FIFTH FIVE-YEAR REVIEW REPORT FOR JOHNS MANVILLE CORP. SUPERFUND SITE LAKE COUNTY, ILLINOIS

Prepared by

U.S. Environmental Protection Agency
Region 5
CHICAGO, ILLINOIS

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LIST OF ABBREVIATIONS & ACRONYMS

ACM	Asbestos-Containing Materials
AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R.	Code of Federal Regulations
COC	Contaminant of Concern
ComEd	Commonwealth Edison
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FACD	First Amended Consent Decree
FYR	Five-Year Review
ICs	Institutional Controls
IDNR	Illinois Department of Natural Resources
IEPA	Illinois Environmental Protection Agency
JM	Johns Manville Corp.
mg/l	milligrams per liter
MCL	Maximum Contaminant Level
MFL	Million Fibers per Liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PPB	Parts Per Billion
PRP	Potentially Responsible Party
SRP	Illinois Site Remediation Program
RAO	Remedial Action Objectives
ROD	Record of Decision
Site	Johns Manville Corp. Superfund Site
TBC	To be Considered
µg/l	micrograms per liter
USACE	United States Army Corps of Engineers
UU/UE	Unlimited Use and Unrestricted Exposure

I. INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 C.F.R. Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fifth FYR for the Johns Manville Corp. Superfund Site (Site) shown in Figure 1. The triggering action for this statutory review is the completion date of the previous FYR on April 30, 2013. The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of eight Operable Units (OUs): OU1, OU2, OU3, OU4, OU5, OU6, OU7, and OU8.

Operable Unit (OU) #	Name	Status
1	Johns Manville Corp. (JM) Waste Disposal Area	Construction Complete
2	Shooting Range (Site 2)	Construction Complete
3	Parking Lot (Site 3)	Construction Complete
4	Sites 4/5	Construction Complete
5	Building Area (SRP)	Construction Complete
6	Nature Preserve Road (Site 1)	Feasibility Study (FS) in development
7	Illinois Beach Nature Preserve (Site 7)	Removal Complete
8	Greenwood Avenue shoulders (Site 6)	Construction Complete

At OUs 5, 6, and 7, EPA has neither signed nor concurred on a Record of Decision (ROD) or other decision document selecting a remedy pursuant to CERCLA Section 121. Therefore, in accordance with CERCLA Section 121, FYRs are not required. OUs 5, 6, and 7 are discussed, but are not formally evaluated for protectiveness in the FYR. OU5 is part of the former manufacturing area. It was incorporated into the Illinois Site Remediation Program (SRP) for remedial action. OU6 is the subject of an ongoing FS. OU7 is north of the industrial canal and was identified to contain surficial asbestos-containing materials (ACM). Surficial asbestos was previously removed from OU7.

The Johns Manville Corp. Superfund Site FYR was led by Matthew J. Ohl, the Remedial Project Manager for the Site. Participants included Heriberto Leon, the Community Involvement Coordinator for the Site, Ben O'Neil from the United States Army Corps of Engineers (USACE), and Charlene Falco from the Illinois Environmental Protection Agency (IEPA). The Potentially Responsible Party (PRP) was notified of the initiation of the FYR. The review began on 10/20/2017.

Site Background

Physical Characteristics

The Johns Manville Corp. Superfund Site in Waukegan, Illinois, is a former asbestos product manufacturing facility on the western shore of Lake Michigan. The facility operated from 1928 through 1998. Asbestos was used in products manufactured at the facility until approximately 1985, when fiberglass was substituted for asbestos. The Johns Manville Corp. (JM) Site consists of both the JM manufacturing facility property (JM property) and adjacent contaminated areas. The JM property is approximately 350 acres, which includes the former manufacturing area (most buildings were demolished in 2001), former parking areas, and an approximately 150-acre waste disposal area (OU1). Other Site areas adjacent to the JM property include the shooting range/fishing pier parking lot area (OU2), the southwestern site area (OUs 3, 4, and 8), the nature preserve road (OU6) and the Illinois Beach Nature Preserve (OU7). The Building Manufacturing Area (OU5) was enrolled in the SRP and received a letter of No Further Remediation (NFR) in 2017. The nearest residences are approximately ½ mile west of the Site.

The Site is located in an environmentally sensitive area, within a wetland recognized for its international importance by the Ramsar Convention[1]. It includes habitat for and occurrences of threatened and endangered species such as the Blanding's Turtle and the Piping Plover. Illinois Beach Nature Preserve and State Park cover about 4,160 acres and are adjacent to the Site on its northern boundary. In 1980, the area was also designated as a National Natural Landmark. Illinois Beach is one of the richest, biologically most diverse areas in the state. The natural communities adapted to this unique lakefront environment include lakeshore, foredune, sand prairie, sand savanna, fen, panne, sedge meadow, marsh and pond. These natural communities support over 500 plant species and a large variety of animal species. Low sand dunes near the beach contain sand-binding grasses, bearberry and trailing juniper. The typical grasses are little bluestem, switch grass, Indian grass and sand reed grass. The preserve supports many species of ducks, shorebirds, gulls, herons, rails and songbirds. A roadbed (OU6) of about one acre, containing asbestos and ACM extends from the Borrow Pit Area into the Nature Preserve.

Land and Resource Use

The JM property is bounded by Lake Michigan to the east, the Illinois Beach Nature Preserve and State Park to the north, a Union Pacific rail corridor to the west and a power generating station to the south. The land was used to manufacture asbestos products until 1985 and non-asbestos products until 1998. The land is currently used as an inactive disposal facility and utility corridor.

Nearby residents obtain drinking water from the City of Waukegan. The city pumps its water supply from Lake Michigan through some 230 miles of mains. Waukegan has the capacity to supply water to the developing parts of Lake County in the future. A water supply main is available adjacent to the Site along Greenwood Avenue. The entire developed portion of the city is served by separate storm and

[1] The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The treaty came into effect in the United States on December 18, 1986. The Ramsar Convention designated 3,914 acres of land owned by eight public landowners along Lake Michigan in southeast Wisconsin and northeast Illinois as a Wetland of International Importance. The designated area starts north within the Village of Pleasant Prairie and continues south to the City of Waukegan, including: Kenosha Sand Dunes, Chiwaukee Prairie State Natural and Scientific Area, Carol Beach Parks and Open Space, Spring Bluff Nature Preserve, Fossland/Novotny Park, Dead Dog Creek, Illinois Beach State Park and Nature Preserve, Hosha Prairie, Bowen Park and Glen Flora Tributary.

sanitary sewers. While the city is responsible for sewerage collection, treatment is the responsibility of the North Shore Sanitary District. This makes the use of the groundwater for potable use or the subsurface for septic disposal less likely in the future.

History of Contamination

Asbestos had been found throughout the manufacturing area and adjacent areas as a result of the manufacturing operation, including ACM and asbestos fiber containing waste and sludge. Other contaminants, including lead, chrome, thiram, and xylene have also been documented, but the primary contaminant of concern (COC) is asbestos. Approximately 3,000,000 cubic yards of off-specification products, primarily containing asbestos, and asbestos-containing sludge dredged from the wastewater treatment system were ultimately disposed in the on-site landfill area. Before the remediation, the asbestos-containing sludge at the Site was located at the landfill surface and wastewater treatment ponds, and in many areas and could easily become airborne. Following the manufacturing plant's closure, asbestos and ACM had been found in areas outside of the waste disposal areas, including the OUs 2, 3, 4, 5, 6, 7, and 8. OU5 has been addressed under the SRP and received a letter from the Illinois EPA on November 11, 2017, indicating no further remediation was required.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Johns Manville Corp.		
EPA ID: ILD005443544		
Region: 5	**State:** IL	**City/County:** Waukegan/Lake

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA
Author name (Federal or State Project Manager): Matthew Ohl
Author affiliation: EPA
Review period: 10/20/2017 to 1/1/2018
Date of site inspection: 12/15/2017
Type of review: Statutory
Review number: 5
Triggering action date: 5/1/2013
Due date *(five years after triggering action date)*: 5/1/2018

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

The primary COC for the Site is asbestos in soils. Elevated levels of asbestos have been documented on-site, creating a potential risk from soils to nearby receptors, including utility workers, pedestrians or other potential users of Greenwood Avenue, trespassers, on-site workers and residents. Due to the presence of asbestos in soils, adverse health risks are reasonably anticipated in the event that exposure occurs. Exposure to asbestos fibers via inhalation results in significant health effects including mesothelioma, lung cancer, asbestosis, thickening of the pleural lining around the lungs and pulmonary deficits. Exposures to soils containing asbestos fibers have been associated with all of these health effects including cancer. To address potential asbestos concerns for the Site, EPA selected remedy options for areas with 1) the potential for releases of ACM or asbestos fibers to the air or water; 2) direct contact with ACM or asbestos fibers; and 3) exposure of on-site workers and the general public to asbestos fibers from contaminated soils.

Asbestos in the form of poor-condition ACM may become friable over time due to weathering or other processes that cause asbestos fibers to be released from the material's matrix. Asbestos fibers may be released to the air through the direct mechanical disturbance (e.g., foot or mechanical traffic), burning, or wind erosion of the ACM, or the indirect disturbance of the ACM through the mechanical disturbance of ACM-containing vegetation, soils and other materials. Airborne dispersion of asbestos fibers could present an inhalation hazard or further migration of contamination.

The basis for taking action for individual operable units is discussed below:

JM Waste Disposal Area (OU1): The primary COC identified during the original Remedial Investigation/Feasibility (RI/FS) Study for the Site was asbestos. The OU1 RI/FS study identified inhalation of asbestos as the most likely type of exposure. Potential receptors included nearby residents, motorists, workers, or trespassers. This exposure pathway was exacerbated by the fact that the asbestos-containing sludge was friable and high winds were frequent due to the effects of Lake Michigan.

Shooting Range (OU2): The primary COC for this OU identified during the emergency response action was asbestos. EPA identified inhalation of asbestos fibers as the most likely exposure pathway. Friable asbestos was found in the surface and subsurface soils in a parking area and along the walking path to the Commonwealth Edison (ComEd) fishing pier, an area that was then receiving substantial recreational use. JM's ACM-containing waste and debris was used as fill to construct berms for the 1959 Pan Am games' shooting range. In OU2, asbestos migration occurs when ACM-containing soil is disturbed.

Southwestern Site Area (OUs 3, 4 and 8): The primary COC identified during the RI/FS study for these OUs was asbestos. EPA identified inhalation of asbestos as the most likely type of exposure. These OUs are located adjacent to Greenwood Ave, Pershing Rd, and the railroad line. ACM and elevated levels of asbestos fibers in soils created a potential risk to users of Greenwood Avenue as well as workers (e.g., utility workers performing excavation within right-of-way).

Former Building Manufacturing Area (OU5): The primary COC identified for this OU was asbestos. EPA identified inhalation of asbestos as the most likely type of exposure. OU5 is located west of the JM Waste Disposal Area within the property limits of JM. After ceasing manufacturing operations in 1998,

JM enrolled the Former Building Manufacturing Area in the SRP. During 1999-2001, JM demolished nearly all the former manufacturing buildings located on the JM-owned property in the approximately 100-acre former manufacturing area, which is adjacent to the JM Waste Disposal Area. JM discovered subsurface ACM on the Former Building Manufacturing Area according to a draft Comprehensive Site Investigation Report.

Nature Preserve Road (OU6): The primary COC identified for the OU is asbestos. EPA has identified inhalation of asbestos as the most likely type of exposure due to the presence of asbestos in subsurface and surficial soils. Subsurface ACM periodically becomes exposed at the surface due to vertical migration from freeze-thaw cycling. Asbestos migration may also occur to adjacent properties via erosion at OU6, or due to potential airborne transport of asbestos-laden dust.

Illinois Beach Nature Preserve Southern Boundary Area (OU7): The primary COC identified for OU7 is asbestos. EPA has identified inhalation of asbestos as the most likely type of exposure. OU7 is located north of the Industrial Canal area, immediately north of the fence-line within the Illinois Beach Nature Preserve. Surficial ACM was discovered at OU7 in May 2003 following a fire within the preserve. Subsequent subsurface investigations did not reveal the presence of buried ACM.

Response Actions

Table 1 - Significant Decision and Supporting Documents

Event	***Date***
NPL listing:	9/08/1983
Removal Actions:	OU2 – Action Memo 9/24/2001 OUs 3, 4, and 8 – Action Memo 11/30/2012
RI/FS Completion	6/30/1987
ROD Signature	OU1 – 6/30/1987
ROD Amendments or Explanations of Significant Differences (ESDs)	OU1 - First ESD – 2/9/1993 OU1 - Second ESD – 9/22/2000 OU1 - Third ESD – 5/17/2005
Enforcement documents (Consent Decree (CD), First Amended Consent Decree (FACD), Administrative Order on Consent (AOC))	CD – 3/18/1988 OUs 1 and 5 - FACD – 12/16/2004 OUs 3, 4, and 8 - AOC – 6/11/2007
Actual Remedial Action Start	10/21/1988
Previous FYRs	1/21/1999, 5/02/2003, 5/01/2008, 5/01/2013

The remedial action objective (RAO) identified in the 1987 ROD was to "mitigate releases of asbestos and other contaminants to the air, direct contact with contaminated soils and surface water, and groundwater contamination." A CD between the United States, JM and the State of Illinois was entered on March 18, 1988 to carry out the selected remedies at OU1. Since the first phase of the Remedial Action was completed at the Site, three ESDs have been executed. Conditions discovered during construction necessitated some changes, which were documented in the first ESD, signed on February 9, 1993. For example, during the Remedial Action, two parking lot areas with ACM at or near the ground surface were discovered and remediated by placing a 6-inch gravel sub-base and then a minimum 2-inch bituminous layer. The first ESD also required that Institutional Controls (ICs) be placed on the Superfund portion of the JM property to protect the integrity of the remedy at the Site. The second ESD was executed on September 22, 2000 and required closure of the on-site waste water treatment system

and non-asbestos containing landfill areas that continued to operate following closure of the JM manufacturing facility. The second ESD outlined the required closure activities for the wastewater treatment portions of the Site. ICs are shown on Figure 2.

The United States, JM and the State of Illinois entered into the FACD on December 16, 2004. The FACD added OU5 to the OU1 remedy, and required monitoring for asbestos, lead, chromium, antimony, and arsenic in both OUs. Water quality action levels were established within the FACD at 7 million fibers per liter for asbestos, 50 micrograms per liter (µg/l) for arsenic, and 6 µg/l for antimony, or whatever groundwater standard is promulgated for these contaminants and is in effect at the time of any periodic review is conducted pursuant to Section 121(c) of CERCLA, 42 U.S.C.

The third ESD for OU1 and OU5, executed on May 17, 2005, addressed amendments to work practices that were necessitated by the discovery of Blanding's turtles (*Emydoidea blandingii*) in the northern portions of the Site. The Blanding's turtle is a state-threatened species in Illinois as well as other states.

JM, ComEd and EPA entered into an AOC, with an effective date of June 14, 2007, providing for an investigation and implementation of a response action at OUs 3, 4, and 8. In November 2012, EPA issued an Action Memorandum selecting a response action including the removal of asbestos, containment of asbestos and environmental covenants for the OUs.

<u>JM Waste Disposal Area (OU1)</u>

- Remedy Selection – The Remedial Action selected for the JM Waste Disposal Area in the June 30, 1987 ROD included a soil cover with vegetation for asbestos containment. Following development of the FACD, remedies were to be approved by EPA in incremental work plans for each of the features of OU1, including the wastewater treatment features (i.e., the industrial canal, collection basin, settling basin, pumping lagoon, and miscellaneous treatment trains) and on-site landfill such that a vegetated cover would be installed over all impacted areas to fulfill the RAO.

- Remedy Implementation – Remedial construction began in October 1988. The soil cover, which was placed over all dry waste disposal areas of the Site, consisted of 6 inches of sand overlain by 15 inches of clay and 3 inches of topsoil. The cover was modified slightly, to 26 inches of clay, on slopes greater than 20 percent. A nominal 12-inch layer of rip rap, with 4 inches of bedding material, was applied around the perimeter of the ponds in the waste water treatment system. Site roadways were provided with a 24-inch cover consisting of sand overlain by gravel. The area of the Site that was provided with soil cover consisted of 120 acres. During the initial remedial action, approximately 30 additional acres of the Site (east of the collection basin, and two parking lot areas adjacent to the manufacturing buildings) were discovered to have ACM at or near the surface. With the exception of the two parking lot areas, these additional areas were covered with 24 inches of soil, with vegetation. The two parking lot areas were covered with 6 inches of gravel and a minimum of 2 inches of bituminous material. Remedial construction for this phase was physically completed in August 1991 under the original ROD. EPA conducted its final inspection shortly thereafter, and EPA signed a Preliminary Close-out Report for the Site on December 31, 1991.

  Following closure of the manufacturing plant and development of the Second ESD and the FACD, a remedy for the wastewater treatment portion of OU1 was selected to be a 24-inch vegetated cover within the Collection Basin, Industrial Canal, and Pumping Lagoon. The cover within the Collection Basin was largely completed in 2003 following the Second ESD. The

adjacent Settling Basin was allowed to passively drain for several years. Finalization of the Collection Basin's cover followed the installation of a drainage gallery that was completed in 2014. To permit installation of a final cover within the Industrial Canal and Pumping Lagoon, a geotextile was deployed over the existing sludge to provide structural ballast, and both on-site and off-site materials were used to backfill the Industrial Canal and Pumping Lagoon to a sub-cap elevation. In lieu of the 24-inch vegetated hybrid clay cover, a native sand 27-inch vegetated clean cap was installed over the backfill and separation barrier at the request of the State to prevent non-native species establishment within the sensitive ecosystem adjacent to the Site. The change from 24-inches of clay/sand cover to 27-inches was necessary based on freeze-thaw protectiveness modeling for the sand cover. Due to the limitations of weather conditions on cover placement, grading and vegetative growth, seeding of these areas with native grasses was completed in 2017.

Closure of the Settling Basin portion of the OU began following the second ESD when additional water pumpage was introduced to the basin to permit wetting of friable asbestos within sludge, and placement of a clay layer along the east bank to reduce flows to the Industrial Canal. Remedial construction activities commenced in 2005 and included installing a high strength woven geotextile over the Settling Basin sludge, draining the settling basin while filling it with sand from the borrow pit, and covering the basin with a separation geotextile and a 27-inch hybrid clay/sand/topsoil cover. A stormwater diversion structure was installed to intercept clean runoff at the Site, draining to an outfall at Lake Michigan. The adjacent wastewater treatment ponds (Papermill Ditch, Catch Basin, Mixing Basin, and Black Ditch) were backfilled with construction debris, sand from the on-site borrow pit, and a clean clay/sand cover was placed over these areas. Subgrade piping and structures connecting the various wastewater treatment facilities were removed or closed. Construction activities associated with this portion of closure were completed in 2016, and the Site was mostly vegetated as of 2017, however re-evaluation of vegetation establishment in the Settling Basin is necessary. The former black ditch area was used as an on-site consolidation area for asbestos-impacted soils; soils from Site excavations were consolidated in this area and a vegetated clay cover was installed in 2016.

The on-site landfill area consists of a miscellaneous disposal pit and a portion of the collection basin. The final cover for these areas was constructed in 2008, and consists of a one-foot thick barrier layer, a one-foot thick sand drainage layer, a three-foot compacted clay layer, and a vegetated topsoil layer. The remedy in this area was selected based on Title 35 of the Illinois Administrative Code, Part 811 as it relates to solid waste landfills.

Fencing was re-installed along the perimeter of the former manufacturing facility, including OU1, in 2017, including signage indicating the presence of an asbestos hazard.

<u>Shooting Range (OU2)</u>

- Remedy Selection – OU2 encompasses approximately 11 acres primarily on the south side of Greenwood Avenue's eastern end. In the late 1950's, protective berms were built for the 1959 Pan American Games' pistol and rifle competition. JM provided waste and scrap products from their asbestos operation to be used as fill in constructing the berms. After the shooting range ceased operations, the berms were leveled. OU2's 2001 Action Memorandum selected a remedy to collect surficial ACM along the fishing pier walking path, to remove the upper two-feet of ACM-contaminated soils in the vicinity of the previously constructed berms and to replace removed soils with backfill.

- Remedy Implementation – Areas of impacted soil were delineated by sampling for asbestos-soil content of greater than 1%, and through targeted visual observation. According to a September 24, 2001 Action Memorandum, EPA implemented a response action to excavate impacted materials identified during characterization and to dispose off-site. After excavating the asbestos, EPA backfilled with approximately two feet of clean, off-site fill material. The cover was then re-vegetated, and EPA installed fencing around the perimeter. Construction completion occurred in 2002. In 2011, additional ACM was discovered in subsurface materials during the drilling of monitoring well SMW-12 for development of the March 28, 2012 Revised Arsenic Source Evaluation Report. Subsequent analysis indicated that the ACM was overlain by between approximately 24 inches and 54 inches of cover, protecting the ACM from freeze-thaw migration.

Parking Lot (OU3)

- Remedy Selection – OU3 is a former parking lot currently owned by ComEd. OU3 is located south of the Greenwood Avenue right-of-way and east of Pershing Road. Asbestos containing pipe was used throughout the parking lot in the 1950s, and subsurface asbestos materials were discovered in the upper five feet of OU3. The November 30, 2012 Action Memo required placement of a vegetative cover over OU3 to contain ACM left in-place.

- Remedy Implementation – JM, ComEd, and EPA entered into an AOC, with an effective date of June 14, 2007, for the implementation of the remedy. Construction began at OU3 in 2015. JM removed soil to a depth of approximately 4 feet to permit placement of a protective cover. JM completed additional excavation for development of a clean soils corridor around a gas main and water main at the OU. Excavated material was disposed in the on-site consolidation area. The base and sides of the excavation were lined with geotextile and the excavated area was backfilled with clean sand. Geotextile and compacted clay layers with a minimum depth of 15 inches were installed over the backfill. Final cover placement and vegetation establishment was completed in 2016.

Site 4/5 (OU4)

- Remedy Selection – OU4 is a swale at the western boundary of the Site within a ComEd right-of way. Asbestos roofing materials, sheeting, and brake shoe materials were found in excavated soils during decommissioning of a natural gas line, resulting in the demarcation of “Site 4”. Subsequently, “Site 5” was identified immediately adjacent to Site 4 following a soil-asbestos fiber investigation by the Waukegan Park District. The November 30, 2012 Action Memo called for the complete removal of asbestos impacted soils to establish a clean corridor for a sanitary sewer.

- Remedy Implementation – JM, ComEd, and EPA entered into an AOC, with an effective date of June 14, 2007, requiring the implementation of the remedy. Construction began in 2015 and consisted of excavating soil within the OU4 boundary to an approximately 2 to 5-foot depth. All impacted material was removed from OU4 by breaking the area into approximately 50-foot grids and incrementally excavating and sampling for asbestos. Excavation was considered complete in each grid when asbestos levels were at “non-detectable” concentrations. The wetland areas were mitigated per a Section 404 Clean Water Act Permit, clean fill and topsoil was placed within the excavations and OU4 was vegetated in 2016.

Building Manufacturing Area (OU5)

- Remedy Selection – The State of Illinois selected the remedy for OU5 under the SRP. The remedy included demolition of buildings with asbestos abatement, removal of building slabs and subsurface features, and installation of a clean cap.

- Remedy Implementation – Remedial action was overseen by the State of Illinois. Building demolition began in 1999 and all remedial measures were complete by 2017.

Nature Preserve Road (OU6)

- Remedy Selection – A remedy has not yet been selected specifically for the Nature Preserve Road Area. OU6 is a narrow roadbed covering about 1 acre, that extends northeast from the perimeter road around the Site into the Illinois Beach Nature Preserve. Historical aerial photography (see Figure 3) shows that a road extended from the Site through OU6 to the north across a bridge over the Dead River and connected with other roads in what is now Illinois Beach State Park. Other roads at the Site have been covered, however, due to the sensitive ecological area of the nature preserve, a separate FS is currently being developed to identify potential remedies. A wildfire potentially set by trespassers occurred in late 2013 within the Illinois Beach State Park, spreading to areas of OU6. The fire removed existing vegetation and revealed the presence of surficial ACM. Emergency responders required access to OU6 for fire control. Following identification, the Illinois Department of Natural Resources (IDNR) oversaw removal of surficial ACM based on visual inspection.

- Remedy Implementation – Since no remedy has been selected, no implementation has occurred to date. However, as an interim measure, the IDNR periodically collects fragments of surficial ACM and disposes of the ACM off-site.

Illinois Beach Nature Preserve Southern Boundary Area (OU7)

- Remedy Selection – No formal decision document selecting a remedy was issued by EPA, however, a Special Use Permit was issued by the Illinois Nature Preserves Commission which formed the basis for the removal action investigation, removal procedures and standards. JM conducted an investigation of OU7 in June 2009 following discovery of surficial ACM. The investigation included a Global Positioning System survey of surficial debris as well as hand borings down to the water level. All potential ACM was submitted to a laboratory for analysis. The investigation revealed the presence of ACM in surficial material, though there was no evidence of buried ACM in soils.

- Remedy Implementation – The removal action required a Special Use Permit from the Illinois Nature Preserves Commission to allow for access, investigation, and removal of surficial ACM. JM's investigation and removal operation were overseen by representatives from IDNR, IEPA and EPA. ACM and debris identified during the June investigation is shown in Figure 4 and includes: tar paper/sheet gasket material (tap, 49 locations); roofing rolls (ror, 15 locations); transite pipe (trp, 2 locations), flat transite (tr, 2 locations); corrugated transite (cor, 2 locations); brake shoes (brk, 2 locations); flexboard (flx, 4 locations); general debris (deb, 8 locations); gasket material (gas, 4 locations); linoleum flooring (lin, 1 location) and clutch plates (dp, 1 location). All material was removed by hand, placed in specialty asbestos-labeled plastic bags, and transferred to an approved landfill.

Greenwood Avenue Shoulder (OU8)

- Remedy Selection – OU8 is located near the southern JM property line on the unpaved shoulders of Greenwood Avenue, within the right-of-way. Soil-asbestos sampling performed as part of a study by the Waukegan Park District revealed the presence of asbestos fibers in surficial soils. The November 30, 2012 Action Memo remedy for OU8 is the removal of asbestos impacted soils up to the adjacent fence line in order to establish a clean soil utility corridor.

- Remedy Implementation – JM, ComEd, and EPA entered into an AOC, with an effective date of June 14, 2007, to implement the proscribed remedy. All asbestos impacted soils were removed from the OU boundary by establishing approximately 50-foot grids within OU8 and incrementally excavating soils based on sampling results. Soils were excavated in each grid cell until sampling results indicated that the soil-asbestos concentration was "non-detect". Excavations were lined with geotextile to act as a separation barrier, and clean sand was used to backfill to grade. Construction began in 2015 and vegetation of the final cover was established by 2017.

Status of Implementation

JM Waste Disposal Area (OU1) – Construction activities are complete within OU1. In 2017, JM completed excavation and/or capping with rock or a vegetated cover, as required, at the on-site landfill, wastewater treatment area, manufacturing areas, perimeter roads, and related areas. JM installed and began operation of a stormwater drainage system that intercepts clean stormwater runoff and discharges to Lake Michigan in 2017. EPA is reviewing construction closure reports and closure inspections will be held in 2018. Continued monitoring and maintenance as part of the O&M Manual, particularly within the Settling Basin, will be necessary as vegetation establishes.

Shooting Range (OU2) – Construction activities are complete within OU2. Asbestos-impacted materials were removed from two to three feet below ground surface in 2002 based on targeted sampling results. Additional asbestos material was discovered in subsurface soils during monitoring well installation, however the material was determined to be contained by the installed cover and no additional removal was necessary.

Parking Lot (OU3) – Construction activities are complete within OU3. JM partially excavated OU3 and installed a clean cover with a clean-soil corridor for utilities in 2016. JM established vegetation by 2017. JM is developing closure reports for OUs 3, 4, and 8 and closure inspections will be held in 2018.

Site 4/5 (OU4) – Construction activities are complete within OU4. Soils with detectable concentrations or visually identified ACM were removed from OU4, clean fill was placed, and the wetland areas were mitigated. Vegetation of OU4 occurred in 2016. JM is developing closure reports for OUs 3, 4, and 8 and closure inspections will be held in 2018.

Building Area (OU5) – Construction activities are complete, and IEPA issued a NFR letter on September 11, 2017. Vegetation establishment was still on-going at the time of this report (see Site Inspection, below).

Nature Preserve Road (OU6) – No remedy has been selected for OU6. EPA is coordinating with IDNR, Illinois Nature Preserve Commission, and other agencies in development of a remedy for OU6, which is also known as Site 1 or the Nature Preserve Road. ACM remains in subsurface soils and may appear at the surface periodically due to freeze-thaw migration or other erosional forces. IDNR periodically picks-

up surficial ACM and disposes of the waste off-site. USACE is developing a FS and a draft report is expected in 2018.

Illinois Nature Preserve (OU7) – Removal of surficial asbestos occurred in June 2003. OU7 was not addressed in a decision document, therefore protectiveness determination is not made in the FYR.

Greenwood Avenue Shoulder (OU8) – Construction activities are complete at OU8. JM completed excavation of material from OU8 and placement of the material in the on-site consolidation area, under a clean sand cover in 2017. JM is developing closure reports for the OUs3, 4, and 8 and closure inspections will be held in 2018.

Institutional Controls

ICs are required at the JM Site to ensure the protectiveness of the remedy. ICs are non-engineered instruments, such as administrative and/or legal controls, that help minimize the potential for exposure to contamination and protect the integrity of the remedy. Compliance with ICs is required to assure long-term protectiveness for any areas which do not allow for UU/UE. A summary of the implemented and planned ICs for the Site is listed in Table 2 and are further discussed below. A map showing the area in which the ICs apply is included as Figure 2.

Table 2 - Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Implemented	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Soil	Yes	Yes	OU1	Prohibits residential, educational, hospital, day care and similar future land uses (see recorded restrictions for further details)	FACD, Notice of Land Use Restriction recorded at 5709337 Lake County Recorder's Office on 12/30/2004
Soil	Yes	Yes	OU1	Prohibit any activity that may disturb integrity of an engineering control	FACD, Notice of Land Use Restriction recorded at 5709337 Lake County Recorder's Office on 12/30/2004
Groundwater	Yes	Yes	OU1	Prohibits groundwater use activities	FACD, Notice of Land Use Restriction recorded at 5709337 Lake County Recorder's Office on 12/30/2004

Soils	No	No	OU2	Usage Limitations	Restrictive Covenant (planned)
Groundwater	No	No	OU2	Prohibit groundwater use activities	Restrictive Covenant (planned)
Groundwater	Yes	Yes	OU5	Prohibits groundwater use activities	FACD, Notice of Land Use Restriction recorded at 5709336 Lake County Recorder's Office on 12/30/2004
Areas Y, Z and western parking lot	Yes	Yes	OU5	Prohibit any activity that may disturb integrity of the asphalt covers	FACD, Notice of Land Use Restriction recorded at 5709336 Lake County Recorder's Office on 12/30/2004
Building Manufacturing Area	Yes	Yes	OU5	Prohibits public access and use. building construction limitation, prohibition on groundwater use, land activity restrictions.	Letter of No Further Remediation, 11 September 2017. FACD, Notice of Land Use Restriction recorded at 5709336 Lake County Recorder's Office on 12/30/2004
Soils	No	Yes	OUs 3, 4, and 8	Use restrictions	Restrictive Covenant (planned)

Soils	No	No	OUs 6 and 7	Limit site access, limit site uses	Illinois Nature Preserve Commission Rules (under evaluation)

Status of Access Restrictions and ICs: The ROD for OU1 requires ICs. OU5 is being addressed under the SRP. Site-specific ICs, in the form of a Notice of Land Use Restriction and recorded in 2004, are in place at OUs 1 and 5. ICs are not in place for OUs 2, 3, 4, 6, 7 and 8. Evaluation of ICs for OU6 is occurring as part of the OU6 FS, expected in 2018. A decision document requiring ICs as part of the remedy is needed for OU2. The ROD for OU6 will address ICs.

There is no current use on the JM property (area encompassed by OU1, a portion of OU2, and OU5). There is no current groundwater use at the property. JM submitted annual certifications to EPA certifying compliance with the ICs at the facility during the last five years. Additionally, access controls, in the form of fencing and warning signs, are in place for the JM property. These controls, along with the continued presence of JM employees at the Site, are effective measures to limit access to the Site.

Current Compliance: Recent inspections indicate compliance with the ICs currently in place.

IC Follow up Actions Needed: Implement needed ICs for OUs 2, 3, 4, 6, 7 and 8. A decision document requiring ICs as part of the remedy is needed for OU2. Incorporate long-term stewardship procedures into the O&M Manual.

Long Term Stewardship: Long-term protectiveness at the Site requires compliance with use restrictions to ensure the remedy continues to function as intended. Under the FACD, JM is required to submit annual certifications to EPA that the ICs are in place and effective for the JM property. JM has submitted annual certifications to EPA certifying compliance with the ICs at the facility during the last five years.

For the rest of the Site, since compliance with ICs is necessary to assure the protectiveness of the remedy, planning for long-term stewardship is required to ensure that the ICs are maintained, monitored and enforced so that the remedy continues to function as intended. Long-term stewardship involves assuring effective procedures are in place to properly maintain and monitor the Site. Long-term stewardship will ensure effective ICs are maintained and monitored and the remedy continues to function as intended with regard to ICs. The final O&M Manual will include procedures to ensure long-term IC stewardship including regular inspections of the engineering controls and access controls at the Site, reviews of the ICs, and annual ICs reports with results of the inspection and review and certification to EPA that ICs remain in-place and are effective.

Systems Operations/Operation & Maintenance

Engineering Control: The principal engineering control for areas where ACM is left in place is an engineered soil barrier overlying the ACM-contaminated soils. O&M consists of monthly inspections of the soil cover at the Site and maintenance, as necessary. Maintenance of soil cover may consist of grading, seeding, erosion repair, or cleaning and repair of drainage features to ensure stormwater control. Construction has been recently completed at several OUs, and maintenance of vegetation will be

ongoing to ensure establishment. Monthly inspections have been, and will continue to be, an effective means to ensure the cover integrity. Minor problems have been noted during inspections related to vegetation establishment on some compacted clay covers. For example, sparse vegetation has exacerbated erosion along slopes of the settling basin. Erosion has been repaired with gravel fill in problem areas as vegetation is established. Continued monitoring and maintenance of the vegetation is expected to be an effective remedy. The Site O&M Manual is currently being updated and this issue will be addressed during continued closure evaluations.

Surface Water Monitoring: Under the Phase II Work Plan (as required by the FACD) for OU1, JM was required to conduct quarterly sampling for arsenic, antimony and asbestos at three locations along the Industrial Canal and two in Lake Michigan. Sampling occurred in the Industrial Canal through November 2015, when the Industrial Canal was backfilled with sand and soils above water levels. Lake Michigan monitoring continued through development of this FYR. Due to the timeline of the statutory review, data collected from the October 2017 sampling event was not evaluated as part of this review. Surface water monitoring results indicate that there have been no exceedances of applicable surface water standards or action levels for asbestos, arsenic or antimony in the Industrial Canal.

Groundwater Monitoring: JM monitors groundwater on a routine basis at OUs 1 and 2. Asbestos has not been consistently detected in groundwater monitoring wells at the Site. However, arsenic has been detected at levels above the maximum contaminant limit (MCL) following a change in the EPA's MCL from 50 µg/l to 10 µg/l in 2006. Data collected from the October 2017 sampling event was not provided in time to be evaluated as part of this review.

Air Monitoring: Air monitoring for asbestos and particulates was conducted daily at the work area perimeter (e.g., material loading and placement areas) and at two locations at the Site perimeter as required under the Phase II Remedial Work Plan and Monitoring Plan (Rev 6, 4 June 2014). JM conducted monitoring when it handled ACM-impacted materials. Air monitoring for other metals constituents was originally required but discontinued after the monitoring resulted in consistent non-detects. There were no detections of asbestos above action levels during perimeter air monitoring over the review period. Data collected from the October 2017 sampling event was not provided in time to be evaluated as part of this review.

System Operations and O&M Costs

Given the final covers were recently completed, the O&M costs will be evaluated in the next FYR when data is available.

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last FYR as well as the recommendations from the last FYR and the current status of those recommendations.

Table 3 - Protectiveness Determinations/Statements from the 2013 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Will be Protective	The remedy at the JM Waste Disposal Area is expected to be protective of human health and the environment once all remedial actions have been implemented. Except for the industrial canal, pumping lagoon and collection basin, the Waste Disposal Area has been closed and provided with the vegetative cover required by the ROD. There is no evidence of breach of the existing cover and there is currently no land or

		groundwater use at the Site. Institutional Controls (ICs) are in place and currently effective in prohibiting inappropriate uses of the site or groundwater. The remedy is functioning as intended because no inappropriate land or groundwater uses are occurring. The design and closure of the industrial canal, pumping lagoon and the collection basin are currently underway. The interim remedy is to maintain the water level in the pumping lagoon and industrial canal and maintain the soil cover in the collection basin such that no asbestos fibers will become exposed to the air. Long-term protectiveness requires compliance with effective ICs and implementation and maintenance of all remedy components. Long-term stewardship is needed to monitor and maintain ICs and the site remedy components.
2	Short-term Protective	The remedy for OU2 is protective in the short-term. ACM was removed to a depth of 2 to 3 feet below ground surface. There is no evidence of breach of the existing backfill and there is currently no land or groundwater use at the property. However, for the remedy to be protective in the long-term, the following actions need to be taken: additional investigation of ACM in site 2 and implementation of an additional response action if needed.
Sitewide	Short-term Protective	The remedy is considered protective of human health and the environment in the short-term because the JM Waste Disposal Area, except for the industrial canal, pumping lagoon and collection basin, has been closed and provided with the vegetative cover required by the ROD. There is no evidence of breach of the existing cover and there is currently no land or groundwater use at the property. ICs are in place and currently effective in prohibiting inappropriate uses of the site or groundwater. The remedy is functioning as intended because no inappropriate land or groundwater uses are occurring. The design and closure of the industrial canal, pumping lagoon and the collection basin are currently underway. The interim remedy is to maintain the water level in the pumping lagoon and industrial canal and maintain the soil cover in the collection basin such that no asbestos fibers will become exposed to the air. At site 2, ACM was removed to a depth of 2 to 3 feet below ground surface. There is no evidence of breach of the existing backfill and there is currently no land or groundwater use. Remedies have not been selected for OUs 5 and 6 so they have not been evaluated as part of this review. EPA has selected response actions for OUs 3, 4 and 8, but the response actions have not yet been initiated and thus were not evaluated as part of this review. To be protective in the long-term, the following actions need to be taken: additional investigation of ACM at site 2 and implementation of an additional response action if needed, compliance with effective ICs, and full implementation and maintenance of all remedy components in the decision documents for the site. Long-term stewardship is needed to monitor and maintain ICs and the site remedy components.

Table 4 - Status of Recommendations from the 2013 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1	Arsenic plume appears to extend beyond the JM property and exceeds the MCL	Continue investigation of arsenic plume and propose response action to address it, if necessary.	Ongoing	Arsenic in groundwater is being monitored during FYR events. Arsenic levels exceed the MCL but may not migrate beyond OU2. Further monitoring is needed.	NA
2	Asbestos and ACM discovered below the surface on site 2 adjacent	Determine extent of contamination, remove any ACM above 3 feet in depth,	Completed	Extent of contamination was at sufficient depth such that no further removal action was necessary.	12/5/2012

	to JM Waste Disposal Area.	determine need for further response action.			

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

EPA provided a public notice in the area newspapers, Lake County News Sun on April 26, 2017, and Nueva Semana on May 26, 2017, stating that there was a FYR and inviting the public to submit any comments to EPA. The results of the review and the report will be made available at the Site's information repository located at the Waukegan Public Library – Reference Desk, 128 N. County Street, Waukegan. It will also be published on the Site's public website: www.epa.gov/superfund/johns-manville.

During the FYR process, interviews were not conducted based upon the level of public interest in the Site and the frequency of EPA's attendance at local meetings and briefings with local officials.

Data Review

Monitoring data from historical reports (e.g., RI, Engineering Evaluation/Cost Analysis, FYRs) as well as routine monitoring data and construction monitoring data were reviewed as part of this FYR. Ambient air, surface water, groundwater, and soil sampling was conducted to support this FYR. Generally, asbestos levels in air have fallen to non-detectable concentrations, surface water data are within defined action levels, and groundwater levels are within applicable standards, except as discussed in this section.

1. Surface Water: Monitoring results indicate that there have been no exceedances of the applicable surface water standards for asbestos, arsenic, or antimony within Lake Michigan. Surface water monitoring of the Industrial Canal ceased after the area was backfilled with sand and surface water was no longer present.

   Surface water samples were collected in the Industrial Canal at OU1 until filling operations were complete in the fall of 2015. There were no detections of asbestos, antimony, or arsenic within Industrial Canal during this period. Surface water monitoring also occurred along Lake Michigan quarterly until March 2017. Between 2013 and 2017 there was one detection of asbestos at the North Lake sampling point at a concentration of 1 MFL, below the action level of 7 MFL, all other Lake Michigan results for asbestos were below detection limits. Between 2013 and 2017, Lake Michigan sampling results for antimony and arsenic were below detection levels. Surface water samples were collected in October 2017 as part of the FYR sampling event. Asbestos was not detected in any surface water sample, and all other parameters were non-detect or below applicable standards.

2. Groundwater: Groundwater monitoring indicates that all monitored parameters are within applicable standards, with the exception of arsenic. The FACD required arsenic monitoring and established a water quality action level of 50 µg/l, or whatever groundwater standard is promulgated for arsenic and is in effect at the time of any periodic review that is conducted pursuant to Section 121(c) of CERCLA. Arsenic has been detected at levels above the MCL following a change in EPA's MCL arsenic standard from 50 µg/l to 10 µg/l in 2006.

Groundwater sampling events occurred quarterly between 2013 and 2017, and asbestos was not detected in groundwater samples during routine monitoring. With the exception of arsenic, all other parameters were below the requisite action levels during quarterly monitoring. An arsenic groundwater sampling event occurred most recently in July 2016. Three of the sixteen sampled wells exceeded the MCL of 10 µg/l during the 2016 event, with the maximum concentration being 24 µg/l . All groundwater wells were sampled in September and October 2017, as part of the Fifth FYR. Results of the sampling event were similar to the results found during the Fourth FYR. No asbestos was detected in groundwater samples. With the exception of singular detections of total chromium and vinyl chloride and site-wide detections of arsenic, all other parameters were below applicable standards. Total chromium was detected in one well at the north end of the Site at a concentration of 0.143 milligrams per liter (mg/l), above the MCL of 0.1 mg/l. Chromium was detected in this well at a similar concentration during the Fourth FYR, and the result appears isolated and may be related to well construction materials. Vinyl chloride was detected in one well at a level of 5.8 µg/l, above the MCL of 2 µg/l. The result appears isolated to one well and is similar to concentrations detected during the Fourth FYR. Arsenic was detected at groundwater wells along the north, east, and west perimeter of the Site above the MCL of 10 µg/l, with a maximum concentration of 26 µg/l along the southern perimeter of the Site. The source of arsenic for the Site is currently unknown. It may be related to past industrial activity, wastes deposited within the on-site landfill, or it may be naturally-occurring arsenic found in geologic materials. Arsenic has not been detected above the MCL in Lake Michigan samples. Additional monitoring for arsenic is recommended in this FYR.

3. Air monitoring: Previous ambient air sampling results have been consistently below detection limits for asbestos. Detections of asbestos have occurred only during monitoring of excavation perimeters during remedial activities, though results are consistently below action levels. Active construction is no longer occurring and ambient air monitoring does not indicate the presence of asbestos in the air.

   Since 2013, air monitoring data for asbestos was collected as required under the FACD and as a component of the monitoring plans for each construction element. Ambient air monitoring at the Site perimeter, as well as at the work area perimeters, occurred periodically between 2013 and 2016 whenever there was excavation or backfilling activities of potential ACM. There were no exceedances of action levels during the subject period and perimeter monitoring results were consistently below the analytical detection limit. Air monitoring also occurred in October 2017 as part of the Fifth FYR. Air monitors were located at the perimeter of the Site, as well as at two off-site locations. There were no detections of asbestos in air during the Fifth FYR sampling event.

4. Soil Monitoring: Soil samples were collected at 10 locations throughout OU1 as part of the Fifth FYR. Samples were collected in 6-inch intervals within the remedial action cover materials to monitor for potential migration of asbestos in underlying materials. Samples were monitored for ACM and fibers. No ACM was discovered, and one asbestos fiber was detected in a single sample. The single asbestos fiber may have been attributable to cross-contamination and microscopic analysis indicated that it may not have originated at the Site. The soil monitoring results indicate that the remedy is functioning as intended.

Site Inspection

The inspection of the Site was conducted on December 15, 2017. Matthew Ohl, EPA, Ben O'Neil, USACE, and Ryan Moore, USACE, participated in the site inspection. The following PRP

representatives also participated: Matt Kyrias, AECOM, and Dave Peterson, DMP. The purpose of the inspection was to assess the protectiveness of the remedy. Photographs of the inspection are provided in Appendix C.

The inspectors observed that the road surfaces were in good condition. Most of the covers were in good condition, but there was little to no vegetation on large areas of OU5. Erosion problems were evident along the southern perimeter fence where surface water flows from OU5 to OU6 and on the slopes of the Settling Basin. Several gullies up to 13-inches deep were noted during the inspection around the Settling Basin.

Inspectors observed two large animal burrows in the settling basin on the south-facing side of the northernmost berm at OU1. Potential ACM, including roofing materials, transite pipe, shingle scraps and pieces of brake shoe linings were deposited on the surface outside one of the animal burrows. A mound of unknown material was piled at the entrance to the second burrow. JM agreed to repair the animal burrows, and additional inspection will be conducted in the spring to verify repairs. The burrows may not indicate long-term issues with the response action, however, overgrowth of vegetation prevented careful inspection of berms. More frequent mowing of berms should be conducted to facilitate inspections. Inspection, repair, and deterrence of animal burrows should be incorporated into the revised O&M Manual.

Most of the Site's perimeter fence has been replaced. Signage is present in adequate intervals along the perimeter of the Site and at the gate on Greenwood Avenue. The large vehicle gate opening into the OU6 roadbed has been removed and replaced by a smaller gate.

Stormwater features were inspected and appear to be in good working order.

Section VI discusses issues and recommendations following the inspection of the Site.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents? Yes.

Question A Summary:
The remedy is functioning as intended by the decision documents. Most OUs where a remedy has been selected and implemented (OUs 1, 2, 3, 4, and 8) are in good condition with caps functioning as intended, except for the issues listed in Section VI of this FYR.

Remedial Action Performance

- The remedial action operates and functions as designed. Vegetated or gravel cover has been installed on all capped areas. Monitoring of ambient air, surface water, and groundwater have shown that remedies are currently protective.

- Containment of materials left in place has been effective. There has been no evidence of ACM at the ground surface in locations where the remedy has been implemented, except in the Settling Basin. These instances are due to animal burrows and will be addressed as part of O&M activities. Debris brought to the surface will be contained and properly disposed of off-site.

- Arsenic in groundwater above the MCL has been detected at several wells along the north, east, and south portions of the Site. The source of the arsenic has not been identified and the stability of the plume has not been confirmed. The monitoring well network and monitoring frequency should be statistically optimized to characterize the plume and support decision making.

System Operations/O&M

- Operation and Maintenance has been effective at maintaining the vegetated soil cover over the short-term. However, vegetation establishment is sparse in areas where compacted clay was used as a vegetation substrate, such as the Settling Basin slopes. Regular O&M activities will be critical in vegetation establishment. The existing O&M manual (2010) is being updated for current conditions, and specific corrective action measures for areas with insufficient vegetative coverage and intrusion from animals should be included. This has been included as an issue and recommendation of this FYR.

Implementation of Institutional Controls and Other Measures

- ICs are in place and effective in preventing exposure at OU1; however, they may not conform to 765 ILCS 122. ICs are being planned for OUs 2, 3, 4, and 8. A decision document requiring ICs as part of the remedy is needed for OU2. Long-term stewardship procedures will be incorporated into the O&M Manual update. There's no indication of inappropriate uses of the Site, soils, or groundwater during inspections of the Site.

- Perimeter fencing with signage has been installed around the perimeter of the former building and manufacturing facility and OU3, where ACM has been contained in place below the clean cover.

- Evaluation of ICs for OU6 is occurring as part of the unit's Feasibility Study, expected in 2018.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid? Yes.

Question B Summary:

All exposure assumptions, toxicity data, cleanup levels, and RAOs are still valid. The principal control at the Site was removal of asbestos-impacted materials, or containment below suitable cover. Both controls remain valid.

Changes in Standards and TBCs

- The MCL for arsenic changed since the ROD, as discussed in previous FYRs. This has resulted in an exceedance of the arsenic standard in groundwater monitoring well 12. Well 12 historically exceeded 10 ug/l but this was not relevant since the standard was 50 ug/l until 2006. Further monitoring was recommended in the last FYR and has been conducted to determine the source(s) and magnitude of arsenic contamination in the vicinity of well 12. The arsenic plume extends beyond the JM property boundary on to property owned by the City of Waukegan including OU2. There have been no other changes in standards or TBC's since the 2013 FYR.

Changes in Toxicity and Other Contaminant Characteristics

- Neither the toxicity factors for the contaminants of concern nor other contaminant characteristics have changed in a way that could affect the protectiveness of the remedy.

Changes in Risk Assessment Methods

- Assessing Protectiveness for Asbestos Sites (OSWER Directive #9355.7-03B-P, 2009) was issued in 2009 and recommended that the "1%" threshold for evaluating asbestos cleaning levels be replaced with a risk-based, site-specific action level. The 1% threshold was utilized at OU2 as an identification standard. Subsequent investigations since the last FYR showed that ACM was at sufficient containment depth. As discovered from a 2012 investigation, this change did not affect the protectiveness of implemented remedies.

Changes in Exposure Pathways

- Potential exposure pathways have been reduced since the 2013 FYR as remedial actions have been implemented throughout the Site, removing or containing potentially contaminated materials at those OUs with a remedy selected and implemented (OUs 1, 2, 3, 4, and 8). The arsenic plume is being monitored and may not currently be migrating, however, additional monitoring is necessary because the available data is inadequate.

- There are no land use changes expected at the Site, nor are any expected in the near future. Existing ICs prohibit uses that may disturb or penetrate the vegetated soil cover or interfere with the remedy.

Expected Progress Towards Meeting RAOs

- The remedy is meeting the RAO to "mitigate releases of asbestos and other contaminants to the air, direct contact with contaminated soils and surface water, and groundwater contamination". Impacted soils have been removed or contained in a manner that prevents release, and no land uses are occurring which would allow contact with contaminated soils, surface water, or groundwater.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy? No.

There have been no newly identified ecological risks, impacts from natural disasters, or any other information that has been identified that could affect the protectiveness of the remedy for the Site.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OUs 5, 6, and 7

Issues and Recommendations Identified in the Five-Year Review:	
OU(s): 1, 2, 3, 4, and 8	**Issue Category:** Operations and Maintenance
	Issue: Cover and berm integrity
	Recommendation: Update O&M Manual to provide for regular monitoring, repair, and maintenance of covers and berm to ensure long-term protectiveness. The O&M Manual should address maintaining cover and berm integrity, vegetation management, ponding of water, erosion and animal burrows, remove

	ACM and other waste material. Implement approved O&M program; apply corrective measures, as needed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	5/01/2022

OU(s): 1 and 2	**Issue Category:** Monitoring			
	Issue: Arsenic plume appears to extend beyond the JM property and exceeds the MCL.			
	Recommendation: Optimize arsenic groundwater monitoring network to support statistical decision making, continue investigation of extent of arsenic plume, and propose response action to address it, as necessary.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	5/01/2022

OU(s): 2, 3, 4, and 8	**Issue Category:** Institutional Controls			
	Issue: Written procedures are not in place to ensure long-term stewardship of ICs at the Site.			
	Recommendation: Update the O&M Manual to develop and implement long-term stewardship procedures for monitoring and tracking compliance with existing ICs, communicating with EPA and IEPA, and providing an annual certification to EPA and IEPA that the ICs remain in place and are effective.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	5/01/2022

OU(s): 2, 3, 4, and 8	**Issue Category:** Institutional Controls			
	Issue: Not all needed ICs have been implemented.			
	Recommendation: Implement needed ICs.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	5/01/2022

OU(s): 2	Issue Category: Institutional Controls			
	Issue: Lack of a decision document requiring implementation of ICs.			
	Recommendation: Complete a decision document to add ICs as a component of the selected remedy.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	5/01/2022

OTHER FINDINGS

OU5 was enrolled in the SRP program; however, it is surrounded by other operable units being remediated under the Superfund program. There is the potential for conditions on OU5 to affect the surrounding operable units. During the inspection of the Site, there was little to no vegetation on large areas of OU5. Erosion problems were evident along the southern perimeter fence where surface water flows from OU5 to OU8 and is eroding the soil cover. Further action is needed to vegetate and stabilize the cover at OU5.

A remedy has not been selected for OU6 to address ACM. The FS should be completed, and a Proposed Plan released for public comment. ICs should be included as part of the potential remedial alternatives and included in the decision document, as appropriate.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)	
Operable Unit: OU1	*Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The remedy at OU1 currently protects human health and the environment because the industrial canal, pumping lagoon, collection basin, and the waste disposal area has been closed and provided with the vegetative cover required by the ROD. There is no evidence of breach of the existing cover and there is currently no land or groundwater use at the property. ICs are in place and currently effective to prohibit inappropriate uses of the Site or groundwater. The remedy is functioning as intended. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness: • Update O&M Manual to provide for regular monitoring, repair, and maintenance of covers and berm to ensure long-term protectiveness. The O&M Manual should address maintaining cover and berm integrity, vegetation management, ponding of water, erosion and animal burrows, remove ACM and other waste material. Implement approved O&M program; apply corrective measures, as needed. • Optimize arsenic groundwater monitoring network to support statistical decision making, continue investigation of extent of arsenic plume, and propose response action to address it, as necessary.	

Protectiveness Statement(s)	
Operable Unit: OU2	*Protectiveness Determination:* Short-term Protective

Protectiveness Statement: The remedy at OU2 currently protects human health and the environment because ACM was removed to a depth of 2 to 3 feet below ground surface, all ACM remaining in place is contained below the cover. There is no evidence of breach of the existing backfill and there is currently no land or groundwater use at the property. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness:

- Update O&M Manual to provide for regular monitoring, repair, and maintenance of covers and berm to ensure long-term protectiveness. The O&M Manual should address maintaining cover and berm integrity, vegetation management, ponding of water, erosion and animal burrows, remove ACM and other waste material. Implement approved O&M program; apply corrective measures, as needed.
- Optimize arsenic groundwater monitoring network to support statistical decision making, continue investigation of extent of arsenic plume, and propose response action to address it, as necessary.
- Update the O&M Manual to develop and implement long-term stewardship procedures for monitoring and tracking compliance with existing ICs, communicating with EPA and IEPA, and providing an annual certification to EPA and IEPA that the ICs remain in place and are effective.
- Implement needed ICs.
- Complete a decision document to add ICs as a component of the selected remedy.

Protectiveness Statement(s)	
Operable Unit: OU3	*Protectiveness Determination:* Short-term Protective

Protectiveness Statement: The remedy at OU3 currently protects human health and the environment because ACM was removed to a depth of approximately 4-feet, and a clean soil corridor was installed for utilities. Any ACM remaining place is contained below the cover. There is no evidence of breach of the existing backfill and there is currently no land or groundwater use at this property. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness:

- Update O&M Manual to provide for regular monitoring, repair, and maintenance of covers and berm to ensure long-term protectiveness. The O&M Manual should address maintaining cover and berm integrity, vegetation management, ponding of water, erosion and animal burrows, remove ACM and other waste material. Implement approved O&M program; apply corrective measures, as needed.
- Update the O&M Manual to develop and implement long-term stewardship procedures for monitoring and tracking compliance with existing ICs, communicating with EPA and IEPA, and providing an annual certification to EPA and IEPA that the ICs remain in place and are effective.
- Implement needed ICs.

Protectiveness Statement(s)	
Operable Unit: OU4	*Protectiveness Determination:* Short-term Protective

Protectiveness Statement: The remedy at OU4 currently protects human health and the environment because asbestos impacted soils were removed to a non-detectable concentration. There is no evidence of breach of the existing backfill and there is currently no land or groundwater use at the property. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness:

- Update O&M Manual to provide for regular monitoring, repair, and maintenance of covers and berm to ensure long-term protectiveness. The O&M Manual should address maintaining cover and berm integrity, vegetation management, ponding of water, erosion and animal burrows, remove ACM and other waste material. Implement approved O&M program; apply corrective measures, as needed.
- Update the O&M Manual to develop and implement long-term stewardship procedures for monitoring and tracking compliance with existing ICs, communicating with EPA and IEPA, and providing an annual certification to EPA and IEPA that the ICs remain in place and are effective.
- Implement needed ICs.

Protectiveness Statement(s)	
Operable Unit: OU8	*Protectiveness Determination:* Short-term Protective

Protectiveness Statement: The remedy at OU8 currently protects human health and the environment because asbestos impacted soils were removed to a non-detectable concentration. There is no evidence of breach of the existing backfill and there is currently no land or groundwater use at the property. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness:

- Update O&M Manual to provide for regular monitoring, repair, and maintenance of covers and berm to ensure long-term protectiveness. The O&M Manual should address maintaining cover and berm integrity, vegetation management, ponding of water, erosion and animal burrows, remove ACM and other waste material. Implement approved O&M program; apply corrective measures, as needed.
- Update the O&M Manual to develop and implement long-term stewardship procedures for monitoring and tracking compliance with existing ICs, communicating with EPA and IEPA, and providing an annual certification to EPA and IEPA that the ICs remain in place and are effective.
- Implement needed ICs.

Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective

Protectiveness Statement: The remedies for the overall site are currently protective because asbestos-containing soils have been removed and/or a protective cap has been installed at the JM waste disposal area, southwestern sites, and OU2. There is no evidence of breach of the existing cover and there is

currently no land or groundwater use at the property. Some ICs are in place and currently effective to prohibit inappropriate uses of the Site or groundwater. No inappropriate land or groundwater uses are occurring.

However, in order for the remedy to be protective in the long-term, the following actions need to be taken: monitoring, repair, and maintenance of covers to ensure protectiveness:

- Update O&M Manual to provide for regular monitoring, repair, and maintenance of covers and berm to ensure long-term protectiveness. The O&M Manual should address maintaining cover and berm integrity, vegetation management, ponding of water, erosion and animal burrows, remove ACM and other waste material. Implement approved O&M program; apply corrective measures, as needed.
- Optimize arsenic groundwater monitoring network to support statistical decision making, continue investigation of extent of arsenic plume, and propose response action to address it, as necessary.
- Update the O&M Manual to develop and implement long-term stewardship procedures for monitoring and tracking compliance with existing ICs, communicating with EPA and IEPA, and providing an annual certification to EPA and IEPA that the ICs remain in place and are effective.
- Implement needed ICs.
- Complete a decision document to add ICs as a component of the selected remedy.

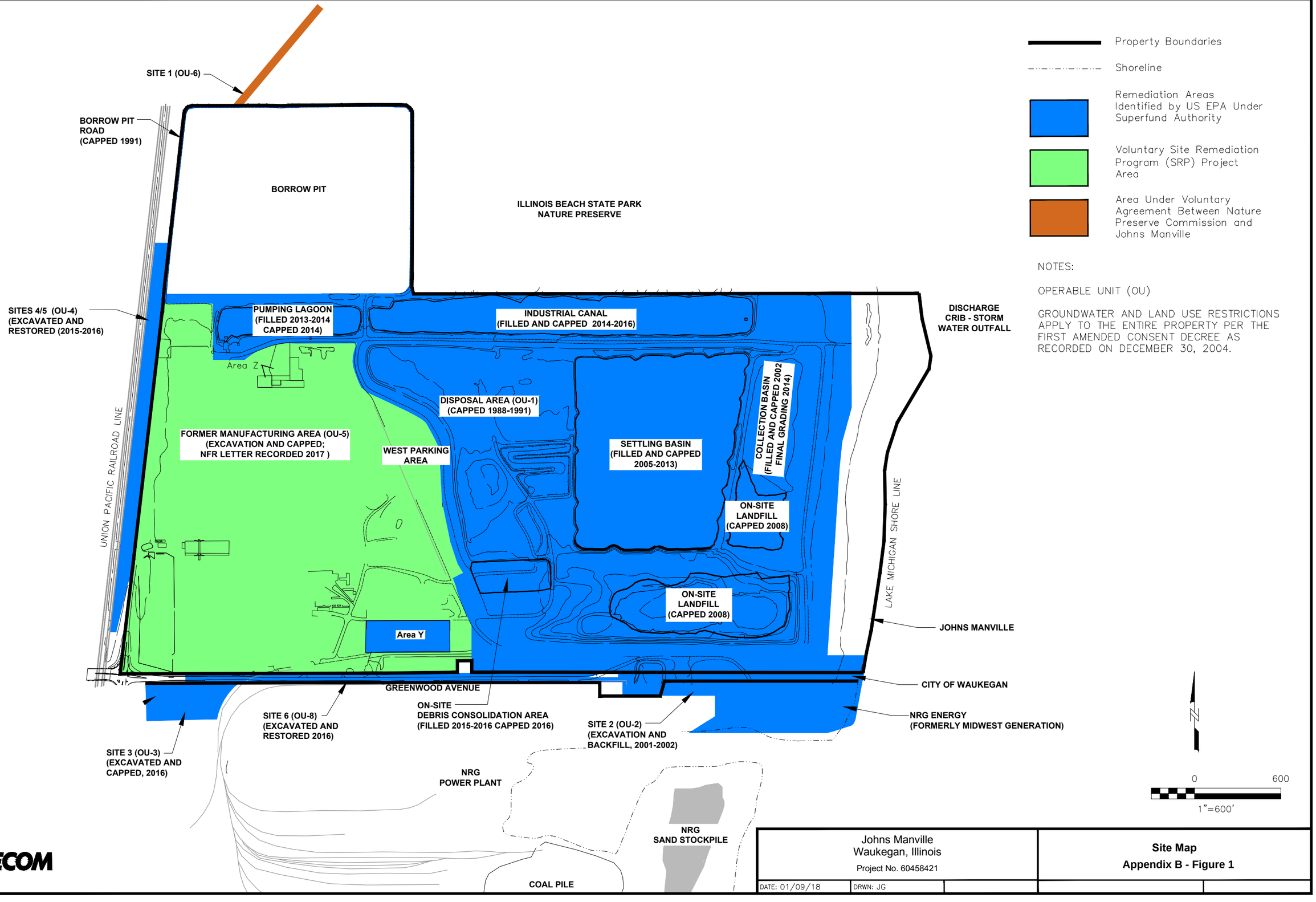
VIII. NEXT REVIEW

The next FYR report for the Johns Manville Corp. Superfund Site is required no less than five years from EPA's signature date of this review.

APPENDIX A – REFERENCE LIST

AECOM. Fifth 5-Year Post-Remedial Construction Ambient Air, Groundwater, Surface Water and Soil Monitoring Event Report 2017. 16 February 2018.

APPENDIX B – FIGURES



NOTES:

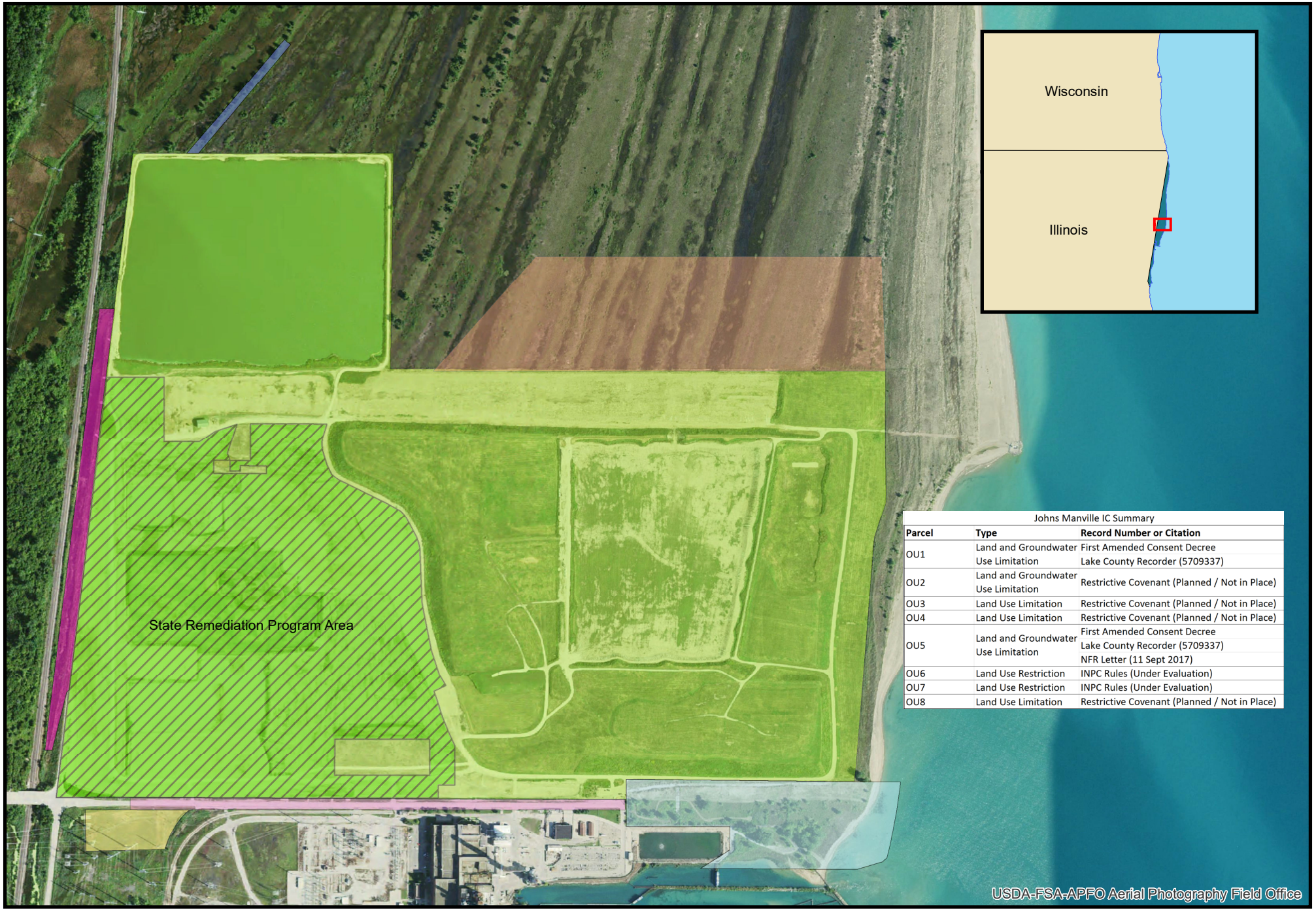
OPERABLE UNIT (OU)

GROUNDWATER AND LAND USE RESTRICTIONS APPLY TO THE ENTIRE PROPERTY PER THE FIRST AMENDED CONSENT DECREE AS RECORDED ON DECEMBER 30, 2004.

AECOM

Johns Manville Waukegan, Illinois Project No. 60458421	**Site Map** **Appendix B - Figure 1**
DATE: 01/09/18 | DRWN: JG	

File: V:\DCS\GIS\Project_Data\Johns Manville\CAD\Production Drawings\Site Map_2018-01-09.dwg Layout: ANSL_BI-LJ User: Brian.Ronstead Plotted: Jan 09, 2018 - 9:25am



Johns Manville IC Summary

Parcel	Type	Record Number or Citation
OU1	Land and Groundwater Use Limitation	First Amended Consent Decree Lake County Recorder (5709337)
OU2	Land and Groundwater Use Limitation	Restrictive Covenant (Planned / Not in Place)
OU3	Land Use Limitation	Restrictive Covenant (Planned / Not in Place)
OU4	Land Use Limitation	Restrictive Covenant (Planned / Not in Place)
OU5	Land and Groundwater Use Limitation	First Amended Consent Decree Lake County Recorder (5709337) NFR Letter (11 Sept 2017)
OU6	Land Use Restriction	INPC Rules (Under Evaluation)
OU7	Land Use Restriction	INPC Rules (Under Evaluation)
OU8	Land Use Limitation	Restrictive Covenant (Planned / Not in Place)

Legend

Facility Boundary

OU2 OU4 OU6 OU7 (approx)

OU3 OU5 OU8

0 0.075 0.15 0.3 0.45 0.6

Miles

N W E S

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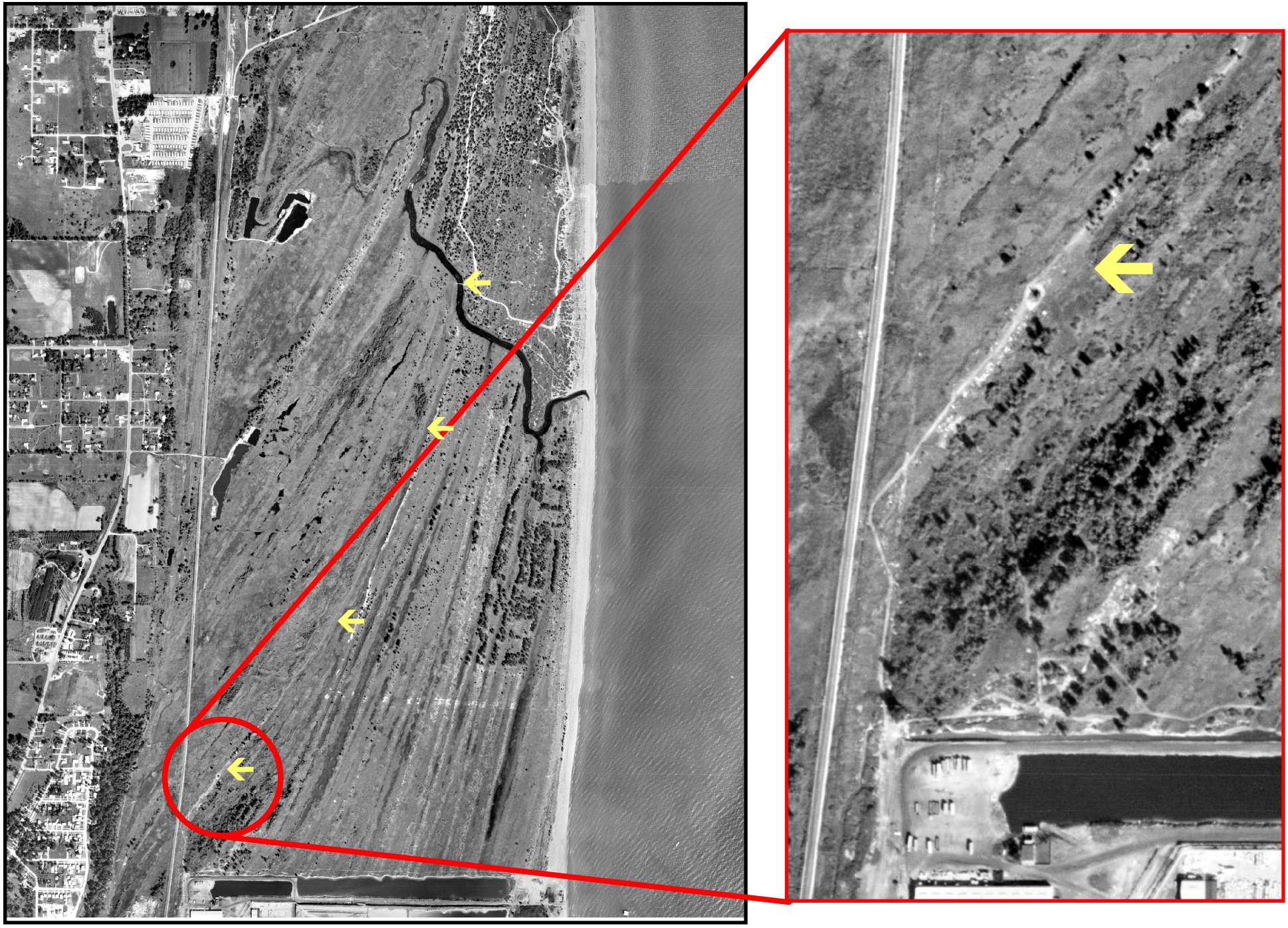
Johns Manville

Five Year Review - Appendix B

Figure 2: Institutional Control Map

Chicago District, U.S. Army Corps of Engineers



U.S. Army Corps Of Engineers ®
Chicago District

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Figure shows a 1961 aerial photograph of what is currently the Illinois Beach State Park and Nature Preserve. A former road or pathway is visible leading from the Johns Manville facility (yellow arrows). Red call-out shows a close-up view of current Operable Unit 6 (OU6).

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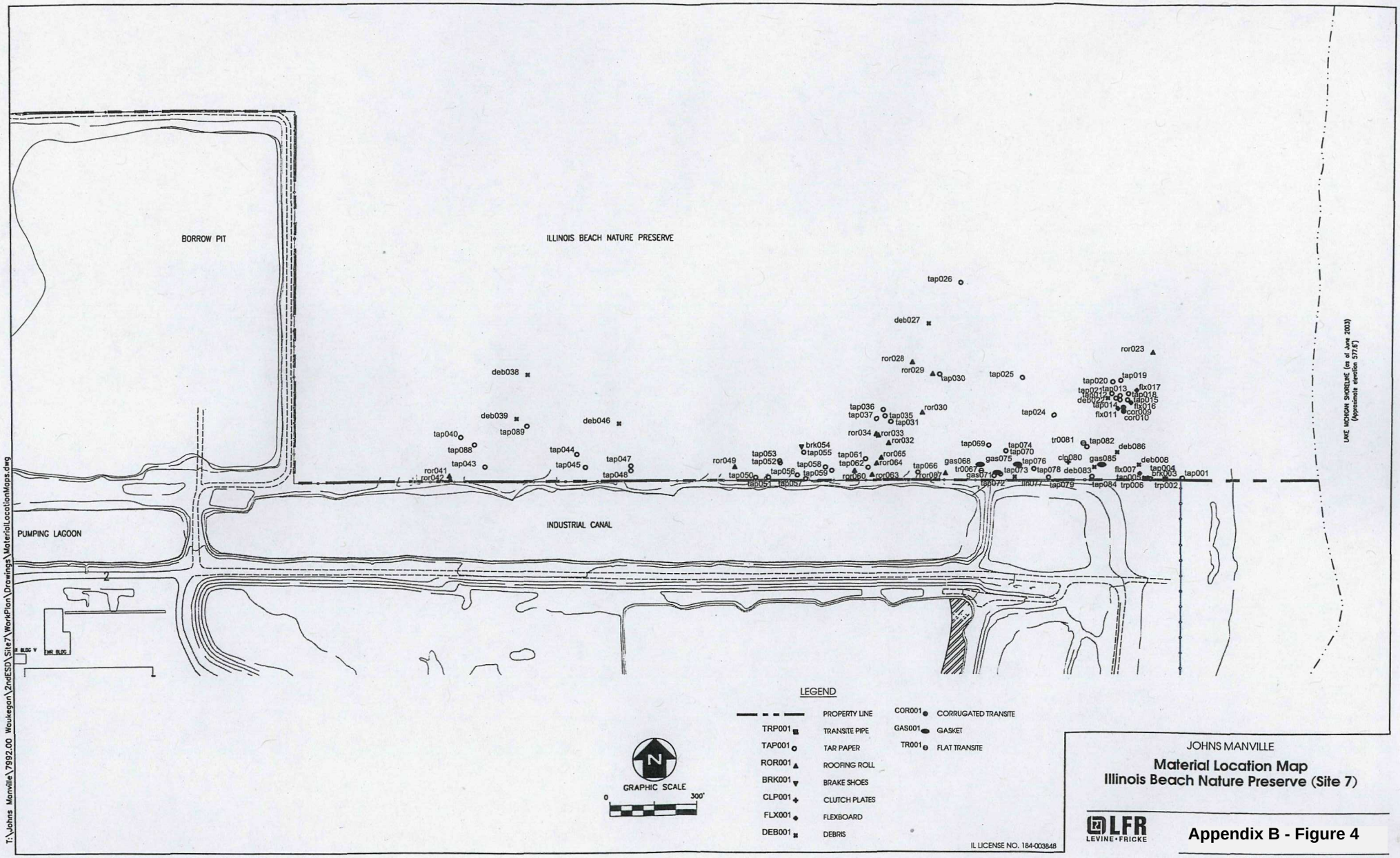
Johns Manville
Five Year Review: Appendix B
Fig 3 - OU6 Historical Aerial Photo

Chicago District, U.S. Army Corps of Engineers



JOHNS MANVILLE

Material Location Map
Illinois Beach Nature Preserve (Site 7)

LFR LEVINE•FRICKE

Appendix B - Figure 4

APPENDIX C – PHOTOGRAPHS FROM THE SITE INSPECTION

U.S. Army Corps Of Engineers ®
Chicago District

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Legend

- Photos

0 0.075 0.15 0.3 0.45 0.6
Miles

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Johns Manville

Five Year Review: Appendix C
Site Inspection Photo Log Map

Chicago District, U.S. Army Corps of Engineers

Johns Manville CERCLA Site

Fifth Five Year Review Inspection Photos – 15 December 2017

Name	Date and Time	Direction (Degrees)
IC-1.JPG	2017:12:15 13:04:40	99.009695

Photo looking east across northern berm separating Industrial Canal and Settling Basin.

IC-2.JPG	2017:12:15 13:04:45	269.976077

Photo looking west across northern berm separating Industrial Canal and Settling Basin.

Name	Date and Time	Direction (Degrees)
IC-3.JPG	2017:12:15 13:22:55	269.30618

Photo looking west across stormwater pipe location between nature preserve and Industrial Canal

IC-4.JPG	2017:12:15 13:18:34	276.044199

Photo looking west across Industrial Canal

Name	Date and Time	Direction (Degrees)
IC-5.JPG	2017:12:15 11:53:41	85.055215

Photo looking east across Industrial Canal

LF-1.JPG	2017:12:15 13:34:48	283.247788

Monitoring well within waste disposal area, adjacent to landfill (typical)

Name	Date and Time	Direction (Degrees)
LF-2.JPG	2017:12:15 13:35:29	264.427419

Photo looking west across perimeter road adjacent to landfill area.

LF-3.JPG	2017:12:15 12:29:24	293.781863

Photo looking west across landfill area.

Name	Date and Time	Direction (Degrees)
OU1.JPG	2017:12:15 12:09:06	278.676829

Photo looking west across former Black ditch area.

OU1-2.JPG	2017:12:15 12:29:14	4.678986

Photo looking northeast across former water treatment area, Settling Basin, and Industrial Canal.

Name	Date and Time	Direction (Degrees)
OU1-3.JPG	2017:12:15 11:51:25	298.615894

Photo looking west across borrow pit, north of former pumping lagoon.

OU1-4.JPG	2017:12:15 12:00:24	85.147826

Photo looking east across borrow pit, at pipe outfall

Name	Date and Time	Direction (Degrees)
OU2.JPG	2017:12:15 13:41:06	275.925926

Photo looking northwest across Site 2 / OU2.

OU3.JPG	2017:12:15 14:15:35	242.501272

Photo looking southwest across Site 3 / OU3.

Name	Date and Time	Direction (Degrees)
OU6.JPG	2017:12:15 11:57:21	3.92569

Photo looking northeast at gate to OU6 / Site 1

OU8-1.JPG	2017:12:15 14:03:59	18.435821

Photo looking west toward signage indicating asbestos hazard at Greenwood Ave.

Name	Date and Time	Direction (Degrees)
OU8-2.JPG	2017:12:15 14:04:05	278.607018

Photo looking west across OU8/Site 6.

OU8-3.JPG	2017:12:15 14:04:09	85.431122

Photo looking east across OU8/Site 6.

Name	Date and Time	Direction (Degrees)
OU8-4.JPG	2017:12:15 14:08:48	30.965728

Figure looking north at OU8 / Site 6. Minor erosion (6-inch) underneath fence to be repaired in Spring.

SB-1.JPG	2017:12:15 12:18:47	115.742834

Photo looking southeast across Settling Basin

Name	Date and Time	Direction (Degrees)
SB-2.JPG	2017:12:15 12:12:48	46.521729

Photo looking northeast across Settling Basin

SB-3.JPG	2017:12:15 13:09:17	329.746341

Photo showing animal burrow in northern berm of Settling Basin. Burrow to be repaired and material repaired.

Name	Date and Time	Direction (Degrees)
SB-4.JPG	2017:12:15 12:51:40	289.250276

Animal burrow within Settling Basin berm.

SB-5.JPG	2017:12:15 12:51:30	262.049861

Unknown material excavated from berm by burrowing animal.

Name	Date and Time	Direction (Degrees)
SB-6.JPG	2017:12:15 13:10:18	79.128906

Northern berm along settling basin.

SB-7.JPG	2017:12:15 12:49:44	76.064639

Material at base of animal burrow, potential asbestos containing material is shown (red circle). Burrow to be repaired and material disposed.

Name	Date and Time	Direction (Degrees)
SB-8.JPG	2017:12:15 13:10:18	79.128906

Stormwater erosion gulley in western berm of Settling Basin. Gulley is approximately 13-inches deep. Gullies are typical along berm face, and are scheduled for repair.