILOT OPERATIONS	68*	19JUN96A	31JAN97	PHASE 1 PILOT OPERATIONS
PILOT PLANT PHASE 2					
4AAI 5000	PHASE 2 SOT TESTING	60	23MAR99	21MAY99	PHASE 2 SOT TESTING
4AAI 5010	MELTER START-UP & SURROGATE	50	27APR00	15JUN00	MELTER START-UP & SURROGATE TESTING
4AAI 5020	PILOT PLANT REMEDIATION	815	05FEB02	29APR04	PILOT PLANT REMEDIATION OPERATION
SILO SUPERSTRUCTURE					
4AEEH150	SILO SUPERSTRUCTURE	510*	04NOV97	25MAY00	SILO SUPERSTRUCTURE CONSTRUCTION
WASTE RETRIEVAL					
4AL# 0523	WRS Preliminary Design (Title I)	80	22AUG97	17DEC97	WRS Preliminary Design (Title I)
4ADF 0500	WRS Pre-Final Design (Title II)	180	25FEB98	12OCT98	WRS Pre-Final Design (Title II)
4ADF 1525	WRS CONSTRUCTION	145	08NOV99	31JUL00	WRS CONSTRUCTION
SILOS PROJECT					
4ADJH000	SP/UU CONSTRUCTION	8	04MAR96	06DEC96	SP/UU CONSTRUCTION
4AEXI K000	NRTS Preliminary Design	100	07JUL97	26NOV97	NRTS Preliminary Design
4ADC0107	NRTS Prefinal Design	100	14JAN98	05JUN98	NRTS Prefinal Design
4ACCH005	MELTER PROCUREMENT	103	12FEB98	10JUL98	MELTER PROCUREMENT
4ACCH004	ADVANCED CONCEPTUAL DESIGN	120	18MAY98	04NOV98	ADVANCED CONCEPTUAL DESIGN (ACD)
4ACCH022	FSAR DEVELOPMENT - RESTART	239*	15JUL98	26JUN99	FSAR DEVELOPMENT - RESTART
4ACCH011	MELTER DESIGN	200	03AUG98	20MAY99	MELTER DESIGN
4ADCH005	NRTS CONSTRUCTION & CAT	100	20AUG98	22FEB99	NRTS CONSTRUCTION & CAT
4ACCH000	K-65 PLANT TITLE I	175	05NOV98	21JUL99	K-65 PLANT TITLE I
4ACCH006	MELTER FABRICATION DRAWINGS	59	21MAY99	13AUG99	MELTER FABRICATION DRAWINGS
4ACCH008	K-65 SILO PLANT TITLE II	230	22JUL99	21JUN00	K-65 SILO PLANT TITLE II
4ACCH600	BID & AWARD FACILITY	120	03FEB00	25JUL00	BID & AWARD FACILITY CONSTRUCTION PACKAGES
4ACCH700	K-65 SILO PLANT CONSTRUCTION	550	17AUG00	26OCT02	K-65 SILO PLANT CONSTRUCTION
4ACCH500	K-65 SILO PRE-OP/START-UP	250	25APR02	24APR03	K-65 SILO PRE-OP/START-UP ACTIVITIES
4ACC8000	K-65 SILO ORR	180	26APR03	14JAN04	K-65 SILO ORR
4ACC8100	K-65 SILO SURROGATE TESTING	90	15JAN04	13APR04	K-65 SILO SURROGATE TESTING
4ACCH1200	K-65 SILO OPERATIONS	1,547	14APR04	08JUL08	K-65 SILO OPERATIONS
4ACCH400	K-65 SILO PLANT DECOMMISSION	189	09JUL08	09APR09	K-65 SILO PLANT DECOMMISSION
FINAL SITE REMEDIATION					
4ACJ1330	AREA 7,1-II,2-II - PROCURE	212	01JUN04	05APR05	AREA 7,1-II,2-II - PROCURE SUBCONTRACTOR
4ACJ1335	AREA 7 SOILS EXCAVATION (INCL	814	06APR05	08JUL08	AREA 7 SOILS EXCAVATION (INCL SOILS)
4ACC9600	SILO 1 & 2 / SILO SUPERSTRUCTURE	164	11APR07	05DEC07	SILO 1 & 2 / SILO SUPERSTRUCTURE D&D
4ACC9800	K-65 SILO / NRTS D&D	237	11APR07	21MAR08	K-65 SILO / NRTS D&D
4ACJ1340	K-65 SILO PLANT D&D & SOIL	279	13APR08	21MAY10	K-65 SILO PLANT D&D & SOIL REMEDIATION

DRAFT

225

132

Project Start	01NOV96	Early Bar
Project Finish	21MAY10	Progress Bar
Date Code	09NOV99	Critical Activity
Plan Date	06JAN97	

**SILOS PROJECT
ALTERNATIVE STUDY 1**

Sheet 1 of 1



Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	
PILOT PLANT PHASE 1					
4AAC1399	PHASE 1 PILOT OPERATIONS	68*	19JUN96A	31JAN97	PHASE 1 PILOT OPERATIONS
PILOT PLANT PHASE 2					
4AAI 5000	PHASE 2 SOT TESTING	60	23MAR99	21MAY99	PHASE 2 SOT TESTING
4AAF 5010	MELTER START-UP &	50	27APR00	15JUN00	MELTER START-UP & SURROGATE TESTING
4AAF 5020	PILOT PLANT REMEDIATION	815	05FEB02	29APR04	PILOT PLANT REMEDIATION OPERATION
SILO SUPERSTRUCTURE					
4AI L1150	SILO SUPERSTRUCTURE	510*	04NOV97	25MAY00	SILO SUPERSTRUCTURE CONSTRUCTION
WASTE RETRIEVAL					
4ADF 0523	WRS Preliminary Design (Title I)	80	22AUG97	17DEC97	WRS Preliminary Design (Title I)
4ADF 0500	WRS Pre-Final Design (Title II)	160	25FEB98	12OCT98	WRS Pre-Final Design (Title II)
4ADF H525	WRS CONSTRUCTION	145	08NOV99	31JUL00	WRS CONSTRUCTION
SILOS PROJECT					
4ADJH000	SP/UL CONSTRUCTION	8	04MAR96A	06DEC96	SP/UL CONSTRUCTION
4ADCH000	NRTS Preliminary Design	100	07JUL97	25NOV97	NRTS Preliminary Design
4ADCO107	NRTS Preliminary Design	100	14JAN98	05JUN98	NRTS Preliminary Design
4ACCH005	MELTER PROCUREMENT	103	12FEB98	10JUL98	MELTER PROCUREMENT
4ACCH004	ADVANCED CONCEPTUAL DESIGN	120	18MAY98	04NOV98	ADVANCED CONCEPTUAL DESIGN (ACD)
4ACCH022	FSAR DEVELOPMENT - RESTART	239*	15JUL98	28JUN99	FSAR DEVELOPMENT - RESTART
4ACCH011	MELTER DESIGN	200	03AUG98	20MAY99	MELTER DESIGN
4ADCH005	NRTS CONSTRUCTION & CAT	100	20AUG98	22FEB99	NRTS CONSTRUCTION & CAT
4ACCH000	K-45 PLANT TITLE I	175	08NOV98	21JUL99	K-45 PLANT TITLE I
4ACCH006	MELTER FABRICATION DRAWINGS	59	21MAY99	13AUG99	MELTER FABRICATION DRAWINGS
4ACCH008	K-45 SILO PLANT TITLE II	230	22JUL99	21JUN00	K-45 SILO PLANT TITLE II
4ACCH600	BID & AWARD FACILITY	120	03FEB00	25JUL00	BID & AWARD FACILITY CONSTRUCTION PACKAGES
4ACCH700	K-45 SILO PLANT CONSTRUCTION	550	17AUG00	28OCT02	K-45 SILO PLANT CONSTRUCTION
4ACCH500	K-45 SILO PRE-OP/START-UP	250	23APR02	24APR03	K-45 SILO PRE-OP/START-UP ACTIVITIES
4ACCR000	K-45 SILO ORR	180	23APR03	14JAN04	K-45 SILO ORR
4ACCB100	K-45 SILO SURROGATE TESTING	90	15JAN04	13APR04	K-45 SILO SURROGATE TESTING
4ACCH200	K-45 SILO OPERATIONS	1,547	14APR04	06JUL06	K-45 SILO OPERATIONS
4ACCH400	K-45 SILO PLANT DECOMMISSION	189	08JUL06	09APR09	K-45 SILO PLANT DECOMMISSION
SILO 3 STABILIZATION					
4ACCH350	SILO 3 STABILIZATION	1,135*	16OCT96A	12JUN01	SILO 3 STABILIZATION
FINAL SITE REMEDIATION					
4ACJ1330	AREA 7, 1-4I, 2-4I - PROCURE	212	01JUN04	05APR05	AREA 7, 1-4I, 2-4I - PROCURE SUBCONTRACTOR
4ACJ1335	AREA 7 SOILS EXCAVATION (INCL	814	08APR05	08JUL08	AREA 7 SOILS EXCAVATION (INCL SILOS)
4ACC9600	SILO 1 & 2 / SILO	164	11APR07	08DEC07	SILO 1 & 2 / SILO SUPERSTRUCTURE D&D
4ACC9800	K-45 SILO / NRTS D&D	237	11APR07	21MAR08	K-45 SILO / NRTS D&D
4ACJ1340	K-45 SILO PLANT D&D & SOIL	279	13APR09	21MAY10	K-45 SILO PLANT D&D & SOIL REMEDIATION

DRAFT

Project Start	01OCT96	Early Bar	ALTMAN
Project Finish	21MAY10	Progress Bar	
Data Date	26MAY09	Critical Activity	
Print Date	26MAY07		

**SILOS PROJECT
ALTERNATIVE STUDY 2
LEVEL 1 SCHEDULE**

Sheet 1 of 1



133

Activity ID	Activity Description	Plan No.	Early Start	Early Finish	
SILO SUPERSTRUCTURE					
4ALL1150	SILO SUPERSTRUCTURE CONSTRUCTION	510*	04NOV97	25MAY00	SILO SUPERSTRUCTURE CONSTRUCTION
WASTE RETRIEVAL SYSTEM					
4ADJ0523	WRS Preliminary Design (Title I)	80	22AUG97	17DEC97	WRS Preliminary Design (Title I)
4ADJ0500	WRS Pre-Final Design (Title II)	160	25FEB98	12OCT98	WRS Pre-Final Design (Title II)
4ADFH525	WRS CONSTRUCTION	145	08NOV98	31JUL00	WRS CONSTRUCTION
SILOS PROJECT					
4ADJH000	SP/UV CONSTRUCTION	8	04MAR96A	06DEC96	SP/UV CONSTRUCTION
4ADCH000	NRTS Preliminary Design	50	07JUL97	15SEP97	NRTS Preliminary Design
4ADC0107	NRTS Prefinal Design	100	11FEB98	06JUL98	NRTS Prefinal Design
4ADCH005	NRTS CONSTRUCTION & CAT	100	21SEP98	22MAR99	NRTS CONSTRUCTION & CAT
4ACCH000	K65 PLANT TITLE I	120	17MAY99	03NOV99	K65 PLANT TITLE I
4ACCH00H	K-65 SILO PLANT TITLE II	180	04NOV99	26JUL00	K-65 SILO PLANT TITLE II
4ACCH600	BID & AWARD FACILITY CONSTRUCTION PACKAGES	120	09MAR00	28AUG00	BID & AWARD FACILITY CONSTRUCTION PACKAGES
4ACCH700	K-65 SILO PLANT CONSTRUCTION	200	27JUL00	09AUG01	K-65 SILO PLANT CONSTRUCTION
4ACCH500	K-65 SILO PRE-OP/START-UP ACTIVITIES	250	05FEB01	04FEB02	K-65 SILO PRE-OP/START-UP ACTIVITIES
4ACC8000	K-65 SILO ORR	180	05FEB02	21OCT02	K-65 SILO ORR
4ACC8100	K-65 SILO SURROGATE TESTING	90	22OCT02	19JAN03	K-65 SILO SURROGATE TESTING
4ACCH200	K-65 SILO OPERATIONS	1,510	20JAN03	09MAR07	K-65 SILO OPERATIONS
4ACCH400	K-65 SILO PLANT DECOMMISSION	180	12MAR07	27NOV07	K-65 SILO PLANT DECOMMISSION
SILO 3 STABILIZATION					
4ACC1350	SILO 3 STABILIZATION	1,117*	18OCT96A	18MAY01	SILO 3 STABILIZATION
FINAL SITE REMEDIATION					
4ACJ1330	AREA 7,1-4L,2-4 - PROCURE SUBCONTRACTOR	212	31JAN03	04DEC03	AREA 7,1-4L,2-4 - PROCURE SUBCONTRACTOR
4ACJ1335	AREA 7 SOILS EXCAVATION (INCL SILO'S)	814	05DEC03	09MAR07	AREA 7 SOILS EXCAVATION (INCL SILO'S)
4ACC9600	SILO 1 & 2 / SILO SUPERSTRUCTURE D&D	184	16JAN06	07SEP06	SILO 1 & 2 / SILO SUPERSTRUCTURE D&D
4ACC9800	K-65 SILO / NRTS D&D	184	16JAN06	07SEP06	K-65 SILO / NRTS D&D
4ACJ1340	K-65 SILO PLANT D&D AND SOIL REMEDIATION	250	28NOV07	24NOV08	K-65 SILO PLANT D&D AND SOIL REMEDIATION

DRAFT

Project Start: 01OCT96
 Project Finish: 18MAY01
 Date Date: 28NOV99
 Plot Date: 01JAN00

Legend:
 [Solid Bar] Early Bar
 [Hatched Bar] Progress Bar
 [Dashed Bar] Critical Activity

ALTERNATIVE

**SILOS PROJECT
 ALTERNATIVE STUDY 3
 LEVEL 4 GANTT CHART**

Sheet 1 of 1

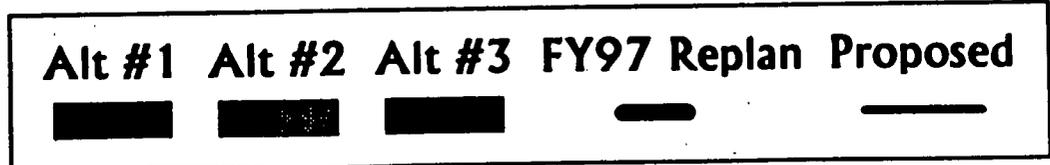
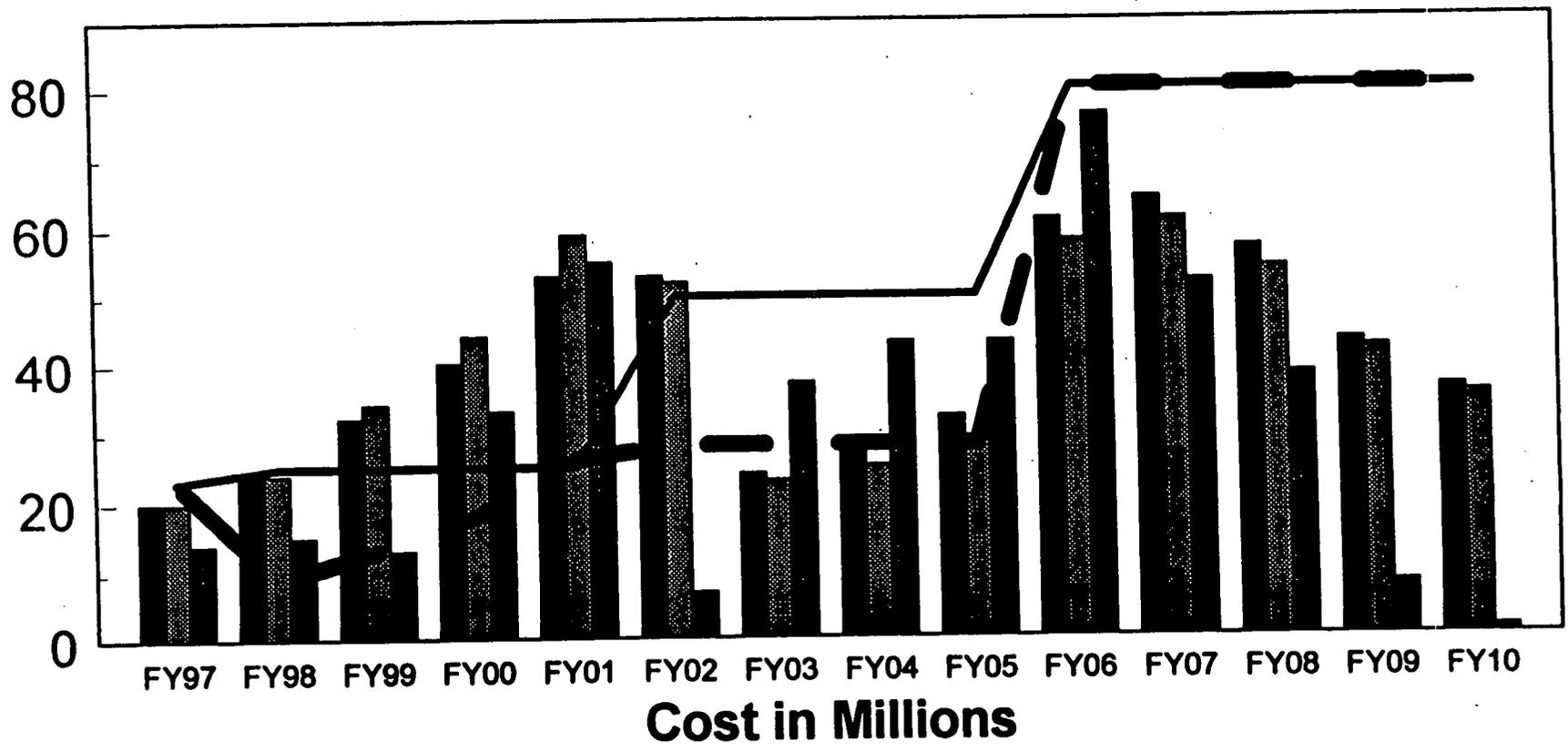


225

134

DRAFT

Alternatives Expenditure Profile



LIST A

See List B	Meets screening criteria?	Technical Uncertainty	Alt 2 Impact	Alt 3 Impact	Comments
1	Y	waste chemistry different than expected	H	M	
	N	waste material not characterized			
2	Y	waste loading varies significantly from basis	H	H	
3	Y	melter design requires development	H	O	
	N	BOP requires development			
	N	surrogate results differ greatly from actual materials			
4	Y	radon standards not met by stab (non-vit)	O	H	
5	Y	NTS won't accept waste other than glass	O	H	
	N	Support systems don't support melter system			
	Y	ability to scale not demonstrated	M	O	Combine with 3
6	Y	melter life differs from design basis	H	H	
	N	questions about institutional controls not answered			
	N	system maintenance more frequent than expected			
	N	melter capacity fails to meet design basis			

	Y	optimum glass composition not determined	H	O	Combine with 3
	N	ability to retrieve not demonstrated			
	N	silo failure			
	N	operating temp not clarified			
7	Y	gem making capacity not achieved	H	O	
	N	H&S standards for operation and disposal not clearly established			
8	Y	lack of vendor response to stab RFP	H	H	
	N	no DNFSB/NRC Buy in			
	N	differential electrode erosion			
	N	inability to resolve ROD amendment/PA			
	Y	failure during silo 3 stab	O	H	
	Y	no formulation for stab	O	L	
	N	shipping rate could impact spending rate (cement)			
	Y	plant availability doesn't meet design basis	M	L	
9	Y	plant capacity doesn't meet design basis	H	L	
	N	baseline assumes level of training for operators not reflected in schedule			
	N	operating procedure not clarified (cold cap yes or no)			

	N	funding falls short of basis			
	N	don't get NRC buy-in			
	Y	extended period for melter development	H	0	Combine with 3
	Y	extended period for gem maker development	L	0	
	N	DOE disbanded/reorganized			
	Y	best tech path forward may not match best risk management approach	M	L	
	Y	best possible tech expertise not available	H	L	Combine with 3
10	Y	difficulty of processing off spec material	L	H	Redefined as significant amounts off-spec material
	N	D&D much more difficult than expected			
	N	less than 1 micron waste in silo 3 is significant			
	N	insufficient design engineering resources for melters			
	N	insufficient plant management resources for concurrent plants			
	N	insufficient operating resources for concurrent plants			
	N	Houdini ineffective (doesn't meet requirements for feed removal)			

LIST B

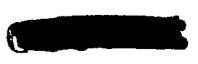
Technical Uncertainties Meeting Screening Criteria	Impact Ranking	Weighted Average Probability Alt 2	Weighted Average Probability Alt 3	Sensitivity Range
1. Melter design requires development (best possible expertise, optimum glass composition)	1	0.58	n/a	0.1-1
2. Melter life differs from design basis	7	0.47	n/a	0-1
3. Waste chemistry different than expected	5	0.34	0.34	0-1
4. Waste loading varies significant from basis	3 (tie)	0.24	0.34	0-1
5. Plant capacity doesn't meet design basis	8	0.23	0.11	Alt. 2:0-1 Alt. 3:0-0.1
6. Generation of significant amounts off-spec material	6	0.15	0.22	Alt. 2:0-0.1 Alt. 3:0-1
7. Gem making capacity not achieved	9 (tie)	n/a	n/a	n/a
8. Lack of vendor response to RFP for stabilization or melter	9 (tie)	n/a	n/a	n/a
9. Radon standards cannot be met by stabilization	2	0.11	0.27	Alt. 2:0-0.1 Alt. 3:0-1
10. NTS won't take waste form other than glass	3 (tie)	n/z	0.22	0-1

List C

Technology Development

Thursday, January 23; 8:25 a.m. Brainstorming Session.

- 2. Formulation for waste
 - Materials testing performed based on formulation
 - recipe based on low temperature (1150 C)
- 1. -characterize the material: (for process control) (for melter design)
 - Physical properties testing (organics) for Silo 1 & 2 materials
 - rheology
 - corrosive testing
 - Develop surrogate (hi intensivity vs. low intensivity)
 - Decision: (joule heated melter?) (temperature?) (Batch vs continuous operation for melter)
 - Test specific requirements for melter (impact of lead in waste)
 - Melter procurement based on performance spec (6MT/day production scale melter)
 - Design evaluation based on alternative melter types
 - Market survey (melters suitable for silos 1 & 2 vit?)
 - Revise specification based on results of design evaluation
 - WRS-demo/testing
 - Transportable/modular system
 - Parallel effort on balance of plant design development
 - Melter control development
 - Safety analysis in parallel with design development
 - Document control
 - Establish parameters for appropriate safety margin (FMEA review by outside specialists)
 - Validate safety envelope definition as part of pilot/proof-of-process operations
 - Failure modes analysis
- 3. Design basis document: (design criteria) (functional requirements)
 - Develop control & surveillance system
 - Determine pretreatment required, if any
 - Revisit plant capacity (is 20 ton per day appropriate?)



List D

Health, Safety and Regulatory Issues

Thursday, January 23; 10:25 a.m. Brainstorming Session:

R = regulatory

H = health & safety

P = programmatic

- Uncertainty of final repository (need for contingency plan)
- State of Nevada could interfere based on change in waste form (nose under the tent theory)
- Laydown performance - used by Nevada to scrutinize change in waste form
 - potential impact -- need for retrievable waste form
- C & S assumptions turn out to be dramatically incorrect
- No stakeholder buy-in
- Consistent H&S criteria for Alternatives 2 & 3
- Potential for interim on-site storage; interim becomes long-term/permanent
- H - R Waste form and packaging performance (interim & long-term storage transport) grout & glass
 - Accurate transportation risk factors (train vs. truck)
 - Expense of implementing ALARA
 - Mitigation of potential accidents
 - Definition of "how clean is clean" for silo heel removal
- H Uncertainty associated with radon exposure to worker during processing (glass vs grout comparison)
- H Application of ALARA to design concept - consistent application to both vit and cement
- H Consideration for increased radiological exposure - resolution of headspace radon concentration
- H Give consideration to radon release (normal & accident) to remainder of site
 - Impacts of other FEMP projects on silos project
 - Contamination control
 - Industrial/OSHA
 - EPA doesn't accept path forward
 - Public perception of consequences
 - Institutional control resolutions
 - Emergency Response capability as program matures (able to maintain capabilities)
 - Demonstrate compliance of process equipment with requirements (CERCLA ARARs)
- H Emergency response capabilities required to deal with transportation accidents
 - Programmatic (free) money bias's decision
 - Ability to attract and hold on to experienced staff
 - Transportation route changes results in new stakeholders with concerns to be y
ddressed
 - Modified environmental permits for the choice of process
 - Changing regulations through the project life
 - Early project alignment with all regulatory bodies
 - Early & final definition of design base events
 - Understanding local hydrology
 - Quantity & extent of contamination of soil under silos
 - Becoming a long-term treatment for other sites' waste

LIST E

**IRT Comments to Base Case - Approach, cost, Schedule
January 24, 1997**

Note: Comments were made on the basis of a review of the summary level (Level 1) schedule and summary level cost comparisons. Many of the activities observed not to show up on the summary level schedule are included in the detailed schedule. FDF will forward copies of detailed (Level 4) schedules to the IRT for review.

- 1. The costs presented in the base case estimates for D&D and treatment of contaminated soils for Alternate 2 and 3 do not appear to be on the same basis (explanation requested).**
- 2. An approach involving a modular / transportable vitrification plant should be evaluated. It represents a significant potential cost reduction and schedule improvement.**
- 3. Consider eliminating future use of the existing vitrification pilot plant (Given the extent of modifications necessary to upgrade the VITPP for both radioactive service and 6 MT/day operation).**
- 4. Evaluate the feasibility of utilizing the existing vitrification pilot plant with a smaller capacity melter (Given that the capacity of many of the pilot plant support systems are marginal for the existing 1 MT/day melter)..**
- 5. From the base case cost estimate presented, it did not appear that the shipping containers for both the Silo 1 & 2 alternatives for vitrification and cement were on the same basis (as described in the basis and assumption for each of the Alternatives).**
- 6. Provide more details on the assumptions for each of the Alternatives.**
- 7. For vitrification alternatives, use a waste form other than gems.**
- 8. Perform a detailed cost contingency analysis.**
- 9. The activity associated with checkout of the Waste Retrieval System is not reflected on the schedule.**
- 10. Eliminate all "fast track" elements of the base case schedule.**
 - System Operability Testing appears to start at about 70% completion of construction**
 - Duration of activity for bid & award of construction packages appears inadequate**
 - Duration of construction activity appears inadequate**

**IRT Comments to Base Case - Approach, Cost, Schedule
January 24, 1997**

- **Duration of design period appears inadequate**
 - **General comment - minimize schedule overlap of critical path activities**
- 11. Perform a detailed schedule contingency analysis.**
 - 12. Allow adequate time for interaction with regulators (EPA, DNFSB, NRC and State of Nevada)**
 - 13. Development of operating and maintenance procedures do not appear on the schedule.**
 - 14. Development of the PSAR appears on the schedule, Development of the FSAR does not.**
 - 15. Operator training for the final remediation facility does not appear on the schedule.**
 - 16. Cold testing of the final remediation facility does not appear on the schedule.**
 - 17. The duration of the Silo 3 Stabilization activity (in Alternative 1 & 2) is too optimistic.**
 - 18. The cost estimate for Silo 3 Stabilization is not adequate.**
 - 19. Consider "privatizing" remediation of Silo 1 & 2 in a manor similar to the proposed approach for Silo 3, where the specific remediation technology is determined by the market place (another IRT member cautioned that such an approach might tend to limit stakeholder input to selection of remediation technology).**
 - 22. Procurement of waste containers is not shown on the schedule.**
 - 21. Site storage of waste containers prior to use is not indicated on the schedule.**