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COMPOSITE LIQUID MITIGATION REPORT

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Abstract:
This document discusses liquid mitigation approaches for selected catch tanks and DCRTs.

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& Environmental Services, Inc.

Composite Liquid Mitigation Report

September 26, 2006

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1.0 INTRODUCTION

CH2M HILL Hanford Group, Inc. (CH2M HILL) recently declared two catch tanks (241-UX-302A and 241-ER-311) as assumed leaking tanks (*Tank 241-ER-311 Leak Assessment Report* [RPP-RPT-29163], *Tank 241-UX-302A Leak Assessment Report* [RPP-RPT-29711]). Following the declaration, the Department of Energy (DOE), Office of River Protection (ORP) agreed to provide the Washington State Department of Ecology (Ecology) with a proposed schedule for mitigation of free liquids from selected catch tanks and double-contained receiver tanks. DOE/ORP subsequently provided direction to CH2M HILL to develop a plan, including a schedule, for mitigation of free liquids from selected catch tanks and double-contained receiver tanks (Reid 2006).

CH2M HILL has initiated actions to remove the free liquids from catch tanks 241-UX-302A and 241-ER-311 in fiscal year 2006 (*Options for Responding to the Assumed Leak from Catch Tank 241-ER-311* [RPP-RPT-29484], *Options for Responding to the Assumed Leak from Catch Tank 241-UX-302A* [RPP-RPT-30564]). In addition, CH2M HILL has initiated an evaluation of 19 other tanks to determine actions required to provide liquid mitigation, and establish a schedule for completing these actions.

Table 1 identifies the additional 19 catch tanks and double-contained receiver tanks (DCRTs), provides a summary description, and identifies their location on the Hanford Site.

Table 1. Catch Tanks and Double-Contained Receiver Tanks (2 Sheets)

Tank	Description	Location
241-A-302A	Horizontal cylinder, 9 feet diameter, 16 feet 6 inches long	South of PUREX, 200 East Area
241-A-302B	Horizontal cylinder, 8 feet diameter, 30 feet long.	241-A tank farm, 200 East Area
241-A-350	Vertical cylinder, sits beneath pump pit, 4 feet 6-inch diameter, 6 feet 11 inches high	241-A tank farm, 200 East Area
241-A-417	Vertical cylinder, sits beneath pump pit, 24 feet 6-inch diameter, 13 feet 8 inches high	241-A tank farm, 200 East Area
241-AX-152	Rectangular stainless steel lined concrete vault, 22 feet 2 inches long, 6 feet wide, 11 feet 5 inches deep	Between 241-AY and 241-AX tank farms, 200 East Area
241-AZ-151	Rectangular carbon steel-lined concrete vault, 24 feet long, 6 feet wide, 11 feet deep	241-AZ tank farm, 200 East Area
241-AZ-154	Rectangular carbon steel lined vault 5 feet long, 5 feet wide, 4 feet 6 inches deep	South of tank 241-AZ-101, 241-AZ tank farm, 200 East Area
241-B-302B	Horizontal cylinder, 9 feet diameter, 36 feet long	East of B Plant, 200 East Area

Table 1. Catch Tanks and Double-Contained Receiver Tanks (2 Sheets)

Tank	Description	Location
241-EW-151	Vertical cylinder, sits within a concrete vault, 4 feet 6 inches diameter, 6 feet 11 inches high	Between 200 East and West Areas
240-S-302	Horizontal cylinder, 9 feet diameter, 39 feet 4 inches long	North of REDOX, 200 West Area
241-S-302A	Horizontal cylinder, 9 feet diameter, 16 ½ feet long	241-S tank farm, 200 West Area
241-S-304	Vertical cylinder, 9 feet diameter, 15 feet tall	East of the SX tank farm, 200 West Area
241-TX-302C	Horizontal cylinder, 9 feet diameter, 39 feet 4 inches long	Southeast of T Plant, 200 West Area
241-U-301B	Vertical cylinder, unlined concrete, 20 feet diameter, 19 feet high	241-U tank farm, 200 West Area
244-A	Vertical stainless steel tank, 14 feet diameter, 14 feet high	North of PUREX and West of 241-AY tank farm, 200 East Area
244-BX	Horizontal carbon steel tank, 12 feet diameter, 38 feet 6 inches long	241-BX tank farm, 200 East Area
244-S	Vertical cylinder, carbon steel, 15 feet diameter, 16 feet high	241-S tank farm, 200 West Area
244-TX	Horizontal cylinder, carbon steel, 12 feet diameter, 38 feet 6 inches long	Between 241-TY and 241-TX tank farms, 200 West Area
244-U	Horizontal cylinder, 12 feet diameter, 35 feet long, never placed into service, never received waste	241-U tank farm, 200 West Area

Notes:
PUREX = Plutonium Uranium Extraction Facility
REDOX = Reduction Oxidation Facility

This report describes the status of each of the 19 tanks based on a visual assessment of the above grade conditions at the tanks (captured in photographs) and a limited review of available drawings and documents (e.g., engineering drawings, reports, walk downs, etc.). Results of the review are presented in Appendix A. An initial review of available waste volume information indicated that a number of the tanks in Table 1 may not require mitigation actions. One of the tanks never received waste and a number of tanks contain little or no liquid. Additionally, some of the catch tanks and DCRTs have sound construction as determined by examinations and evaluations completed as a part of tank integrity assessments.

A review of photographs and the limited information available on the tank risers suggests that significant uncertainty exists regarding the ability to access the tanks for sample collection and equipment installation. These tanks will require an assessment of current tank conditions to determine riser availability and status (e.g., equipment requiring removal to make use of the riser). Given the relatively small volumes of liquids in some of the tanks and unique tank

configurations, alternative mitigation strategies such as evaporation and the use of absorbents were identified as alternatives to pumping the liquid out of the tanks.

This report presents planning level schedule estimates along with the associated assumptions for mitigating the free liquids in the selected tanks. The proposed schedule mitigates the potential for future leakage by addressing the highest risk tank first, and maximizes efficiency by re-deploying the same or similar systems on as many tanks as possible. These schedules have a high degree of risk due to technical uncertainties. For example, accessing some tanks will require opening pits and making manned pit entries. Other tanks will require removal of installed long-length equipment or riser sleeves to make use of existing risers.

Additionally, this report assumes that free liquids originated predominantly from the intrusion of rain water and snowmelt and have contamination levels low enough to meet Washington State Department of Transportation (DOT) Type A limits for transport on public roads. The schedule estimates assume the transport of most of the recovered liquid using the available Walker tanker. However, waste must meet Type A limits to use this tanker.

Where information regarding treatment, management, and disposal of the radioactive source, byproduct material, special nuclear material (as defined by the Atomic Energy Act of 1954, as amended) and/or the radionuclide component of mixed waste has been incorporated into this report, it is not incorporated for the purpose of regulating the radiation hazards of such components under the authority of this report and Chapter 70.105 RCW.

2.0 TANK STATUS

2.1 CONTENTS

Available information on tank content varies from tank to tank. Sample analysis results and/or process knowledge exists for some tanks. Other tanks have little or no available information on their contents.

Determining activities required to mitigate free liquids requires information on the liquid volume and characteristics (e.g., free versus interstitial liquid). Some tanks may contain liquid primarily from infiltration of precipitation while some tanks may contain a combination of process liquid and infiltration from rain and snow melt. Process liquid will likely have higher concentrations of radiological and toxicological constituents.

The characteristics of the liquid in the tanks determine the requirements and regulations that apply to its recovery, transportation, and disposal. Managing lightly contaminated water has a less restrictive set of requirements than managing the highly contaminated waste in the single- and double-shell tanks. Completion of a safety evaluation requires a technical basis for assumptions about the liquids and solids in a tank. Also, the volume and characteristics influence the selection of the disposal site (e.g., waste compatibility for a double-shell tank,

acceptance criteria for the Liquid Effluent Retention Facility [LERF]/Effluent Treatment Facility [ETF]).

Whenever possible, sampling provides the preferred method for establishing liquid characteristics for planning purposes. In the absence of samples, historical process knowledge may provide an adequate basis for estimating liquid characteristics in some tanks. The tanks addressed in this report have limited available information on their solids content. The overall waste volumes are measured using a level gauge and the tank geometry. In lieu of solids data, this report uses the total waste volume as representative of the liquid volumes.

Table 2 summarizes the best available information for the liquid content of the 19 tanks.

Table 2. Tank Contents (2 Sheets)

Tank	Total Waste Volume (gallon)	Notes	Reference
240-S-302	8,033	Sample data available for liquids. Liquids have low concentration consistent with rain water/snow melt. Identified as an assumed leaking tank in 1985.	HNF-EP-0182 RPP-RPT-29878
241-A-302A	662	Liquids expected to be rain water/ snow melt	HNF-EP-0182
241-A-302B	6,226	Liquids expected to be rain water/ snow melt	HNF-EP-0182
241-A-350	487	Liquids expected to be rain water/snow melt	HNF-EP-0182
241-A-417	1,176	Liquids expected to be rain water/ snow melt	HNF-EP-0182
242-AX-152	26	Drainage receiver for A farm complex. Declared a leaking tank in 2001 and pumped. Level constant at 0 in early 2006	HNF-EP-0182 RPP-RPT-29878
241-AZ-151	1,436	Collected water condensate from tanks 241-AZ-101, 241-AZ-102, 241-AY-101, and 241-AY-102	HNF-EP-0182
241-AZ-154	25	Used to collect condensate from AZ-101 and AZ-102 in-tank steam heating coils. Waste level constant at 0 in early 2006	HNF-EP-0182 RPP-RPT-29878
241-B-302B	4,930	Liquids expected to be rain water/ snow melt	HNF-EP-0182
241-EW-151	506	Liquids expected to be rain water/ snow melt along with drainage from the old cross-site transfer line that is no longer in service	HNF-EP-0182

Table 2. Tank Contents (2 Sheets)

Tank	Total Waste Volume (gallon)	Notes	Reference
241-S-302A	0	Partially filled with grout in 1991	HNF-EP-0182
241-S-304	4	Received drainage from the 241-S-151 diversion box and S-304 pump pit.	HNF-EP-0182
241-TX-302C	193	Drainage from 241-TX-154 diversion box and 241-TX-302C pump pit	HNF-EP-0182
241-U-301B	1,436	Drainage from diversion boxes. Liquid and solid sample data is available.	HNF-EP-0182
244-A	4,754	Designed to provide short term storage of supernatant waste pumped from the A single-shell tank farm.	HNF-EP-0182
244-BX	10,960	Designed to provide short term storage of supernatant waste pumped from the B, BX, and BY single-shell tank farms.	HNF-EP-0182
244-S	4,073	High activity liquids and sludge waste from 222-S lab. And S/SX saltwell pumping. BBI Inventory available. Expected to exceed DOT Type A shipment thresholds	HNF-EP-0182
244-TX	7,156	Designed to provide short term storage of supernatant waste pumped from the T, TX, and TY single-shell tank farms.	HNF-EP-0182
244-U	Unknown	Never in service and never received waste. Estimated by CH2M HILL process engineering to contain approximately 10,000 gallons of rain/snowmelt	RPP-13033

Notes:

BBI = Best Basis Inventory

DOT = U.S. Department of Transportation

References:

HNF-EP-0182, 2006, *Waste Tank Summary Report for Month Ending June 30, 2006*, Rev. 219, CH2M HILL Hanford Group, Inc., Richland, Washington.

RPP-13033, 2006, Tank Farms Documented Safety Analysis, Rev. 1-P, CH2M HILL Hanford Group, Inc., Richland, Washington.

RPP-RPT-29878, 2006, *Catch Tank Level Trend Assessment*, Rev. 0, CH2M HILL Hanford Group, Inc., Richland, Washington.

2.2 CONFIGURATION

Columbia Energy & Environmental Services, Inc. (Columbia Energy), under contract to CH2M HILL, performed an initial investigation of the tanks. The investigation establishes the (likely) configuration of the tanks based on a review of engineering drawings and a visual assessment of surface conditions at the tank sites. Appendix A provides a tank summary.

Table 3 summarizes the current configuration of the 19 tanks and identifies reference drawings.

Table 3. Configuration (3 Sheets)

Tank	Notes	Drawing Reference
240-S-302	One visible above-grade riser containing an ENRAF	H-2-5211
241-A-302A	Weather sealed. Two visible risers containing an ENRAF and breather filter or vapor sample port	H-2-53096
241-A-302B	Located on slope east of A farm. Entire surface area is covered by shotcrete indicating a potential surface contamination problem. One visible riser containing a manual tape.	D-61696 H-2-44505 H-2-53096 H-2-57452
241-A-350	Sealed with Hypalon. No visible above-grade risers. One 12-inch riser in pump pit	D-62002 H-2-70538 H-2-70539
241-A-417	Weather sealed. No visible above-grade risers. One 12-inch riser in pump pit identified on drawings	H-2-56800 H-2-57302
241-AX-152	Weather sealed and isolated. Potential access through breather filter. 1-inch riser with manual tape (Johnson 1999)	H-2-44580
241-AZ-151	Weather sealed. Four visible above-grade risers. One 12-inch riser in pump pit	H-2-68308 H-2-68316 RPP-5963
241-AZ-154	Weather sealed and isolated.	H-2-68315 H-2-68367
241-B-302B	Surface covered with shotcrete indicating a potential surface contamination problem. No visible above-grade risers	W-77092
241-EW-151	Weather sealed. Three above-grade risers containing a FIC, breather filter, and leak detector	D-62002 H-2-43148 RPP-5963
241-S-302A	Weather sealed and isolated	H-2-1795 H-2-71664
241-S-304	Weather sealed and isolated	H-2-85019 H-2-85031
242-TX-302C	Visible riser with an ENRAF	H-2-832 H-2-71660

Table 3. Configuration (3 Sheets)

Tank	Notes	Drawing Reference
241-U-301B	Four visible above-grade risers. Two empty 12-inch risers, one 4-inch riser containing an ENRAF, one 4-inch riser with cap	H-2-71653 RPP-5963
244-A	Weather sealed and isolated	H-2-38203 H-2-38229
244-BX	Weather sealed and isolated	H-2-73781 H-2-73865 H-2-73933
244-S	No above grade access. Tank access requires pit entry and may require removal of the drop leg lid	H-2-71049 H-2-71052
244-TX	Weather sealed and isolated	H-2-73781 H-2-73909 H-2-73933
244-U	Not in service, above grade risers with manual tape visible	H-2-73917 H-2-73919 H-2-73933

Notes:

FIC = Food Instrument Corporation

References:

D-61696, Sheet 1, 1943, *Untitled*, Rev. 0, DuPont, Wilmington, Delaware.

D-62002, Sheet 1, 1961, *Untitled*, Rev. 59, DuPont, Wilmington, Delaware.

H-2-832, Sheet 1, 1980, *Catch Tank Elevation and Piping Arrangement 241-TX-302B-C and 241-UX-302*, Rev. 4, General Electric Co., Fairfield, Connecticut.

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H-2-5211, Sheet 1, 1981, *Catch Tank Elevation & Piping Arrangement*, Rev. 2, General Electric Co., Fairfield, Connecticut.

H-2-38203, Sheet 1, 1990, *Structural Plans – Sections & Details 244-A Lift Station*, Rev. 2, Vitro Engineering Division, Automation Industries, Inc., Richland, Washington.

H-2-38229, Sheet 1, 1976, *Catch Tank Modifications TK-244-A*, Rev. 1, Vitro Engineering Division, Automation Industries, Inc., Richland, Washington.

H-2-43148, Sheet 1, 1991, *General Arrangement Vent Station Diversion Box 241 EW 151*, Rev. 5, General Electric Co., Fairfield, Connecticut.

H-2-44505, Sheet 1, 1972, *Schematic Piping Diagram for 241-A Waste Disposal Facility*, Rev. 3, General Electric Co., Fairfield, Connecticut.

H-2-44580, Sheet 1, 1964, *Structural 241-AX-152 Diverter Station Plans & Section*, Rev. 2, General Electric Co., Fairfield, Connecticut.

H-2-53096, Sheet 1, 1961, *Piping – General Arrangement Underground & Trench Piping Diversion Box – Stack-Catch Tank Plan – Sections*, Rev. 5, General Electric Co., Fairfield, Connecticut.

H-2-56800, Sheet 1, 1987, *Structural Concrete Tank 241-A-417, Plan, Sections, and Details*, Rev. 4, General Electric Co., Fairfield, Connecticut.

H-2-57302, Sheet 1, 1990, *Pump Pit Arrangement*, Rev. 3, General Electric Co., Fairfield, Connecticut.

H-2-57452, Sheet 1, 1959, *Catch Tank Installation at Diversion Box 241-A-152*, Rev. 3, General Electric Co., Fairfield, Connecticut.

Table 3. Configuration (3 Sheets)

Tank	Notes	Drawing Reference

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H-2-68315, Sheet 1, 1973, *Structural Concrete Condensate Pump Pit Plans, Sections, & Details*, Rev. 2, Hanford Engineering Services, Vitro Corporation of America, Richland, Washington.

H-2-68316, Sheet 1, 1974, *Structural Concrete Catch Tank Plans, Sections & Details*, Rev. 2, Vitro Engineering Corporation, Automation Industries, Inc., Richland, Washington.

H-2-68367, Sheet 1, 1990, Condensate Pump Pit Arrangement, Rev. 2, Vitro Engineering Corp., Richland, Washington.

H-2-70538, Sheet 1, 1981, *Piping Arrangement Drainage Lift Station 241-A-350*, Rev. 3, Vitro Engineering Corporation, Automation Industries, Inc., Richland, Washington.

H-2-70539, Sheet 1, 1980, *Drainage Lift Station Sections and Details*, Rev. 3, Vitro Engineering Corporation, Automation Industries, Inc., Richland, Washington.

H-2-71049, Sheet 1, 1981, *Catch Tank TK-244-S*, Rev. 3, Vitro Engineering Corporation, Automation Industries, Inc., Richland, Washington.

H-2-71052, Sheet 1, 1983, *Piping Plans and Sections*, Rev. 3, Vitro Engineering Corporation, Richland, Washington.

H-2-71653, Sheet 1, 1985, *Piping Plans and Sections 241-U Area*, Rev. 1, Vitro Engineering Corporation, Richland, Washington.

H-2-71660, Sheet 1, 1985, *Piping Plan and Elevations 241-TX-154 & 241-TX-302C*, Rev. 2, Vitro Engineering Corporation, Richland, Washington.

H-2-71664, Sheet 1, 1985, *Piping Plans, Section & Detail 241-A-151 & 241-A-302A*, Rev. 1, Vitro Engineering Corporation, Richland, Washington.

H-2-73781, Sheet 1, 1982, *Civil Site Plans 241-BX and TX Tank Farms*, Rev. 1, Vitro Engineering Corporation, Richland, Washington..

H-2-73865, Sheet 1, 1983, *Piping Receiver Vault Plan & Sections*, Rev. 4, Vitro Engineering Corporation, Richland, Washington.

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H-2-73917, Sheet 1, 1982, *Piping Plans & Sections*, Rev. 3, Vitro Engineering Corporation, Richland, Washington.

H-2-73919, Sheet 1, 1983, *Piping Receiver Vault Plan & Elevations*, Rev. 4, Vitro Engineering Corporation, Richland, Washington

H-2-73933, Sheet 1, 1979, *Receiver Vessel Interface Control Requirements*, Rev. 3, Vitro Engineering Corporation, Richland, Washington.

H-2-85019, Sheet 1-2, 1993, *STRL 241-S-304 Catch Tank Elevation/Section*, Rev. 1, Kaiser Engineers Hanford Company, Richland, Washington.

H-2-85031, Sheet 1-2, 2006, *Piping Plan Catch Tank*, Rev. 2, Kaiser Engineers Hanford Company, Richland, Washington.

Johnson, 1999, "Report on Catch Tank Configurations", Interoffice Memo 74F00-GDJ-99040, Lockheed Martin, Nuclear Safety and Licensing, December 14, 1999, Richland, Washington.

RPP-5963, 2000, *Engineering Task Plan for the Integrity Assessment Examination of Double Contained Receiver Tanks (DCRT) Catch Tanks and Ancillary facilities*, Rev. 0, CH2M HILL Hanford Group, Inc., Richland, Washington.

W-77092, Sheet 1, 1944, *9'-0" Dia. X 36'-0" Catch Tank Arrangement*, Rev. 0, DuPont, Wilmington, Delaware.

3.0 REQUIREMENTS

No established criteria define the extent of liquid removal from catch tanks and DCRTs required for regulatory acceptance. However, the primary goal is to minimize the potential for continued or future leakage while protecting the worker, public, and environment. As such, this report assumes that best available technology will be used to remove or mitigate, through pumping, evaporation or stabilization with absorbent, as much free liquid as technically practical. Furthermore, this report assumes that these mitigation measures will meet criteria once established.

Consistent with goals of protecting the worker, public, and environment, the following requirements apply to recovery or mitigation of free liquids in catch tanks and DCRTs:

- Use either passive or active high-efficiency particulate air (HEPA) filtration (as appropriate) during all activities that will or may disturb waste.
- Comply with the approved safety basis during all liquid mitigation actions.
- Establish a technical basis for waste characterization before retrieving any liquid (i.e., sampling or process knowledge).
- Dispose of recovered liquid at the ETF or a double-shell tank based on waste characterization information.
- Ensure liquid destined for the ETF meets LERF/ETF acceptance criteria.
- Ensure liquid destined for a double-shell tank meets waste compatibility requirements by completing a waste compatibility assessment.
- Transport recovered liquid to the unloading location in the Walker tanker or the LR-56 tanker truck.
- Use the Walker tanker to transport recovered liquid when the waste does not exceed thresholds for DOT Type A waste.
- Use the LR-56 tanker truck to transport recovered liquid when the waste characteristics exceed thresholds for DOT Type A shipments.
- Complete an operational readiness review and required air permitting before using the LR-56 tanker truck to transport liquid waste.
- Isolate tanks after free liquid removal to prevent intrusion. Isolation does not fall within the scope of liquid mitigation actions and will occur as a follow-on action.
- Use breather filters or exhausters to enhance airflow and assume subsequent evaporation will meet existing requirements for ventilation systems.

- Develop requirements for absorbents, both from a material selection and delivery into the tank standpoint, prior to design, testing, and deployment.

4.0 MITIGATION OPTIONS

RPP-RPT-29484 and RPP-RPT-30564 describe three options for mitigating free liquids from within catch tank 241-UX-302A and 241-ER-311. The options apply equally to the other tanks, and include the following:

- Pump the free liquids out of the tank and into a tanker truck for transfer to a double-shell tank or to ETF.
- Use a portable exhauster or passive ventilation system to enhance evaporation in the tank to dry it out.
- Add absorbents to the tank to bind with the free liquid.

A review of available information identified a number of unique conditions that warrant further evaluation and consideration. Additionally, this report identifies alternative options to liquid mitigation that warrant consideration to address specific conditions.

Some tanks contain installed pumps that might still operate. However, use of existing pumps would require new measures to minimize drain back.

Some tanks sit in vaults. The potential exists to remove these tanks and package them for onsite disposal in a low-level burial ground. Reportedly, the Idaho National Engineering and Environmental Laboratory removed and disposed of a small tank (PM2A tank). Investigative actions did not determine the details associated with this action. Tank removal provides more permanent solution that may offer near term benefits from a work completion standpoint and long-term benefits by precluding the need to perform future actions on the tank. Further investigation would be required to identify the details and issues required to develop and evaluate the strategy.

The summary schedule includes an engineering evaluation task to develop and evaluate alternatives for liquid mitigation.

4.1 REMOVAL OF LIQUIDS BY PUMPING

CH2M HILL has considerable experience pumping and transferring free liquids from tanks. The pumping/transfer system developed for tank 241-UX-302A (i.e., bladder pump and Walker tanker) has potential applicability at other catch tanks.

The bladder pump can fit down a 4-inch riser and has the capacity to pump approximately 200 to 300 gallons per 24-hour period. The bladder pump has a low pumping rate suitable for use in catch tanks with small liquid volumes. Alternatively, this report identifies a progressive cavity pump with a higher pumping rate as a substitute for the bladder pump in tanks with substantial liquid volumes.

The retrieval system can transfer liquid to a double-shell tank through a hose or by way of a tanker (i.e., Walker tanker).

For tanks with waste concentrations that exceed the DOT Type A waste shipment criteria, liquid transfers will have to occur using a hose-in-hose transfer line assembly or by way of the LR-56 tanker truck. The LR-56 has a design consistent with the function, but the unit available onsite requires an Operational Readiness Review as well as air permitting (both rad and non-rad) prior to being put into operation.

4.2 REMOVAL OF LIQUIDS THROUGH EVAPORATION

One of the catch tanks has a configuration uniquely suited to take advantage of an operating ventilation system to evaporate the free liquids. Tank 241-AZ-151 connects to the 241-AZ-702 vent station. Liquid level monitoring performed before weather sealing of the tank showed a measurable evaporation rate due to air flow through the tank and out the vent station. Weather sealing stopped the in leakage of air and the resulting evaporation rate dropped. Installation of a breather filter on tank 241-AZ-151 will restore air flow and the associated evaporative effects.

4.3 STABILIZATION OF LIQUIDS WITH ABSORBENTS

The use of absorbents has a number of advantages in tanks with small volumes of liquids, tanks where installed pumps cannot line up with the low point in the tank, and tanks with installed contaminated equipment requiring removal to permit installation of retrieval equipment.

The use of absorbents to stabilize free liquids may reduce worker exposures and the risks associated with pumping and transfer of contaminated liquid using a tanker truck. Also, placement of absorbents would not disturb waste since the distribution equipment will not directly contact the waste.

However, a number of technical issues require resolution prior to placing absorbents in tanks. A suitable materials needs to be selected and the delivery system designed. Initial uncertainties associated with absorbents include the following:

- The resistance of the material to degradation in a radioactive environment
- The impact the material will have on future waste retrieval
- Ventilation requirements during material placement

- Material distribution requirements (e.g., polymer type materials may not wick and require an even distribution across the tank bottom).

Issues associated with the use and delivery of absorbents in the catch tank that require resolution in the development phase include the following:

- The absorbent delivery system must have characteristics and dimensions suitable for vertical deployment through a 4-inch riser.
- The system must have the ability to deliver the absorbent horizontally. The delivery system will require an articulating nozzle capable of distributing absorbent across the tank floor.
- The delivery system must have the ability to propel absorbent to or near the edges of the catch tank (depending on the tank and its configuration, the system may have to propel the absorbent up to 25 or 30 feet).
- The absorbent must have the ability to withstand the deleterious effects of exposure to low-level radiation for years until tank closure will occur.
- If the delivery system utilizes compressed air to disperse the absorbent, it must demonstrate that this does not present an increased radiological contamination hazard.
- The absorbent must have sufficient compatibility with the liquid and environment to resist degradation.
- The absorbent may require additional actions be taken for future retrieval.

5.0 TANK GROUPS

Grouping tanks based on similar characteristics simplifies the planning process by evaluating tanks with similar configurations and or liquid volumes together.

A number of tanks appear to have configurations and waste volumes that do not require removal of free liquids. Of the 19 tanks, 4 of the tanks have little or no free liquid. Three other DCRTs have undergone an integrity assessment that determined they have secondary containment suitable for storage of liquids in the event of a tank leak. One of the DCRTs, 244-U never entered service and never received any waste. Table 4 contains a list of tanks that do not require mitigation to prevent leakage.

Table 4. Tanks Not Requiring Mitigation

Tank	Basis	Reference
241-AX-152	Weather sealed and isolated. Tank is virtually empty (<26 gallons of waste).	HNF-EP-0182
241-AZ-154	Weather sealed and isolated. Tank is virtually empty (~25 gallons of waste).	HNF-EP-0182
241-S-302A	Weather sealed and isolated. Tank is empty (0 gallons of waste).	HNF-EP-0182
241-S-304	Weather sealed and isolated. Tank is virtually empty (4 gallons of waste).	HNF-EP-0182
244-A	Functional secondary containment as determined through tank integrity assessment. Sump level at 0 inches based on SACS.	RPP-6829
244-BX	Functional secondary containment as determined through tank integrity assessment. Sump level at 0 inches based on SACS.	RPP-6829
244-TX	Functional secondary containment as determined through tank integrity assessment. Sump level at 1.25 inches based on SACS.	RPP-6829
244-U	Never placed into service. Tank was never used to receive or store waste. Tank level 32.65 inches in October of 1999 based on SACS. Estimated at ~10,000 gallons of water.	RPP-13033

Notes:

SACS = surveillance analysis computer system

References:

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RPP-6829, 2001, *Engineering Report on Double Shell Tank (DST) System Miscellaneous Tanks*, Rev. 0, CH2M HILL Hanford, Group, Inc., Richland, Washington.

RPP-13033, 2006, *Tank Farms Documented Safety Analysis*, Rev. 1-P, CH2M HILL Hanford Group, Inc., Richland, Washington.

The other 11 tanks require mitigation to remove or stabilize free liquid or confirm the integrity of the primary and secondary containment system. Section 6.0 and Appendix C present a plan and schedule for these tanks.

Sample data exists for some but not all of the tanks. The combination of sample data and process knowledge suggests that most tanks contain dilute liquid. This liquid will likely have low concentrations of radiological and toxicological constituents and can be handled as contaminated water. An exception is DCRT 244-S. DCRT 244-S contains highly-contaminated liquid and initial evaluations indicate that the liquid in 244-S will exceed DOT Type A waste shipment criteria. Any liquids removed from 244-S would require transport through a hose-in-hose transfer line to a double-shell tank or to the LR-56 tanker truck.

Of the tanks that require mitigation action, there are two general categories based on waste volume. A number of tanks have waste volumes in the hundreds to 1,000-gallon range. A second group of tanks have waste volumes between 4,000 and 8,000 gallons. There are four catch tanks with less than 1,000 gallons of waste, three tanks with an estimated wastes volume between 1,000 and 2,000 gallons, and three tanks with estimated waste volumes between 4,000 and 8,000 gallons.

6.0 MITIGATION STRATEGY

The mitigation strategy adopted in this report seeks to minimize the potential for continued and future leakage from catch tanks and DCRTs and maximize number of tanks and extent of actions taken within available resources. Consistent with these goals, this report adopts the following planning assumptions:

- Pump free liquids from tanks containing estimated waste volumes greater than 2,000 gallons.
- Use absorbents to stabilize free liquids in tanks with estimated waste volumes below 1,000 gallons.
- For tanks with estimated waste volumes between 1,000 and 2,000 gallons perform a tank specific assessment considering tank access, availability of sampling and analysis data, and the issues associated with either pumping the liquids or placing absorbent in the tank.
- Schedule activities necessary to support removal of free liquids from assumed leaking tanks (e.g., tank 240-S-302) first to minimize the potential for additional leakage.
- Re-use the tank 241-UX-302A liquid retrieval system and Walker tanker to remove free liquids from as many tanks as possible (e.g., tanks with available 4-inch risers, no or few in-tank obstructions, free liquid low in radiological/toxicological contaminates, etc.) (*Engineering Report for 241-UX-302A Liquid Retrieval System* [CEES-0330]).
- For planning purposes, assume that collection of solid samples requires development of a peristaltic pump system. Three of the 11 tanks require sampling to establish the waste characteristics of the liquids and solids. This assumes no sampling is required for tanks where absorbent is added as the liquid mitigation method.
- Initiate sampling and analysis for tanks without existing sample data, and assume the results will permit liquid removal using the tank 241-UX-302A liquid retrieval system and Walker tank.

- Schedule walk downs and field work necessary to assess current tank conditions and configurations to determine riser availability and equipment removal requirements.

- Develop and evaluate alternative mitigation options that may provide lower risk approaches to removing or stabilizing the free liquids in the tanks.

- Update this report based on sample results and walk downs.

- If Ecology agrees that integrity assessments for tanks 244-A, 244-BX, and 244-TX provide a sufficient basis for deferring near term action, initiate an integrity assessment of DCRT 244-S. If the assessment determines that DCRT 244-S does not have sound secondary containment, determine whether or not to use the LR-56 tanker for waste transport.

Evaluation of the available tank information along with consideration of the planning assumptions results in the tank specific recommendation for liquid removal presented in Table 5.

Table 5. Liquid Mitigation Strategy Summary Table (2 Sheets)

Tank	Initial Conditions Assessment Required?	Sample Needs	Assume Equipment Removal Required	Total Waste Volume (gallon) (HNF-EP-0182)	Liquid Mitigation System/Equip	Planning Assumption for Tank Access	Overground Transfer an Option?	DSA Amendment Required?	Notes	Basis	Project Risks (Schedule)
240-S-302	Yes	Solid	Yes	8,033	PC pump & WT	Uncover 2 x 4-inch risers, direct access to tank	No, ~2,500 feet to SY tank farm	Yes, one time DSA amendment for pump & WT systems. DSA amendment will cover both bladder pump and PC pump	Assumed leaking tank, high priority Risers buried, requires excavation as a part of the initial conditions Drawings show several risers above grade, field inspection shows only an ENRAF with a partially buried isolation valve	Need solids sample/analysis Risers buried Assumes FIC sleeve removal New pumping system required AB amendment assumed	Moderate
241-A-302A	Yes	None	ENRAF	662	Add absorbent	2 above grade risers available	No, tank south of PUREX	Yes, one time DSA amendment for absorbent delivery system	No FIC sleeve Easy access to tank through existing riser	No pit entry Uses ENRAF riser without sleeve	Low
241-A-302B	Yes	Liquid & Solid	Yes	6,226	PC pump & WT	1 riser available	Yes, pump up over hill ~750 feet to AY tank farm	No, one time DSA amendment for pump & WT systems	Tank located on side of hill Area covered by gunite with one riser with a manual tape visible Assume sufficiency of one riser	Need solids & liquid sample/analysis No pit entry Uses FIC riser with sleeve On steep hillside Uses tank 240-S-302 design Assumes AB amendment for tank 240-S-302 will cover this activity	Modedrate
241-A-350	Yes	None	Yes	487	Add absorbent	12-inch riser in pump pit	Yes, ~500 feet to AY tank farm	No, one time DSA amendment for pump & WT systems	Cover block removal and pit entry required to investigate conditions Most penetrations contain one or more elbows. Assume removal of pump in central 12-inch riser required for access Assume WT unless DST is a viable option	Pit entry Assumes LLCE removal required Assumes AB amendment for tank 241-A-302A will cover this activity	High
241-A-417	Yes	None	Yes	1,176	Add absorbent	12-inch riser in pump pit	Yes, ~350 feet to AY tank farm	No, one time DSA amendment for absorbent delivery system	High uncertainty for access, two layers of cover blocks to remove, deep pit (pit floor 14-feet below grade) None of the tank penetrations appear to extend through the valve pit to an accessible location	Pit entry, large deep pit Assumes cover block replacement Assumes LLCE removal required to reach sump Assumes AB amendment for tank 241-A-302A will cover this activity	HIgh
241-AZ-151	No	None	Yes	1,436	Install breather filter & evaporate free liquid	12-inch riser in pump pit	Yes, ~150' from tank 241-AZ-102	No	Connected to 241-702-AZ vent system Candidate for breather filter (may take up to 3 years to evaporate) Existing risers are not at low point in tank Requires cover block removal and equipment removal to access low point in tank Cover block 2 ½ feet thick, potential dose concern. Internal pump pit conditions unknown Pit floor ~11 feet below grade	**Evaporation** No sampling required No pit entry Uses ENRAF riser Assumes AB amendment is not required	High
241-B-302B	Yes	Liquid & Solid	Yes	4,930	PC pump & WT	Use 240-S-302 for digging up risers	No, ~1-mile from nearest double-shell tank farm	No, one time DSA amendment for pump & WT systems	High – risk Entire area covered by gunite, no visible signs of tank risers Locating risers may be a problem Tank has been sealed for >20 years Drawings show three potential risers for direct tank access	Need solids & liquid sample/analysis Covered in gunite No recent (<20year) history Nothing visible above grade Assumes AB amendment for tank 240-S-302 will cover this activity	High

Table 5. Liquid Mitigation Strategy Summary Table (2 Sheets)

Tank	Initial Conditions Assessment Required?	Sample Needs	Assume Equipment Removal Required	Total Waste Volume (gallon) (HNF-EP-0182)	Liquid Mitigation System/Equip	Planning Assumption for Tank Access	Overground Transfer an Option?	DSA Amendment Required?	Notes	Basis	Project Risks (Schedule)
241-EW-151	Yes	None	Yes	506	Add absorbent	1 x 4-inch available	No, located between 200 East and 200 West	No, one time DSA amendment for pump & WT systems	With low volume may be a candidate for evaporation One riser at the tank has an FIC instrument, this should provide direct access to the tank.	No pit entry Uses FIC riser with possible sleeve Assumes AB amendment for tank 241-A-302A will cover this activity	Low
241-U-301B	No	None	No	1,436	Bladder pump & WT	2 x 12-inch risers available	Yes, hose-in-hose transfer line to tank 241-U-107 a possibility	No, one time DSA amendment for pump & WT systems	Field inspection shows two risers 12-inch diameter with blind flanges Verify 2 x 12-inch risers are open DSA amendment will be performed for tank 240-S-302 will include both bladder pump and PC pump	No sampling required At least two risers immediately available Uses tank 241-UX-302A design Uses spares bought for tank 241-ER-311 Assumes AB amendment for tank 240-S-302 will cover this activity	Low
241-TX-302C	Yes	None	Yes	193	Add absorbent	1 x 2-inch riser available, 4-inch riser with FIC sleeve sandwiched by a riser extension	No, >1-mile to SY tank farm	TBD based on approach	One visible above grade riser with an ENRAF. Previous operations on the tank noted that the ENRAF is sitting on a riser extension and that an FIC sleeve is on the old riser and the interface is covered by shotcrete Access through this riser is limited to approx 2 inches There is a 12-inch riser in the pump pit caisson and it contains a pump	TBD, requires further evaluation	TBD
244-S	No	None	No	4,073	N/A	N/A	N/A	No	Complete integrity assessment	Preferred, less expensive than other options.	Moderate

Notes:
AB = authorization basis
DSA = Documented Safety Analysis
FIC = Food Instrument Corporation
PC = progressive cavity pump
PUREX = Plutonium Uranium Extraction Facility
TBD = to be determined
WT = Walker tanker

7.0 SCHEDULE

Schedule templates were developed for each of the tanks based on the mitigation strategy identified in Table 5. Schedule assumptions are discussed in Appendix B. Summary schedules are presented in Appendix C. Mitigation activities require the performance of the following activities:

- Tank investigation – Review drawing and perform field work necessary to determine the presence of equipment and the steps required to access the tank.
- Equipment removal – Take actions required to remove equipment observed or assumed to exist in risers (in the case of tanks under pits, and tanks with covered risers).
- Sampling and analysis – Sampling and analysis of the solids and liquids are assumed to be required for all tanks selected for pumping of liquids. All of the tanks identified for pumping (with the exception of 241-U-301B) require sampling and analysis. The summary schedule includes a number of one time activities applicable to all sampling not in the individual tank schedules.
- System design – Design liquid retrieval systems. The schedule assumes design activities will have durations consistent with those for the tank 241-UX-302A liquid retrieval system.
- Safety basis – Prepare a safety basis amendment one time for each new system configuration or alternative liquid removal strategy.
- Absorbent addition- A number of one time development activities are required to support deployment of an absorbent delivery system in the field. These activities include material evaluation, testing, and selection; delivery system design, development, and testing; and the evaluation of safety related issues associated with the absorbent delivery system.
- Testing (new systems) – Perform testing for each new alternative liquid mitigation system (i.e., progressive cavity pump, absorbents, etc.).
- Operations – Operate the liquid retrieval system. The schedule assumes that bladder pumps will retrieve 200 to 300 gallons per 24 hour-day, and progressive activity pumps will retrieve 800 gallons per 24 hour-day.

The order in which the tanks are scheduled for liquid mitigation actions is flexible. Tank S-302 is scheduled to initiate activities necessary to support liquid removal starting at the beginning of fiscal year 2007. The overall duration for liquid removal from tank 240-S-302 is long because tank access is uncertain and will require further investigation, the need to perform sampling and analysis, as well as the assumption that a safety basis amendment will be required. Following tank 240-S-302 the order in which the remaining tanks are scheduled can be adjusted to accommodate resource constraints, other ongoing activities, or priorities.

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APPENDIX A

CATCH TANK AND DOUBLE-CONTAINED RECEIVER TANK DATA

A1.0 INTRODUCTION

This appendix documents the findings of a preliminary investigation of catch tanks and double-contained receiver tanks requiring liquid mitigation (Section 5.0). The investigation assessed the ability to access the tank interior as well as the current tank inventory. These investigative assessments support planning and estimating activities to remove liquid from the tanks.

The majority of tank construction drawings were issued more than 50 years ago. The preliminary investigation did not look for documented changes to these drawings.

A2.0 TANK 241-A-302A

Tank 241-A-302A is located on the south side of PUREX (Plutonium-Uranium Extraction Facility) in the 200 East Area of the Hanford Site. This tank received drainage from the 241-A-151 diversion box. The tank has an estimated current waste inventory of 662 total gallons (*Waste Tank Summary Report for Month Ending June 30, 2006* [HNF-EP-0182]) believed to consist primarily of low activity liquids. Based on the estimated waste volume and the tank configuration, addition of absorbents was selected as the liquid mitigation strategy for this tank.

The tank has a diameter of 9 feet and a length of 16 feet 6 inches (*Piping – General Arrangement Underground & Trench Piping Diversion Box – Stack-Catch Tank Plan – Sections* [H-2-53096]). Tank 241-A-302A has a capacity of approximately 8,500 gallons.

Visual inspection of the tank reveals a pump pit not shown on the drawings. The floor of the tank rests approximately 26 feet 6 inches below grade (H-2-53096) (Figure A1).

No tank penetration appears to extend through the pump pit. Two visible above-grade risers appear to extend vertically into the tank. One riser contains an ENRAF. The other riser may contain a breather filter, but not of the typical Flanders-type, or vapor sample port (Figure A2).

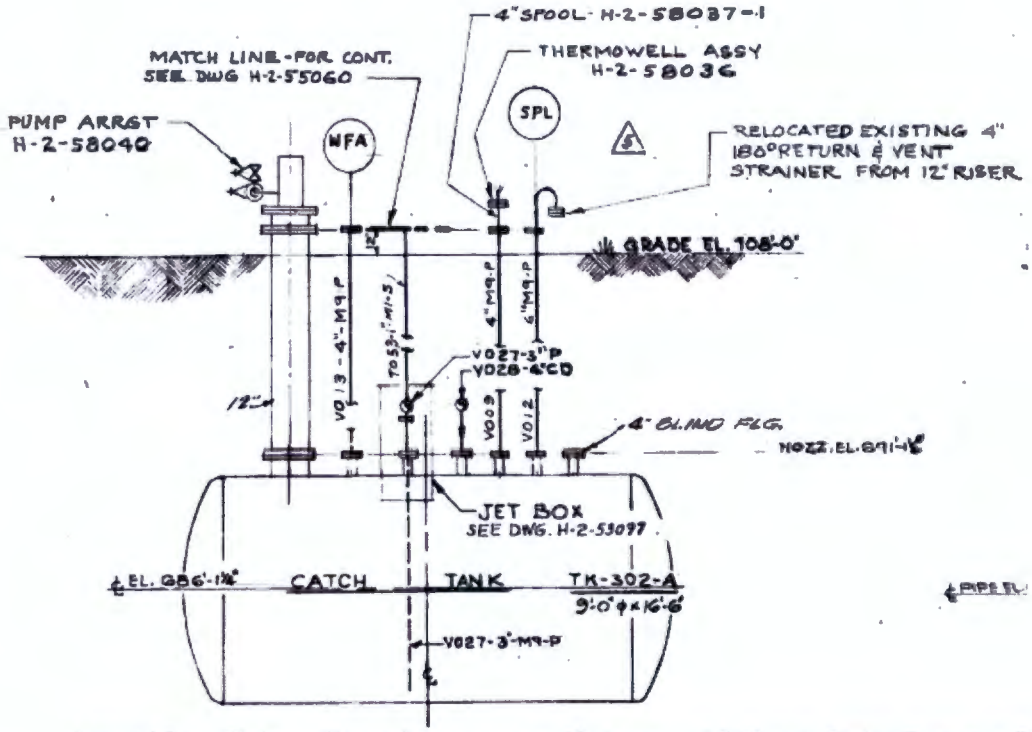
The investigative process did not examine the interface between the ENRAF installation and the riser as it sits slightly below grade. As a result, this riser may contain a Food Instrument Corporation (FIC) sleeve requiring removal. Removal of the ENRAF will probably permit tank access, but this assumption requires additional field investigation to verify.

The following assumptions support preparation of a liquid mitigation schedule developed for planning purposes only:

- The absorbent delivery system will be deployed through the riser currently housing the ENRAF
- An FIC sleeve will require removal from the ENRAF riser for deployment of the absorbent delivery system.

- Placement of absorbents in the tank will require an authorization basis amendment, but this activity will have already concluded before the start of the project.

Figure A1. Cutaway View of Tank 241-A-302A



Adapted from *Piping – General Arrangement Underground & Trench Piping Diversion Box – Stack-Catch Tank Plan – Sections* (H-2-53096)

Figure A2. Photograph of Tank 241-A-302A

A3.0 TANK 241-A-302B

Tank 241-A-302B tank is located on the eastern side of the A tank farm in the 200 East Area of the Hanford Site. The tank was originally constructed and installed as tank 211-T (D-61696)[1]. It was later exhumed and relocated to the A tank farm (H-2-53096). This tank received drainage from the 241-A-152 diversion box. The tank has an estimated current waste inventory of 6,226 total gallons (HNF-EP-0182) believed to consist primarily of low activity liquids. Based on the estimated waste volume, removal of the free liquid from the tank by pumping was selected for liquid mitigation.

The preliminary investigation could not determine the dimensions of tank 241-A-302B. However, the tank has a capacity of approximately 11,695 gallons (*Schematic Piping Diagram for 241-A Waste Disposal Facility* [H-2-44505]) (Figure A3).

Visual inspection of the tank reveals a single riser protruding above grade. The riser contains a manual tape (see Figure A4). Manual tape installations generally include centering devices and frequently riser liners. If liquid mitigation requires use of this riser, then the planning process should assume that it contains a liner requiring removal.

The tank does not appear to have adequate riser availability to support sampling and liquid removal, but this determination requires verification through additional field investigation.

The following assumptions support preparation of a liquid mitigation schedule developed for planning purposes only:

- Liquid mitigation planning will require acquisition and analysis of both the tank liquids and solids
- Sample analysis will confirm that the liquids meet criteria for classification as Type A waste in accordance with DOT regulations. This determination will permit transport of the retrieved liquid using the Walker tanker
- The liquid removal system will use a pump with an on-board camera deployed through the riser currently housing the ENRAF
- An FIC sleeve will require removal from the ENRAF riser for pump insertion
- The liquid removal system will use the design from the tank 240-S-302 pumping system to the largest extent possible
- Removal of the liquid will require an authorization basis amendment, but this activity will have already concluded before the start of the project.

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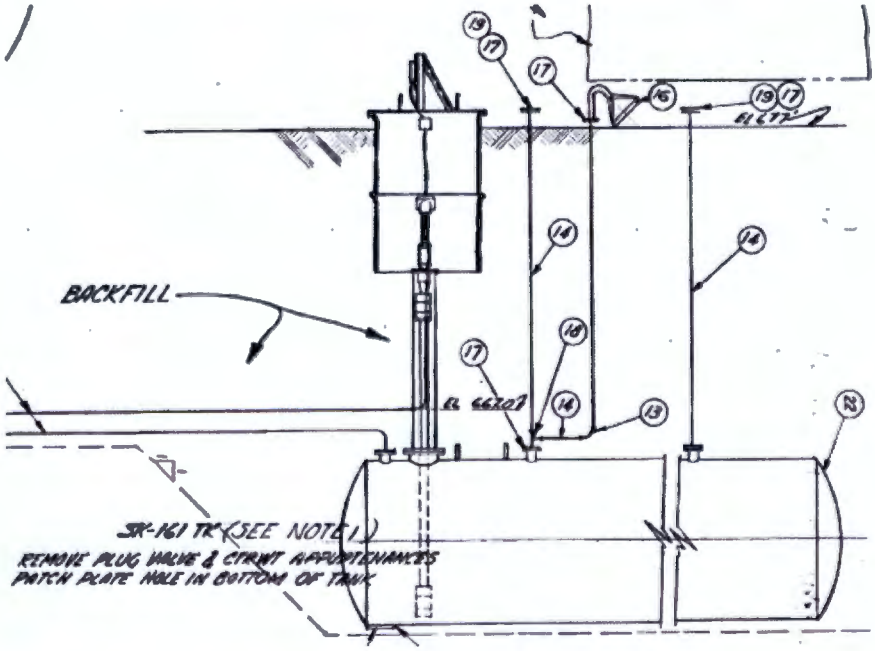
[1] A preliminary drawing search failed to locate D-61696.

Figure A3. Cutaway View of Tank 241-A-302B



Adapted from *Catch Tank Installation at Diversion Box 241-A-152* (H-2-57452)

Figure A4. Photograph of Tank 241-A-302B

A4.0 TANK 241-A-350

The 241-A-350 lift station and catch tank is located in the A tank farm in the 200 East Area of the Hanford Site. The tank has an estimate current waste inventory of 487 total gallons, consisting primarily of low activity liquids that have drained back from A tank farm transfer pits. Based on the estimated waste volume and the tank configuration, addition of absorbents was selected as the liquid mitigation strategy for this tank.

The tank has an outside diameter of 4 feet 6 inches and height of approximately 6 feet 11 inches (D-62002). The tank has a capacity of approximately 776 gallons.

The floor of the tank slopes 1 11/16-inch toward one edge. Tank 241-A-350 sits inside an 8-foot diameter caisson on top of four integral feet and a concrete pad. A concrete pump pit is installed above the tank and caisson (*Drainage Lift Station Sections and Details* [H-2-70539]). The floor of the tank rests approximately 26 feet 6 inches below grade.

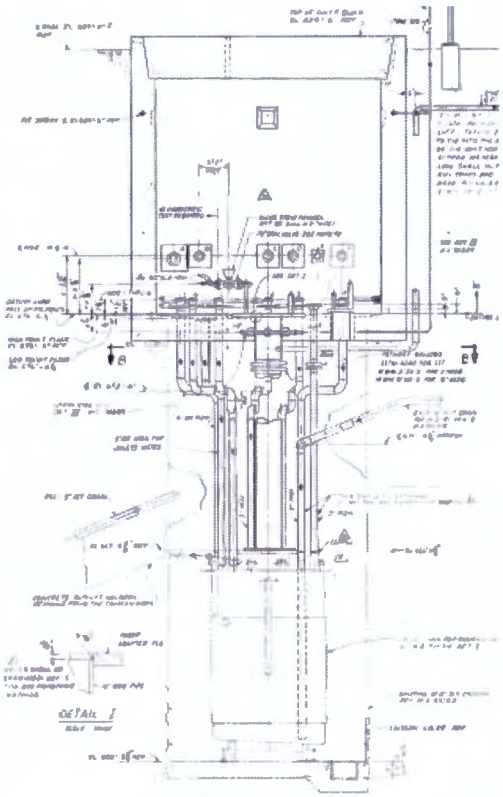
The floor of the pit has numerous penetrations into the top and side of the tank (H-2-70538). None of the tank penetrations appear to extend through the pit to an immediately accessible location. Additionally, most of the tank penetrations contain one or more elbows that preclude direct vertical access (Figure A5). Several pieces of equipment appear on top the pit cover but are unrecognizable due to a covering of Hypalon™ (Figure A6).

241-A-350 and its transfer system were removed from service on June 30, 2005 consistent with the requirements of TPA milestone M-48-07. The tank has not been pumped since that date. Some of the liquid in the tank is a result of line holdup and drain back from the transfer system which precluded emptying the tank with the current pumping system.

The following assumptions support preparation of a liquid mitigation schedule developed for planning purposes:

- Placement of absorbents in the tank will require a pit entry to gain access to the tank
- One piece of long-length contaminated equipment (LLCE) will require removal and disposal to gain access to the tank
- The absorbent delivery system will be deployed through the riser currently housing the LLCE
- Placement of absorbents will require an authorization basis amendment, but this activity will have already concluded before the start of the project.

Figure A5. Cutaway View of Tank 241-A-350



Adapted from *Piping Arrangement Drainage Lift Station 241-A-350* (H-2-70538)

Figure A6. Photograph of Tank 241-A-350

A5.0 TANK 241-A-417

Tank 241-A-417 is located in the A tank farm complex in the 200 East Area of the Hanford Site. The tank has an estimated current waste inventory of 1,176 total gallons, believed to consist primarily of low activity liquids. Based on the estimated waste volume and the tank configuration, addition of absorbents was selected as the liquid mitigation strategy for this tank.

The tank has a diameter of 24 feet 6 inches and a height of approximately 13 feet 8 inches (*Structural Concrete Tank 241-A-417, Plan, Sections, and Details* [H-2-56800]). The tank has a capacity of approximately 44,000 gallons.

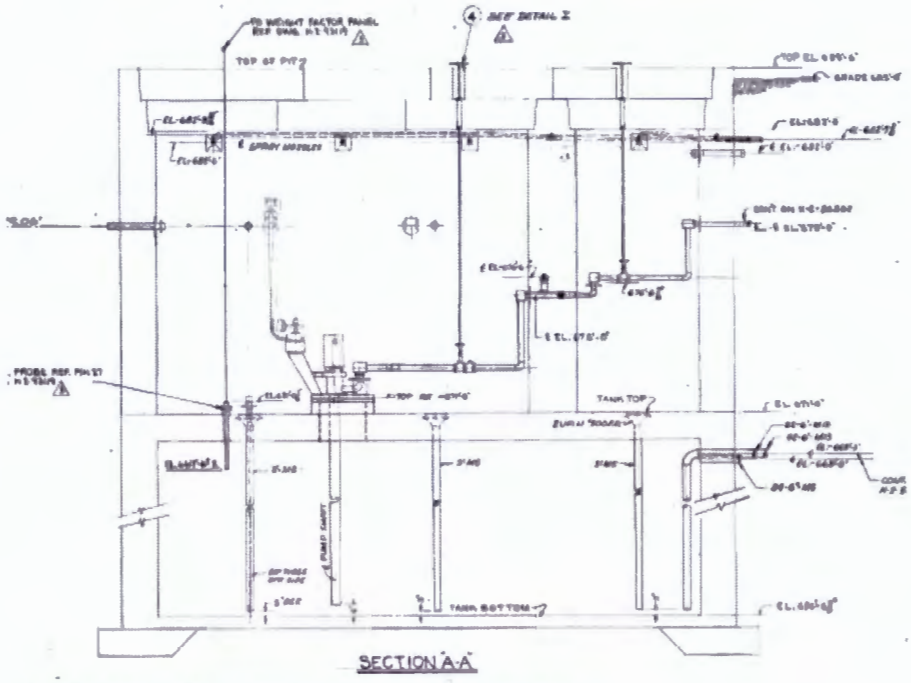
Tank 241-A-417 has a flat floor. A large concrete pump pit is installed above the tank (26 feet 4 inches by 11 feet). The floor of the tank rests approximately 29 feet below grade (*Pump Pit Arrangement* [H-2-57302]).

The floor of the pit has several penetrations into the top of the tank (H-2-57302). None of the tank penetrations appear to extend through the pit to an immediately accessible location (Figure A7). The top of the pit cover has no visible equipment (Figure A8).

The following assumptions support preparation of a liquid mitigation schedule developed for planning purposes only:

- Placement of absorbents will require a pit entry to gain access to the tank
- One piece of LLCE will require removal and disposal to gain access to the tank
- The absorbent delivery system will be deployed through the riser currently housing the LLCE
- Placement of absorbent in the tank will require an authorization basis amendment, but this activity will have already concluded before the start of the project.

Figure A7. Cutaway View of Tank 241-A-417



Adapted from *Pump Pit Arrangement* (H-2-57302)

Figure A8. Photograph of Tank 241-A-417

A6.0 TANK 241-AZ-151

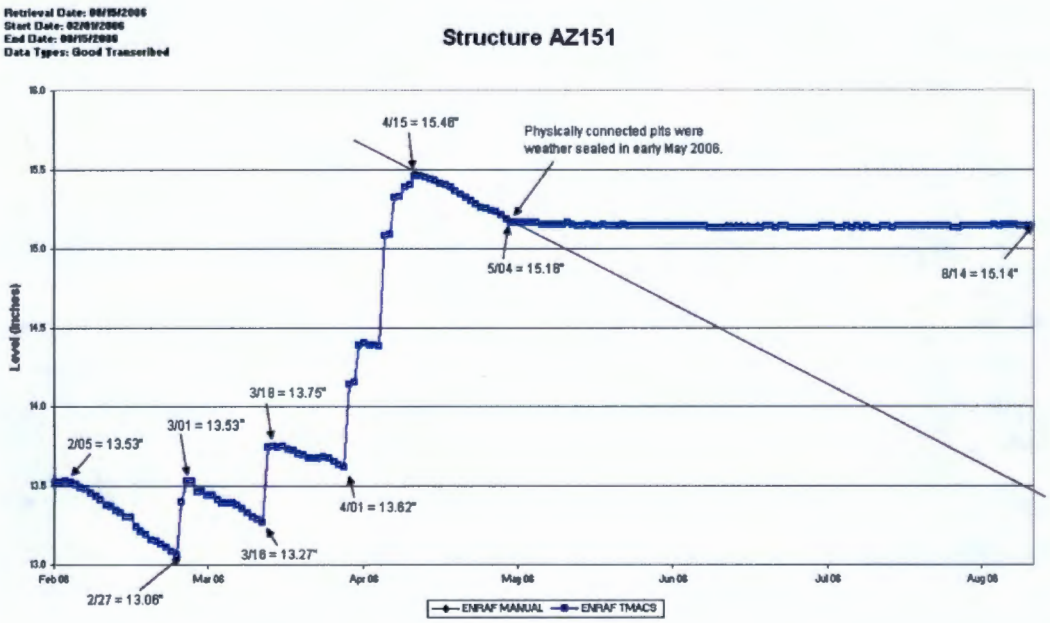
The 241-AZ-151 catch tank is located in the AZ tank farm in the 200 East Area of the Hanford Site. The tank has an estimated current waste inventory of 1,436 total gallons, consisting primarily of condensate from 241-AZ-702. Based on the estimated waste volume, configuration, and the connection to the 241-AZ-702 ventilation system, evaporation was selected as the liquid mitigation strategy for this tank.

Until recently, the waste level inside tank 241-AZ-151 has shown sharp increases and gradual decreases presumably due to intrusion and evaporation. Liquid level data supports this assumption and shows a steady waste surface level after weather sealing the connected valve pits (Figure A9).

The tank consists of a rectangular-shaped, concrete vault lined with carbon steel. It has a length of 24 feet, a width of 6 feet, and depth of 11 feet (*Engineering Task Plan for the Integrity Assessment Examination of Double Contained Receiver Tanks (DCRT) Catch Tanks and Ancillary Facilities* [RPP-5963]). The floor of the tank slopes 4 inches towards a 10-inch deep rectangular sump on the pit end of the tank (*Structural Concrete Catch Tank Section & Details*, H-2-68308). The tank has a capacity of approximately 11,900 gallons (Figure A10).

Inspection revealed numerous above grade risers that presumably extend vertically into the tank. One 4-inch riser contains an installed ENRAF. Removal of the ENRAF would provide at least one open vertical 4-inch riser access (Figure A11). Inspection of the ENRAF riser does not reveal the installation of a FIC sleeve. However, this access point sits off to the side of the low point in the sump. A shield plug in the cover plate may provide access to the sump but does not appear to sit directly over the sump (H-2-68308). Tank 241-AZ-151 requires additional field investigation to verify unobstructed access to the tank.

Figure A9. Tank 241-AZ-151 Liquid Level Data

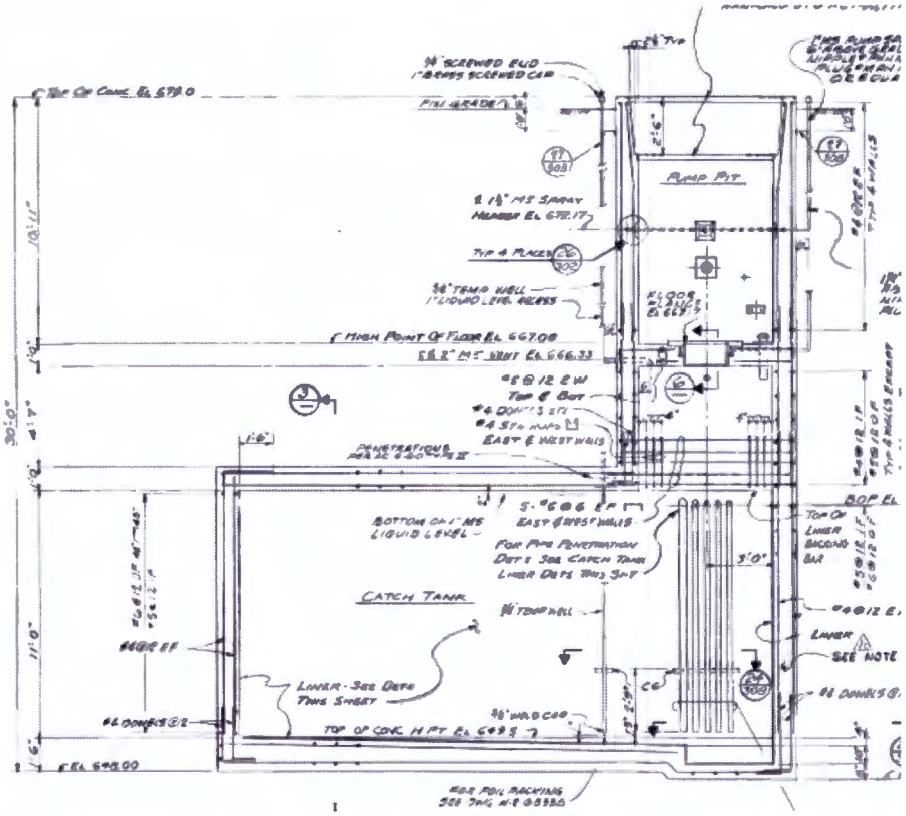


The preferred method for installing a breather filter on 241-AZ-151 would be to install a Y-adapter and breather filter on the ENRAF riser. The waste level would be monitored and a liquid removal system (i.e., pumping system) could be installed if sufficient liquid removal was not achieved. The installation of the breather filter and continued operation of the 241-AZ-702 vent system is expected to enhance the flow of air and evaporation in the tank. As a result, the tank may not require pumping to removing the free liquids.

The following assumptions support preparation of a liquid mitigation schedule developed for planning purposes only:

- Installation of a breather filter will not require an authorization basis amendment.
- Maintain the ability to monitor the waste level and remove the free liquid using a pump prior to the end of fiscal year 2009 if required.

Figure A10. Cutaway View of Tank 241-AZ-151



Adapted from *Structural Concrete Catch Tank Plans, Sections & Details* (H-2-68316)

Figure A11. Photograph of Tank 241-AZ-151

A7.0 TANK 241-B-302B

Tank 241-B-302B is located on the east side of B Plant in the 200 East Area of the Hanford Site. The tank has an estimated current waste inventory of 4,930 total gallons consisting primarily of drainage from the 241-B-154 diversion box. Based on the estimated volume of waste in this tank, pumping the free liquids from the tank was selected as the mitigation strategy.

The tank has a diameter of 9 feet and length of 36 feet. Tank 241-B-302B has a capacity of approximately 17,700 gallons (Figure A12).

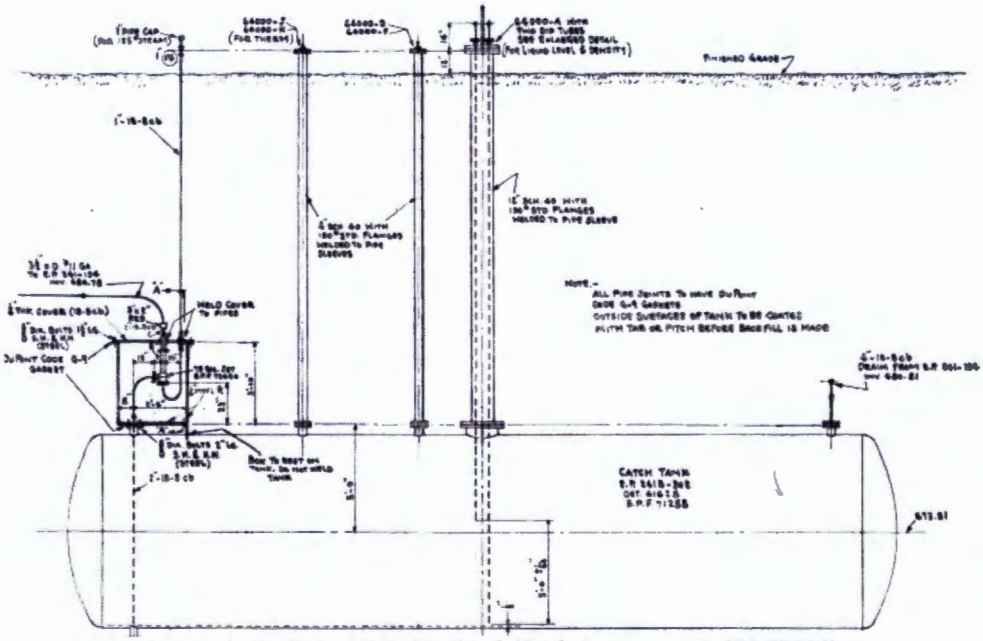
Visual inspection of the tank reveals nothing protruding above grade (Figure A13).

The tank does not appear to have adequate riser availability to support sampling and liquid removal, but this determination requires verification through additional field investigation.

The following assumptions support preparation of a liquid mitigation schedule developed for planning purposes only:

- Liquid mitigation planning will require acquisition and analysis of both the tank liquids and solids
- Sample analysis will confirm that the liquids meet criteria for classification as Type A waste in accordance with DOT regulations. This determination will permit transport of the retrieved liquid using the Walker tanker
- Contaminated soil and potentially lead bearing shotcrete will require removal to gain tank access
- Locating the tank and risers will require a survey
- One piece of LLCE will require removal and disposal to gain access to the tank
- The liquid removal system will use a pump with an on-board camera deployed through the riser currently housing the LLCE
- The liquid removal system will use the design from the tank 240-S-302 pumping system to the largest extent possible
- Removal of the liquid will require an authorization basis amendment, but this activity will have already concluded before the start of the project.

Figure A12. Cutaway View of Tank 241-B-302B



Adapted from *9'-0" Dia. X 36'-0" Catch Tank Arrangement* (W-77092)

Figure A13. Photograph of Tank 241-B-302B

A8.0 TANK 241-EW-151

The 241-EW-151 air vent station and catch tank (also known as tank 221-U-217) is located between the 200 East and West Areas of the Hanford Site. The tank has an estimated current waste inventory of 506 total gallons, consisting of drainage from the old cross site transfer line and rain water/snow melt. Based on the estimated waste volume and the tank configuration, addition of absorbents was selected as the liquid mitigation strategy for this tank.

The tank has an outside diameter of 4 feet 6 inches and height of approximately 6 feet 11 inches (D-62002). The tank has a capacity of approximately 776 gallons.

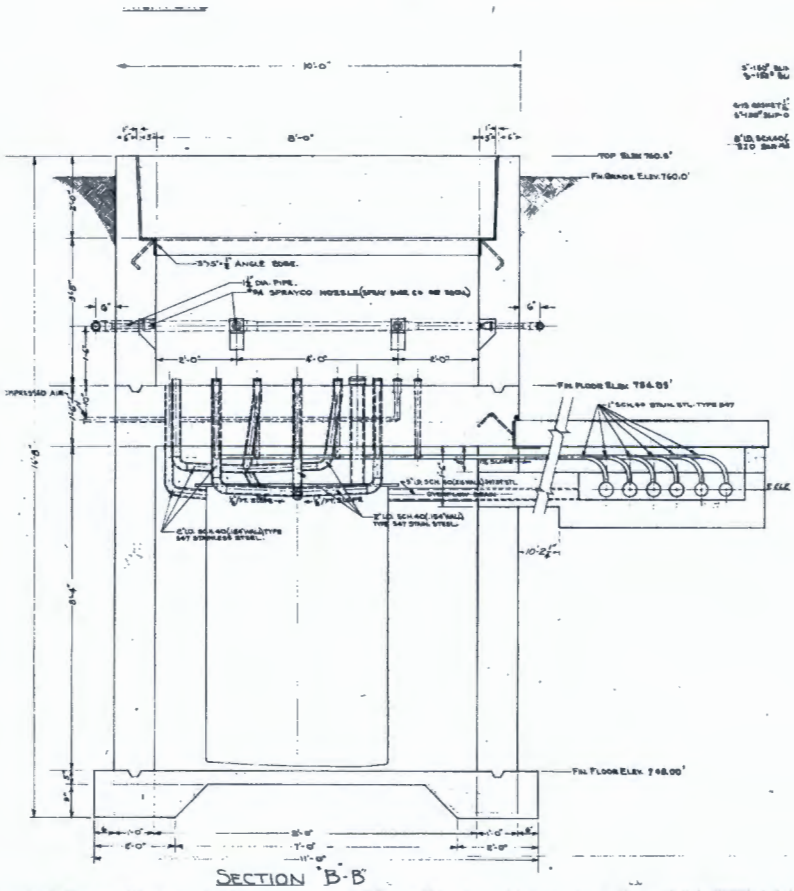
The floor of the tank slopes 1 11/16-inch toward one edge. Tank 241-EW-151 sits inside a concrete pit/vault measuring approximately 8 feet 6 inches long by 8 feet wide and 8 feet 4 inches high. The tank sits vertically and rests on top of four integral feet on the floor of the pit. A valve/nozzle pit is installed above the tank vault. The floor of the tank rests approximately 15 feet 6 inches below grade (RPP-5963) (Figure A14).

None of the tank penetrations appear to extend through the valve/nozzle pit to an immediately accessible location. Three risers adjacent to the pit structure may extend vertically into the tank. One riser contains a manual tape and probably a FIC sleeve. One appears to have a Flanders G-1 filter housing. The third riser, and least likely to enter the tank, appears to contain a annulus leak detector (Figure A15). One or more of these risers should support sampling and liquid removal, but this determination requires verification through additional field investigation.

The following assumptions support preparation of a liquid mitigation schedule developed for planning purposes:

- The absorbent delivery system will access the tank through the riser currently housing the manual tape
- The riser with the manual tape has a covering of adhesive tape to fix surface contamination. The riser will require decontamination in a glove-bag/box before use
- An FIC sleeve will require removal from the manual tape riser.
- Placement of absorbents in the tank will require an authorization basis amendment, but this activity will have already concluded before the start of the project.

Figure A14. Cutaway View of Tank 241-EW-151



Adapted from *General Arrangement Vent Station Diversion Box 241 EW 151* (H-2-43148)

Figure A15. Photograph of Tank 241-EW-151

A9.0 TANK 240-S-302

Tank 240-S-302 is located north of REDOX (Reduction-Oxidation Facility) in the 200 West Area of the Hanford Site. The tank has an estimate current waste inventory of 8,033 total gallons. This tank received leaks, spills, line flushes, and drainage associated with waste transfers through diversion box 241-S-151. Based on the estimated volume of waste in this tank, removal of the free liquid by pumping was selected as the liquid mitigation strategy.

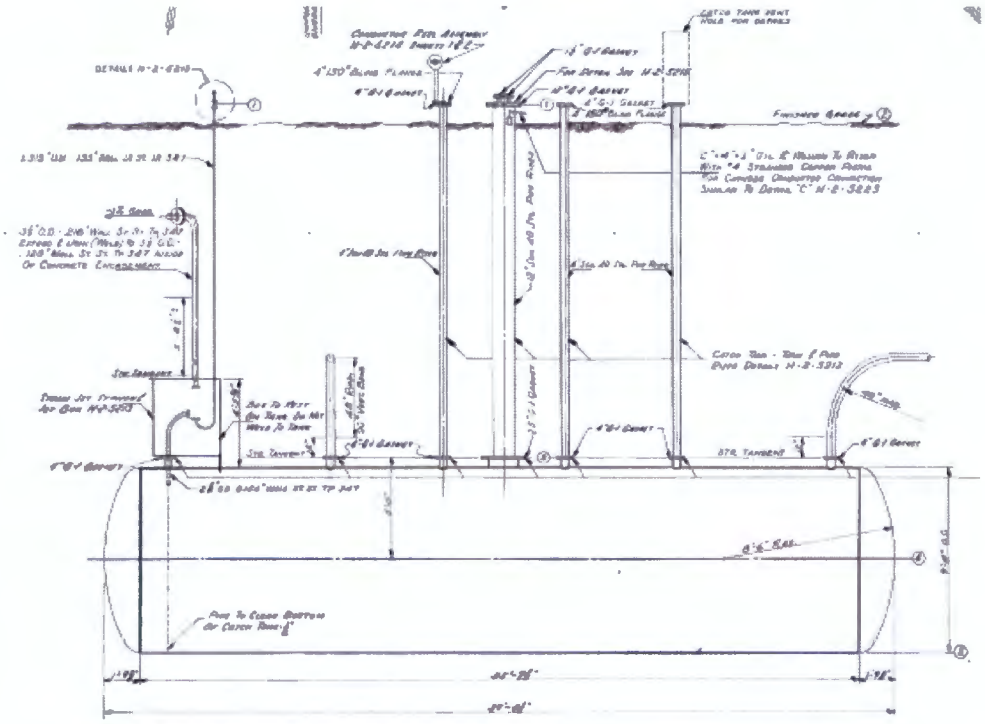
The tank has an outside diameter of 9 feet and length of approximately 39 feet 4 inches measured at the center line (*Catch Tank Elevation & Piping Arrangement* [H-2-5211]). Tank 240-S-302 has a capacity of approximately 17,700 gallons (Figure A16).

Drawing H-2-5211 shows several risers extending above-grade, however the field inspection only revealed the presence of an ENRAF. The ENRAF isolation valve is partial buried so inspection could not confirm the presence of an FIC sleeve. The half buried valve suggests that the other risers may sit approximately 6 inches below grade in potentially contaminated soil (Figure A17). Positively determining the presence or absence of the other risers will require excavation.

The following assumptions support preparation of a liquid mitigation schedule developed for planning purposes only:

- Tank 240-S-302 is a RCRA Past Practice inactive miscellaneous underground storage tank. As such, the following schedule activities will be required:
  - Removal of the liquid will require an authorization basis amendment.
  - Removal of the liquid will require a system with a higher pumping rate than the system deployed at tank UX-302A.
- Liquid mitigation planning will require acquisition and analysis of both the tank liquids and solids
- Sample analysis will confirm that the liquids meet criteria for classification as Type A waste in accordance with DOT regulations. This determination will permit transport of the retrieved liquid using the Walker tanker
- The liquid removal system will use a pump with an on-board camera deployed through the riser currently housing the ENRAF
- Location of tank risers will require a survey
- An FIC sleeve will require removal from the ENRAF riser for pump insertion.

Figure A16. Cutaway View of Tank 240-S-302



Adapted from *Catch Tank Elevation & Piping Arrangement* (H-2-5211)

Figure A17. Photograph of Tank 240-S-302

A10.0 TANK 241-TX-302C

Tank 241-TX-302C is located on the east side of T Plant in the 200 West Area of the Hanford Site. The tank has an estimate current waste inventory of 193 total gallons consisting of drainage from the 241-TX-154 diversion box (HNF-EP-0182). Based on the estimated waste volume and the tank configuration, addition of absorbents was selected as the liquid mitigation strategy for this tank.

The tank has a diameter of 9 feet and a length of 39 feet 4 ½ inches (*Catch Tank Elevation and Piping Arrangement* [H-2-832]). Tank 241-TX-302C has a capacity of approximately 17,700 gallons.

Visual inspection of the tank reveals a single riser protruding above grade. The riser contains an ENRAF (Figure A19). Operation records show that the ENRAF sits on top of a riser extension. An FIC sleeve sits on top of the old riser with the interface covered in a layer of shotcrete. The shotcrete has an unknown thickness and composition (i.e. lead or steel). As a result, the ENRAF riser only provides an access point 2 inches in diameter (i.e., the inside diameter of the FIC sleeve).

A pump pit caisson sits adjacent to the ENRAF riser. The caisson contains a 12-inch diameter riser, based on the construction drawings and confirmed with operations. The 12-inch riser contains a pump that would require removal to use this riser for accessing the tank.

Fabrication drawings show an additional riser on the other side of the ENRAF riser (opposite of the pump pit) 5 feet 6 inches away. Presumably, shotcrete covers this riser.

Tank 241-TX-302C has a stable waste level of 3.76 inches as of August 30, 2006 (see http://twinsweb.pnl.gov/twinsdata/forms). The tank contains an unknown volume of solids. As noted in *Engineering Report on Double-Shell Tank System Miscellaneous Tanks* (RPP-6829), a visual examination on May 12, 2000 found the bottom of the tank obscured by a layer of salt cake or sludge.

Initial investigative actions should support the planning process by determine the volume of solids and liquids. The tank may contain little or almost no liquid.

The planning process will have to address tank access if investigation determines the tank has sufficient liquid to warrant mitigation. In even the worst case scenario the tank contains approximately 200 gallons of liquid.

Adding an absorbent to stabilize the liquid in the tank will require a delivery system to distribute absorbent in the tank. The tank does not have a configuration conducive to the introduction of absorbent. Absorbent will only bind with liquid it contacts. As a result, this method requires installation of a distribution system through a tank riser. This option requires tank access with all of the same challenges that apply to pumping. This approach may also require an authorization basis amendment specific to the activity. Finally, design, deployment, and operation of an absorbent distribution system have significant technical uncertainties (*Options for Responding to the Assumed Leak from Catch Tank 241-UX-302A* [RPP-RPT-30564]).

Figure A18. Cutaway View of Tank 241-TX-302C

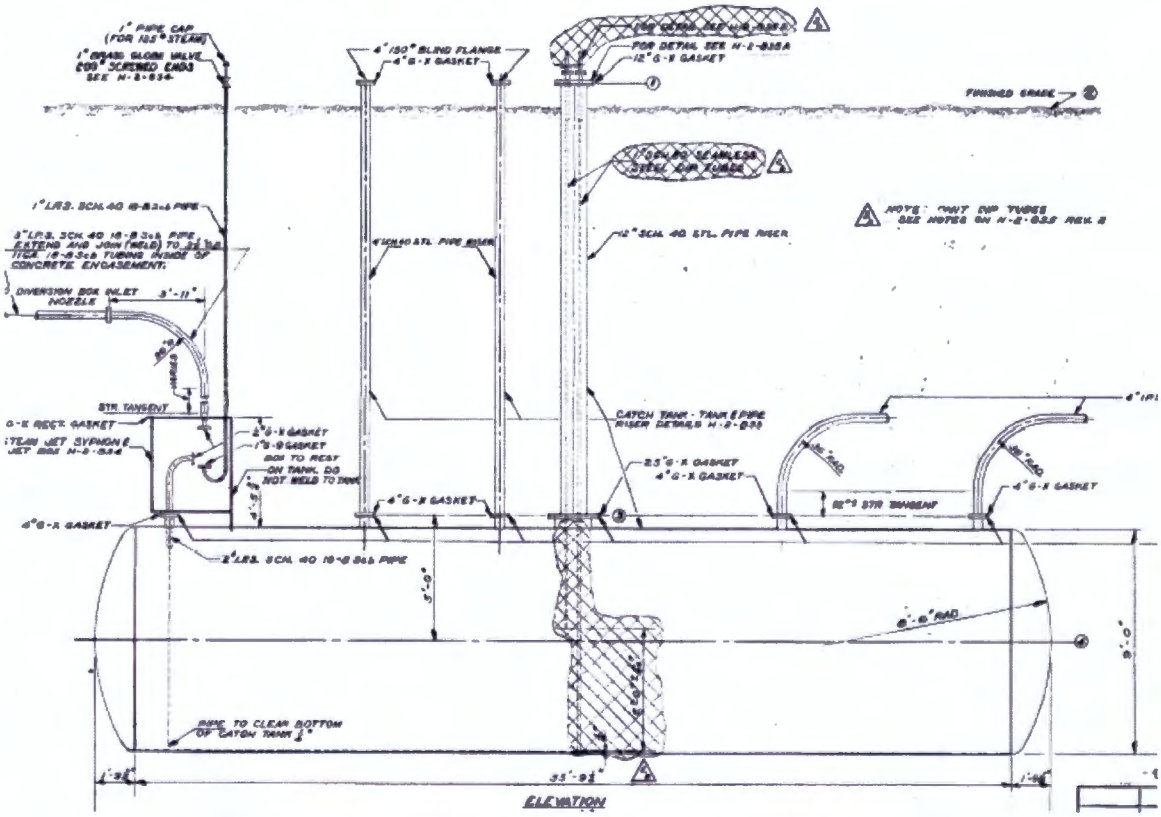


Figure A19. Photograph of Tank 241-TX-302C

A11.0 TANK 241-U-301B

Tank 241-U-301B is located in the U tank farm in the 200 West Area of the Hanford Site. The tank has an estimate current waste inventory of 1,436 total gallons, consisting of drainage from diversion boxes 241-U-151, -152, -153, and -252. Based on the estimated waste volume, removal of free liquids by pumping was selected as the liquid mitigation strategy for this tank.

The tank has an outside diameter of 20 feet and height of approximately 19 feet measured to the top of the dome (RPP-5963). Tank 241-U-301B has a capacity of approximately 36,000 gallons.

The tank has a flat floor. A pump pit (caisson) is installed above the tank on the north end. The floor of the tank rests approximately 26 feet below grade (RPP-5963) (Figure A20).

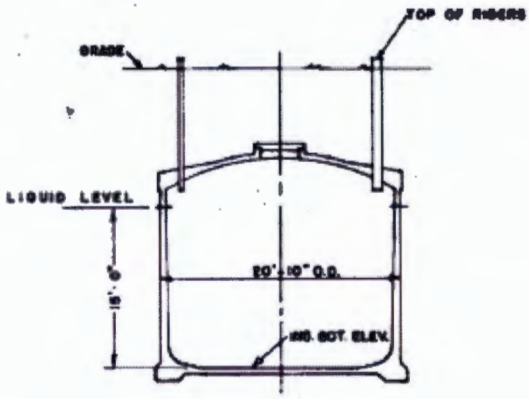
One tank penetration appears to extend through the pump pit and has a breather filter installed. Four visible risers appear to extend vertically into the tank. Two have the appearance of open 12-inch risers. One appears to contain an ENRAF and one has a cap (Figure A21).

This tank appears to have adequate riser availability to support sampling and liquid removal. However, additional field investigation should verify accessibility.

The following assumptions support preparation of a liquid mitigation schedule developed for planning purposes only:

- Liquid mitigation planning will not require acquisition and analysis of new samples
- One or both of the 12-inch risers will provide immediate access to the tank
- The liquid removal system will use the design from the tank 241-UX-302A pumping system to the largest extent possible
- Liquid removal from tank 241-U-301B will follow closely after tank 241-UX-302A and use the same pumping system eliminating additional procurement activities
- Removal of the liquid will require an authorization basis amendment, but this activity will have already concluded before the start of the project.

Figure A20. Cutaway View of Tank 241-U-301B



Adapted from *Tanks 241-301 & 261 Riser and Nozzle Elevs.* (H-2-1749)

Figure A21. Photograph of 241-U-301B

A12.0 DOUBLE-CONTAINER RECEIVER TANK 244-S

DCRT 244-S is located in the S tank farm in the 200 West Area of the Hanford Site. The tank has an estimate current waste inventory of 4,073 total gallons consisting of high activity liquids and sludge. This tank has most recently received waste from the 222-S Laboratory and from salt well pumping by interim stabilization of multiple S and SX tank farm single-shell tanks. The liquid in the tank will not meet DOT criteria for Type A waste precluding use of the Walker tanker for transport. Based on the configuration of the tank and previous integrity assessment work, completion of the integrity assessment by performing visual examinations to verify the integrity of the secondary containment was selected as the mitigation strategy for this tank.

An integrity assessment of this tank was performed in 1998 and documented in, HNF-3608. This integrity assessment recommends in Section 5.6, "Based on observations of abnormal and non-uniform corrosion of the tank and temperature element pipe, perform and document a second integrity assessment on or before the last day of year 2003. Alternatively, perform wall thickness measurement by ultrasonic testing (UT) to determine the remaining tank wall thickness and use the data to select date for the second integrity assessment". A UT inspection of the tank wall thickness was performed in March of 2001 and is documented in RPP-6829. Based on the UT thickness measurements it was concluded that the tank had not undergone any measurable general corrosion. Since approximately eight years have gone by since the 1998 integrity assessment, it is assumed that some follow up inspection of the tank and vault would be necessary in order to rely on the integrity of the tank and secondary containment for continued storage of liquids.

The tank has an outside diameter of 15 feet and height of approximately 16 feet measured to the top of the dome (*Catch Tank TK-244-S* [H-2-71049]). Tank 244-S has a capacity of approximately 22,625 gallons.

The tank sits in the lower chamber of a vault. The vault has a total depth of approximately 45 feet from grade. The upper chamber/pit has a depth of approximately 23 feet (Figure A22).

Access to the tank requires removal of the cover blocks over the upper chamber. The inside of the vault contains numerous risers, however many are small (less than 2 inches) and/or have one or more elbows (Figure A23).

Access to the tank will require pit entry and probable removal of the drop leg lid to permit sampling and liquid recovery; however this assumption will require additional field investigation to verify.

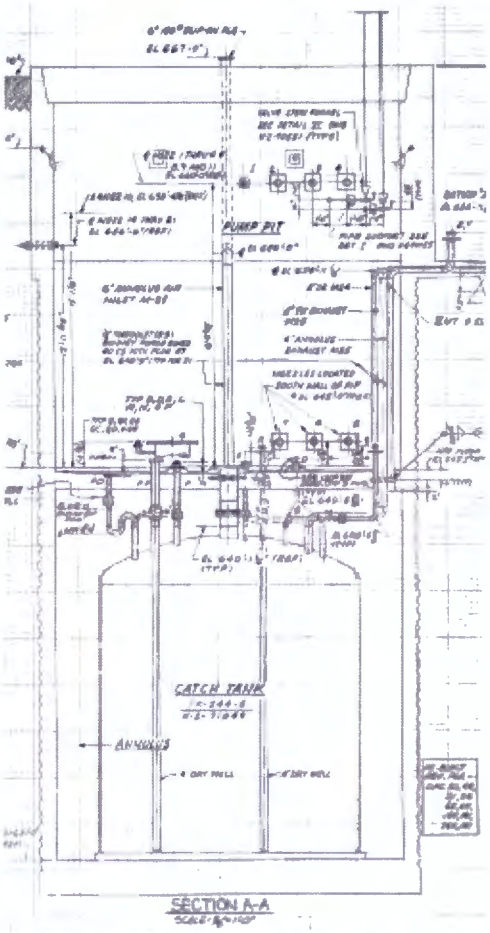
Transport of the liquid from the tank to the long-term storage location will require a method other than the Walker tanker. The straight-line center-to-center distance from tank 244-S to DST 241-SY-102 (scaled from the Hanford site atlas [p. 110]) is 530 feet. The actual transfer line will have a length considerably longer; approximately 750 feet.

The following factors make tank 244-S a likely candidate for retrieval and closure not just liquid mitigation:

- The tank liquids have high radioactivity
- The tank contains substantial solids with high radioactivity
- Retrieving any waste (liquid or solid) will require a higher level of effort (relative to the other tanks) due to the time and resources required to remove the cover blocks, entering the pit, transporting waste using a system with secondary containment, etc.

Removal of the free liquids from tank 244-S would require additional investigation to support selection and development of an appropriate liquid mitigation strategy. For the purposes of planning liquid mitigation activities it is assumed that a follow on integrity assessment would be performed and this would serve as a basis for continued storage of the liquids in the tank.

Figure A22. Cutaway View of Tank 244-S



Adapted from *Piping Plans and Sections* (H-2-71052)

Figure A23. Photograph of Tank 244-S

A13.0 REFERENCE

D-61696, Sheet 1, 1943, Untitled, Rev. 0, DuPont, Wilmington, Delaware.

D-62002, Sheet 1, 1961, *Untitled*, Rev. 59, DuPont, Wilmington, Delaware.

H-2-832, Sheet 1, 1981, *Catch Tank Elevation and Piping Arrangement*, Rev. 4, Hanford Engineering Works, Richland, Washington.

H-2-1749, Sheet 1, 1949, *Tanks 241-301 & 261 Riser and Nozzle Elevs.*, Rev. 0, General Electric Co., Fairfield, Connecticut.

H-2-5211, Sheet 1, 1981, *Catch Tank Elevation & Piping Arrangement*, Rev. 2, General Electric Co., Fairfield, Connecticut.

H-2-43148, Sheet 1, 1991, *General Arrangement Vent Station Diversion Box 241 EW 151*, Rev. 5, General Electric Co., Fairfield, Connecticut.

H-2-44505, Sheet 1, 1972, *Schematic Piping Diagram for 241-A Waste Disposal Facility*, Rev. 3, General Electric Co., Fairfield, Connecticut.

H-2-53096, Sheet 1, 1961, *Piping – General Arrangement Underground & Trench Piping Diversion Box – Stack-Catch Tank Plan – Sections*, Rev. 5, General Electric Co., Fairfield, Connecticut.

H-2-56800, Sheet 1, 1987, *Structural Concrete Tank 241-A-417, Plan, Sections, and Details*, Rev. 4, General Electric Co., Fairfield, Connecticut.

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H-2-57452, Sheet 1, 1959, *Catch Tank Installation at Diversion Box 241-A-152*, Rev. 3, General Electric Co., Fairfield, Connecticut.

H-2-70539, Sheet 1, 1980, *Drainage Lift Station Sections and Details*, Rev. 3, Vitro Engineering Corporation, Automation Industries, Inc., Richland, Washington.

H-2-71049, Sheet 1, 1981, *Catch Tank TK-244-S*, Rev. 3, Vitro Engineering Corporation, Automation Industries, Inc., Richland, Washington.

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HNF-3608, 1998, *244-S Double-Contained Receiver Tank Facility Integrity Assessment Report*, Rev 0, COGEMA Engineering Corp., Richland, Washington.

HNF-EP-0182, 2006, *Waste Tank Summary Report for Month Ending June 30, 2006*, Rev. 219, CH2M HILL Hanford Group, Inc., Richland, Washington.

RPP-5963, 2000, *Engineering Task Plan for the Integrity Assessment Examination of Double Contained Receiver Tanks (DCRT) Catch Tanks and Ancillary Facilities*, Rev. 0, CH2M HILL Hanford Group, Inc., Richland, Washington.

RPP-6829, 2001, *Engineering Report on Double-Shell Tank System Miscellaneous Tanks*, Rev. 0, CH2M HILL Hanford Group, Inc., Richland, Washington.

RPP-RPT-30564, 2006, *Options for Responding to the Assumed Leak from Catch Tank 241-UX-302A*, Rev. 0, CH2M HILL Hanford Group, Inc., Richland, Washington.

W-77092, Sheet 1, 1944, *9'-0" Dia. X 36'-0" Catch Tank Arrangement*, Rev. 0, DuPont, Wilmington, Delaware.

APPENDIX B

SCHEDULE DATA

B1.0 SURVEY AND VERIFICATION OF TANK CONFIGURATION

Nine of the eleven tanks have had little or no access for years. As a result, the existing design media and process history do not provide adequate information to plan liquid mitigation activities. These tanks will require further investigation to compile and evaluate the completeness and correctness of existing documentation, and inspect the tank and ancillary equipment in order to identify what if any equipment requires removal and/or to verify riser availability to access the tanks.

In general, investigative activities will include performing radiological surveys, removing obstructions such as sealants, and lifting cover plates and/or removing installed equipment to access tank risers and ancillary structures (e.g., pits, diversions boxes, etc.) for visual/video inspection.

This information will form the basis for establishing or confirming the appropriate liquid mitigation strategy. Performance of schedule activities will occur in series. Table B1 provides a schedule estimate for investigation and verifying tank configuration. Additional effort is assumed when cover blocks are removed to replace the cover blocks with steel plate.

Table B1. Schedule Estimate for Tank Investigation and Verification

Activity	Duration (week)	Basis
Evaluate design media/data, prepare ECNs, perform tool evaluations, perform structural calculations	2	1 FTE * 8 hr/day * 15 day
Prepare work package	3	1 FTE * 8 hr/day * 20 day
Verify tank configuration (access tank, inspect/video tank, evaluate configuration), clean-up	2	1 Crane Crew @ 3 day 9 FTE * 8 hr/day * 1.5 day
Duration (Total)	**7**	

Notes:

ECN = engineering change notice
FTE = full-time equivalent
hr = hour

B2.0 REMOVAL AND CUTUP OF LONG-LENGTH EQUIPMENT

This report assumes that a number of catch tanks and double-contained receiver tanks will require removal of installed long length waste contacting equipment to gain access to the tank. The following schedule estimate was developed for removing long-length equipment, including

engineering support, work package preparation, equipment removal, equipment disposal, demobilization, and document closeout.

For scheduling purposes, the work package preparation starts at the end of the first week of engineering change notice preparation. Performance of other activities occurs in series. Table B2 provides a schedule estimate for cutting up long-length equipment.

Table B2. Schedule Durations for Cutup of Long-Length Equipment

Activity	Duration (week)	Basis
Prepare ECNs, prepare lift plan, perform structural calculation, perform tool evaluation	3	1 FTE * 8 hr/day * 20
Prepare work package	3	1 FTE * 8 hr/day *20 day
Prepare, remove equipment	2.5	1 Crane Crew 9 day 166 FTE * 8 hr/day * 1.3 day
Prepare, cut-up equipment, clean-up	1	1 Crane Crew @ 5 day 54 FTE * 8 hr/day * 1.3 day
Engineering support, closeout documents, equipment disposal	2	5 FTE * 8 hr/day * 15 day
Duration (Total)	**10.5**	

Notes:

ECN = engineering change notice
FTE = full-time equivalent
hr = hour

B3.0 SAMPLE TANKS

CH2M HILL recently designated tank 241-ER-311 and 241-UX-302A as assumed leaking tanks, and accelerated plans for removing the liquids from these tanks. Sample data for the liquid and conservative estimates for the composition of the solids supported planning for liquid removal from these tanks. Sample data is required from the catch tanks/DCRTs being evaluated in this white paper to support system design, nuclear safety and licensing, and waste compatibility studies. Table B3 summarizes the available sample data and the sample needs for the remaining tanks.

Table B3. Catch Tank Sampling Needs

Tank	Available Sample Data	Sample Needs*
241-A-302A		Liquid and solids
241-A-302B		Liquid and solids
241-A-350		Liquid and solids
241-A-417		Liquid and solids
241-AZ-151		Liquid and solids
241-B-302B		Liquid and solids
241-EW-151		Liquid and solids
240-S-302	Liquid	Solids
241-TX-302C	Liquid	Solids
241-U-301B	Liquid and solids	None
244-S	Liquid	Solids

*Sampling not required if liquid is mitigated by the addition of absorbent or by ventilation

Based on process history these catch tanks should contain mostly dilute water from precipitation. Liquid sample data is available for DCRT 244-S and these liquids are more concentrated and are not consistent with intrusion from rain or snow melt.

For planning purposes, the following assumptions apply to sampling for these tanks:

- Liquids in the tanks (other than DCRT 244-S) will meet U.S. Department of Transportation Type A thresholds and will qualify for shipment to a double-shell tank using the Walker tanker. This assumption will require verification based on the results of analysis of samples of the liquid. DCRT 244-S received waste from the 222-S Laboratory and S/SX tank farm saltwell pump and the liquid waste exceeds DOT Type A thresholds.

  Conservative estimates for solids in these tanks, and the liquids in tanks 241-A-302A, A-350, A-417, and AZ-151, are based on process knowledge. These estimates likely exceed DOT Type A thresholds and may exclude the use of the Walker tanker. However, the estimates may allow shipment by other methods such as using an existing transfer line (if available), shipping in the Type B-compliant LR-56 tanker truck, or pumping through an above-ground hose-in-hose transfer line. These tanks may not require sampling if other transfer methods are used.

- Solids in the tanks will require sampling to support equipment design, nuclear safety analysis, shipping of liquids, and disposal of miscellaneous solid waste.

  Similar to tanks 241-ER-311 and 241-UX-302A, process knowledge may permit the development of conservative estimates for the composition of the solids in the

tanks. In the case of tanks 241-ER-311 and 241-UX-302A, the conservative estimates assumed that the solids consisted of solid waste from the tank farms that may have entered the tanks in the past (with an appropriate reduction to account for soluble constituents likely in the liquid). For example, the liquid retrieval system currently planned for deployment on tank 241-UX-302A will incorporate an in-line filter to prevent solids from reaching the Walker tanker that could cause the shipment to exceed Type A thresholds.

If the solids in the tanks consist mostly of sand and dirt carried into the tanks, and not process waste, then the results of sample analysis may have the following beneficial effects:

- The liquid retrieval system may not require an in-line filter to prevent solids from reaching the Walker Tanker as these solids will not likely result in the shipment to exceeding Type A thresholds. This would reduce the complexity and duration of the design, and reduce the complexity and duration of equipment testing. The liquid retrieval system will not have to shut down due to filter loading. The absence of a filter will remove the requirement to survey the filter during operations for dose rates, and sample and/or assay the filter for waste disposal.

- Waste in a tank may be designated as Waste (L), significantly reducing the nuclear safety evaluation required for liquid removal.

- The potential risk of having the filled Walker tanker inadvertently exceed the Type A thresholds would be significantly reduced. Also, there may be no need for radiation monitoring of the tanker during pumping to ensure Type A thresholds are not exceeded.

B3.1 SAMPLING METHOD

Assuming readily available access to the tank, the bottle-on-a-string method can be used to obtain liquid samples. However, this method does not to collect an adequate sample of solids. CH2M HILL has the following methods available to sample solids: core, finger trap, and clamshell.

Core sampling with a core sample truck requires significant resources and is normally reserved for single-shell tanks. Past experience indicates finger traps may not work well to capture solids under a layer of liquid. Clamshells can likely obtain adequate samples, but require the use of a large glove box with significant scaffolding for support.

CH2M HILL can use one of the following methods to sample the solids in a catch tank:

- Use a clamshell system but replace the glove box with a much smaller glove bag. CH2M HILL previously initiated this change to support single-shell tank closure but put it on hold before implementation.

- Use a peristaltic pump to obtain a sample of solids. A subcontractor demonstrated the viability of this method by using a peristaltic pump to collect liquid and solid samples from tank 241-U-301B. CH2M HILL has a suitable pump, but has not used it in a number of years. This method will require development of a procedure and training operators. It will also require an authorization basis evaluation. This type of pump cannot retrieve samples deeper than approximately 20 to 30 feet.

In addition to solids, either of these methods can retrieve liquid samples. If CH2M HILL elects to sample solids, then this report recommends the use of one of these methods to obtain both liquid and solid samples to reduce the number of sampling events. Table B4 provides a schedule estimate for tank sampling.

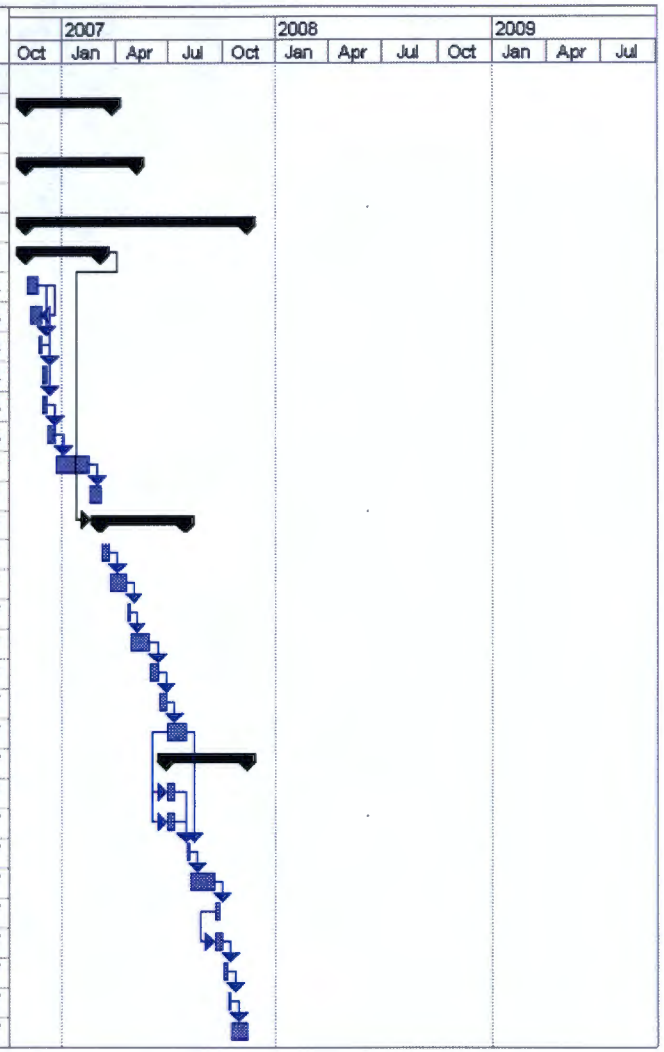
Table B4. Schedule Estimate for Tank Sampling

Activity	Basis	Duration (week)
Prepare tank analysis and sample plan (one plan for all tanks)	1 plan for all tanks = 5 week Plan for remaining tanks = 0 week	0 - 5
Prepare work package	First work package = 6 week Remaining work packages = 3 – 4 week	3 - 6
Sample tanks	1 week/tank	1
Analyze samples	12 week/sample	12
Other	Develop glove bag for clamshell = TBD week Prepare procedure/train operators for peristaltic pump = 8 – 12 week	8 - 12
	Duration (Total)	**24 - 36**

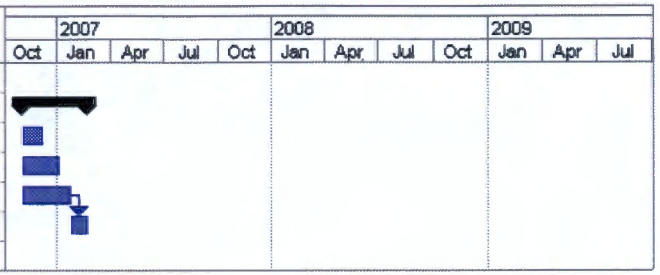
APPENDIX C

SCHEDULES

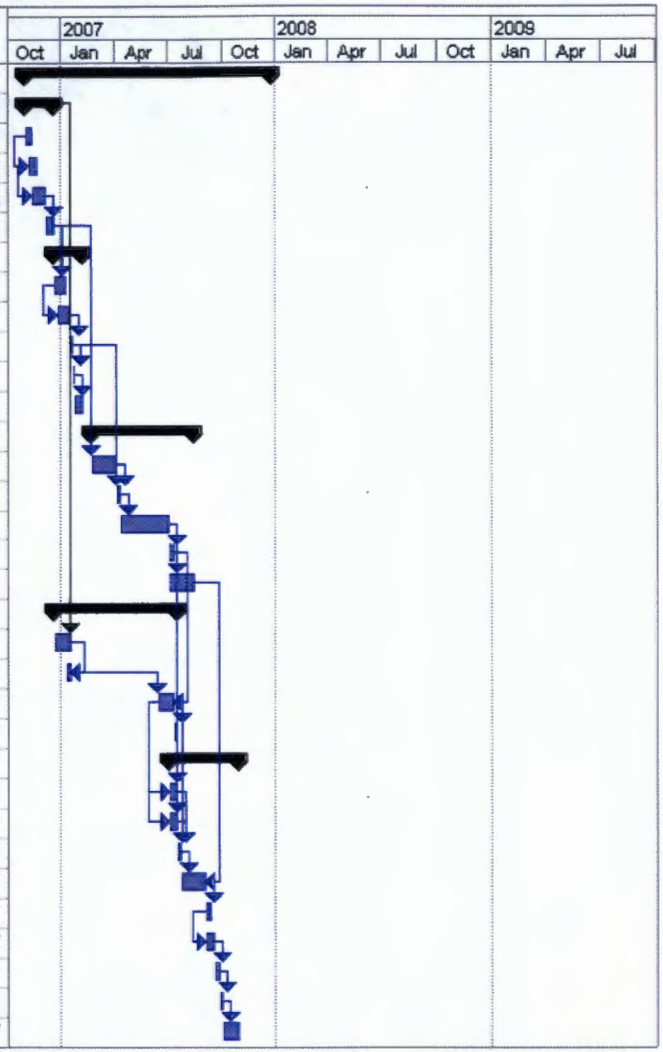
ID	Task Name	Duration	Start	Finish
1				
2	**Engineering Evaluation - Alt Liq Mit Methods**	**105 days**	**Wed 11/1/06**	**Tue 3/27/07**
19				
20	**Complete Integrity Assessment- 244-S**	**135 days**	**Wed 11/1/06**	**Tue 5/8/07**
31				
32	**Develop Absorbent System**	**270 days**	**Wed 11/1/06**	**Tue 11/13/07**
33	**Material Selection**	**90 days**	**Wed 11/1/06**	**Tue 3/6/07**
34	Define material requirements	15 days	Wed 11/1/06	Tue 11/21/06
35	Identify absorbent materials	15 days	Wed 11/8/06	Tue 11/28/06
36	Develop material test criteria	5 days	Wed 11/22/06	Tue 11/28/06
37	Develop test plan	5 days	Wed 11/29/06	Tue 12/5/06
38	Select absorbents for material testing	5 days	Wed 11/29/06	Tue 12/5/06
39	Procure absorbent materials	10 days	Wed 12/6/06	Tue 12/19/06
40	Material testing	40 days	Wed 12/20/06	Tue 2/13/07
41	Document test results	15 days	Wed 2/14/07	Tue 3/6/07
42	**Develop delivery system**	**105 days**	**Wed 3/7/07**	**Tue 7/31/07**
43	Define delivery system requirements	10 days	Wed 3/7/07	Tue 3/20/07
44	Perform delivery system conceptual design	20 days	Wed 3/21/07	Tue 4/17/07
45	Develop test plan for absorbent delivery system	5 days	Wed 4/18/07	Tue 4/24/07
46	Procure equipment and materials	25 days	Wed 4/25/07	Tue 5/29/07
47	Assemble/Test Set Up	10 days	Wed 5/30/07	Tue 6/12/07
48	Perform Testing	10 days	Wed 6/13/07	Tue 6/26/07
49	Complete system design	25 days	Wed 6/27/07	Tue 7/31/07
50	**Safety Basis Amendment (absorbent delivery)**	**100 days**	**Wed 6/27/07**	**Tue 11/13/07**
51	Hazards Analysis	10 days	Wed 6/27/07	Tue 7/10/07
52	Accident Analysis	10 days	Wed 6/27/07	Tue 7/10/07
53	Control Decision	5 days	Wed 8/1/07	Tue 8/7/07
54	Safety Basis Amendment	30 days	Wed 8/8/07	Tue 9/18/07
55	Draft SBA to DOE-ORP/DOE-ORP Review	5 days	Wed 9/19/07	Tue 9/25/07
56	Comment Resolution	10 days	Wed 9/19/07	Tue 10/2/07
57	Prepare Formal Letter	5 days	Wed 10/3/07	Tue 10/9/07
58	ORP Approve SER	5 days	Wed 10/10/07	Tue 10/16/07
59	Safety Basis Implementation	20 days	Wed 10/17/07	Tue 11/13/07



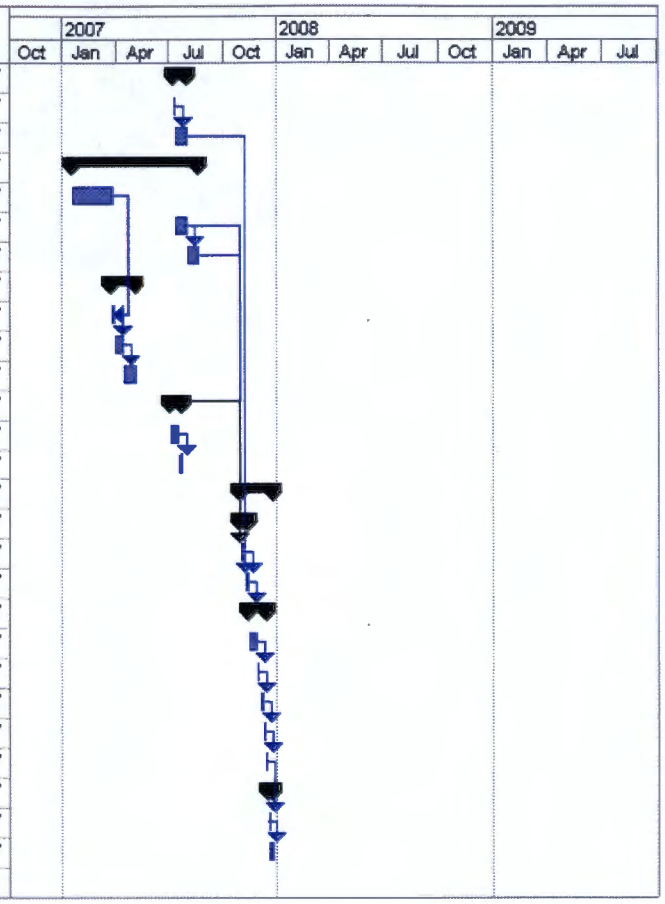
ID	Task Name	Duration	Start	Finish
60				
61	**Sampling and Analysis Capability (one time only)**	**80 days**	**Wed 11/1/06**	**Tue 2/20/07**
62	Develop TSAP (one time only)	**25 days**	**Wed 11/1/06**	**Tue 12/5/06**
63	Develop glovebag for clamshell	**45 days**	**Wed 11/1/06**	**Tue 1/2/07**
64	Develop sampling procedure	**60 days**	**Wed 11/1/06**	**Tue 1/23/07**
65	Authorization basis	**20 days**	**Wed 1/24/07**	**Tue 2/20/07**
66				



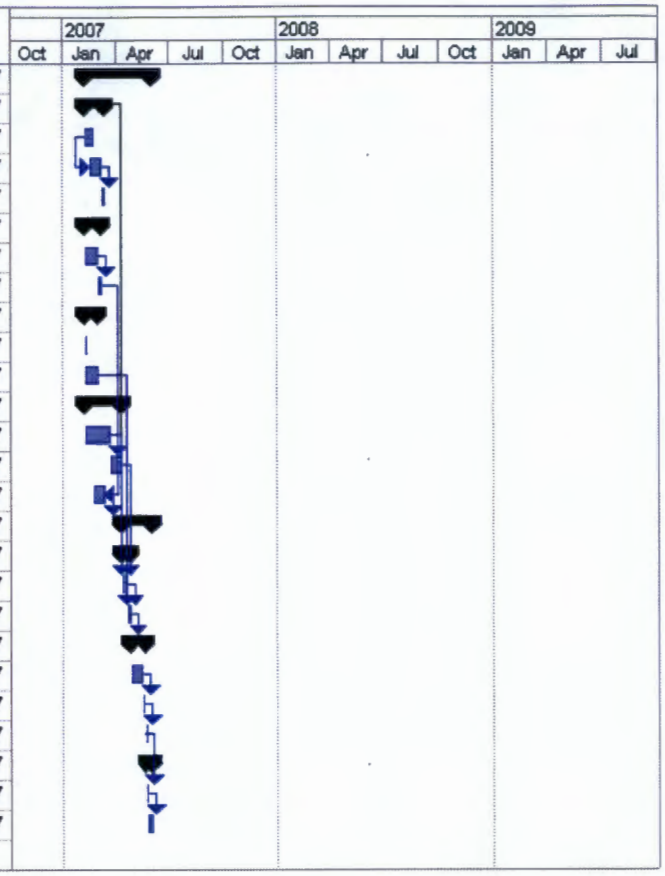
ID	Task Name	Duration	Start	Finish
67	**S-302 Catch Tank (pump liquids)**	**301 days**	**Wed 11/1/06**	**Wed 12/26/07**
68	**Tank Investigation**	**35 days**	**Wed 11/1/06**	**Tue 12/19/06**
69	Drawing Search & Review	**10 days**	**Wed 11/1/06**	**Tue 11/14/06**
70	Plan (evaluation, lift calc, ECNs)	**10 days**	**Wed 11/8/06**	**Tue 11/21/06**
71	Work Package - Ready to Work	**15 days**	**Wed 11/15/06**	**Tue 12/5/06**
72	Determine Initial Conditions (uncover risers, remov	**10 days**	**Wed 12/6/06**	**Tue 12/19/06**
73	**Riser Preparation**	**35 days**	**Wed 12/20/06**	**Tue 2/6/07**
74	Engineering	**15 days**	**Wed 12/20/06**	**Tue 1/9/07**
75	Work Package - Ready To Work	**15 days**	**Wed 12/27/06**	**Tue 1/16/07**
76	Remove FIC Sleeve	**3 days**	**Wed 1/17/07**	**Fri 1/19/07**
77	Equipment Cut Up & Package	**2 days**	**Mon 1/22/07**	**Tue 1/23/07**
78	Close out and Disposal	**10 days**	**Wed 1/24/07**	**Tue 2/6/07**
79	**Catch Tank Sampling and Analysis (solids only)**	**125 days**	**Wed 2/21/07**	**Tue 8/14/07**
80	Work Package -ready to work (first tank sampled :	**30 days**	**Wed 2/21/07**	**Tue 4/3/07**
81	Sampling	**5 days**	**Wed 4/4/07**	**Tue 4/10/07**
82	Analysis	**60 days**	**Wed 4/11/07**	**Tue 7/3/07**
83	Type A Waste Evaluation	**5 days**	**Wed 7/4/07**	**Tue 7/10/07**
84	Prepare Report	**30 days**	**Wed 7/4/07**	**Tue 8/14/07**
85	**System Design**	**150 days**	**Wed 12/20/06**	**Tue 7/17/07**
86	Pump Specification	**20 days**	**Wed 12/20/06**	**Tue 1/16/07**
87	Develop Test Plan	**5 days**	**Wed 1/10/07**	**Tue 1/16/07**
88	System Design	**20 days**	**Wed 6/13/07**	**Tue 7/10/07**
89	Sys Install & Tank Prep (ECNs)	**5 days**	**Wed 7/11/07**	**Tue 7/17/07**
90	**Safety Basis Amendment**	**85 days**	**Wed 7/4/07**	**Tue 10/30/07**
91	Hazards Analysis	**10 days**	**Wed 7/4/07**	**Tue 7/17/07**
92	Accident Analysis	**10 days**	**Wed 7/4/07**	**Tue 7/17/07**
93	Control Decision	**5 days**	**Wed 7/18/07**	**Tue 7/24/07**
94	Safety Basis Amendment	**30 days**	**Wed 7/25/07**	**Tue 9/4/07**
95	Draft SBA to DOE-ORP/DOE-ORP Review	**5 days**	**Wed 9/5/07**	**Tue 9/11/07**
96	Comment Resolution	**10 days**	**Wed 9/5/07**	**Tue 9/18/07**
97	Prepare Formal Letter	**5 days**	**Wed 9/19/07**	**Tue 9/25/07**
98	ORP Approval of SER	**5 days**	**Wed 9/26/07**	**Tue 10/2/07**
99	Safety Basis Implementation	**20 days**	**Wed 10/3/07**	**Tue 10/30/07**



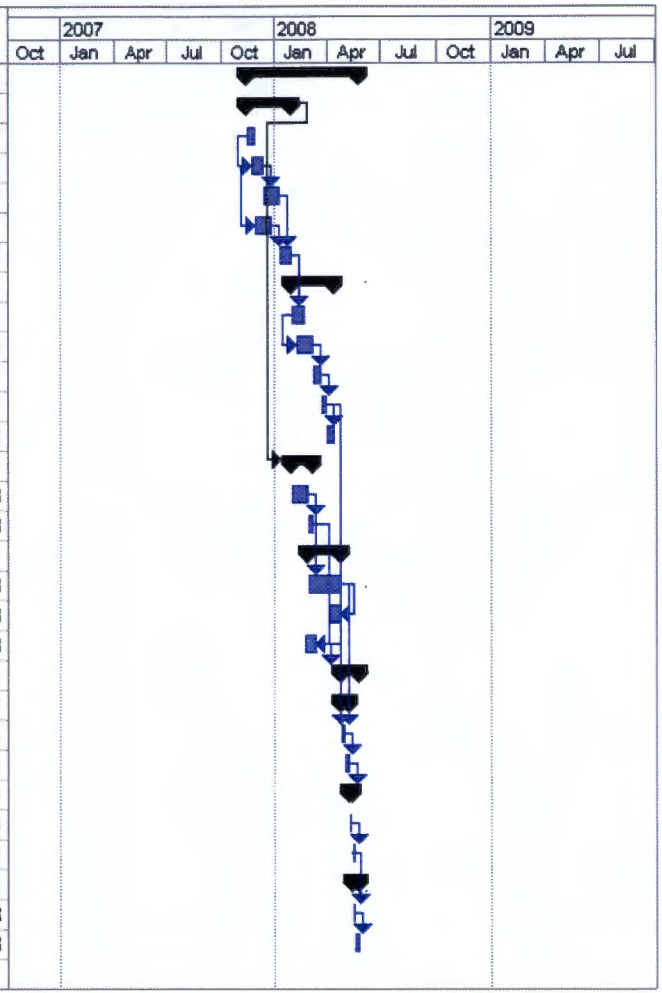
ID	Task Name	Duration	Start	Finish
100	**Waste Compatibility**	17 days	Mon 7/9/07	Tue 7/31/07
101	Select Receiver Tank	2 days	Mon 7/9/07	Tue 7/10/07
102	Prepare/Rev/Approve Compatibility Assessment	15 days	Wed 7/11/07	Tue 7/31/07
103	**Procurement**	155 days	Wed 1/17/07	Tue 8/21/07
104	Procure Pump	50 days	Wed 1/17/07	Tue 3/27/07
105	Procure Material & Equipment	15 days	Wed 7/11/07	Tue 7/31/07
106	Fabricate Equipment	15 days	Wed 8/1/07	Tue 8/21/07
107	**Testing at CTF**	30 days	Fri 3/23/07	Thu 5/3/07
108	Procure Test Matl/Equip	5 days	Fri 3/23/07	Thu 3/29/07
109	Perform Testing	10 days	Fri 3/30/07	Thu 4/12/07
110	Test Report	15 days	Fri 4/13/07	Thu 5/3/07
111	**Work Package Preparation**	15 days	Wed 7/4/07	Tue 7/24/07
112	Draft Work Package	10 days	Wed 7/4/07	Tue 7/17/07
113	Review/Approve WP	5 days	Wed 7/18/07	Tue 7/24/07
114	**Operations**	41 days	Wed 10/31/07	Wed 12/26/07
115	**Field Work**	10 days	Wed 10/31/07	Tue 11/13/07
116	Install Pump and Assemble Equipment	5 days	Wed 10/31/07	Tue 11/6/07
117	Readiness	5 days	Wed 11/7/07	Tue 11/13/07
118	**Pumping & Transfer**	23 days	Wed 11/14/07	Fri 12/14/07
119	Phase 1 Pumping	10 days	Wed 11/14/07	Tue 11/27/07
120	Phase 1 Transfer/Unloading	3 days	Wed 11/28/07	Fri 11/30/07
121	Phase 2 Pumping	5 days	Mon 12/3/07	Fri 12/7/07
122	Phase 2 Transfer/Unload	3 days	Mon 12/10/07	Wed 12/12/07
123	Clean up/ Demobilize	2 days	Thu 12/13/07	Fri 12/14/07
124	**Closeout**	8 days	Mon 12/17/07	Wed 12/26/07
125	Work Package Closeout	2 days	Mon 12/17/07	Tue 12/18/07
126	Prepare Closeout Report	6 days	Wed 12/19/07	Wed 12/26/07
127				



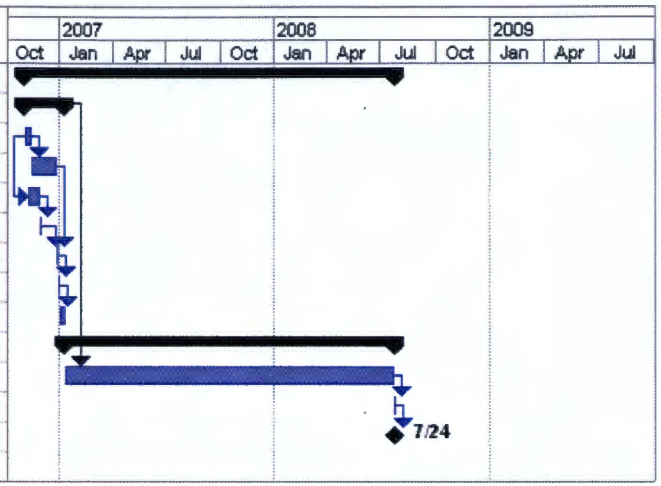
ID	Task Name	Duration	Start	Finish
128	**U-301B Catch Tank (pump liquids)**	83 days	Wed 2/7/07	Fri 6/1/07
129	**Riser Preparation**	25 days	Wed 2/7/07	Tue 3/13/07
130	Engineering (Temp ECN)	10 days	Wed 2/7/07	Tue 2/20/07
131	Work Package - Ready To Work	15 days	Wed 2/14/07	Tue 3/6/07
132	Close out	5 days	Wed 3/7/07	Tue 3/13/07
133	**System Design**	20 days	Wed 2/7/07	Tue 3/6/07
134	System Design	15 days	Wed 2/7/07	Tue 2/27/07
135	Sys Install & Tank Prep (ECNs)	5 days	Wed 2/28/07	Tue 3/6/07
136	**Compatibility Assessment**	15 days	Wed 2/7/07	Tue 2/27/07
137	Select Receiver Tanks	2 days	Wed 2/7/07	Thu 2/8/07
138	Prepare/Review/Approve Compatibility Assessment	15 days	Wed 2/7/07	Tue 2/27/07
139	**Procurement**	45 days	Wed 2/7/07	Tue 4/10/07
140	Procure Material & Equipment	30 days	Wed 2/7/07	Tue 3/20/07
141	Fabricate Equipment	15 days	Wed 3/21/07	Tue 4/10/07
142	Work Package Preparation	15 days	Wed 2/21/07	Tue 3/13/07
143	**Operations**	38 days	Wed 4/11/07	Fri 6/1/07
144	**Field Work**	10 days	Wed 4/11/07	Tue 4/24/07
145	Install Pump and Assemble Equipment	5 days	Wed 4/11/07	Tue 4/17/07
146	Readiness	5 days	Wed 4/18/07	Tue 4/24/07
147	**Pumping & Transfer**	20 days	Wed 4/25/07	Tue 5/22/07
148	Pumping	15 days	Wed 4/25/07	Tue 5/15/07
149	Transfer/Unloading	3 days	Wed 5/16/07	Fri 5/18/07
150	Clean up/ Demobilize	2 days	Mon 5/21/07	Tue 5/22/07
151	**Closeout**	8 days	Wed 5/23/07	Fri 6/1/07
152	Work Package Closeout	2 days	Wed 5/23/07	Thu 5/24/07
153	Prepare Closeout Report	6 days	Fri 5/25/07	Fri 6/1/07
154				



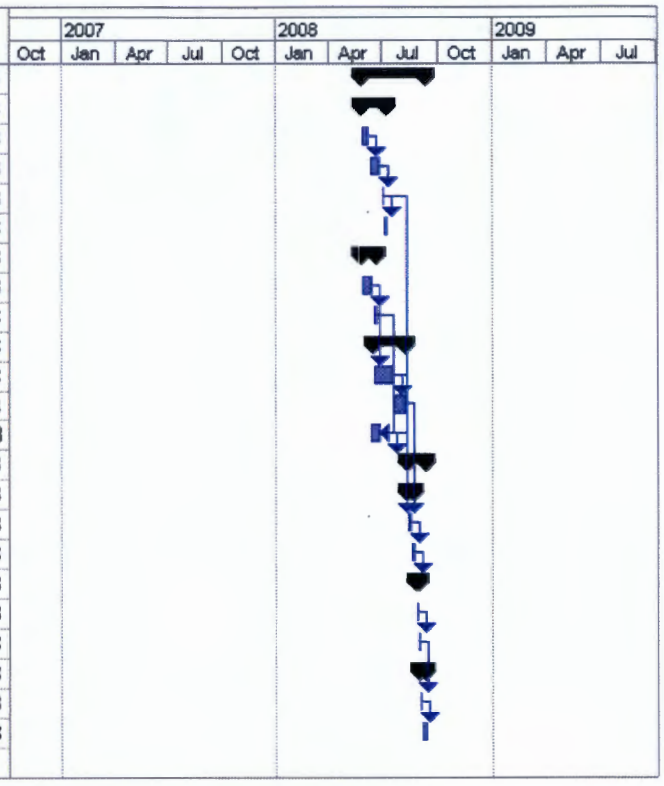
ID	Task Name	Duration	Start	Finish
155	**A-350 Catch Tank (add absorbent)**	**138 days**	**Wed 11/14/07**	**Fri 5/23/08**
156	**Tank Investigation**	**55 days**	**Wed 11/14/07**	**Tue 1/29/08**
157	Drawing Search & Review	**10 days**	**Wed 11/14/07**	**Tue 11/27/07**
158	Engineering (evaluation, lift calc, ECNs, lifting bail	**15 days**	**Wed 11/21/07**	**Tue 12/11/07**
159	Procure Cover Plate	**20 days**	**Wed 12/12/07**	**Tue 1/8/08**
160	Work Package - Ready to Work	**20 days**	**Wed 11/28/07**	**Tue 12/25/07**
161	Determine Initial Conditions (uncover risers, replac	**15 days**	**Wed 1/9/08**	**Tue 1/29/08**
162	**Establish Tank Access**	**52 days**	**Wed 1/30/08**	**Thu 4/10/08**
163	Engineering	**15 days**	**Wed 1/30/08**	**Tue 2/19/08**
164	Work Package - Ready To Work	**20 days**	**Wed 2/6/08**	**Tue 3/4/08**
165	Remove Pump	**12 days**	**Wed 3/5/08**	**Thu 3/20/08**
166	Equipment Cut Up & Package	**5 days**	**Fri 3/21/08**	**Thu 3/27/08**
167	Close out and Disposal	**10 days**	**Fri 3/28/08**	**Thu 4/10/08**
168	**System Design**	**25 days**	**Wed 1/30/08**	**Tue 3/4/08**
169	System Design (tank specific delivery sys)	20 days	Wed 1/30/08	Tue 2/26/08
170	Sys Install & Tank Prep (ECNs)	5 days	Wed 2/27/08	Tue 3/4/08
171	**Procurement**	**40 days**	**Wed 2/27/08**	**Tue 4/22/08**
172	Procure Delivery System and Riser Prep Matl	40 days	Wed 2/27/08	Tue 4/22/08
173	Fabricate Misc Equipment	15 days	Wed 4/2/08	Tue 4/22/08
174	Work Package Preparation -Absorbent Placement	15 days	Wed 2/20/08	Tue 3/11/08
175	**Operations**	**23 days**	**Wed 4/23/08**	**Fri 5/23/08**
176	**Field Work**	**10 days**	**Wed 4/23/08**	**Tue 5/6/08**
177	Install Absorbent Delivery System (vent/cam/d	**5 days**	**Wed 4/23/08**	**Tue 4/29/08**
178	Readiness	**5 days**	**Wed 4/30/08**	**Tue 5/6/08**
179	**Place Absorbent in Tank**	**5 days**	**Wed 5/7/08**	**Tue 5/13/08**
180	Operations	**3 days**	**Wed 5/7/08**	**Fri 5/9/08**
181	Clean up/ Demobilize	**2 days**	**Mon 5/12/08**	**Tue 5/13/08**
182	**Closeout**	**8 days**	**Wed 5/14/08**	**Fri 5/23/08**
183	Work Package Closeout	2 days	Wed 5/14/08	Thu 5/15/08
184	Prepare Closeout Report	6 days	Fri 5/16/08	Fri 5/23/08
185				



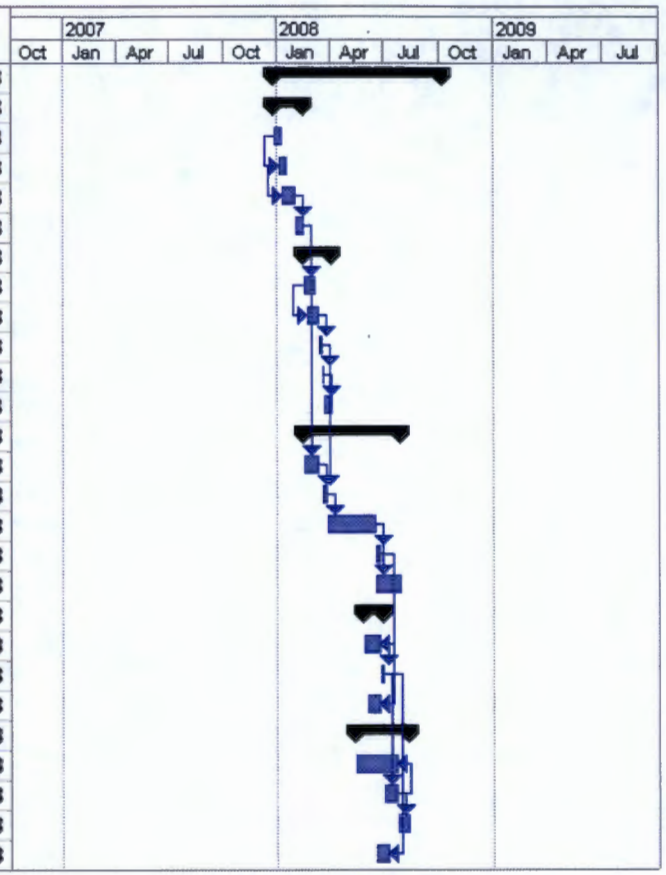
ID	Task Name	Duration	Start	Finish
186	**AZ-151 Catch Tank (install breather filter)**	**452 days**	**Wed 11/1/06**	**Thu 7/24/08**
187	**Install Breather Filter**	**50 days**	**Wed 11/1/06**	**Tue 1/9/07**
188	Engineering	**10 days**	**Wed 11/1/06**	**Tue 11/14/06**
189	Procure Materials (Y adapter/BF)	**30 days**	**Wed 11/15/06**	**Tue 12/26/06**
190	Work Package - Ready To Work	**15 days**	**Wed 11/8/06**	**Tue 11/28/06**
191	Remove ENRAF	**2 days**	**Wed 11/29/06**	**Thu 11/30/06**
192	Install Y adapter - Inlet BF	**2 days**	**Wed 12/27/06**	**Thu 12/28/06**
193	Work package closeout	**2 days**	**Fri 12/29/06**	**Mon 1/1/07**
194	Prepare Closeout Report	**6 days**	**Tue 1/2/07**	**Tue 1/9/07**
195	**Evaporate AZ-151**	**402 days**	**Wed 1/10/07**	**Thu 7/24/08**
196	Ventilate Tank/Evaporation	**400 days**	**Wed 1/10/07**	**Tue 7/22/08**
197	Inspect Tank	**2 days**	**Wed 7/23/08**	**Thu 7/24/08**
198	Decision to continue ventilation or other	**0 days**	**Thu 7/24/08**	**Thu 7/24/08**
199				



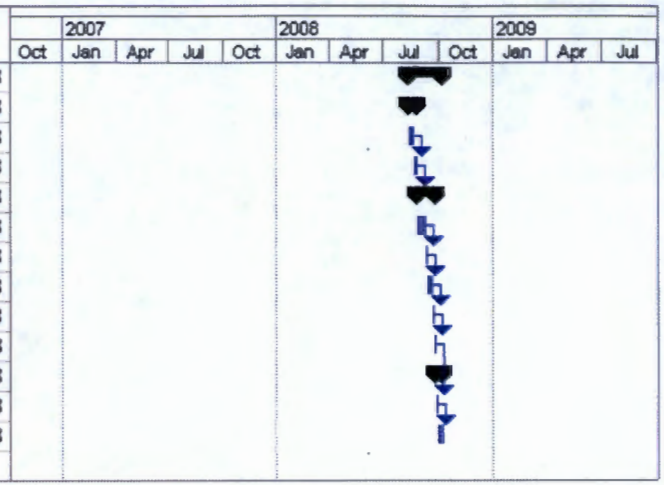
ID	Task Name	Duration	Start	Finish
200	**A-302A Catch Tank (add absorbent)**	**78 days**	**Mon 5/26/08**	**Wed 9/10/08**
201	**Riser Preparation**	**32 days**	**Mon 5/26/08**	**Tue 7/8/08**
202	Engineering (Temp ECN)	**10 days**	**Mon 5/26/08**	**Fri 6/6/08**
203	Work Package - Ready To Work	**15 days**	**Mon 6/9/08**	**Fri 6/27/08**
204	Remove ENRAF and Filter	**2 days**	**Mon 6/30/08**	**Tue 7/1/08**
205	Close out	**5 days**	**Wed 7/2/08**	**Tue 7/8/08**
206	**System Design**	**20 days**	**Mon 5/26/08**	**Fri 6/20/08**
207	System Design (tank specific delivery system)	**15 days**	**Mon 5/26/08**	**Fri 6/13/08**
208	Sys Install & Tank Prep (ECNs)	**5 days**	**Mon 6/16/08**	**Fri 6/20/08**
209	**Procurement**	**40 days**	**Mon 6/16/08**	**Fri 8/8/08**
210	Procure Material & Equipment	**25 days**	**Mon 6/16/08**	**Fri 7/18/08**
211	Fabricate Equipment	**15 days**	**Mon 7/21/08**	**Fri 8/8/08**
212	Work Package Preparation	15 days	Mon 6/9/08	Fri 6/27/08
213	**Operations**	**23 days**	**Mon 8/11/08**	**Wed 9/10/08**
214	**Field Work**	**10 days**	**Mon 8/11/08**	**Fri 8/22/08**
215	Install Absorbent Delivery Sys	**5 days**	**Mon 8/11/08**	**Fri 8/15/08**
216	Readiness	**5 days**	**Mon 8/18/08**	**Fri 8/22/08**
217	**Place Absorbent**	**5 days**	**Mon 8/25/08**	**Fri 8/29/08**
218	Absorbent Placement	**3 days**	**Mon 8/25/08**	**Wed 8/27/08**
219	Clean up/ Demobilize	**2 days**	**Thu 8/28/08**	**Fri 8/29/08**
220	**Closeout**	**8 days**	**Mon 9/1/08**	**Wed 9/10/08**
221	Work Package Closeout	**2 days**	**Mon 9/1/08**	**Tue 9/2/08**
222	Prepare Closeout Report	**6 days**	**Wed 9/3/08**	**Wed 9/10/08**
223				



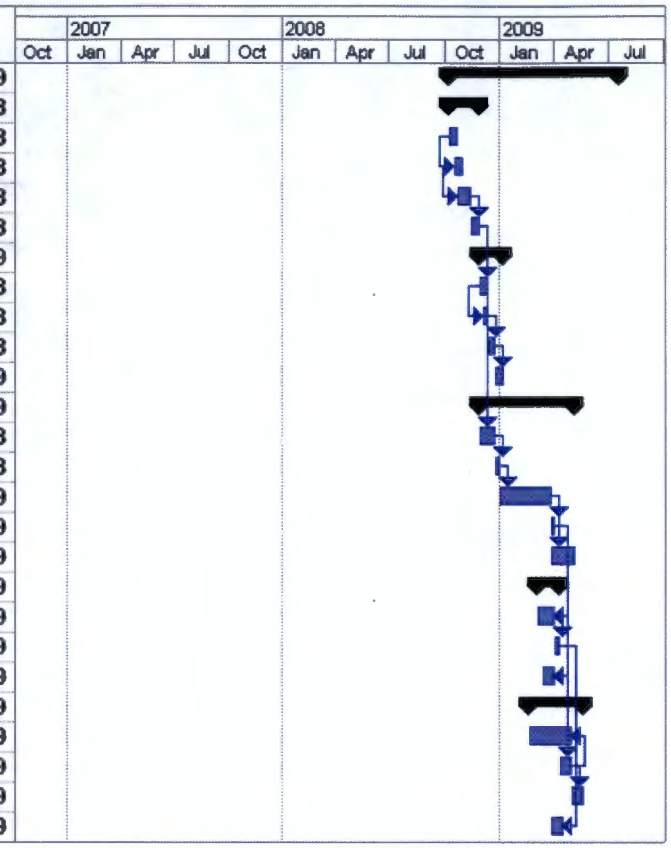
ID	Task Name	Duration	Start	Finish
224	**A-302B Catch Tank (pump liquids)**	204 days	Thu 12/27/07	Tue 10/7/08
225	**Tank Investigation**	35 days	Thu 12/27/07	Wed 2/13/08
226	Drawing Search & Review	10 days	Thu 12/27/07	Wed 1/9/08
227	Plan (evaluation, lift calc, ECNs)	10 days	Thu 1/3/08	Wed 1/16/08
228	Work Package - Ready to Work	15 days	Thu 1/10/08	Wed 1/30/08
229	Determine Initial Conditions (uncover risers, remove soil, sur	10 days	Thu 1/31/08	Wed 2/13/08
230	**Riser Preparation**	35 days	Thu 2/14/08	Wed 4/2/08
231	Engineering	15 days	Thu 2/14/08	Wed 3/5/08
232	Work Package - Ready To Work	15 days	Thu 2/21/08	Wed 3/12/08
233	Remove Liner	3 days	Thu 3/13/08	Mon 3/17/08
234	Liner Cut Up & Package	2 days	Tue 3/18/08	Wed 3/19/08
235	Close out and Disposal	10 days	Thu 3/20/08	Wed 4/2/08
236	**Catch Tank Sampling and Analysis (liquids and solids)**	118 days	Thu 2/14/08	Mon 7/28/08
237	Work Package -ready to work	20 days	Thu 2/14/08	Wed 3/12/08
238	Sampling	5 days	Tue 3/18/08	Mon 3/24/08
239	Analysis	60 days	Tue 3/25/08	Mon 6/16/08
240	Type A Waste Evaluation	5 days	Tue 6/17/08	Mon 6/23/08
241	Prepare Report	30 days	Tue 6/17/08	Mon 7/28/08
242	**System Design**	25 days	Tue 5/27/08	Mon 6/30/08
243	System Design	20 days	Tue 5/27/08	Mon 6/23/08
244	Sys Install & Tank Prep (ECNs)	5 days	Tue 6/24/08	Mon 6/30/08
245	Compatibility Assessment	15 days	Tue 6/3/08	Mon 6/23/08
246	**Procurement**	65 days	Tue 5/13/08	Mon 8/11/08
247	Procure Pump	50 days	Tue 5/13/08	Mon 7/21/08
248	Procure Material & Equipment	15 days	Tue 7/1/08	Mon 7/21/08
249	Fabricate Equipment	15 days	Tue 7/22/08	Mon 8/11/08
250	Work Package Preparation	15 days	Tue 6/17/08	Mon 7/7/08



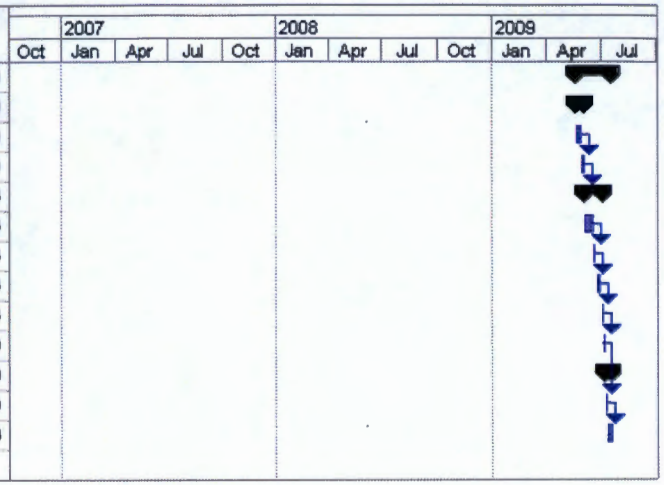
ID	Task Name	Duration	Start	Finish
251	**Operations**	**41 days**	**Tue 8/12/08**	**Tue 10/7/08**
252	**Field Work**	**10 days**	**Tue 8/12/08**	**Mon 8/25/08**
253	Install Pump and Assemble Equipment	**5 days**	**Tue 8/12/08**	**Mon 8/18/08**
254	Readiness	**5 days**	**Tue 8/19/08**	**Mon 8/25/08**
255	**Pumping & Transfer**	**23 days**	**Tue 8/26/08**	**Thu 9/25/08**
256	Phase 1 Pumping	**10 days**	**Tue 8/26/08**	**Mon 9/8/08**
257	Phase 1 Transfer/Unloading	**3 days**	**Tue 9/9/08**	**Thu 9/11/08**
258	Phase 2 Pumping	**5 days**	**Fri 9/12/08**	**Thu 9/18/08**
259	Phase 2 Transfer/Unload	**3 days**	**Fri 9/19/08**	**Tue 9/23/08**
260	Clean up/ Demobilize	**2 days**	**Wed 9/24/08**	**Thu 9/25/08**
261	**Closeout**	**8 days**	**Fri 9/26/08**	**Tue 10/7/08**
262	Work Package Closeout	**2 days**	**Fri 9/26/08**	**Mon 9/29/08**
263	Prepare Closeout Report	**6 days**	**Tue 9/30/08**	**Tue 10/7/08**
264				



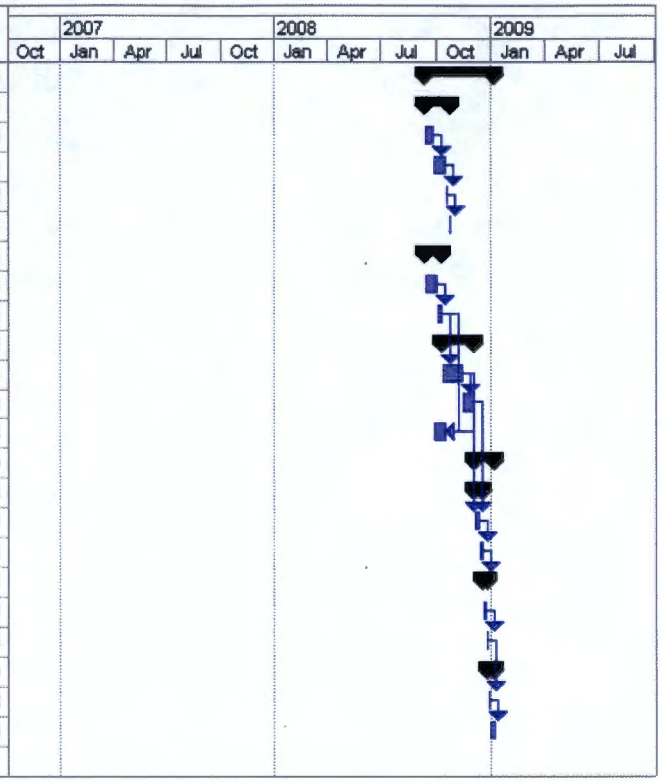
ID	Task Name	Duration	Start	Finish
265	**B-302B Catch Tank (pump liquids)**	**201 days**	**Wed 10/8/08**	**Wed 7/15/09**
266	**Tank Investigation**	**35 days**	**Wed 10/8/08**	**Tue 11/25/08**
267	Drawing Search & Review	**10 days**	**Wed 10/8/08**	**Tue 10/21/08**
268	Plan (evaluation, lift calc, ECNs)	**10 days**	**Wed 10/15/08**	**Tue 10/28/08**
269	Work Package - Ready to Work	**15 days**	**Wed 10/22/08**	**Tue 11/11/08**
270	Determine Initial Conditions (remove gunite, uncover risers, r	**10 days**	**Wed 11/12/08**	**Tue 11/25/08**
271	**Riser Preparation**	**30 days**	**Wed 11/26/08**	**Tue 1/6/09**
272	Engineering	**10 days**	**Wed 11/26/08**	**Tue 12/9/08**
273	Work Package - Ready To Work	**5 days**	**Wed 12/3/08**	**Tue 12/9/08**
274	Install riser extensions	**10 days**	**Wed 12/10/08**	**Tue 12/23/08**
275	Close out and Disposal	**10 days**	**Wed 12/24/08**	**Tue 1/6/09**
276	**Catch Tank Sampling and Analysis (liquid only)**	**115 days**	**Wed 11/26/08**	**Tue 5/5/09**
277	Work Package -ready to work	**20 days**	**Wed 11/26/08**	**Tue 12/23/08**
278	Sampling	**5 days**	**Wed 12/24/08**	**Tue 12/30/08**
279	Analysis	**60 days**	**Wed 12/31/08**	**Tue 3/24/09**
280	Type A Waste Evaluation	**5 days**	**Wed 3/25/09**	**Tue 3/31/09**
281	Prepare Report	**30 days**	**Wed 3/25/09**	**Tue 5/5/09**
282	**System Design**	**25 days**	**Wed 3/4/09**	**Tue 4/7/09**
283	System Design	**20 days**	**Wed 3/4/09**	**Tue 3/31/09**
284	Sys Install & Tank Prep (ECNs)	**5 days**	**Wed 4/1/09**	**Tue 4/7/09**
285	Compatibility Assessment	**15 days**	**Wed 3/11/09**	**Tue 3/31/09**
286	**Procurement**	**65 days**	**Wed 2/18/09**	**Tue 5/19/09**
287	Procure Pump	**50 days**	**Wed 2/18/09**	**Tue 4/28/09**
288	Procure Material & Equipment	**15 days**	**Wed 4/8/09**	**Tue 4/28/09**
289	Fabricate Equipment	**15 days**	**Wed 4/29/09**	**Tue 5/19/09**
290	Work Package Preparation	**15 days**	**Wed 3/25/09**	**Tue 4/14/09**



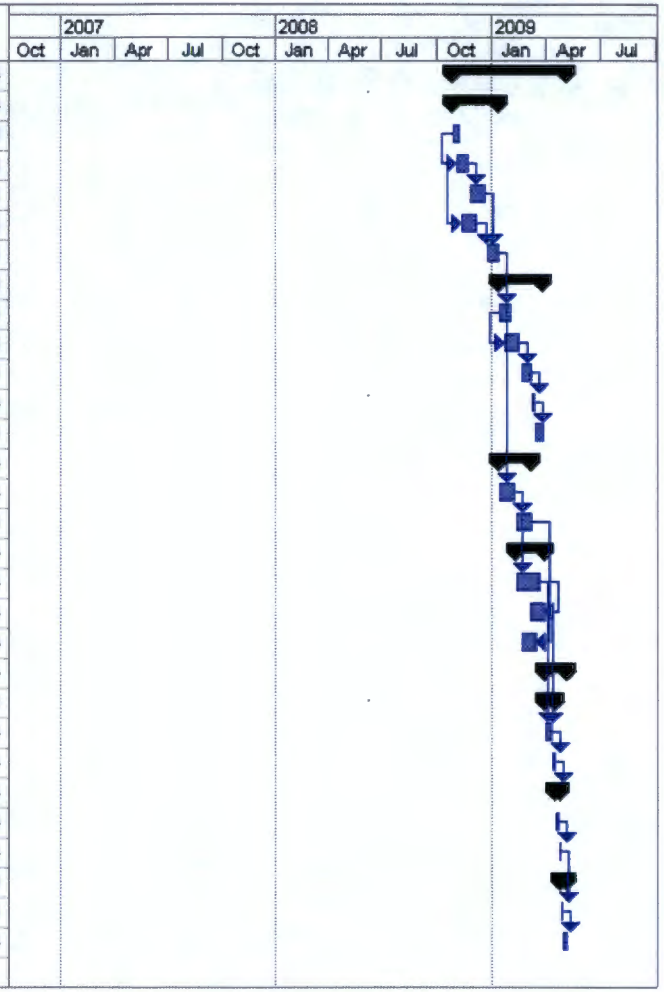
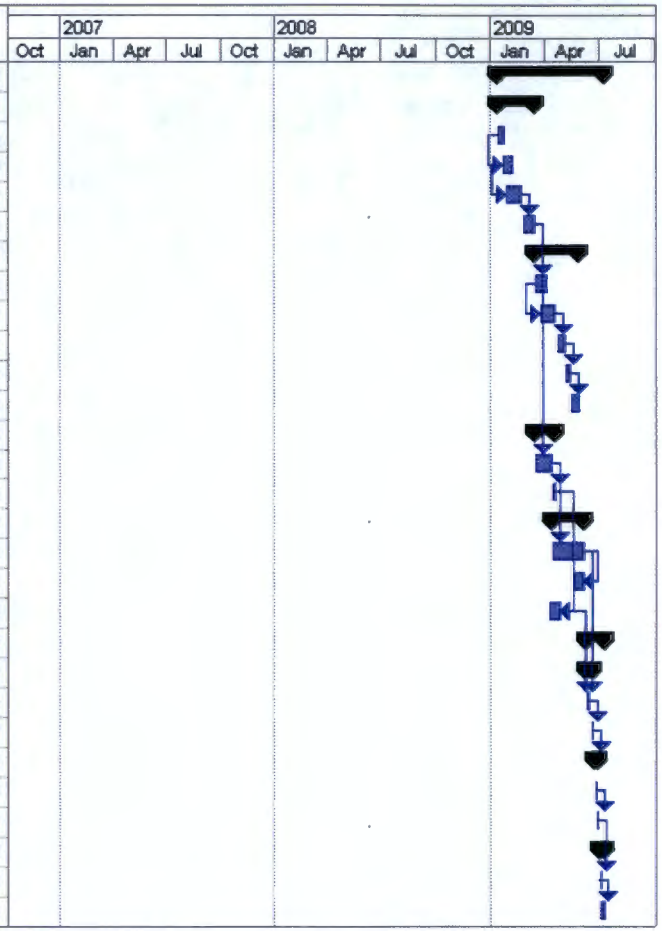
ID	Task Name	Duration	Start	Finish
291	**Operations**	**41 days**	**Wed 5/20/09**	**Wed 7/15/09**
292	**Field Work**	**10 days**	**Wed 5/20/09**	**Tue 6/2/09**
293	Install Pump and Assemble Equipment	**5 days**	**Wed 5/20/09**	**Tue 5/26/09**
294	Readiness	**5 days**	**Wed 5/27/09**	**Tue 6/2/09**
295	**Pumping & Transfer**	**23 days**	**Wed 6/3/09**	**Fri 7/3/09**
296	Phase 1 Pumping	**10 days**	**Wed 6/3/09**	**Tue 6/16/09**
297	Phase 1 Transfer/Unloading	**3 days**	**Wed 6/17/09**	**Fri 6/19/09**
298	Phase 2 Pumping	**5 days**	**Mon 6/22/09**	**Fri 6/26/09**
299	Phase 2 Transfer/Unload	**3 days**	**Mon 6/29/09**	**Wed 7/1/09**
300	Clean up/ Demobilize	**2 days**	**Thu 7/2/09**	**Fri 7/3/09**
301	**Closeout**	**8 days**	**Mon 7/6/09**	**Wed 7/15/09**
302	Work Package Closeout	**2 days**	**Mon 7/6/09**	**Tue 7/7/09**
303	Prepare Closeout Report	**6 days**	**Wed 7/8/09**	**Wed 7/15/09**
304				



ID	Task Name	Duration	Start	Finish
305	**EW-151 Catch Tank (add absorbent)**	**83 days**	**Thu 9/11/08**	**Mon 1/5/09**
306	**Riser Preparation**	**32 days**	**Thu 9/11/08**	**Fri 10/24/08**
307	Engineering (Temp ECN)	**10 days**	**Thu 9/11/08**	**Wed 9/24/08**
308	Work Package - Ready To Work	**15 days**	**Thu 9/25/08**	**Wed 10/15/08**
309	Remove Filter	**2 days**	**Thu 10/16/08**	**Fri 10/17/08**
310	Close out	**5 days**	**Mon 10/20/08**	**Fri 10/24/08**
311	**System Design**	**20 days**	**Thu 9/11/08**	**Wed 10/8/08**
312	System Design (tank specific delivery system)	**15 days**	**Thu 9/11/08**	**Wed 10/1/08**
313	Sys Install & Tank Prep (ECNs)	**5 days**	**Thu 10/2/08**	**Wed 10/8/08**
314	**Procurement**	**40 days**	**Thu 10/9/08**	**Wed 12/3/08**
315	Procure Material & Equipment	**25 days**	**Thu 10/9/08**	**Wed 11/12/08**
316	Fabricate Equipment	**15 days**	**Thu 11/13/08**	**Wed 12/3/08**
317	Work Package Preparation	**15 days**	**Thu 9/25/08**	**Wed 10/15/08**
318	**Operations**	**23 days**	**Thu 12/4/08**	**Mon 1/5/09**
319	**Field Work**	**10 days**	**Thu 12/4/08**	**Wed 12/17/08**
320	Install Absorbent Delivery Sys	**5 days**	**Thu 12/4/08**	**Wed 12/10/08**
321	Readiness	**5 days**	**Thu 12/11/08**	**Wed 12/17/08**
322	**Place Absorbent**	**5 days**	**Thu 12/18/08**	**Wed 12/24/08**
323	Place Absorbent	**3 days**	**Thu 12/18/08**	**Mon 12/22/08**
324	Clean up/ Demobilize	**2 days**	**Tue 12/23/08**	**Wed 12/24/08**
325	**Closeout**	**8 days**	**Thu 12/25/08**	**Mon 1/5/09**
326	Work Package Closeout	**2 days**	**Thu 12/25/08**	**Fri 12/26/08**
327	Prepare Closeout Report	**6 days**	**Mon 12/29/08**	**Mon 1/5/09**
328				



ID	Task Name	Duration	Start	Finish
329	**A-417 Catch Tank (add absorbent)**	136 days	Mon 10/27/08	Mon 5/4/09
330	**Tank Investigation**	55 days	Mon 10/27/08	Fri 1/9/09
331	Drawing Search & Review	10 days	Mon 10/27/08	Fri 11/7/08
332	Engineering (evaluation, lift calc, ECNs, lifting bail inspection)	15 days	Mon 11/3/08	Fri 11/21/08
333	Procure Cover Plate	20 days	Mon 11/24/08	Fri 12/19/08
334	Work Package - Ready to Work	20 days	Mon 11/10/08	Fri 12/5/08
335	Determine Initial Conditions (uncover risers, replace cover bl	15 days	Mon 12/22/08	Fri 1/9/09
336	**Establish Tank Access**	54 days	Mon 1/12/09	Thu 3/26/09
337	Engineering	15 days	Mon 1/12/09	Fri 1/30/09
338	Work Package - Ready To Work	20 days	Mon 1/19/09	Fri 2/13/09
339	Remove Pump/Video Tank	14 days	Mon 2/16/09	Thu 3/5/09
340	Equipment Cut Up & Package	5 days	Fri 3/6/09	Thu 3/12/09
341	Close out and Disposal	10 days	Fri 3/13/09	Thu 3/26/09
342	**System Design**	40 days	Mon 1/12/09	Fri 3/6/09
343	System Design (tank specific delivery sys)	20 days	Mon 1/12/09	Fri 2/6/09
344	Sys Install & Tank Prep (ECNs)	20 days	Mon 2/9/09	Fri 3/6/09
345	**Procurement**	35 days	Mon 2/9/09	Fri 3/27/09
346	Procure Material and Equipment	30 days	Mon 2/9/09	Fri 3/20/09
347	Fabricate Equipment	20 days	Mon 3/2/09	Fri 3/27/09
348	Work Package Preparation -Absorbent Delivery	20 days	Mon 2/16/09	Fri 3/13/09
349	**Operations**	26 days	Mon 3/30/09	Mon 5/4/09
350	**Field Work**	13 days	Mon 3/30/09	Wed 4/15/09
351	Install Absorbent Delivery Sys	8 days	Mon 3/30/09	Wed 4/8/09
352	Readiness	5 days	Thu 4/9/09	Wed 4/15/09
353	**Pumping & Transfer**	5 days	Thu 4/16/09	Wed 4/22/09
354	Place Absorbent	3 days	Thu 4/16/09	Mon 4/20/09
355	Clean up/ Demobilize	2 days	Tue 4/21/09	Wed 4/22/09
356	**Closeout**	8 days	Thu 4/23/09	Mon 5/4/09
357	Work Package Closeout	2 days	Thu 4/23/09	Fri 4/24/09
358	Prepare Closeout Report	6 days	Mon 4/27/09	Mon 5/4/09
359				



ID	Task Name	Duration	Start	Finish
360	**TX-302C Catch Tank (add absorbent)**	128 days	Mon 1/12/09	Wed 7/8/09
361	**Tank Investigation**	45 days	Mon 1/12/09	Fri 3/13/09
362	Drawing Search & Review	10 days	Mon 1/12/09	Fri 1/23/09
363	Engineering (evaluation, lift calc, ECNs, lifting bail inspection)	15 days	Mon 1/19/09	Fri 2/6/09
364	Work Package - Ready to Work	20 days	Mon 1/26/09	Fri 2/20/09
365	Determine Initial Conditions (uncover pump pit, survey, inspe	15 days	Mon 2/23/09	Fri 3/13/09
366	**Establish Tank Access**	52 days	Mon 3/16/09	Tue 5/26/09
367	Engineering	15 days	Mon 3/16/09	Fri 4/3/09
368	Work Package - Ready To Work	20 days	Mon 3/23/09	Fri 4/17/09
369	Remove Pump	12 days	Mon 4/20/09	Tue 5/5/09
370	Equipment Cut Up & Package	5 days	Wed 5/6/09	Tue 5/12/09
371	Close out and Disposal	10 days	Wed 5/13/09	Tue 5/26/09
372	**System Design**	25 days	Mon 3/16/09	Fri 4/17/09
373	System Design (tank specific delivery sys)	20 days	Mon 3/16/09	Fri 4/10/09
374	Sys Install & Tank Prep (ECNs)	5 days	Mon 4/13/09	Fri 4/17/09
375	**Procurement**	40 days	Mon 4/13/09	Fri 6/5/09
376	Procure Delivery System and Riser Prep Matl	40 days	Mon 4/13/09	Fri 6/5/09
377	Fabricate Misc Equipment	15 days	Mon 5/18/09	Fri 6/5/09
378	Work Package Preparation -Absorbent Placement	15 days	Mon 4/6/09	Fri 4/24/09
379	**Operations**	23 days	Mon 6/8/09	Wed 7/8/09
380	**Field Work**	10 days	Mon 6/8/09	Fri 6/19/09
381	Install Absorbent Delivery System (vent/cam/delivery)	5 days	Mon 6/8/09	Fri 6/12/09
382	Readiness	5 days	Mon 6/15/09	Fri 6/19/09
383	**Place Absorbent in Tank**	5 days	Mon 6/22/09	Fri 6/26/09
384	Operations	3 days	Mon 6/22/09	Wed 6/24/09
385	Clean up/ Demobilize	2 days	Thu 6/25/09	Fri 6/26/09
386	**Closeout**	8 days	Mon 6/29/09	Wed 7/8/09
387	Work Package Closeout	2 days	Mon 6/29/09	Tue 6/30/09
388	Prepare Closeout Report	6 days	Wed 7/1/09	Wed 7/8/09