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**WASTE PIT 5 LINER REPAIR PROJECT FINAL
REPORT CERCLA/RCRA UNIT 1**

02/17/93

**DOE-FN/EPA
25
REPORT**

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FERNALD ENVIRONMENTAL RESTORATION MANAGEMENT COMPANY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

CERCLA/RCRA UNIT 1

WASTE PIT 5 LINER REPAIR PROJECT FINAL REPORT

JANUARY 1993

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EXECUTIVE SUMMARY

This document summarizes information about the Waste Pit 5 Liner Repair Corrective Action. Waste Pit 5 had been identified as a Hazardous Waste Management Unit (HWMU) at the Fernald Environmental Management Project (FEMP). The Waste Pit 5 Liner Repair project began October 15, 1991 and was completed February 6, 1992. The initial inspection of the liner indicated that 98 repairs would be required, but over the course of the project, 108 repairs and/or corrections were made. The project specific Health and Safety Plan was followed for this project. No unusual occurrence occurred during this project.

Subsequent to the completion of the Corrective Action, an independent observation was performed by the Ralph M. Parsons Company. Based upon a review of the appropriate documentation and visual observations of the repairs, the repairs made to the liner appeared to be acceptable. It was noted that some of the repairs appeared to be inferior and efforts have been initiated to correct these patches. The repair of the Waste Pit 5 liner will continue as a maintenance activity in accordance with the approved Work Plan.

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I INTRODUCTION

This document describes activities performed during the Waste Pit 5 Liner Repair project. This Corrective Action was initiated to reduce the potential release of contaminants from Waste Pit 5 to the environment; it was performed as a maintenance/corrective action. While a formal submittal of a final report is not required by the amended consent agreement between DOE and the Ohio EPA, this document has been prepared for submittal to DOE as part of the corrective action.

II WASTE PIT 5 BACKGROUND INFORMATION

Waste Pit 5 was constructed in 1968 and received wastes from 1968 to 1983. The pit was lined with clay and a 60 mil thick elastomeric membrane. This pit received liquid waste slurries from the refinery and the Recovery Plant, including neutralized raffinate settled solids, slag leach slurry, sump slurries, and lime sludge. The waste volume contains an estimated 50,729 kg. of uranium and 17,000 kg. of thorium.

From 1983 to February 1987, when it was taken out of service, Pit 5 received only clear decant from the General Sump, filtrate from the recovery plant, or non-radioactive slurries, such as filtrate (clear liquor) from the Boiler Plant and the Water Treatment Plant. The surface of Waste Pit 5 is open and has not been covered with any type of fill material. Over the years, routine maintenance repairs to the Pit 5 liner has been made by the Maintenance Department. The repairs that were outlined in the Work Plan and completed as part of this Corrective Action, were performed by FEMP site hourly personnel.

III DESCRIPTION OF PIT 5 LINER REPAIR CORRECTIVE ACTION

The first phase of the project involved lowering the water level in Waste Pit 5. Water was transferred to the Clearwell to allow access to the identified liner seams or tears which required repair. Following this, a water fogging system consisting of a standard pressurized water hose system was installed at the berm of Pit 5. The waste material within the vicinity of the work was sprayed with a water fog prior to the start of any repairs to the liner to control the release of airborne contaminants.

The second phase of the project involved the removal of the waste material and vegetation from the tears. No waste material was removed from the pit. All waste material was returned to the impoundment to minimize the generation of additional waste requiring storage pending final remediation of the pit. In accordance with the Work Plan, vegetation was removed and containerized and is currently stored in accordance with site policies and procedures. The liner area was cleaned and a visual inspection was performed; 98 repairs were identified. Subsequent to this and prior to the completion of the project, 10 additional tears were identified which required repair.

The project team decided to recommend making the repairs to the Pit 5 liner by using a similar method that had been used in the past years. This method basically involved the installation of a slightly larger piece of liner material over the area to be patched and then gluing it into

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place. Then the entire edge of the patch was caulked. A reference number was painted at each seam so the location in the pit could be documented as identified by the grid map on Figure 1 (note that this map identifies only the original 98 repairs).

Each seam was inspected and the size of the patch was determined by the condition of the seam. Three sizes of patches used to repair the Pit 5 liner were:

- Type A - 10" x 120" minor seam deterioration
- Type B - 18" x 120" major seam deterioration
- Type C - 48" x 120" major patch (old patch removed)

The liner was repaired in accordance with the manufacturer's requirements given in the Work Plan. The manufacturer's instructions suggest that all repairs be performed on clean, dry surfaces when the ambient air temperature is above 40 F. The liner repair was performed between October 15, 1991 and February 6, 1992 on a periodic basis depending upon the weather conditions. Seam repair involved these steps:

1. Liner was washed, cleaned, and left to dry.
2. The adhesive was brushed on the liner area to be patched and left to dry (becoming tacky).
3. The patch was installed over the repair area, smoothed out, and rolled out flat with a hand roller.
4. After the patch was dry, a bead of caulking was installed around the entire perimeter of the patch.

When the repairs were completed, the water level was reestablished by adding potable water and discharge wastewater from the General Sump. An independent observation was performed by representatives of the Ralph M. Parsons Company on May 5, 1992 in which a review of all pertinent documents and inspection of the repairs was performed. A copy of the Pit 5 Liner Repair Observations report is attached in Appendix A.

IV WASTE DISPOSAL SUMMARY

During repair of the Pit 5 liner, the main objective of the project was to repair the identified tears in the liner and restore the integrity of the liner to control leakage of waste material. The disposal and decontamination activities associated with the Corrective Action were completed in accordance with site policies and procedures. Several equipment decontamination methods were available for this project. The method selected and the setup for equipment decontamination was designed to contain and reduce the waste generated and to reduce the potential for release of hazardous wastes and constituents to the environment. No reusable equipment could be salvaged. All tools consisting of trowels, caulking guns, knives, and other miscellaneous hand tools were containerized with the PPE that was generated and stored. All disposable equipment such as PPE was placed in containers and managed as a mixed (hazardous radionuclide contaminated) waste. In addition, in accordance with the Work Plan,

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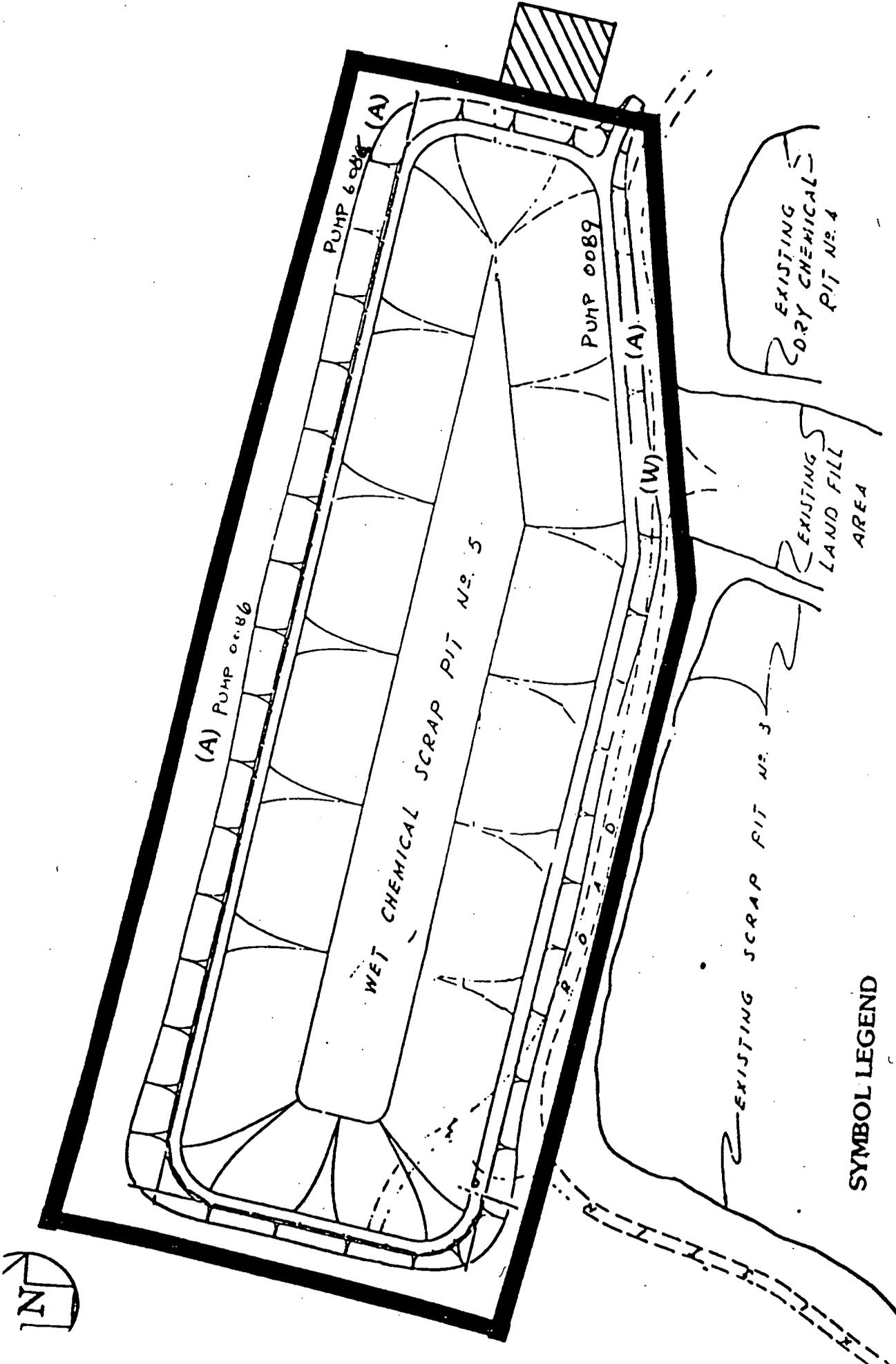
all vegetation that was removed from the tears was collected and containerized with the remaining material. Approximately five (5) cubic yards of waste material consisting of PPE, hand tools, and vegetation was generated by this project. This material was placed in a white metal box, labeled, and stored in an appropriate storage area for mixed wastes.

Sample material has been previously collected from the waste material within Pit 5 to determine the levels and types of contamination that is contained within the pit. These samples are being analyzed for Appendix IX, HSL, TCLP, and full Radiological analyses to fully characterize the waste. The information gained from this characterization will be used to evaluate the disposition of the waste generated by the project.

V SAMPLING AND ANALYSIS SUMMARY

As specified in the Corrective Action Work Plan, radionuclide monitoring was conducted while the liner repairs were being performed. Three high volume air monitors were set up in an area adjacent to the pit as identified in Figure 2. These locations were determined based upon the predominant wind direction in the area.

The high volume air samplers work on the principle that ambient air is drawn via a vacuum pump through an air sample filter. The air sample filters were then removed and counting was performed on a low background counter for gross alpha and beta, following a minimum seven day decay period. This seven day decay period was necessary to allow for the decay of short lived radon daughter products. The results were then used to assess airborne contamination levels in the work area. Since previous sampling and process knowledge for Pit 5 has been assembled, it has been determined that the limiting nuclide is thorium-230 (Th-230). From the data that was collected, the alpha and beta results were compared against the Derived Air Concentration (DAC) for Th-230, uranium, and uranium daughter products. Based upon the DAC for Th-230 (DAC 1.95×10^{-2} Ci/g) and natural uranium metal (DAC 6.62×10^{-7} Ci/g), the alpha and beta results are at least an order of magnitude less than the DAC for the constituents of concern. Table 1 provides a summary of the results generated by the air sampling activity. Actual total uranium and thorium analytical analysis was not performed since based upon the alpha and beta results, the levels detected in the air sample filter would be well below the minimum detectable amount (MDA) for analytical analysis.



SYMBOL LEGEND

- EXCLUSION AREA
- ▨ DECON ZONE
- A HIGH VOLUME SAMPLER
- W WATER CONNECTION

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TABLE 1
 AIR SAMPLING DATA FROM WASTE PIT 5 LINER REPAIR

| Date | Pump # | Alpha Reading mCi/ml ($\times 10^{-14}$) | Beta Readings pCi/ml ($\times 10^{-13}$) |
|----------|--------|---|---|
| 10/10/91 | 0089 | 8.86 | 1.73 |
| | 0086 | 3.91 | 3.49 |
| | 0085 | 206.0 | 737.0 |
| 10/16/91 | 0089 | ND | 2.51 |
| | 0086 | ND | 2.51 |
| | 0085 | 16.7 | 3.65 |
| 10/17/91 | 0085 | ND | 5.66 |
| | 0086 | 14.1 | 5.18 |
| | 0089 | ND | 8.72 |
| | 1438 | 3380.0 | 562.0 |
| 10/18/91 | 0089 | N/A | N/A |
| | 0086 | 12.0 | 2.18 |
| | 0085 | ND | 1.67 |
| | 1438 | 780.0 | 260.0 |
| 10/21/91 | 0086 | 13.1 | 5.33 |
| | 0089 | ND | 1.25 |
| | 0085 | ND | 3.85 |
| 10/22/91 | 0085 | ND | 1.86 |
| | 0086 | 9.44 | 6.13 |
| | 0089 | 11.7 | 2.32 |
| 10/23/91 | 0089 | 17.3 | 7.09 |
| | 0086 | 19.9 | 5.15 |
| | 0085 | 2.21 | 3.71 |
| 10/30/91 | 0086 | 4.17 | 14.2 |
| | 0089 | 18.4 | 1.18 |
| | 0085 | 45.9 | 11.6 |
| 10/31/91 | 0085 | 4.133 | 2.06 |
| | 0086 | 23.4 | 4.16 |
| | 0089 | 7.57 | 2.65 |
| 11/02/91 | 0089 | 14.7 | 2.22 |
| | 0086 | 6.04 | 4.01 |
| | 0085 | 8.17 | 2064 |

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TABLE 1 (cont)
AIR SAMPLING DATA FOR WASTE PIT 5 LINER REPAIR

| Date | Pump # | Alpha Reading mCi/ml ($\times 10^{-14}$) | Beta Readings mCi/ml ($\times 10^{-13}$) |
|----------|--------|---|---|
| 11/03/91 | 0085 | ND | ND |
| | 0086 | 7.08 | 4.52 |
| | 0089 | 10.0 | 8.59 |
| 11/06/91 | 0089 | 14.9 | 10.4 |
| | 0085 | 20.8 | 10.5 |
| | 0086 | 9.33 | 11.4 |
| 11/12/91 | 0086 | 0.688 | 2.23 |
| | 0089 | 18.0 | 4.63 |
| | 0085 | 7.31 | 5.13 |
| 11/29/91 | 0085 | 4.18 | 0.471 |
| | 1438 | 592.0 | 106.0 |
| | 0086 | 6.27 | 2.23 |
| | 0089 | 1.42 | 0.231 |
| 12/07/91 | 0089 | 1.62 | 8.97 |
| 12/08/91 | 0089 | 33.1 | 10.6 |
| | 0085 | 2.27 | 0.849 |
| | 0085 | 1.51 | ND |
| 01/06/92 | 0085 | 2.48 | 6.86 |
| | 0086 | 1.52 | 0.567 |
| | 0089 | ND | 1.18 |
| 01/07/92 | 0085 | 18.1 | 2.29 |
| | 0086 | 2.14 | 0.80 |
| | 0089 | 16.0 | 3.18 |
| 02/03/92 | 0085 | 7.06 | 19.6 |
| | 0086 | ND | 6.93 |
| | 0089 | 2.05 | 42.9 |
| 02/04/92 | 0089 | 1.41 | 44.1 |

VI HEALTH AND SAFETY CONTROLS

The work done for this Corrective Action was consistent with the project specific Health and Safety Plan. The plan recognizes, evaluates, and controls all identified safety and health hazards. In addition, it provides for emergency response for hazardous operations and decontamination procedures. The project specific Health and Safety Plan is consistent with 29 CFR 1910.120 and the RI/FS Health and Safety Plan. Safety documentation was prepared according to FMPC-2116 Topical Manual "Implementing FMPC Policies and Procedures for System Safety Analysis." FMPC-2116 has been prepared to implement DOE Order 5481.1B "Safety Analysis and Review System" and DOE/OR-901 "Guidance for Preparation of Safety Analysis Reports."

During the completion of field activities, care was taken to assure that all personnel working in the area were protected from the hazards associated with the materials that were being handled. During this removal action the following personnel protective equipment (PPE) were required to be worn:

- Full-face or half-face respirator with HEPA/Organic vapor cartridges depending upon activity
- Saran coated Tyvek anti-c clothing
- Cotton gloves
- Vinyl disposable inner gloves
- Nitrile rubber gloves
- Process coveralls
- Safety glasses (only when wearing half-face respirator)
- Safety goggles when additional protection was dictated
- Safety shoes
- Rubber/latex shoe covers
- Life jackets, lanyards, and life lines.

The requirements for the level of PPE required to work in and around Pit 5 was originally based upon historical understanding of the contents of the pit and previous air sampling data as identified in Section 5. As additional air sampling data was made available, the levels of protection were modified in accordance with site policies and procedures to assure that all operators were assured the maximum possible and necessary level of protection.

In addition, the following safety equipment was required, as specified, within the work area:

- Two-way radio communication
- Fire extinguisher
- Portable eye wash station

To prevent the spread of contamination, a radiologically controlled access point was established for the work area. This access point identified an area where the workers would remove their PPE prior to exiting the work area to prevent the spread of contamination outside of the work zone. At the access point, workers were monitored to verify that contamination had not been spread to their clothing. No instances of worker contamination were identified during this project. The PPE that was generated by this Removal Action was collected, placed

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in white metal boxes, sealed and labeled as mixed waste material. The PPE has been stored along with the remaining waste material generated by this project in the appropriate storage area on Plant 1 Pad.

**APPENDIX A
PIT 5 LINER REPAIR OBSERVATIONS**

**PREPARED BY
THE RALPH M. PARSONS COMPANY**

Project Order No. 19
Pit 5 Liner Repair Observation

I. Purpose

Repairs were conducted by WEMCO on the Waste Pit 5 liner from 10/15/91 to 2/6/92. WEMCO has requested that PARSONS perform an independent review of the repairs that were made (letter dated March 31, 1992). This review should summarize the present condition of the liner and identify locations of any needed repair.

The observations for the review were based on a field visit to Waste Pit 5, conducted on May 7, 1992. A copy of the observation report is attached. The visit consisted of visual observations only, no probing or testing of the liner was performed. The review included a study of the following documents supplied by WEMCO:

- 1) Draft copy of "Waste Pit 5 Liner Repairs Final Report"
 - Includes scope of repairs, description of work, grid map, air monitoring data, weather data, and purchase requisitions.
- 2) Waste Pit 5 Liner Repair Work Plan
- 3) Daily field logs of liner repair work implementation from 10/15/91 to 12/8/91
 - No field logs available from 12/8/91 to 2/6/92
- 4) Daily checklist logs from 10/15/92 to 11/13/91
 - No checklist logs available from 11/13/91 to 2/6/92

II. Existing Conditions and Observations

Waste Pit 5 was constructed in 1968 and lined with a 60-mil-thick Royal Seal ethylene-propylene-diene monomer (EPDM) elastomeric membrane. Waste Pit 5, which is 30-feet deep, covers about 161,100 square feet of area, and contains approximately 98,000 cubic yards of waste. From 1968 until 1983, Waste Pit 5 operated as a surface impoundment receiving high solids bearing (slurry) waste streams from the refinery and the recovery plant, including neutralized raffinate settled solids, slag leach slurry, sump slurry, and lime sludge. From 1983 to 1987, Waste Pit 5 received low solids-bearing wastewater from the general sump, filtrate from the recovery plant, and nonradioactive slurries. Waste Pit 5 was taken out of service in February 1987, but remains uncovered.

The repairs made to the 60 mil membrane are on a 2 1/2 H:1V slope, between the top of the slope and the existing waste surface. The width of this exposed liner area varies from 1 foot at the east end, to over 10 feet at the west end. The perimeter of this area is over 2,000 lineal feet. The pit was maintained in a drained condition during the repairs. Presently, water covers approximately one half of the waste surface. The patched areas have been labeled and numbered to #108. Other, older patch areas were evident. The repairs were of various sizes and dimensions, from under 1 square foot to over 10 square feet. The majority of the repairs occurred at the existing liner seams, that run parallel to the pit's slope. The patch material was bonded to the existing liner with adhesive. The edges of the repairs were sealed with caulking. Several repairs extended below the waste pit surface. Waste had been removed from these areas and the liner cleaned. The material used for the repairs was labeled "0.060 12-90". Hence, the patch material was 60 mils thick and was manufactured 12/90.

No physical contact with the liner was permissible for this visit. Observations were made from the dike's crest with binoculars. In general, no visible rips, tears, vegetation through, or punctures were visible on the liner. Some defects were evident. These defects are noted in the attached Field Observation Report.

III. Conclusions

The patch repairs were made under difficult conditions. The liner is old and had numerous distresses in it. The work took place in the winter season. The repairs were located on a steep slope and the EPDM liner is slippery, which creates hazardous underfoot conditions.

Daily logs and check lists indicate that work was basically performed as per the manufacturer's instructions. The repairs took place on days when weather conditions were sunny and above 40° F. Care was taken to clean the existing liner thoroughly. Seams were caulked correctly using the "high profile" method. In general, the majority of the repairs appear to be sound and adequate. Some minor defects were present. These areas should be inspected and monitored. Some larger defects were evident. These areas should be addressed and repaired. Reference Field Observation Report for locations of defects.

Quality Assurance procedures were available to document the conditions of the liner repairs. The existence of daily logs, checklists, and work plan shows that proper thought and care was given to the task. Another standard and important part of most field quality control programs is performance testing. No record of testing was provided for the repairs. Conducting performance tests would verify that the repairs met the intended specifications. For liner repairs, a piece of a completed seam is removed and tested for peel adhesion (ASTM D A15) and seam strength (ASTM D 3083). These tests can be conducted at an independent lab, or, if the material is not permitted to leave the site, it can be tested in the field using a tensiometer. Attached to the report is a copy of the manufacturer's literature for a tensiometer.

The liner is over 20 years old. It has received numerous repairs. The liner is intact, and appears to be in a reasonable functioning condition. To ensure a reasonable functioning condition, a liner of this age will require frequent inspections (recommend semi-annually) and subsequent repairs.



FIELD OBSERVATION REPORT

Doc. Control No.: 10TE05199201

Sheet: 1 of 2

Date: May 19, 1992

Operable Unit No.: 1

Job Name: Pit 5 Liner Repair

Inspector: Ed Kubrin

Contractor: N.A.

Date: May 7, 1992

Weather: Sunny 70°

Project Order No.: 19

Subject:

FIELD REPORT

Arrived at site at 12:30 p.m. The purpose of today's visit was to visually assess recently completed repairs made to the Pit 5 geomembrane liner. I was accompanied by Dimitri Georgopoulos (WEMCO) throughout the course of my visit.

We proceeded to the waste pit area to the Rad Tech's trailer. Here we obtained a radiation work permit for today's observation, from the crest of the Pit 5 berm. A Rad Tech furnished us with hooded tyvek suits, and other appropriate personal protective equipment. He escorted us to Pit 5 for the observation.

The observation at Pit 5 started at the effluent tower, in the southeast corner, and progressed clockwise along the perimeter of the pit. All observations were made from the crest of the pit's dike. Binoculars were used to view the repaired seams.

At present, the pit is partially filled with water covering approximately one half of the waste surface. Several of the repairs, that are completed, are under water in the eastern portion of the pit. The patched areas have been labeled with a number that is still readable. The material used for the patch is stamped "0.060 12-90". This means that the material was manufactured 12/90 and is 60 mils thick. Numerous areas have been repaired. A bead of caulking exists at the intersection of the old and new liner. Areas where waste was removed from the liner surface and where the liner was cleaned are still readily visible. No visible rips, tears, or punctures were evident. I was informed that the patch repairs were bonded using adhesive. The original liner is over 24 years old. Evidence of older patches were apparent, as well as the most recent.

FIELD OBSERVATION REPORT (Continued)

Sheet: 2 of 2

The repairs were all located on the dike's slope, which is 2 1/2 horizontal to 1 vertical in steepness. Several of the repairs extended below the waste surface. Most of the patched areas appeared to be proper and acceptable. Several areas had minor defects, which were:

- 1) 2 patches at repair #65 need a caulk bead
- 2) Patch between #73 and #74 needs a caulk bead and 2 small fishmouth repairs
- 3) Patch #83 needs a fishmouth repair
- 4) Old patch between #20 and #21 needs repair
- 5) Fishmouth repair at patch #23
- 6) Fishmouth repair at patch #32
- 7) Fishmouth repair at patch #38

Several areas had larger defects that need attention:

- 1) There is not sufficient space between patch #72 and patch #73 where they abut each other.
- 2) Patch next to #98 needs repair
- 3) Patch next to #100 needs repair
- 4) Insufficient space between patches at patch #2
- 5) There is not sufficient space between patch #53 and patch #54 where they abut each other.

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