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TUESDAY: AUG 5, 1991: 9:00 AM PAUL STASCHI:
PROPOSED RD&D

RD & D Permit Meeting
July 2, 1991
AGENDA

o Introduction	Dave Turner
o Pilot Plant Testing Program	Don Flyckt
o Documentation	Don Flyckt
o Facility Description	Don Flyckt
o Permit Application	Steve Skurla/Lee Bostic
o Discussion	All
o Agreements/Action Items	

Pilot Plant Testing Program

Introduction

- Pilot Plant on the Hanford Site is needed to support:
  - Groundwater Remediation
  - Design of Effluent Treatment Systems
  - Permitting of Effluent Treatment Systems
- Immediate Concern is the Evaporator/PUREX Condensate Treatment Facility (Project C-018H)
  - Project Design Reviews
  - RCRA Delisting
  - WAC 173-216 or NPDES Permitting
  - Operator Training

Specific Pilot Plant Data Needs (Examples)

- Removal Efficiencies of Individual Unit Operations
- Removal Efficiencies of Combined Unit Operations
- Impact of Variable Feeds 2BDST : VARIABLE FEEDS -
- Establish Treatment Envelope
- Secondary Waste Volume and Composition
- Process Control Data
- Process Optimization Data
  - Oxidant Dosage
  - pH Range
  - Reaction Chamber Design
  - Operating Pressure
- Ion Exchange Resin Selection
- Long-Term Fouling Potential LEAF : PROCESS CONTROL (TO BE HELD FOR I/C) ? EFFLUENT
  - Maintenance and Cleaning Procedures
- Pre-Treatment Requirements

Testing Scope (Project C-018H)

- **Waste Types**
  - **Synthetic Wastes** (Evap. Process Condensate):
  - **Actual Evaporator Process Condensate**
  - **Spiked Process Condensate**
- **Bench-Scale**
- **Pilot Scale**
  - **5 gpm** (150gpm Full scale).
  - **Smallest Units Available which are Representative of Full-Scale Equipment**

Delisting Petition: ? SR Feeds:
Use of Verification Tanks.

Testing Approach

- o Performed on Individual and Combined Unit Operations
- o Pilot Plant will not be Integrated (i.e., Mock-up of C-018H System)
- o Initial Tests performed on Synthetic Wastes
  - Start-up Training and Development of Procedures
  - Establish Operating Envelope
- o Actual Wastes for Permitting and Delisting Data
  - Demonstrate Capabilities of Equipment with Actual Waste Matrix

Waste Description - Project C-018H

- 242-A Evaporator Process Condensate
  - Condensed Overheads from the Concentration of Double-Shell Tank Wastes
  - RCRA Listed Waste (F003, F005)
  - State Dangerous Waste (Ammonia)
- PUREX Ammonia Scrubber Distillate and PUREX Process Condensate
  - Condensed Overheads from the Concentration of Liquid Wastes Produced during the Reprocessing of Spent Nuclear Fuels
- Stored 242-A Evaporator Process Condensate
  - Liquid Effluent Retention Facility (LERF)
  - 13 million gallons maximum

Categories of Contaminants

- Suspended Solids (Particulates)
  - Inorganic
  - Organic

- Organics
  - Miscible
  - Immiscible

- Dissolved Ammonia

- Dissolved Solids (Ions)
  - Radioactive
  - Non-radioactive
  - Heavy Metals

Waste Description Summary

- Dilute Wastewater with Low-levels of Contamination

Constituent	Maximum
TOC	4900 ppm
Ammonia	9400 ppm
TDS	3.0 ppm
Conductivity	1500 US
pH	11.3
Total Beta	200,000 pCi/L

- Waste is not Ignitable; Corrosive; Reactive

Table 3-2. Chemical Constituents of Concern in C-018H Waste Water.

Constituents	Maximum Influent Concentration (ppb)	Most Restrictive Discharge Limit (ppb)	Constituents	Maximum Influent Concentration (ppb)	Most Restrictive Discharge Limit (ppb)
Inorganics			Organics		
Aluminum	4,992	50	1,1,1-Trichloroethane	5	7
Ammonia	1,360,000	1,300	1-Butanol	88,000	5,000
Barium	8	1,000	2-Butanone (methylethylketone)	120	10
Chloride	3,220	250,000	Acetone	5,100	50
Chromium	156	50	Benzyl Alcohol	18	20
Copper	127	1,000	Chloroform (Trichloromethane)	27	6
Cyanide	47	5.2	Dimethylnitrosamine	57	0.002
Fluoride	12,273	2,000	Methylenechloride	180	5
Iron	503	300	MIBK (Hexone)	17	5
Manganese	5	50	Phenol	33	39
Mercury	1.9	2	Pyridine	550	14
Nickel	17	100			
Nitrate	217,000	10,000[a]			
Sulfate	13,000	250,000			
Sulfide	66,000	14,000			
Uranium	1.03	59			
Vanadium	7	40			
Zinc	77	5,000			

[a]As equivalent nitrogen

- FW Chronic Toxicity Criteria: NPDES Permits -
- MTCA:

Table 3-3. Radionuclides and Radioactivity of Concern in C-018H Waste Water.

Radionuclides	Maximum Influent Level (pCi/L)	Most Restrictive Limit (pCi/L)
Total Alpha	100,000	1.2
Total Beta	200,000	40
* Tritium	60,000,000	80,000
90-Strontium	81,000	40
103-Ruthenium	48,000	2,000
106-Ruthenium	240,000	240
113-Tin	28,000	2,000
129-Iodine	560	20
134-Cesium	0.0088	80
137-Cesium	45,000	120
147-Promethium	32,000	4,000
155-Europium	1,400	4,000
238-Plutonium	1,200	1.6
239- & 240-Plutonium	120,000	1.2
241-Plutonium	12,000	80
241-Americum	6,500	1.2
Uranium(gross)	140	24

Planned Testing

- Filtration
- UV Oxidation
- Granulated Activated Carbon
- Reverse Osmosis
- Ion Exchange

Filtration

- Conducted near LERF
  - Transport of Waste will alter Characteristics
  - Skid Unit with up to Three Filtration Technologies (e.g., Backwashable Filter, Tubular Ultrafilter, Centificial Ultrafilter
- Long-term Test to Evaluate Performance and Fouling Potential
- Patterned after Savannah River Plant Testing

UV Oxidation

- Vendor Tests : PEROXIDE -
- Synthetic Process Condensate
  - Shakedown and Familiarization
  - Determine Organic Destruction Efficiency
  - Evaluate Effect of Feed Variability
  - Establish Operability Parameters
- Actual or Spiked Process Condensate
  - Determine Organic Destruction Efficiency
  - Optimization of Operability Parameters (pH, Oxidant Dose, Reaction Time)
  - Determine Cleaning Method and Frequency

UV Oxidation Pilot Plant Equipment Selection

- o Based on Initial Feasibility Testing
- o Preferred a System without Ozone for Safety Reasons
- o Preferred a Compacted System due to Space Considerations
- o 5 gpm Peroxidation Systems, Inc. Selected
  - Most Consistent Performance in Meeting Feasibility Criteria
  - Hydrogen Peroxide as Oxidant
  - Compact System using High Energy UV Lamps

-Air Emission Limits: Air Permits (Organics).

Granulated Activated Carbon

- o Potential Replacement or Enhancement of UV Oxidation
- o Synthetic Process Condensate
  - Capacity for Low Molecular Weight Organics
  - Secondary Waste Volume
- o Actual Wastes
  - No Test Currently Planned

Reverse Osmosis

- o Synthetic Process Condensate
  - Required Number of Stages
  - Shakedown and Familiarization
  - Determine Removal Efficiencies
  - Determine Water Recovery
  - Composition and Volume of Reject
- o Actual Process or Spiked Condensate
  - Confirm Number of Stages Required
  - Optimization Removal Efficiencies
  - Procedures to Reduce Effect of Fouling
  - Evaluate Cleaning Methods
- o Pilot Plant Equipment based on Feasibility Testing
  - 5 gpm Applied Membrane Unit Selected
  - Filmtech Poly Amide Membrane

Ion Exchange

- Performed on Bench-Scale

- Synthetic Process Condensate

  - Determine Removal Efficiencies
  - Select Preferred Resin
  - Determine Sizing Requirements
  - Determine Secondary Waste Volume and Composition

- Actual Process Condensate

  - Confirm Removal Efficiencies of Selected Resin
  - Verify Sizing Requirements
  - Verify Secondary Waste Volume and Composition

Pilot Plant Faciiity Description

Pilot Plant Siting

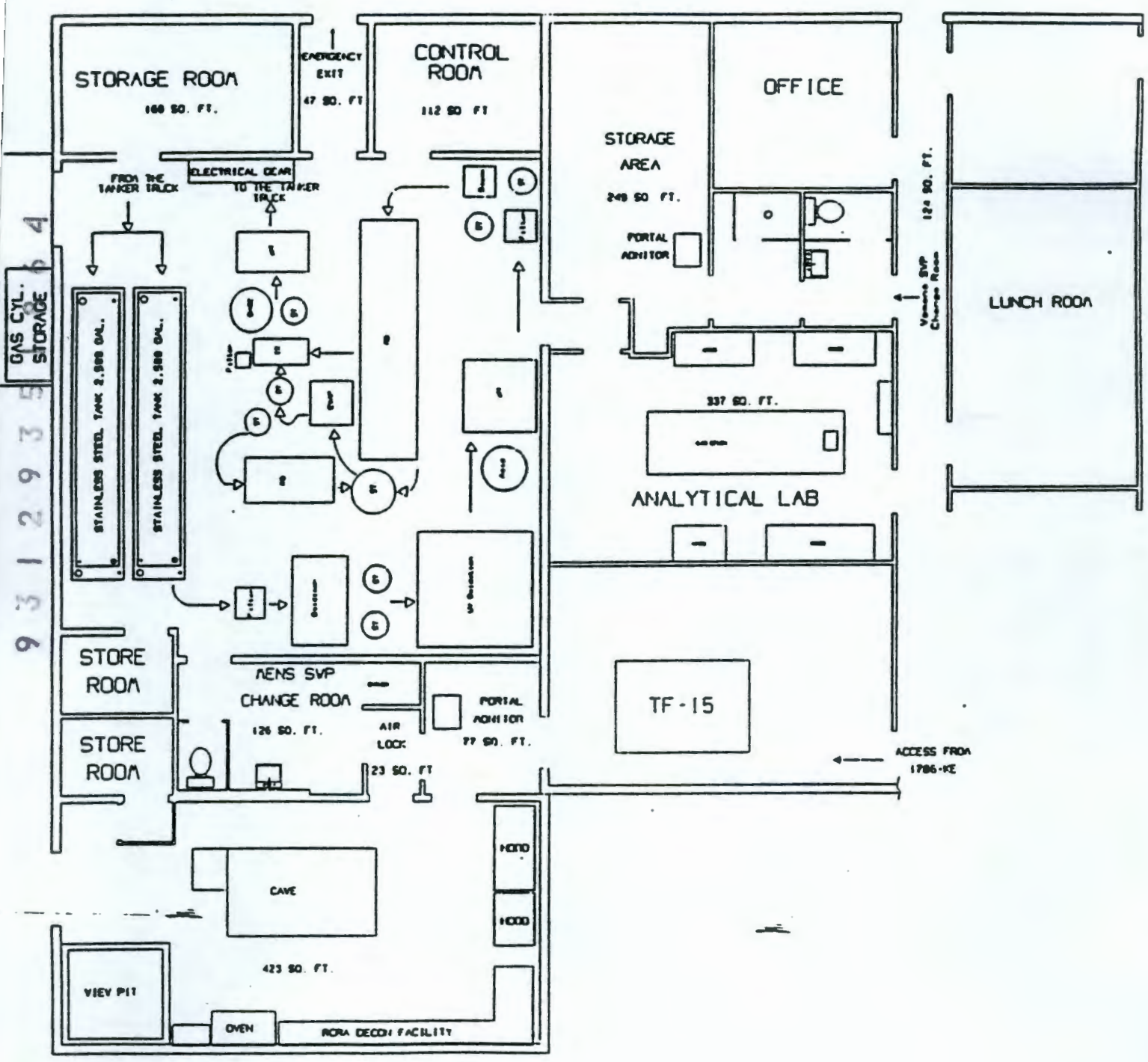
- o Construct New Facility
  - Did not Support C-018H Schedule
  - Expensive
- o Renovate Existing Facility at 1706-KE
  - Supported C-018H Schedule
  - Less Expensive than New Facility
  - Access to Ancillary Laboratory Equipment
  - Facility can be Reconfigured to Accommodate Other Flowsheets (i.e., Projects)

: 2903 Facility - Temporary location: Clean Fuels Lab.
pH 11 - (4-6) months RD (99% Removal of Ammonia).

1706-KE

- Past Use
  - Water Chemistry Studies and Treatment Development for 100 Area Reactors
- Current Use
  - RCRA Sample Equipment Preparation and Certification
- 242-A Process Condensate must be Transported to 1706-KE (approximately 6 miles)
  - Purchase Two (2) 5000 gallon Tankers (Temp Storage)
  - DOT Certified

PROPOSED PILOT PLANT FACILITY IN 1706-KE



Building Upgrades

- Remove Old Equipment/Piping
- Upgrade Restroom/Changeroom Facilities
- Ventilation : HVAC
- Seal Floor Drains
- Painting

- NEPA Documentation.

Feed System

- o Tanker Truck Unloading and Loading Area
  - Feed Tanker (5,000 gallon)
  - Effluent Tanker
- o Intermediate Storage Tanks
  - Approximately 500 Gallon Tanks between Unit Operations
- o Piping
  - Leak Tested
  - Catch Pans - below flanged joints
  - Some Flexible Piping may be Utilized
- o Catch Pans below Unit Operations

Analytical Upgrades

- Provide Quick Turn-around Process Testing:
  - Gas Chromatography
  - Ion Chromatography
  - Total Organic Carbon
  - Basic Wet Chemistry

Documentation

Documentation

- Treatability Test Program Plan
- Quality Assurance Program Plan
- Test Plans
  - Scope Limited to a Specific Test Objective
  - Results of Initial Test Plans used to Design Subsequent Tests
- Test Reports
  - Summarize the Results of Several Test Plans

Treatability Test Program Plan Outline

- Introduction
- Approach
- Program Management
- Cost
- Schedule
- Quality Assurance Requirements

Quality Assurance Project Plan Outline

- Based on QAMS-005

1. Project Description
2. Project Organization and Responsibilities
3. Quality Assurance Objectives
4. Sampling Procedures
5. Sample Custody
6. Calibration Procedures
7. Analytical Procedures
8. Data Reduction, Validation, and Reporting
9. Internal Quality Control
10. Performance and System Audits
11. Preventive Maintenance
12. Data Assessment Procedures
13. Corrective Action
14. Quality Assurance Reports
15. References

Table 3.2

DATA ACQUISTION PROTOCOL APPROPRIATE TO DATA USES

Quality Level	Data Uses	Data Acquisition Protocol: Equipment Configuration	Data Acquisition Protocol: Operating Parameters	Data Acquisition Protocol: Analytical Measurements
I	a. Familiarization b. Shakedown c. Non-process	Logbook sketch. Deviations from H-2 drawings/CVI/SOP noted in logbook.	Noted in logbook and on SOP data sheets. Documentation of equip. maintenance/instrument calibrations not required. Deviations from SOP noted in logbook.	Data to be noted in logbook/data sheets. Matrix spikes, matrix spike duplicates, surrogates, or determination of precision, accuracy, representativeness, comparability and completeness (PARCC) not required.
II	a. Optimization b. Determination of treatability range.	Same as for Quality Level I above.	Follow approved SOP. Process related equip. maintenance/instrument calibrations to be documented.	Same as for Quality Level I above except: documentation of analytical instrument calibrations required. Analyses to be per SOP.
III	a. Delisting petition. b. RCRA permitting c. Design	Logbook sketch. Configuration per H-2 drawings/CVI/and SOP.	Same as for Quality Level II above.	Matrix spikes, matrix spike duplicates, surrogates, and determination of PARCC required. Use SW-846 or other approved EPA protocol. Use CLP.

Test Plan Format

- Engineering Document Content Guidelines

- Outline
  1. Introduction
  2. Objective
  3. Scope
  4. Description of Test
  5. Expected Results
  6. Test Procedure
  7. Safety
  8. Quality Assurance → QAPP
  9. Organization and Functional Responsibilities
  10. Schedule
  11. Reports
  12. References
  13. Data Sheets

Test Report Format

- Engineering Document Content Guidelines

- Outline
  1. Introduction
  2. Description of Test
  3. Test Results
  4. Conclusions and Recommendations
  5. References
  6. Appendix

Permit Application

RD&D Permit Application - Contents

- FLEXIBILITY:
  - TEST PLANS
  - WASTE STREAMS / SPIKING OF WASTE STREAMS

- Introduction
- Research Plan
- Facility Description
- Waste Characteristics
- Process Information
- Procedures to Prevent Hazards
- Contingency Plan
- Personnel Training
- Closure Plan
- Reporting and Recordkeeping
- Certification
- Appendix - Example Test Plan

Introduction

- Reasons for Conducting the Tests
- Facility Permitting Method

Research Plan

- Type of Testing to be Completed under the RD&D Permit
- Structure under which Test Plans will be Performed so that Worker Health and the Environment are Protected
  - PROTECTIVE SYSTEMS DURING TESTING.
  - NO RELEASE DURING TESTING.
  - ORGANICS EMISSIONS.
- Flexibility to Add or Modify Test Plans as Testing Proceeds
- Format and Content of the Test Plans
  - LIMITATIONS OF EQUIPMENT -
    - Temp, Pressure, PH etc.
- Test Results to be Included in Test Reports
  - PROCESS FLOW SHEETS -
    - P&ID
- <u>Schedule for Development of Test Plans</u>
  - Provide EPA and Ecology with an Advance <u>Informational</u> Copies
- QA Program Plan under Which the Program will Operate

Facility Description

- Locations of Test Facilities
- Facility Site Plans Showing Additional Details

Waste Characteristics

- o Waste Sources Currently Planned for Test (242-A Process Condensate, Purgewater)

- o Incoming Waste is of Low Toxicity, not Ignitable or Reactive, will not Contain Greater than 10 Percent Organics

- o Waste will be Treated in 5,000 Gallon Batches (maximum)

  - Waste feed rate is 5 gpm

- o Waste will be Lower in Dangerous Constituents after Testing and will be Returned to LERF; Solids will be Transported to the Central Waste Complex for Storage and Eventual Disposal

- o Permit Flexible Enough to Allow Treatment of Other Waste Sources by Specifying Maximum Contaminant Limits

  - OVERALL PROTECTION

Process Information

- Equipment Description (Vendor Drawings, etc.) and Quantities of Waste Equipment can Hold
- Description of Secondary Containment
- Permit is Flexible Enough to Allow Other Equipment to be used if EPA is Supplied with Equipment Description Information
  - EQUIVALENT MATERIALS.
  - SAFEGUARDS FOR EQUIPMENT.

Procedures to Prevent Hazards

- Security Procedures and Structures
- Inspection Plans for Detecting Equipment Malfunctions, Leaks, etc.

o SAFEGUARDS FOR PROCESS TO PREVENT HAZARDS TO HUMAN HEALTH & ENVIRONMENT.

Contingency Plan

- General Hanford Site Emergency Plan
- Facility Specific Building Emergency Plan Developed using Existing Tank Farms Plans as a Guide

- 1706 KE:
- LERF :
- INTERNAL WASTE ACCOUNTING SYSTEM:
- TANK TRUCKS → TANK FARMS.

Personnel Training

- Guidance from Other Part B Applications
- 40 hour Hazardous Waste Training used where Applicable
- OJT Training Program for Personnel who will use the Various Pieces of Equipment

Closure Plan

- Assume Clean Closure

- Existing Facility Conditions (e.g., asbestos tile) will Require NEPA Documentation which may Affect the Closure Plan Content

Reporting and Recordkeeping

- Treatment Verification Testing
- Test Frequency
- Information Submitted to the Regulatory Agencies