1.0 EXECUTIVE SUMMARY

The Michigan Department of Natural Resources (MDNR) has contracted MACTEC Engineering & Consulting of Michigan, Inc.[1] (MACTEC) to perform radiological characterization, and to develop the site radiological Decommissioning Plan (DP) leading to license termination at their Tobico Marsh State Game Area (SGA) Site located in Kawkawlin Township, Michigan. MACTEC has developed this DP to be implemented during decommissioning activities of the Tobico Marsh SGA Site (site), such that radiologically impacted areas will meet the U.S. Nuclear Regulatory Commission's (NRC's) decommissioning criteria for unrestricted future use as specified by 10 CFR 20.1402 (NRC 1997a).

1.1 SITE AND LICENSEE INFORMATION

The Site is located in Bay County, Michigan, 8 miles north of Bay City, Michigan. The entire MDNR property consists of thousands acres; however, this DP applies only to the 3-acre portion of the property that is potentially impacted by radiological materials. The name and address of the licensee are:

Michigan Department of Natural Resources
c/o Denise Gruben
Design and Construction Section
Office of Land and Facilities
P.O. Box 30033
Lansing, MI 48909-7948

Street Address for UPS etc.:
Stevens T. Mason Building, 8th Floor
530 West Allegan
Lansing, MI 48933

The address where licensed material is possessed is:

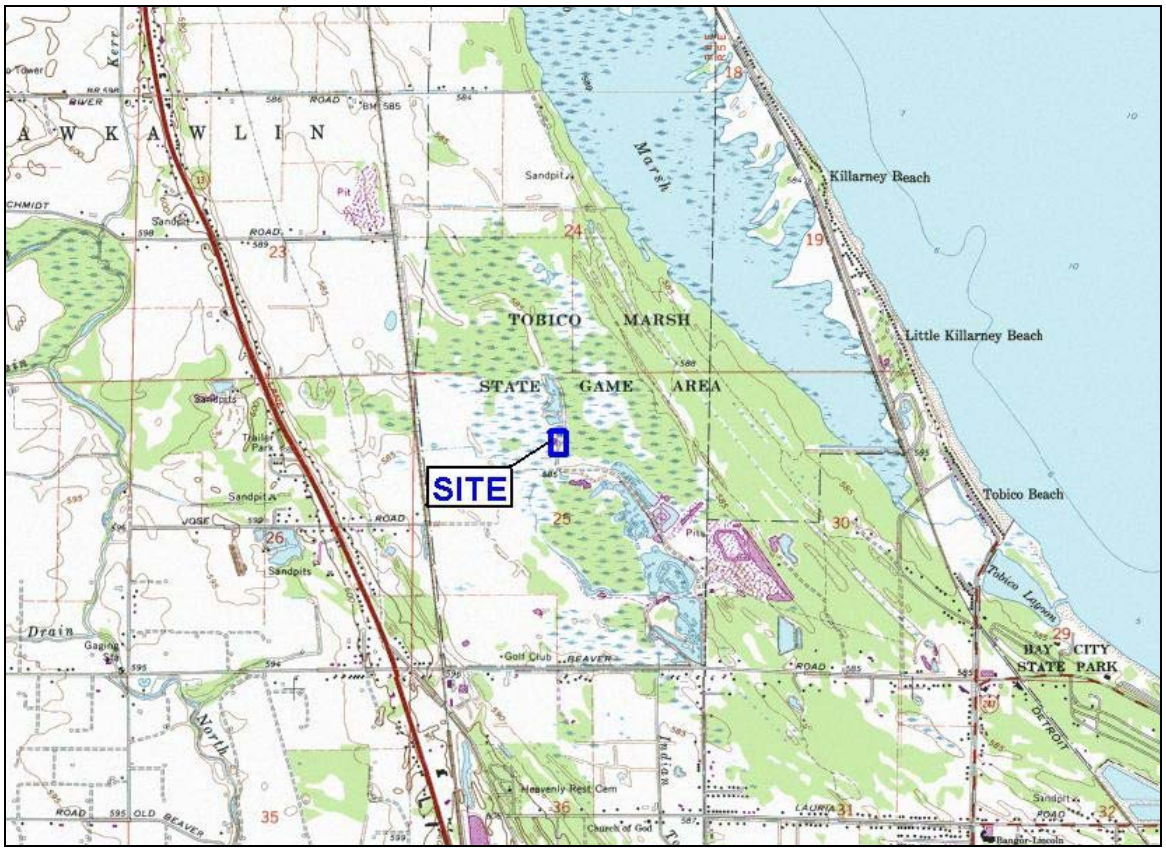
2301 Two Mile Road (north of Beaver Road)
Bay County, MI 48631

1.2 SITE DESCRIPTION

The Tobico Marsh SGA Site is a small part of a former (now closed) industrial waste disposal area locally known as the Hartley and Hartley Landfill. The SGA Site covers approximately 3 acres of land within the State of Michigan's Tobico Marsh State Game Area and is located within Kawkawlin Township, Bay County, Michigan (Figure 1-1 and

[1] Formerly Harding ESE of Michigan, Inc. (Harding ESE).

Figure 1-2). The Site is located in a vast land preserve on the edge of Lake Huron's Saginaw Bay where marshy wetland conditions and ponded water predominate. The topography of the site and surrounding environs is very flat.



(Source: USGS Topographic Map, Bay City, Michigan)

Figure 1-1 Site Location and Surrounding Area

The industrial disposal facility, which opened in the mid-1950s, was originally operated by the Hartley family and is estimated to have received some 18,000 barrels of spent solvents, oils, and other liquid and solid wastes for disposal during the 1960s and early-1970s. Foundry waste containing low levels of naturally occurring radioactivity in the form of magnesium-thorium slag was also disposed at the site beginning late in 1970.

Today, the industrial disposal site is treated as two separate sites after having been subdivided by ownership. In a formal land exchange concluded in 1973, the Hartleys conveyed land to the State of Michigan (including approximately three acres where waste disposal had previously occurred) in return for lands bordering their industrial waste disposal site[2]. It was unknown to the State of Michigan at that time that a portion of the land they had received in the exchange had been used to dispose of thorium-bearing slag wastes. The approximately 3-acre portion where industrial waste disposal had occurred

[2] Ownership of the adjacent industrial waste disposal site has changed hands a number of times since 1998 and is now owned by Waste Management, Inc.

on that is now State of Michigan property is known as the Tobico Marsh SGA Site and is the subject of this DP.

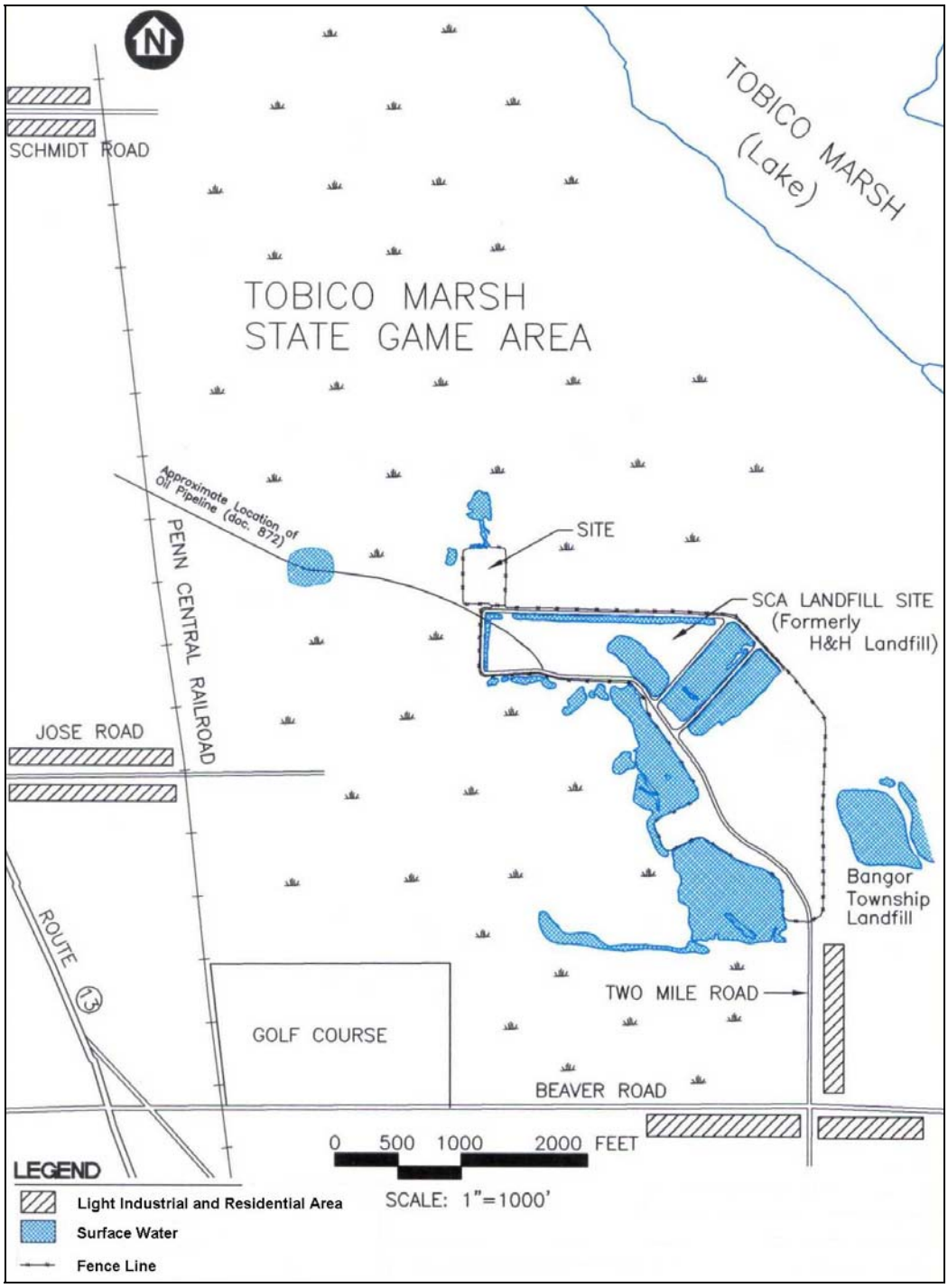


Figure 1-2 Location and Area Features Map

Residual radioactivity at the site is the result of the deposition of slag wastes bearing naturally occurring thorium (Th). The vitreous slag, thought to have been generated by Wellman Dynamics at a site in Bay City, Michigan, is derived from casting and foundry operations involving magnesium-thorium alloys.

To contain the chemical wastes and preclude the potential migration of chemical contaminants (contaminants other than radioactivity) beyond those lands already impacted by the disposal, a bentonite slurry wall was placed around the disposal area, and the disposal area was covered with a clay cap.

One building, constructed after the slurry walls and clay cover were installed, is present at the site. The building was designed to house equipment and controls associated with a leachate collection and treatment system (LCTS) that was installed within the slurry walls. The LCTS, designed by the Michigan Department of Environmental Quality (MDEQ) to address non-radiological contaminants, has never been operated. The building has been used to stage characterization survey equipment and temporarily store containerized, and potentially contaminated, investigation-derived waste.

1.3 DECOMMISSIONING OBJECTIVE

The MDNR's objective for the Tobico Marsh SGA site is decommissioning, such that the site will meet the criteria for unrestricted use as specified by 10 CFR 20.1402 (NRC 1997a), thus permitting the termination of its radioactive materials license.

1.4 NATURE AND EXTENT OF RESIDUAL RADIOACTIVITY AT THE SITE

The radionuclides of concern in the slag are the isotopes of Th-230 and Th-232 and their progeny. The physical form of the slag material is vitreous (glass-like) material in irregularly shaped pieces ranging in size from approximately 1 to 50 mm in diameter. Most pieces are in the 5- to 15-mm size range. Both thorium-bearing and non-thorium-bearing slags are known to have been disposed by the Hartleys over the years that the facility was in operation, but there is no known record indicating which slag forms were deposited in which locations. They are comparable in physical appearance differing only in the occurrence of thorium in the slags.

Radiological characterization surveys conducted at the site confirm that the thorium-bearing slag waste is confined to the area circumscribed by the slurry walls and confined vertically by an underlying, undisturbed, native clay-till layer and an overlying clay cover. Radioactivity associated with contributions from thoriated slag has not been identified in water samples collected at the site (ABB 1997, MACTEC 2002). Characterization survey results also showed that elevated radioactivity associated with thoriated-slag disposal is generally confined to thin deposits (approximately 1.2 meters thick) along a track running near the center of the area confined by the slurry walls corresponding to the site's former access road (Figure 1-3).

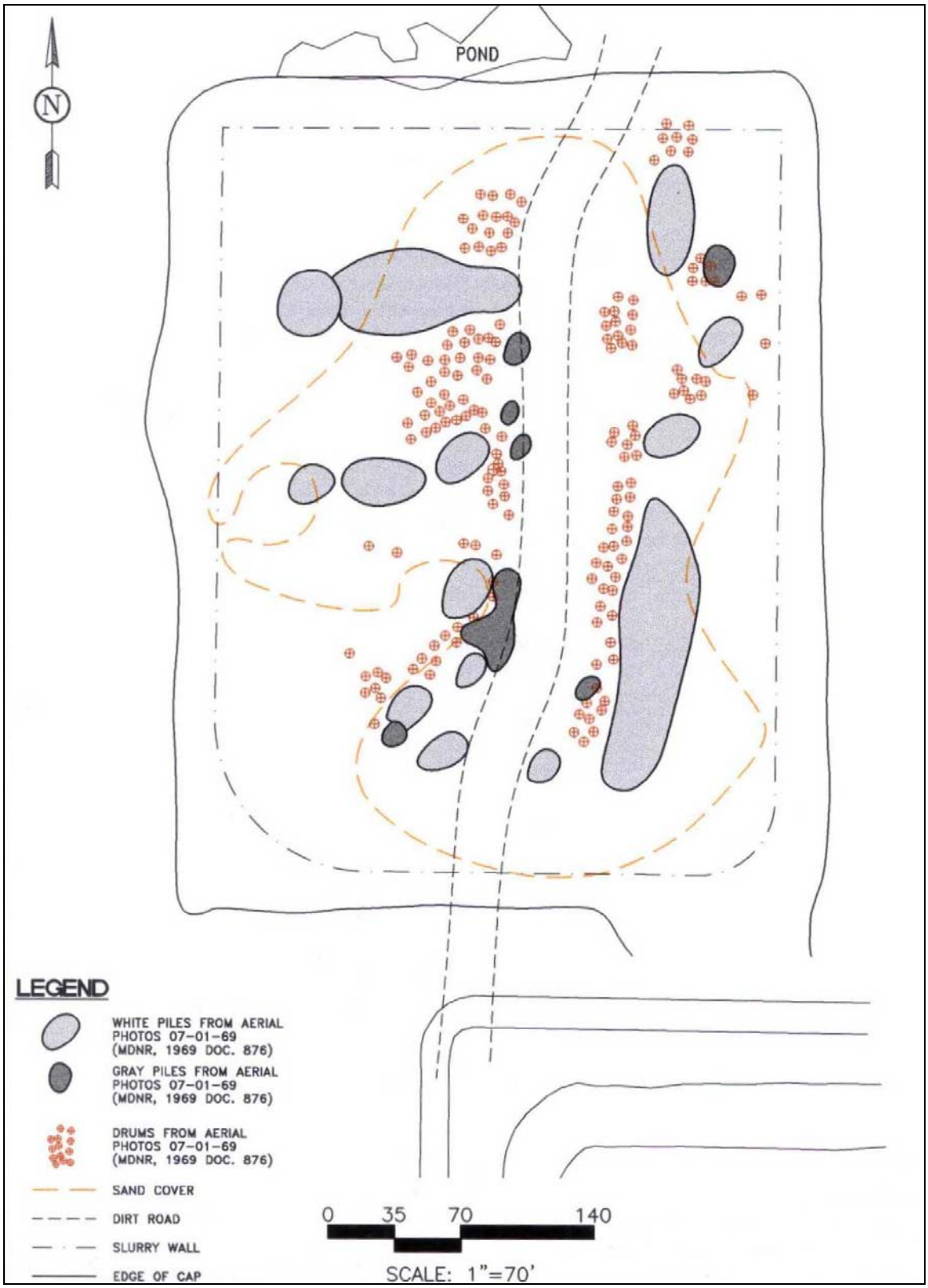


Figure 1-3 Historic Site Map with Former Access Road

1.5 SITE-SPECIFIC DCGLS

The objective of the MDNR is to decommission the site in accordance with applicable Federal and State requirements and regulations such that the radioactive materials license held by the MDNR can be terminated. To achieve this objective, the MDNR intends to show that concentrations of residual radioactivity in soils resulting from the disposal of thoriated slag are below that which might produce an annual radiation dose in excess of the NRC's decommissioning dose limit (NRC 1997a).

The evaluation of potential risks posed by hazardous or potentially hazardous chemical substances at the site is being addressed by the MDEQ on a separate but parallel track to that for residual radioactivity. Residual radioactivity at the site is being addressed by the licensee, the MDNR, following the NRC's guidance in the *NMSS Decommissioning Standard Review Plan,* NUREG-1727 (NRC 2000a). In keeping with this guidance, MDNR previously completed and documented the following tasks:

- Historical Site Assessment (HLA 1998a),
- Assessment of Local Background Radioactivity (MDPH 1983, ABB 1998),
- Radiological Scoping Survey (HLA 1998b),
- Radiological Characterization Survey (Cabrera 2001)

Based upon information gained through the completion of these former tasks, a conceptual model of the site was developed, and site-specific permissible concentrations of residual radioactive material in soil–derived concentration guideline levels (DCGLs) were calculated. The DCGLs derived to be protective of human health and the environment and such that potential future exposures at the site are unlikely to result in an annual radiation dose exceeding 25 mrem total effective dose equivalent (TEDE) following release of the site for unrestricted use.

The RESRAD computer modeling code (Version 6.21) was used to derive the site-specific soil DCGL (Yu 2002). Two discrete soil source terms have been evaluated: 1) the subsurface soils source term (corresponding to the slag deposits contained within the cell); and 2) the surface-soils source term (corresponding to the surface veneer layer of the engineered clay cover of the cell, which, hypothetically may have been impacted by subsurface soil sampling and characterization activities). As described in detail in Section 5.0 (Dose Modeling), it has been shown that the subsurface-soil source term cannot reasonably produce an annual dose approaching the decommissioning dose limit even if the Th-232 activity were present at its specific activity limit of 1.09×10^{-1} μCi/g. Consequently, there is no practical need to establish a DCGL for the subsurface-soils source term.

The surface-soil source term, if it is present, could potentially result in exceedances of the applicable dose limit, although that is considered extremely unlikely. The Composite

Recreational User scenario proves to be the most limiting among the scenarios considered.

The proposed media-specific $DCGL_W$ for surface soils containing thoriated slag is 357 pCi/g Th-232.

Since the LCTS building, miscellaneous concrete pads, and the above-grade appurtenances of the LCTS itself are planned for removal prior to achieving the final condition for the site, they are not subject to the decommissioning dose limit. As a result, DCGLs designed to satisfy the decommissioning dose limit have not been developed for these. However, MDNR proposes that the release criterion published in the NRC's Policy and Guidance Directive 83-23 (PGD 83-23), which are applicable to the radiological release of materials and equipment, be used when performing radiological surveys of the LCTS building and other materials and equipment (NRC 1987). This release criterion is already specified and approved in MDNR's radioactive materials license (NRC 1999a). The concentration-based decontamination limits in PGD 83-23 are conservative as they are set near the limits of detection for standard, portable, radiation detection equipment. The applicable limits from PGD 83-23 for the radionuclides present at the site are:

- 200 dpm/100 cm^2 (removable, alpha or beta)
- 1,000 dpm/100 cm^2 (total, alpha or beta, averaged over 1 m^2)
- 3,000 dpm/100 cm^2 (maximum, alpha or beta)

1.6 ALARA ANALYSIS

A pre-remediation As Low As Reasonably Achievable (ALARA) analysis has been completed to evaluate whether it is reasonable to further reduce the allowable levels of residual radioactivity to levels below those necessary to meet the dose criteria (i.e., to levels that are ALARA below the DCGL).

Based on the MDNR's decision to implement the NRC's unilaterally approved annual dose limit under the unrestricted use criteria of 10 CFR §20.1402 (NRC 1997a), and given that potential exposure at the site is associated with bulk quantities of subsurface soils or trace quantities of surface soils containing residual radioactivity (as opposed to discrete sources of radioactivity associated with systems, materials, or building structures), it is accepted on an *a priori* basis that compliance with the unrestricted use release criteria is ALARA. Decommissioning guidance published by the NRC (NRC 2000a) supports the rationale that concentrations of residual radioactivity in bulk soils at a DCGL corresponding to 25 mrem/y cannot reasonably be further reduced within the context of the ALARA principle. NUREG-1727, Appendix D, Section 1.5 states: "In certain circumstances, the results of an ALARA analysis are known on a generic basis and an analysis is not necessary. For residual radioactivity in soil at sites that will have unrestricted release, generic analysis shows that shipping soil to a low-level waste disposal facility is unlikely to be cost effective for unrestricted release, largely because of

the high cost of waste disposal and accident potentials associated with transportation. Therefore shipping soil to a low-level waste disposal facility generally does not have to be evaluated [to determine whether it is ALARA] for unrestricted release."

Based on these factors, it was determined that the proposed remedial action DCGLs are ALARA, and no remedial action to reduce concentrations of residual radioactivity in soil below the proposed remedial action DCGLs is warranted.

1.7 START AND END DATES

Following and contingent upon approval of this DP, decommissioning project activities are scheduled to start on February 1, 2005 with the removal of the LCTS building, above-grade LCTS piping, and miscellaneous structures as described in Section 8.0. MDNR anticipates that the decommissioning project activities will be completed on June 19, 2006 with the submittal of the Final Status Survey (FSS) Report and request for license termination. Additional details related to project schedules are discussed in Section 8.5.

1.8 POST-REMEDIATION ACTIVITIES

The MDNR has not identified any post-remediation activities related to the radiological constituents found at the site.

1.9 AMENDMENT TO LICENSE TO INCORPORATE DP

This Decommissioning Plan submittal includes a request to amend NRC License No. SUC-1581 to incorporate the DP.