

Remediation of Nuclear Regulatory Commission Burial Pits No. 1, 2, and 3 and Lessons Learned at the FUSRAP Maywood Superfund Site, Maywood, New Jersey - 11594

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ABSTRACT

The U.S. Army Corps of Engineers (USACE) and Shaw Environmental, Inc. are conducting a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Remedial Action (RA) at the Formerly Utilized Sites Remedial Action Program Maywood Superfund Site (FMSS) located in Maywood, New Jersey (NJ). The FMSS consists of 88 designated properties: the Stepan Company property, which includes contaminated buildings, and three Nuclear Regulatory Commission (NRC) licensed burial pits (Figure 1); the Maywood Interim Storage Site (MISS) and contaminated building; 59 residential properties; three properties owned by the state or Federal government; four municipal properties; and 20 commercial properties.

In 2009, USACE commenced the remediation of the NRC-licensed burial pits on the Stepan Company property by excavation with off-site disposal to the substantive requirements of 10 Code of Federal Regulations (CFR) 20.1402 (less than 25 millirem [0.25 mSv] per year above background) and the substantive requirements of New Jersey Administrative Code (NJAC) 7:28-12.8(a) (less than 15 millirem [0.15 mSv] per year above background). This paper will discuss the lessons learned (LL) by USACE as related to challenges of working on a NRC-Licensed and National Priorities List Site.

INTRODUCTION

The U.S. Army Corps of Engineers (USACE) and Shaw Environmental, Inc. are conducting a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Remedial Action (RA) at the Formerly Utilized Sites Remedial Action Program (FUSRAP) Maywood Superfund Site (FMSS) located in Maywood, New Jersey (NJ). One of the 88 properties comprising the FMSS is the Stepan Company Property (Stepan). Stepan currently holds a Nuclear Regulatory Commission (NRC) license for storage of source material. The purpose of this paper is to document lessons learned while conducting a CERCLA action on areas also requiring decommissioning under the NRC licensing rules and regulations. It is the expectation of the authors that other FUSRAP sites or CERCLA sites with NRC-licensed activities will benefit from understanding these lessons learned.

A certain level of understanding of the Site history, the CERCLA process, and the NRC decommissioning process is required to understand the challenges and lessons learned. Accordingly, it is not the authors' intent to fully explain these aspects but to briefly present them.

SITE HISTORY [1]

Radiological contamination on FMSS properties resulted from rare earth and thorium processing conducted by the Maywood Chemical Works (MCW) between 1916 and 1956. These operations resulted in the generation of wastes and residues associated with the extraction of thorium and thorium compounds from monazite ores. Thorium processing ceased in 1956; approximately three years later, the 30-acre MCW Property was purchased by the Stepan Company.

Waste generated from the manufacturing process was generally stored in open piles and retention ponds on the original processing site where the Maywood Interim Storage Site (MISS) and Stepan Company are now located. These wastes were spread to nearby properties through two primary mechanisms: the use of contaminated soil as mulch and fill material; and sediment transport from natural drainage and flooding associated with the former open channel of the Lodi Brook, which originated on the MCW property.

In the late 1960s, Stepan Company took corrective measures at some of the former disposal areas located on the original MCW property. These corrective measures included relocation and burial of approximately 19,100 yd³ of excavated waste materials. Between 1966 and 1968 these waste materials were relocated to three Burial Pits (BP) on the current Stepan Company Property (Figure 1). These burial pits were subsequently licensed by the NRC to Stepan Company pursuant to 10 CFR 40 on April 4, 1978. The possession-only” license authorized Stepan to possess the material in underground storage.



Figure 1. NRC-licensed burial pits and vicinity at the FUSRAP Maywood Superfund Site.

The FMSS was added to the *National Priorities List* as the “Maywood Chemical Company” in 1983, and that same year the U.S. Department of Energy (DOE) began investigating the FMSS and the surrounding area. The DOE proceeded to cleanup 25 residential properties during 1984 and 1985. The contamination removed from these residential properties was stored on property owned by the Stepan Company. The DOE subsequently acquired this property from the Stepan Company and named it the MISS. Additional cleanup activities were initiated by the DOE in 1995. In 1997, responsibility for the execution and administration of FUSRAP was transferred from the DOE to the USACE, and by 2000 the USACE completed the remainder of the residential cleanup actions initiated by the DOE in 1995. The remaining 24 properties were designated as Phase II properties, and in 2003, the USACE published the Record of Decision (ROD) [1] to address these properties, including the Stepan property and its NRC-licensed

burial pits. At the time of the FMSS ROD New Jersey was not an NRC Agreement State (a State that has signed an agreement with the NRC authorizing the State to regulate certain uses of radioactive materials within the State). New Jersey has since become an Agreement State; however, the regulation of the Stepan license remains with the NRC.

REGULATORY CONSIDERATIONS

The NRC Decommissioning Process and the CERCLA Process are designed to reach a similar end point (Site Release); however, there are differences in approaches. These differences come from the points of focus for each process. The CERCLA process is meant to cover any potentially contaminated site while the NRC process addresses only NRC-licensed sites. The broad scope of the CERCLA process requires many more aspects be considered than that of the NRC process. Additionally, the CERCLA process covers all contaminants while the NRC process focuses on licensed aspects. However, the NRC process does rely on CERCLA or Resource Conservation and Recovery Act (RCRA) processes to address other related (but not licensed) contaminants. Thus the potential exists that an NRC-released site may be part of or become a CERCLA site.

To reduce the possibility of an NRC decommissioned site becoming a CERCLA site due to residual contamination, the NRC and U.S. Environmental Protection Agency (EPA) entered into a Memorandum of Understanding (MOU), *CONSULTATION AND FINALITY ON DECOMMISSIONING AND DECONTAMINATION OF CONTAMINATED SITES* [2]. This MOU lists residual concentrations that if exceeded would trigger consultation between the two agencies. The Maywood Soils ROD criterion for licensed portions of the FMSS does exceed the MOU trigger level.

For radiological sites both the EPA and the NRC utilize the *Multi-Agency Radiation Site Survey and Investigation Manual* (MARSSIM) [3] as guidance to demonstrate compliance with their respective processes. MARSSIM provides a summary comparison of the MARSSIM Process, the CERCLA process, and the RCRA process in Appendix F, Table F.1. The FMSS project team prepared a Master Final Status Survey Plan [4] to document the project's MARSSIM compliance approach.

A notable difference between the processes is the level of detail found in a Decommissioning Plan (DP) and a ROD. While both documents establish the approach to Site release based on previous studies and investigations, a ROD does not address the level of implementation of a remedy as is typical of a DP. In the CERCLA process this is left for the Remedial Design and Implementation Plan (RDIP). Additionally, the CERCLA process requires pre decisional documents such as a Remedial Investigation and Feasibility Study (FS). While the DP approach requires similar steps and documentation of all the information is typically rolled into the DP for review. The FMSS team followed the CERCLA process. Documents such as the FMSS RDIP [5] were provided to the NRC as requested.

LESSONS LEARNED

For the purposes of this paper Lessons Learned (LL) will be divided into three groups:

1. Pre-RA (ROD and Decommissioning Considerations)
2. RA Application (During Construction)
3. Post-RA (Final Status Surveys and Reports)

Pre-RA Lessons Learned

Three primary pre-RA challenges exist at FMSS with regard to the NRC-licensed areas versus the rest of the CERCLA Site. These were administrative and physical control of licensed materials and areas, selection of Applicable or Relevant and Appropriate Regulations (ARAR) to set limits for the RA, and the respective review processes of USACE and NRC.

The first challenge to overcome was the site control aspect. How do a licensee and NRC allow USACE (not an NRC licensee for decommissioning) to have control over licensed areas and materials? Additionally, it must be considered how USACE will control the radiation protection aspects of these areas. This issue was resolved by USACE and NRC entering into a MOU, *Memorandum of Understanding Between The U.S. Nuclear Regulatory Commission and The U.S. Army Corps of Engineers for Coordination on Cleanup & Decommissioning of the FUSRAP Sites with NRC-Licensed Facilities, 2001*, [6] which provides the conditions and requirements whereby NRC would place licenses into abeyance for the period of time that USACE is remediating those areas.

The second challenge involved ARARs. ARAR selection is typically done during the FS phase of a CERCLA project and is done by Operable Unit (OU). The FMSS has two OUs (Soil and Groundwater).

As noted, New Jersey was not an agreement state at the time of the FMSS project FS. The state did have regulations (NJAC 7:28-12) [7] that specified remediation dose limitations of 15 mrem (0.15 mSv) per year for non-NRC licensed sites. It should be noted that the preamble to NJAC 7:28-12 provided justification for the standard not being more stringent than federal (NRC) standards. Dose limitations for NRC-licensed sites are in Title 10 of the Code of Federal Regulations (10 CFR) and depend on which 10 CFR section the license is issued under. Potential NRC ARARs at FMSS were 10 CFR 40 [8] and 10 CFR 20 [9]. Dose release criteria of both parts could potentially exceed 15 mrem/yr (0.15 mSv/yr). Additionally, the EPA and DOE had agreed through a formal dispute resolution process in 1994 [10] on the criteria to be used at FMSS for certain radiological contaminants. The resulting criteria is essentially that presented in 40 CFR 192 [11]. Addressing the potential ARARs was a critical step in moving forward at FMSS.

Considering the fact that the FMSS has licensed and unlicensed portions with the same contaminants, the first step was to determine if a separate standard should be used for each. The decision was yes, but the impact of this was mitigated due to a few facts:

1. The dispute resolution criteria was not changed (equivalent to 40 CFR 192)
2. 10 CFR 40 site release dose limits are based on criteria from 40 CFR 192
3. The dispute criteria were demonstrated as protective under NJAC 7:28-12
4. The dispute criteria were demonstrated as protective under 10 CFR 20.1402 and 10CFR 40
5. Demonstration of protectiveness included the Groundwater pathway as appropriate

For the purposes of dose assessment and criteria protectiveness for the Soils OU, the Groundwater pathway was evaluated as appropriate for each scenario [12]. This approach thus accounted for potential dose from groundwater. For the Groundwater OU, radionuclides are not currently contaminants of concern [13], but the future potential exposures are addressed in the soils dose criteria.

For licensed and non-licensed areas the actual soils criteria (in terms of activity per gram) did not change, but ARAR selection did, as the primary ARARs selected were NJAC 7:28-12 for unlicensed portions and 10 CFR 20.1402 for licensed portions. The licensed areas are subject to 10 CFR 40. Accordingly, this would normally be chosen as the release ARAR; however, the USACE-NRC MOU requires that a Site be

remediated in accordance with 10 CFR 20.1402 or a more stringent criterion, before the NRC will place the license in abeyance. Since the actual criteria to be used would not change regardless of the ARAR chosen, and the use of 10 CFR 20.1402 is protective and would facilitate the remediation, 10 CFR 20.1402 was chosen as the ARAR for the licensed portions of the site.

A third pre-RA consideration is the review process. CERCLA and NRC projects may have different regulators. At the FMSS, NRC was not a signatory to the ROD. As such they did not have the same level of involvement as they would in review of a DP. USACE consulted with NRC periodically and provided NRC with copies of all pertinent documents to facilitate their understanding of the planned RA. While it did not cause project delays at FMSS, since the documents were not in the same general format as that of a NRC DP, delays in review cycles can occur. CERCLA projects with NRC-licensed components should consult with NRC as early as possible to mitigate these potential impacts by agreeing upon a process and final objectives.

It is important to note that these pre-RA challenges were recognized early on and in large measure addressed through early communications. Remedial construction at the first burial pit (Burial Pit 3) began in January 2009. Prior to that, USACE, NRC, NJDEP, Stepan and contractor representatives had an extensive onsite meeting in November 2008 to discuss a range of issues, including: remediation scope and schedule, cleanup criteria, license abeyance, public notification, post-RA reporting, and regulatory responsibilities of the respective parties. This meeting established basic understandings on how the work would be accomplished and also established points of contact at both the program and project levels. This was followed by regular contacts beginning in March 2009 between FMSS and NRC personnel to coordinate data and other technical information requests, site visits and split sampling.

Just as early and consistent communication helped meet some of the technical challenges described above, communication was a key factor in the successful public outreach conducted during the pre-RA period. One example involved Burial Pit 2, which at its closest point is less than 200 feet from the nearest residences. Given that proximity, FMSS elected to hand-distribute notification letters to these nearby homes as well as those further east and west on the same street, West Central Avenue. In all, 26 residences received notices in July 2009 prior to the start of RA. Local officials and Stepan Company management were also copied on the letter in the event they received inquiries from the public regarding the burial pit remediation. The notification letters provided a brief FMSS site history, summarized the remediation scope and schedule, and included a central point of contact for more information. The letters prompted several residents to contact the project shortly thereafter regarding various aspects of the work, including: safety and health protection for workers and the public; onsite hazardous waste management during the remediation; construction noise and lighting; and restoration plans for lost vegetative screening. Two of the residents, among those closest the burial pit site, had particular concerns about potential health effects: one had a newborn in the house and another had recently been diagnosed with cancer. Together with project management and the project health physicist and construction supervisor, the FMSS Community Relations Coordinator developed responses to the community questions and concerns and communicated them to directly by telephone and in the case of one resident during personal meetings in the home. In addition, coordination with Stepan Company and New York, Susquehanna & Western Railway Company (NYS&W) representatives was required to address the property restoration questions. Stepan had plans to replace nearby fencing not impacted by the remediation in conjunction with FUSRAP restoration activities; NYS&W approval was required for restoration plantings to replace vegetation removed from their property bordering the Burial Pit 2 site. This coordination resulted in an equitable resolution to concerns over lost visual screening, through installation of 10-foot privacy fencing (at Stepan's cost) and planting of 14 evergreen trees (at FUSRAP cost) in the NYS&W right-of-way.

Some classic community relations lessons were reinforced during the outreach activities in support of the Burial Pit 2 remediation. Establishment of a single point of contact, early notification and prompt follow-up, message consistency across audiences, and meaningful consideration of public input all contributed to a successful outcome.

RA Application Lessons Learned

During NRC decommissioning, agency staff typically visit sites to conduct inspections and provide formal oversight of the RA. Accordingly, NRC inspectors have a significant and defined role in the RA process. When licenses are placed into abeyance, the NRC inspection role in RA is less formally defined. The USACE-NRC MOU states that NRC may observe the RA. The FMSS team welcomed NRC site visits as an opportunity to improve efficiency and a few lessons were learned.

The first LL was to define the “inspectors” role upfront and make sure all management (NRC and Corps) understand the role. Communication with the NRC and Project management and staff facilitated NRC site visits and set the guidelines that visits were more for observation, collection, and sharing of information and experiences, than for formal inspections. However, NRC standard practice is to call records of site visits “Inspection Reports”. NRC reviewed aspects of work not solely related to licensed materials, including RA activities common to licensed and non-licensed areas alike such as water treatment and transportation. Good communication by all kept this process a positive one.

The NRC and USACE agreed to split samples for NRC analysis as part of the site visits. This was not an issue at FMSS; however, minor data reporting issues did arise. Issues were 1. USACE does not share non-validated data with anyone outside the project team, prompting NRC concerns over report timeliness, and 2. NRC inspection reports (including sample data) are placed in the Agency-wide Documents Access and Management System (ADAMS) database for public review, giving rise to USACE concern for privacy of property owners. The first issue of timing for USACE to provide data was resolved through communication and it was agreed that data would be validated and provided as soon as possible. The second issue was resolved by USACE only presenting data and sample numbers without location specifics. This allowed NRC to compare and present data publically, well ahead of the time frame that it would normally be publicly available on a CERCLA project.

A second LL during RA is that although the license was in abeyance, NRC still expected the licensee to maintain its ground water monitoring requirements required in the license. Access to some of the wells was problematic given the ongoing RA construction activities. This was explained in writing to the NRC. Monitoring requirements such as this should be a part of discussions early in the process so all parties understand what is required and what is actually possible, given the physical limitations posed by ongoing remedial construction. Figure 2 shows the scope of remedial construction at Burial Pit 2, which made three of the NRC groundwater monitoring wells inaccessible for sampling for varying amounts of time.



Figure 2. Ongoing remediation at NRC-licensed Burial Pit 2 in July 2010.

A third LL during RA is to define when the licensed RA work is done. This may seem obvious but the USACE-NRC MOU states that USACE will notify the NRC when RA is complete and the license will be reinstated accordingly. Depending on the time of year of excavation completion, certain restoration activities such as landscaping may not be able to be performed for several months. This raises the question, should USACE be responsible for licensed areas until restoration is complete or only until all licensed material is removed from the area? At FMSS it was decided that minor restoration, if still required, could be done after the licensed area is returned to licensee control.

A fourth LL during RA was the need for and when to stop monitoring required by the NRC license. During the RA radiological monitoring was conducted per USACE project work plans and the USACE-NRC MOU. An issue arose specific to monitoring once all radioactive contamination had been removed. Normally after Final Status Surveys demonstrate an area is suitable for release, radiological monitoring is reduced or suspended. How to reduce monitoring of an area that is still on an NRC license requiring monitoring should be addressed prior to RA.

A fifth LL during RA involves excavation growth. The remediation of BP#3 grew beyond the known limits of the burial pit. When dealing with burials it is not uncommon for wastes to have spread beyond the licensed limits of the waste pits. While this material is obviously still subject to the License the fact that additional areas may require excavation and control should be made clear to all parties and accounted for in the project schedule. Additionally, the Maywood Soils ROD contains provisions for inaccessible soils (material that cannot be removed due to safety concerns for structures or utilities). This raises the issue: should an excavation grow to the point that it impacts the safety of a structure how these materials would be addressed (under the ROD inaccessible provisions or required to remain licensed)? The USACE team is currently assessing potential options to this hypothetical but plausible situation. Inaccessible contamination should be discussed during project meetings with NRC and the Licensee.

Post RA Lessons Learned

Licensed areas of the FMSS are currently in the post-RA process but some LL have resulted from efforts to date.

At FMSS, Stepan Company hopes to terminate its NRC license as soon as possible. Normally, a Post-Remedial Action Report (PRAR) would be prepared to address release of the entire property. PRARs serve as required CERCLA RA reports and contain MARSSIM Final Status Survey reports. Given the extensive remediation of non-licensed contamination that remains, PRAR preparation for the entire Stepan property may be years away. To facilitate the Licensee's termination request, a PRAR will be written for each licensed area as RA is completed.

Another LL involves the timing of license reinstatement. Similar to the restoration timing issue discussed earlier, this lesson focuses on post-RA documentation. It can take months before PRARs and other post-RA documents are complete. It is clear in the USACE-NRC MOU that post-RA reports should be completed before license reinstatement. The licensee should be made aware of this early in the process. Again, the question arises, should USACE maintain control while the post-RA documentation proceeds? The timing for turning areas back to NRC and Licensee control should be specified in terms of documentation also. At FMSS it was decided to wait until the PRARs are complete, however, as discussed earlier, specific licensed area PRARs are being prepared to accelerate the license reinstatement process.

CONCLUSION

The FMSS project team learned many lessons during remediation of NRC- licensed areas as part of a CERCLA site. The project team presented some of the issues in this paper with the expectation that readers with similar site issues and situations will benefit from these Lessons Learned.

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