Reuse Plan Update

Velsicol Chemical Corp. (Michigan) Superfund Site
St. Louis, Michigan

EPA

April 2026

Contents

Introduction

The Velsicol Chemical Corporation Superfund site (the Site) is in St. Louis, Michigan. It encompasses about 100 acres. A chemical manufacturer was active on-site from the mid-1930s until the facility's demolition in 1978. Industrial operations at the plant, which included manufacturing pesticides and fire retardants, resulted in widespread contamination. The U.S. Environmental Protection Agency (EPA) added the site to the Superfund program's National Priorities List (NPL) in 1983.

At Superfund sites, EPA's Superfund Redevelopment Program (SRP) engages with community and site stakeholders, helping to bring parties to the table to identify reasonably anticipated future land uses to help inform cleanup plans and ensure site remedies do not create unnecessary barriers to site reuse. EPA began planning for reuse early on at this Site.

In 2004, SRP sponsored a community-based reuse planning process for the Site that resulted in this reuse planning report. Developed in coordination with EPA's site team and a committee of local stakeholders, the 2004 reuse plan proposed transforming a significant part of the Site into a recreational area. Since the 2004 reuse assessment was conducted, EPA has made significant progress on the site's remedy, and additional community input was compiled through a county planning effort and a student-led survey. SRP initiated a follow-up planning process to update the Site's reuse assessment in 2023.

Overview

This report can help community stakeholders understand EPA's cleanup plans, learn about potential reuse options identified so far, visualize opportunities to integrate reuse ideas with cleanup plans, and identify key steps to help prepare for implementation of reuse plans.

What is included in this report?

- An overview of the Site's cleanup status.
- A discussion of future uses that may be suitable for the 52-acre Former Plant Site (FPS).
- A set of future use goals gathered through targeted outreach discussions with the city of St. Louis, property owners, the Site's community advisory group, the Michigan Department of Environment, Great Lakes, and Energy (EGLE) and EPA.
- Recommendations of potential reuse options for the Site including opportunities for education, recreation, heritage, and sustainable site stewardship, along with near-term actions to advance implementation.
- Detailed reuse studies that explore design considerations for a river walk, pollinator habitat and a solar farm.

What comes next?

Additional planning and outreach at the local level is needed to:

- Further refine reuse plans.
- Engage a broader group of community, regional and state partners.

Site Background and Remedy Status

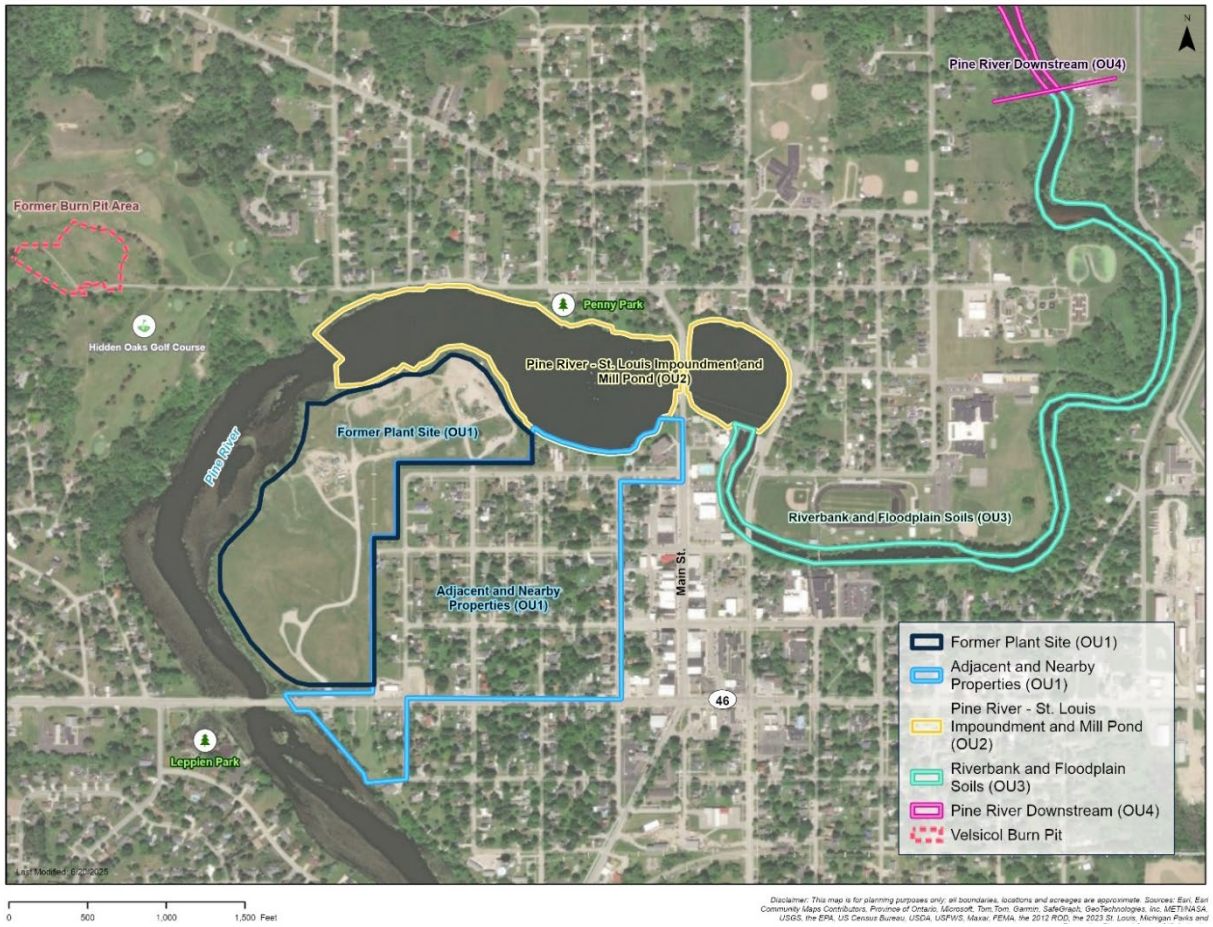


Figure 1. This map of St. Louis, Michigan shows the Site's four OUs.

Site Operable Units

To manage investigations and cleanup, EPA divided the Site into four areas, or operable units (OUs) (see Figure 1):

- OU1 addresses the FPS and the adjacent and nearby properties. Remedial design and remedial action activities are in progress for multiple components that make up the OU1 remedy.
- OU2 addressed Pine River and Mill Pond sediment next to and upstream of the St. Louis hydroelectric dam. Cleanup finished in 2006.
- OU3 addresses the Pine River riverbank and floodplain soils from the St. Louis hydroelectric dam to about 1.5 miles downstream of the dam. EPA selected the OU3 remedy in the Site's October 2022 Record of Decision. Remedial action is planned to take place in 2026.
- OU4 addresses the Pine River floodplain soils from about the boundary of OU3 to the confluence of the Pine, Chippewa and Tittabawassee rivers. Remedial investigation activities are ongoing.

OU1 Remedy Status

OU1 areas include the FPS and residential properties that border the FPS. The residential area is also known as the "adjacent and nearby properties" (see Figure 1). The FPS is a fenced, 52-acre area. Washington Avenue (also known as Michigan State Route 46, or M-46) is along its southern edge. Watson Street and North Avenue mark its eastern edge. The Pine River and Mill Pond form its western and northern boundaries. Adjacent and nearby properties are primarily residential, spanning about 12 blocks and located south and east of the FPS boundary. A few commercial properties are south of the FPS, along Washington Avenue.

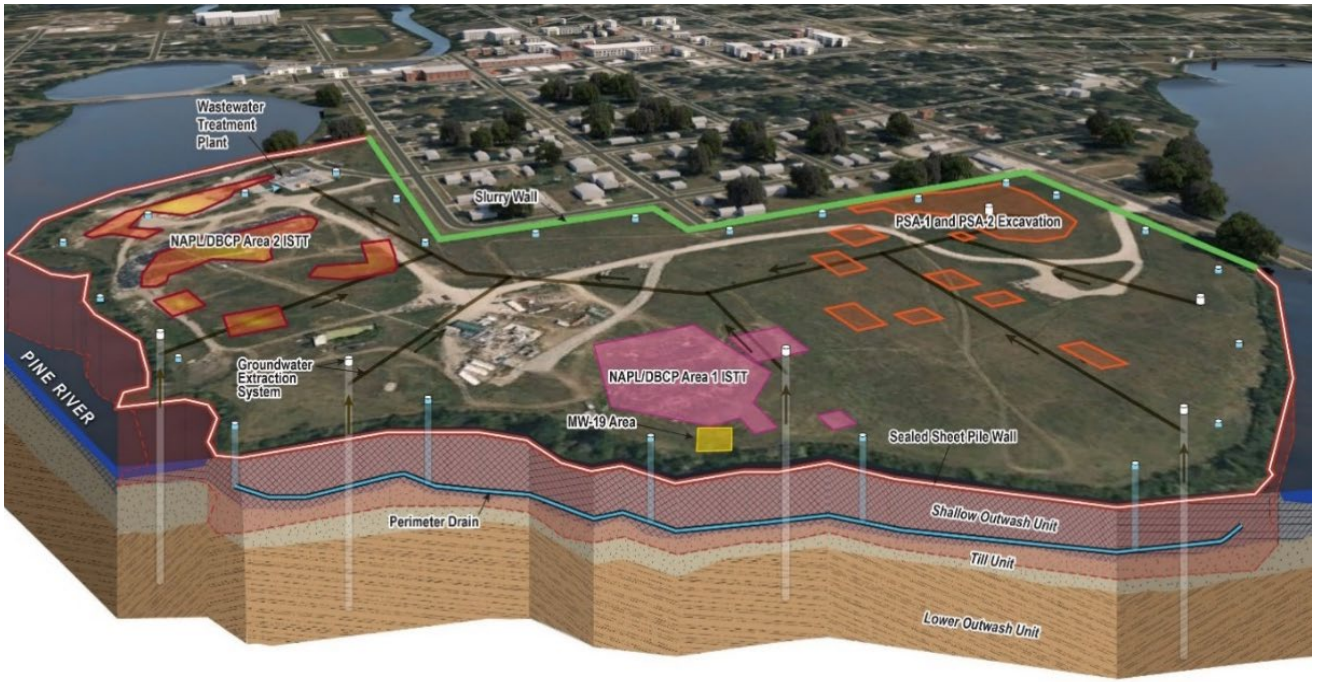


Figure 2. EPA's Conceptual Site Model (above) highlights features that are part of the OU1 remedy.

Before EPA listed the Site on the NPL, a court required the Site's potentially responsible parties put in a containment system remedy to stop the migration of site contaminants from the FPS into the environment. After construction of the containment system remedy, dense non-aqueous phase liquids (DNAPLs) were found in the Pine River during EPA sediment investigations. EPA determined that the containment remedy had failed.

To address the failed remedy, EPA signed a Record of Decision for OU1 in 2012 that addressed the FPS and the adjacent and nearby properties. The Record of Decision selected a 14-part remedy to address risks to human health and the environment in this operable unit. The OU1 remedy addresses contaminated media through containment, treatment, removal and municipal wellfield replacement. Figure 2 shows many of the OU1 remedy components. Table 1 lists all 14 remedy components and their status. The following sections highlight key reuse considerations related to the OU1 remedy.

Table 1. OU1 Remedy Components and Status

Containment Features	Source Control Features		Other Features
	Treatment Components	Removal Components	
Vertical Barrier Wall (Component 1)	**In-Situ Thermal Treatment for Non-Aqueous Phase Liquid/1,2 Dibromo-3-chloropropane (DBCP) Areas** (Component 5)	**DNAPL Recovery from Lower Outwash Unit** (Component 6)	**Replacement of the City of St. Louis Municipal Water Supply** (Component 9)
Perimeter Drain System (Component 2)			**Groundwater Monitoring Program** (Component 12)
Continued Operation of Existing DNAPL/Groundwater Collection System (Component 3)		**Potential Source Areas 1 and 2 Excavation** (Component 7)	**Site Restoration** (Component 13)
Extension of DNAPL/Groundwater Collection System segment in MW-19 Area (Component 4 – removed from the remedy)	**In-Situ Chemical Oxidation for Potential Source Areas 3 and 4** (Component 7)		**Institutional Controls** (Component 14)
Cap (Component 8)		**Adjacent Nearby Properties Excavation** (Component 11)	
Wastewater Treatment Plant and Groundwater Extraction System (Component 10)			
Remedy Status Key			
Complete	In Progress	Not Yet Started	Components Removed from OU1 Remedy

Institutional Controls

The OU1 remedy includes institutional controls. These administrative and legal tools help protect remedies over the long term. EPA has not yet put institutional controls in place at the Site. The Site's most recent Five-Year Review Report noted that fish advisories issued by the Michigan Department of Health and Human Services for the Pine River are in place and may be updated based on sampling data.

Future institutional controls anticipated for the Site include:

- A restrictive covenant on the FPS properties to make sure only industrial or recreational development occurs in the area. The restrictive covenant would ensure that site contaminants are not disturbed, and that redevelopment does not affect the cap or other remedy components.
- A groundwater use restriction at and near the FPS to prevent the use of contaminated groundwater as a drinking water source or for industrial purposes. EPA will work with the city of St. Louis on an ordinance that prevents groundwater use near the FPS.

As EPA works to finalize institutional controls for the FPS properties, close coordination among property owners, local government staff and developers will be necessary to ensure they are implemented effectively, protecting human health and the integrity of the remedy without creating barriers to reuse at the FPS.

In situ soil treatment operations.

EPA led a Site tour as part of stakeholder workshop in October 2023.

Reuse Considerations

The information below highlights key reuse considerations for the FPS, including land use, ownership and remedy design.

Land Use and Zoning

The Site is located along a natural oxbow (curve) of the Pine River and is bordered on the east and south by residential neighborhoods. Approximately 3,800 people live within 1 mile of the Site, and about 10,000 people live within 3 miles of the Site.

Although the Site is zoned for residential (R-2) and commercial (T) uses, per the city of St. Louis' 2011 Zoning Ordinance (Figure 3), the Site's remedy for OU1 requires institutional controls to limit land use at the FPS to recreational and industrial uses.

Ownership

The Michigan State Land Bank Authority (State Land Bank) acquired the site property in 2023 from a court-appointed trust established to manage environmental cleanup after the bankruptcy of the Site's previous owners. The State Land Bank is a committed and engaged owner focused on revitalizing former industrial properties. It is well-positioned to collaborate with EPA, the state, and local partners and agencies to explore reuse opportunities for the Site. The State Land Bank will help the state generate economic benefits from the property.

The Michigan EGLE, a sister agency of the State Land Bank, will maintain responsibility for funding a portion of the site remedy operation and maintenance activities, which include operating the Site's water treatment plant. The State Land Bank anticipates working with community and EGLE to identify future uses for the Site that can help to offset operation and maintenance costs.

Figure 3. This map shows zoning districts in the city of St. Louis that include OU1 areas.

View of the FPS area that will be capped once OU1 remediation is complete.

Remedial Design

Several components of the OU1 remedy will require permanent physical features or engineered controls. These features and controls will also inform reuse opportunities at the Site.

Vertical Barrier Wall (Component 1) – A vertical sheet pile and king pile combination barrier wall that separates the Pine River from the FPS and repair of the existing slurry wall located on the upgradient portion of the FPS.

Cap (Component 8) – A multi-layer cap containing the following components will be placed over contaminated soils (from bottom to top): a rough grading layer base for effective drainage, a 36-inch compacted clay layer, a flexible membrane liner, a lateral drainage layer composed of sand or geocomposite material to absorb infiltrating water, a root zone layer with at least 42 inches of soil and a topsoil layer at least 6 inches thick for cap-covering vegetation. Reuse features will need to be sited on top of the cap.

Wastewater Treatment Plant and Groundwater Extraction System (Component 10) – This long-term groundwater remedy component will replace the current groundwater collection system (Component 3). The location of treatment system facilities, including extraction wells and monitoring wells, will need to be taken into account when considering compatible surface uses at the FPS.

Site Restoration (Component 13) – The final surface cover and grading at the Site will be completed after the installation of the cap. These site restoration efforts could be coordinated with grading and access plans for future site uses.

Institutional Controls (Component 14) – Land use restrictions to prevent contact with subsurface soils, protect the integrity of the cap and prevent groundwater use will likely include zoning and land use controls such as restrictive covenants that run with the land.

Reuse Suitability

Figure 4 highlights three reuse suitability zones at the Site that could host various future uses. The zones are based on EPA's cleanup plans, institutional control requirements and remedial design approach. For all three zones discussed below, institutional controls will restrict groundwater use, limit future uses to recreational or industrial, and limit disturbance of the cap and other remedy components.

Zone A (6 acres)

Zone A is most suitable as the remedy operations area. This area encompasses about 6 acres and includes groundwater remedy components and a cap that need to remain in place over the long term. There are also remedy requirements to maintain the perimeter fence and ensure access for ongoing operation and maintenance activities. The Site's current groundwater collection system (Component 3) in Zone A will eventually be decommissioned and replaced with the long-term wastewater treatment plant and groundwater extraction system (Component 10). The new system will be located in the same part of Zone A as the current system.

Suitable Future Uses: Access will be restricted in this area; anticipated future uses include access roads and utility infrastructure.

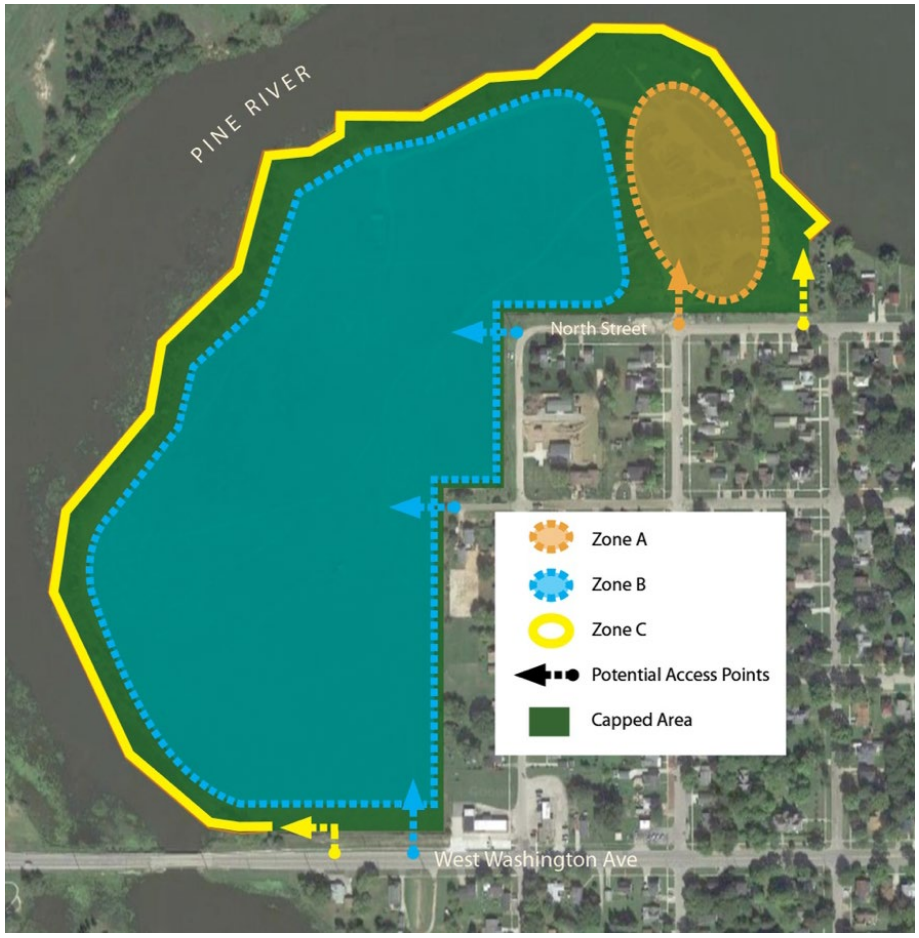


Figure 4. Reuse Suitability Map

Zone B (40 acres)

Zone B comprises the largest, most accessible and highly visible area of the Site at roughly 40 acres. It also represents the largest undeveloped parcel in St. Louis. As such, this area could provide great benefits to the community.

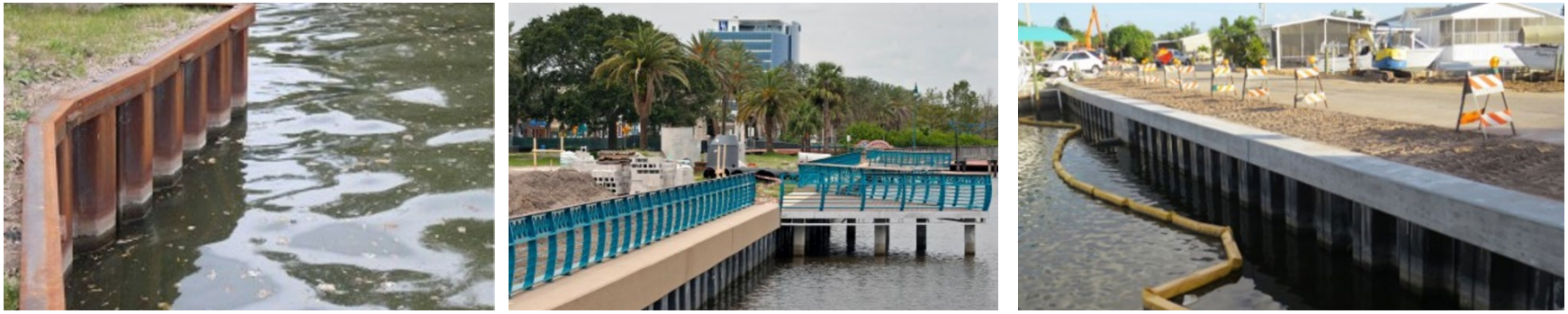
Any development in Zone B will need to ensure that the integrity of the cap remains intact. Future uses within Zone B will need to accommodate access for regular monitoring and maintenance of the perimeter drainage system, cap, groundwater monitoring wells and extraction system. As reuse plans are refined, reuse features will need to be compatible with three components of the OU1 remedy: cap construction (Component 8), site restoration (Component 11) and institutional controls (Component 14).

Suitable Future Uses: Recreation, ecological revitalization, low-impact industrial or commercial uses, remedy operation and maintenance. Potential features could include native pollinator vegetation, trails, paved or gravel surface roads, and light structures with foundations that can be anchored on top of the cap or without penetrating the cap.

Zone C (6 acres)

Zone C is defined as a narrow, roughly 6-acre riverfront corridor that runs along the western side of the Site. This zone is suitable for a publicly access pedestrian way that could also serve as a vehicular route for ongoing monitoring and maintenance activities. This area will be regraded and capped as part of the OU1 remedy. A Vertical Barrier Wall (Component 1), which is a combination vertical sheet pile and king pile barrier wall, will separate the river from the FPS. The images below showcase several examples of vertical barrier walls that edge publicly accessible areas and are designed with different edge treatments.

Suitable Future Uses: Public access, paved or gravel trails, river access, light structures such as interpretive signage, and remedy operation and maintenance.



Photos of three different edge treatments at the top of a barrier wall. Left photo: a grass lawn abuts the wall. Center photo: a concrete cap with a guardrail edges a path set atop the sheet piling with decking added beyond the wall for pedestrian access. Right photo: a concrete cap creates a border for a planted median adjacent to a road or path.

Reuse Goals

This reuse plan update included outreach to local stakeholders, including the property owner, the city of St. Louis and community partners through the Pine River Superfund Citizens Task Force (the Site's community advisory group). Key perspectives regarding reuse and recent plans that may influence future land use are outlined below.

Municipal Plans and Priorities (City of St. Louis)

- In January 2023, the city of St. Louis published a Five-Year Parks and Recreation Plan that addressed potential community reuse opportunities at the Site as well as other recreational improvements that could be made at existing parks and undeveloped lands throughout the city. The plan expanded on the Conceptual Reuse Framework in the Site's 2004 Reuse Planning Report by including community-oriented recreation amenities that are potentially eligible for state grant programs.
- Components of the 2023 Five-Year Parks and Recreation Plan for the Site include an education building with parking, sports fields and courts, an amphitheater and landscaping. The plan proposes an accessible path that connects these amenities, borders the river and provides access for visitors to boat launches, fishing platforms and exercise stations. The waterfront trail is designed to connect with other parks and paths, providing residents with a network of recreation areas. The expansion of the path system into a regional trail is intended to provide non-motorized transportation and recreational opportunities for the St. Louis community, as well as in various destinations, including neighborhoods, schools, commercial and civic areas, places of employment, parks, and nearby communities, particularly the city of Alma. The trail extension will give area residents and regional users the opportunity to enjoy a scenic, multi-use recreational trail in central Michigan.
- City staff highlighted potential challenges facing significant public use at the Site. The city of St. Louis has not expressed interest in taking ownership of the Site. The city has 14 acres of parkland in its inventory and spends $6,500 per acre each year for maintenance. The city has raised concerns that its municipal fiscal resources are insufficient to fund additional maintenance-related costs for a large new park.

Property Owner Priorities (Michigan State Land Bank Authority)

The State Land Bank identified several priorities for the Site during discussions in September 2023.

- The State Land Bank anticipates maintaining its ownership of the Site over the long term.
- The State Land Bank would like to repurpose former industrial property at the Site for community and economic benefit.
- The State Land Bank seeks to ensure that future site uses benefit the community and help generate revenue that can offset state maintenance costs. State Land Bank staff have been approached by solar developers interested in leasing capped areas for renewable energy generation.

- The State Land Bank would like to work with local champions that can form partnerships, fundraise and demonstrate the economic viability of community benefit projects.
- The State Land Bank would like to support workshops and discussions to ground-truth potential reuse ideas with local stakeholders and partners.

Community Advisory Group Perspectives

Discussions at a November 2023 meeting convened by the Pine River Superfund Citizens Task Force in St. Louis identified the community perspectives below.

- The Pine River is nearby and is a source for recreational activities, including fishing. The region has few lakes and a boardwalk with fishing platforms could create a valuable amenity.
- The Site has a unique story through its role in the Michigan Polybrominated Biphenyl (PBB) Disaster. A historical landmark designation could capture this history.
- Given the Site's history, a working laboratory or learning center could provide a place for environmental and historical education. Several nearby colleges have been involved in studies related to the Site. Bringing people to the Site for education opportunities would generate economic benefits for the city.
- A health clinic in the community could be tied to education opportunities. People across the country are involved in a PBB study; the third generation is now being tracked. Research funding is available from national health research programs.
- An amphitheater for concerts would generate revenue. There are typically three to four concerts held in the community each year. The topography of the Site could be designed to provide seating.
- Officers of the group stated opposition to large-scale solar development at the Site.
- Discussions at a community advisory group meeting highlighted opportunities for native vegetation and pollinator habitat plantings at the Site.

Potential Reuse Options

The scenarios below highlight reuse options for Site Reuse Zones C and B. The potential future land uses in these scenarios are provided to inform redevelopment strategies and remedy compatibility considerations for the potential uses identified in site stakeholder discussions.

Recreation and River Access

- Riverwalk path or trail.
- River viewing and interaction stations.

Educational, Institutional Uses and Interpretive Opportunities

- Interpretive signage about site history, cleanup and community heritage topics.
- Community education center or museum space.
- Community health clinic.
- Gathering space or event venue.

Sustainable Property Stewardship

- Native plantings, pollinator gardens or meadow.
- On-site energy generation to support remedy operations.

Examples of riverwalk and river-based recreation, pollinator plantings and related interpretive signage.

Image of a meadow with pollinator plantings and a solar farm.

Recommendations and Next Steps

A 52-acre capped area at the Site is expected to be available for a range of flexible surface reuse, offering a range of possibilities. The 6-acre riverfront corridor features areas for potential public access, along with an access road for maintenance purposes. Opportunities for recreational and community open space uses,

such as a trail along the Pine River, as well as historical preservation and interpretive resources and exhibits can inform EPA cleanup efforts as well as local planning activities.

Additional work is needed to refine reuse plans, gather input from a wider range of community stakeholders and implementation partners. The following implementation considerations can help inform local stakeholder discussions in the near term.

EPA will continue to work with the city of St. Louis, the State Land Bank, community members and other interested parties to ensure that any reuse actions taken in the future will maintain the protectiveness of the Site's remedy.

Implementation Considerations

Below are a series of questions grouped by reuse topic. They are included to support ongoing reuse planning at the Site.

Action Plan for Community Outreach and Engagement

- What partnerships are needed to advance specific reuse ideas?
- Who has not had a chance to share ideas about the reuse of the Site?
- What steps are needed to initiate outreach to implementation partners and other community stakeholders?
- Who could be potential local, regional and state champions that can help to drive implementation of various reuse ideas?

Near-Term Actions for Advancing Public Access at the Site

- What river walk features would the community like to see?
- What type of market research would help to refine features such as path types, recreation themes or specific access types for river viewing and interaction stations?
- For the river edge, railings or fencing may be needed for safety. Will the Site's remedial design for the vertical barrier wall be compatible with installation of railings along the river edge? What limitations need to be considered?
- Where would visitors park and where would access points be established?

Near-Term Actions for Developing Interpretive Signage

- What are some potential themes or topics for interpretive signage exhibits?
- How will community voices and perspectives be considered in signage development?
- Can interpretive signage be developed as part of larger sitewide education strategy? What would that look like?

Near-Term Actions for Pollinator Habitat

- What are some options for establishing native vegetation?
- Are there local entities or institutions that could help with selecting plant mixes, or offering educational programming about the plants and species they support?
- What areas are best suited to vegetation cover? Are there areas that may be better suited for a building or structure?

Near-Term Actions for Evaluating Potential for On-Site Solar

- How much power will the long-term groundwater remedy use? Detailed projections on a monthly and annual basis are needed to assess potential system sizing, economics and anticipated payback for a solar project.
- When will the new groundwater pump-and-treat system begin operations?
- What incentives are or may be available when on-site power is needed?

CONCLUSION

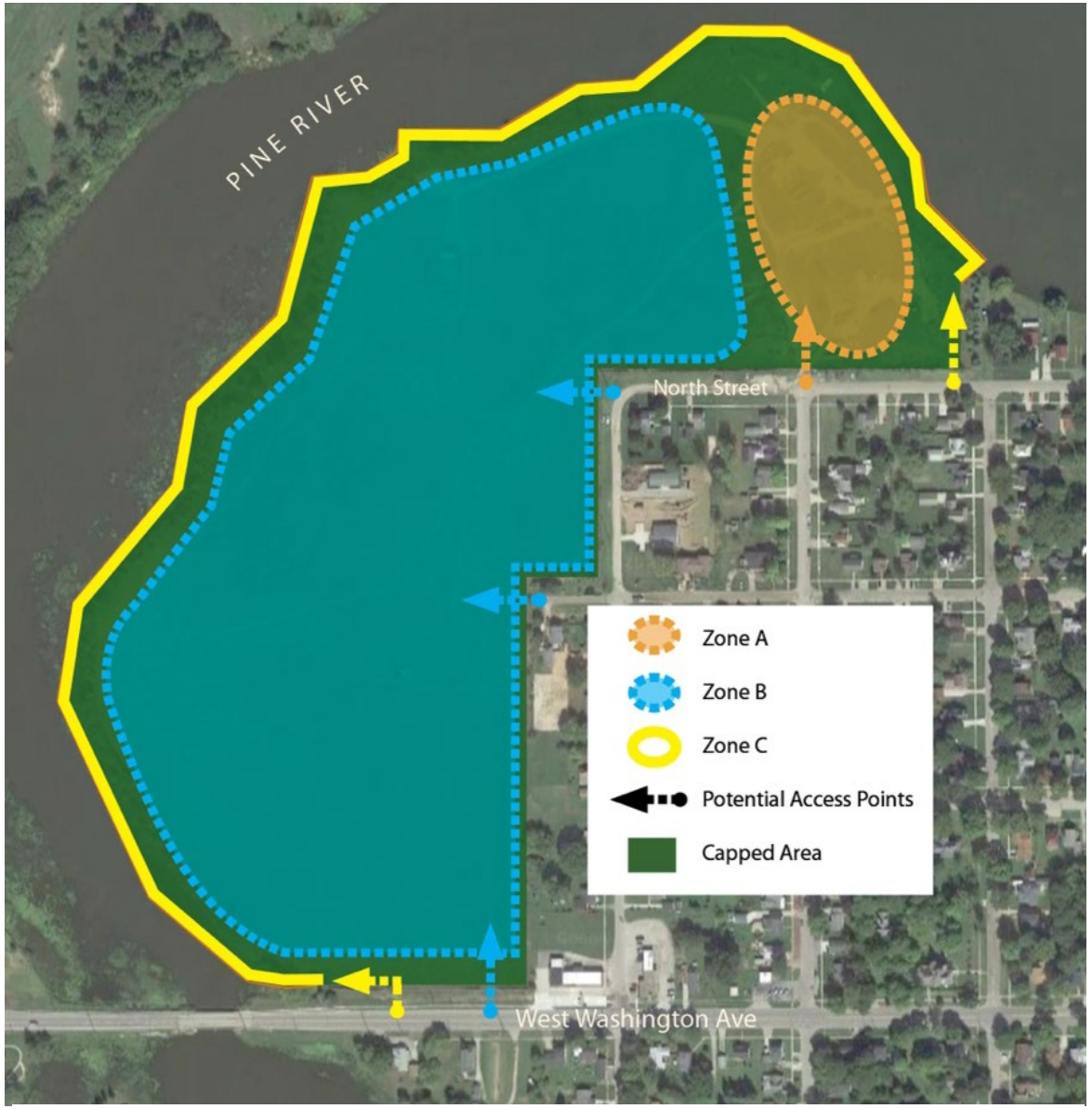
This report summarizes key findings from SRP's analysis and stakeholder engagement activities in St. Louis, Michigan in 2023 and 2024. The selected remedy, current site status and reuse scenarios identify conditions, future land use concepts and key actions to advance reuse at the Site to inform partners' strategic planning work in the future. Close coordination among community members, local government, the State Land Bank, EPA and EGLE is needed as cleanup proceeds and reuse plans are finalized. EPA will continue with remedy implementation and can work with prospective development plans into the future. EPA will continue to work with all interested parties to ensure any reuse actions taken at the Site in the future will maintain the protectiveness of the Site's remedy.

Appendix A - Detailed Future Use Studies

The following section includes detailed studies for three potential reuse options highlighted in the reuse plan update. This information is intended to inform ongoing community engagement, partnership building and due diligence work that will be needed to refine reuse plans. Concepts include a pedestrian walking path and multi-use gathering areas, in alignment with the community's reuse preferences. Zone B, the largest undeveloped parcel in St. Louis, could be a combination of uses such as a community natural area that attracts pollinators and other species, a recreation area or solar farm sized to help off-set remedy operation costs.

Studies include:

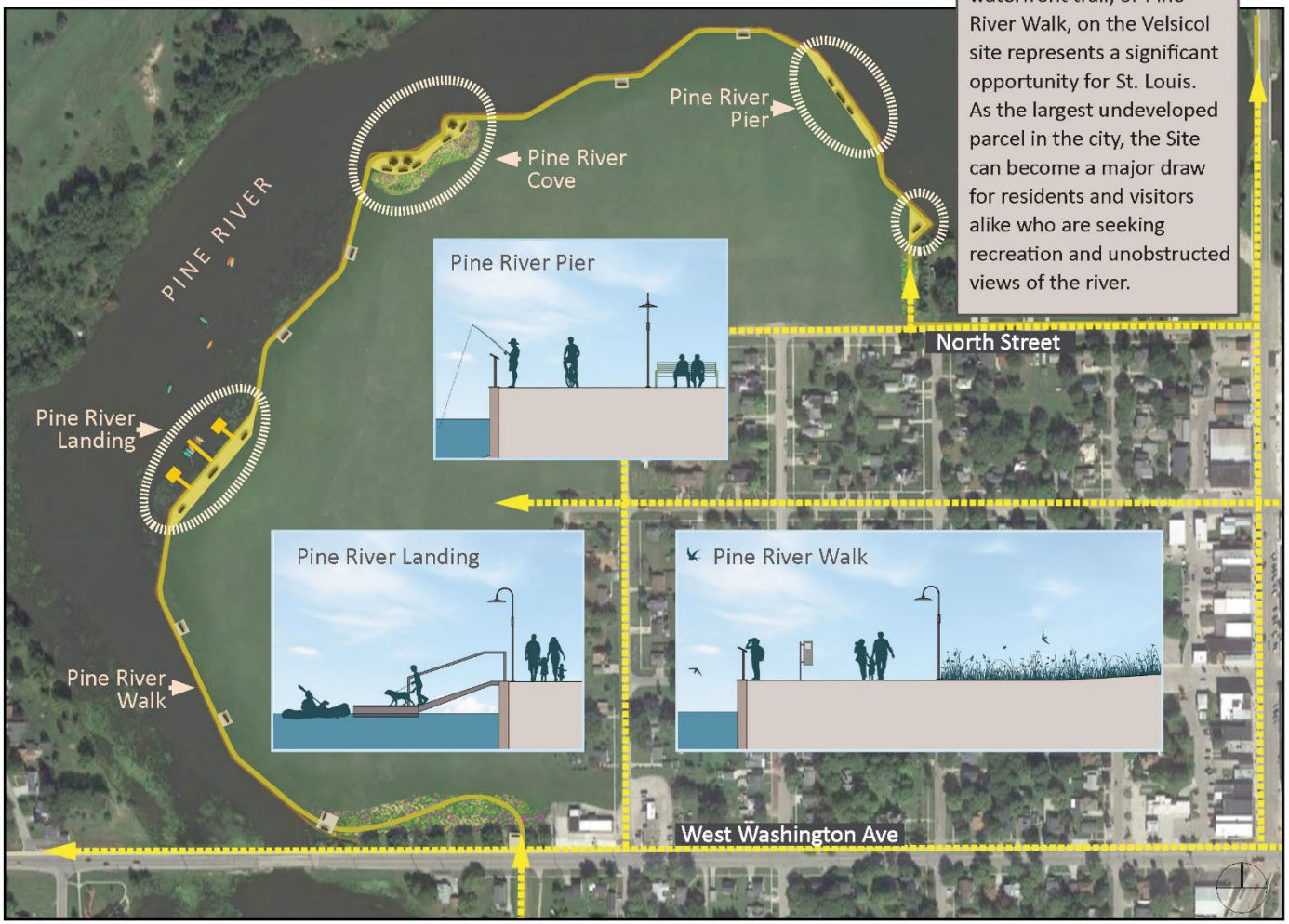
- River Walk Design Considerations.
- Pollinator and Native Planting Design Considerations.
- Solar Development Considerations.



This map shows potential site reuse suitability zones.

River Walk Design Considerations

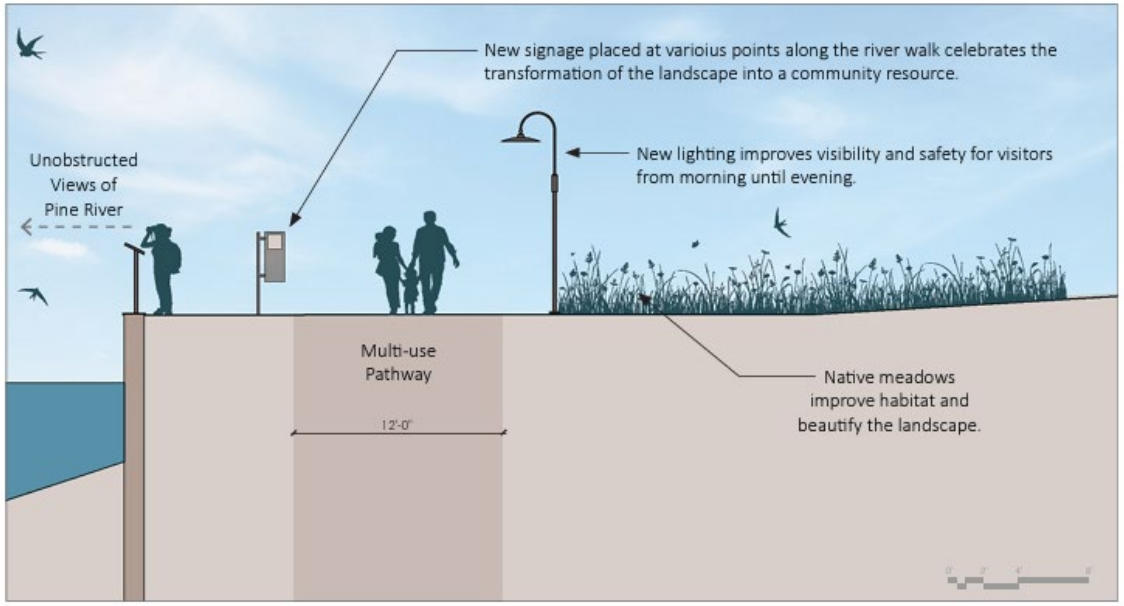
Conceptual Plan: Pine River Walk



The walk at the Site can be accessed from two main points in the city: West Washington Avenue, south of the site, and North Street. Residents in the nearby neighborhoods will also have easy access.

Pine River Walk

Along the riverfront and access corridor at the Site, there is an opportunity to provide a 0.75-mile river walk for visitors to view and enjoy the waterfront setting. The walk could be wide enough to allow all types of pedestrian activity while being accessible to maintenance vehicles for ongoing operation and monitoring of the remedy.



This image displays a potential design for the Pine River Walk.

Path Lighting

Lighting the trail, as called for in the city's 2023 Five-Year Parks and Recreation Plan, could extend the trail's daily usage and provide an enhanced sense of safety on the trail in the evening.

Enhanced Interpretation

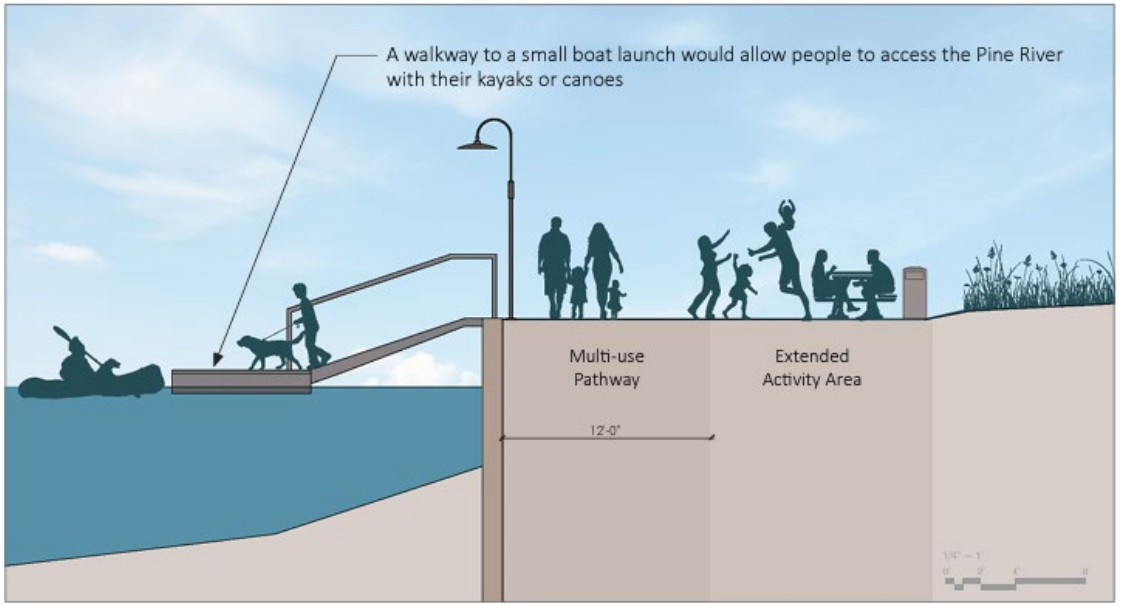
The former industrial area's nearly 90-year history was once represented by a granite marker warning visitors of potential hazards; it was relocated off the FPS in 2013. Adding new interpretation signage that celebrates the area's transformation from a toxic site to a community asset could help reduce any remaining stigma associated with the Site. Signage can also provide the community with related site information and a map of the trail system that connects the area with other local parks.

Capping and Vegetation

The Site will be covered by an engineered cap that will include a soil layer of at least 3.5 feet topped with 6 inches of nutrient-rich topsoil. This design will enable the Site to support a diverse range of vegetation, including pollinator plants and native prairie grasses that thrive in the region. The introduction of flowering plants can not only beautify the area but also attract a variety of wildlife, such as birds, bees and butterflies, enriching visitors' experiences.

Pine River Landing

In addition to scenic views of the Pine River, the community is interested in exploring the possibility of direct river access from the Site in the future. A small boat landing could offer visitors a convenient spot to launch canoes or kayaks, enhancing their experience on the water and encouraging recreational activities.



This image displays the Pine River Landing reuse scenario.

Extended Activity Areas

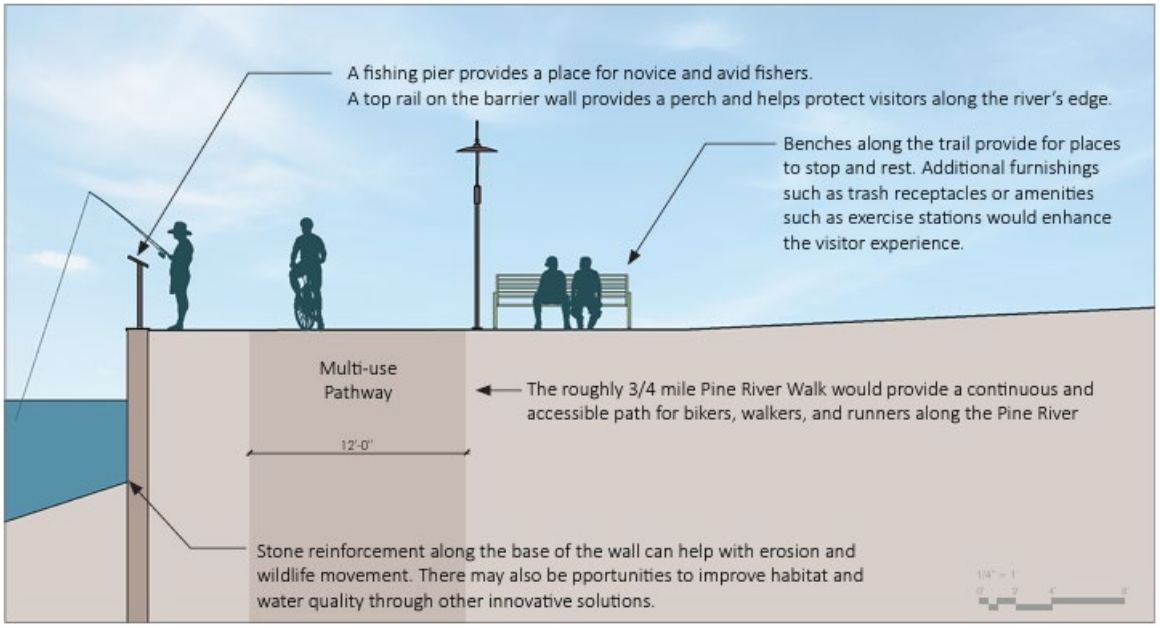
Along certain stretches of the river walk, the multi-use pathway could be widened for larger gathering spaces. These areas could feature chairs, hammocks and picnic tables, inviting families and friends to relax and enjoy unparalleled views of the river. These spaces would enhance community engagement and promote outdoor social activities. Adding shade with trees or shade structures would improve comfort during summer months.

Pollinator-Friendly Solar

Discussions about integrating solar panels on the central part of the Site are ongoing. With more research, there may be an opportunity to co-locate solar panels with pollinator-friendly plantings. This innovative approach would harness renewable energy while bolstering local biodiversity by providing essential habitats for pollinators. This dual-use strategy has the potential to enrich the ecological value of the area while supporting sustainable practices.

Pine River Piers

Given the proximity of the walk to the river, the community has indicated interest in creating activity areas (such as a fishing pier), similar to what is available at nearby Barnum Park.



This image displays the Pine River Piers reuse scenario.

Barrier Wall and Railing

The Vertical Barrier Wall is a primary component of the Site's remedy. The river walk will border the vertical barrier wall, which will function as a bulkhead delineating the boundary between the river and the land. A top railing could be added to the wall to enhance visitor safety and provide a perch for fishing and enjoying the river views. A fish cleaning station could be part of the design. The path and adjacent railing will allow visitors to walk, run, bike or leisurely stroll safely along a route that follows the river. Rest areas with benches and other furnishings, including exercise stations, could be placed along the walk.

Habitat Enhancement

During remedy construction, the base of the barrier wall will be strategically reinforced to enhance the habitat along the riverbank. By incorporating natural stones, the design will facilitate a smooth transition between the river and land, promoting wildlife movement while preventing erosion and maintaining the wall's structural integrity. Integrating native plants will further enrich the ecosystem, improve water quality and provide food and habitat for aquatic life. Further research may also identify opportunities to enhance fish habitat along the barrier wall by using "green bulkheads," which consist of baskets filled with sticks, plants or other materials beneficial to fish. This approach may also improve water quality in the river.

STEPS TOWARD RIVER WALK IMPLEMENTATION

Creating a river walk at the Site offers several benefits for residents and visitors. Suggestions to ensure the project's success include:

- **Engage the Community**: Collaborate closely with residents to pinpoint the most desirable locations along the river's edge for the activities they value most. This effort will ensure that the trail meets the needs and interests of the community.
- **Coordinate Remediation and Reuse**: During the remedial design, work with EPA to design the Pine River Walk with several key considerations in mind:
    - **Emergency and Maintenance Access:** Ensure that the trail design includes provisions for emergency access and maintenance routes to keep the area safe and well-maintained. Consider designing emergency access in coordination with the ongoing monitoring that will be necessary to ensure the cleanup remains protective.
    - **Americans with Disabilities Act (ADA) Accessibility**: Design the grading and slopes to accommodate ADA accessibility, ensuring that all visitors can enjoy the river walk regardless of mobility challenges.
    - **Soil Depth for Vegetation:** Plan for soil depths that support a variety of plant life. Where possible, identify locations where soil depth can be increased to accommodate trees or taller shrubs that can provide shade. Consider how large, above-ground planters might satisfy this need.
    - **Support for Infrastructure**: Ensure that the soil depth is sufficient to support infrastructure needs, including footers and conduits for lighting, ground-mounted furnishings such as benches, picnic tables or shade structures, and potential irrigation systems.
    - **Habitat Restoration:** Explore more restoration opportunities along the Vertical Barrier Wall to support aquatic life and enhance the habitat quality of the Pine River. In particular, consider more innovative strategies, such as green bulkheads and pollinator habitat beneath solar arrays.
    - **Educational Opportunities:** Consider a sitewide interpretation strategy. Consider ways to integrate features related to ongoing monitoring, such as wells, with education opportunities that highlight the Site's transformation and environmental improvements.
    - **Visitor Safety and Comfort:** Consider amenities that will draw visitors to use the Site throughout the day and in all four seasons, such as lighting, dog waste stations and shade structures.

By addressing these components, the Pine River Walk can become a highlight for the community, blending recreation with ecological and educational benefits.

Pollinator and Native Planting Design Considerations

Pollinator habitat and native vegetation cab help to rebuild functioning ecosystems on capped surfaces and provide education opportunities while reducing the mowing frequency and maintenance burden.

Creating pollinator habitats at Superfund sites can revitalize formerly denuded landscapes and help rebuild functioning ecological systems.

Pollinators are essential to life-sustaining food systems, vibrant natural spaces and robust local economies. Three-fourths of flowering plants and about 35% of all food crops depend on animal pollinator species to reproduce. Birds, bees, bats, butterflies, moths and beetles are all examples of pollinators. Pollination occurs when pollen is moved within flowers or carried from flower to flower by animals or wind. The transfer of pollen in and between flowers of the same species leads to fertilization and successful seed and fruit production for plants. Pollination ensures that a plant will produce full-bodied fruit and a full set of viable seeds.

Several common steps for the development of pollinator habitats at Superfund sites are highlighted below. These strategies can be integrated with solar power production and help establish primary groundcover across areas of the Site.

Design and Plant Selection: Plants selected for a pollinator meadow or garden should be native or well-adapted to central Michigan. Consider a planting strategy that includes:

- Herbaceous plants: Prioritize plants with shallow, fibrous root systems on landfill caps. Woody species, which have deeper and more vigorous roots than herbaceous plants, could potentially damage the cap.
- Plant grasses, grass-like species and forbs: Use grasses to provide structure and groundcover, and forbs (flowers) that produce nectar to attract insects.
- Perennial species: Perennial species will return year after year, while annual species die at the end of the season and require replanting. Planting with perennials requires less maintenance for a sustained pollinator habitat.
- Diversity: Use a wide diversity of plant species. Planting 12 to 25 different species allows for good variety with less susceptibility to pests or other issues that arise with monocultures.

Planting Guidance: The recommendations below address best practices for planting and managing a pollinator habitat in its first few years. More guidance should be sought from a native plant nursery, landscape contractor and/or drawings and specifications included in final construction deliverables. Other useful resources are included at the end of this document.

- When possible, prepare the area two to three months before planting to allow the soil to settle. Many pollinator plants require well-drained, scarified soil, so supplementing the prepared soil with sand, gravel or other material that loosens it and permits good drainage may be needed.
- Planting with seed mixes: For steeper terrain with slopes greater than 3:1, the recommended application method for planting is typically hand seeding, broadcast seeding, hydroseeding or drill seeding. For areas with a slope less than 3:1, cover the seed 1/8-inch to 1/4-inch deep by dragging with a spring-tooth harrow or firmly pressing the seed into the soil using a cultipacker, lawn roller or all-terrain vehicle (ATV).
- Many pollinator plants require several seasons before they flower for the first time. As they mature, bees, butterflies and other pollinators, such as hummingbirds, will become increasingly abundant. As such, the vegetation should remain undisturbed to the greatest extent possible throughout the growing season.
- Guidelines on mowing are critical. With pollinator habitat, mowing is much more limited than at sites where lawn or a simpler planting regime is used. One rule of thumb is that whenever the canopy height (overall vegetation) reaches 18 to 24 inches, use a brush hog mower or string trimmer to cut the pollinator vegetation to a height of 8 inches. Mower height should be no lower than 8 inches.

Resources for Planning, Planting and Maintaining Pollinator Gardens:

- Native Plant Nursery and Guidance: www.ernstseed.com
- Revegetating Landfills and Waste Containment Areas (EPA): www.epa.gov/sites/default/files/2015-08/documents/revegetating_fact_sheet.pdf
- How to Build a Pollinator Garden: www.fws.gov/story/how-build-pollinator-garden
- Planting Pollinator Friendly Gardens: www.extension.psu.edu/planting-pollinator-friendly-gardens
- Freshkills Park: www.freshkillspark.org
- Nesting and Overwintering Habitat for Pollinators and Other Beneficial Insects: www.xerces.org/publications/fact-sheets/nesting-overwintering-habitat
- Milkweed Species Found throughout the US: www.fs.usda.gov/wildflowers/pollinators/Monarch_Butterfly/documents/MilkweedInfoSheet.pdf

Solar Development Considerations

The Michigan Land Bank Authority, property owner at the Former Plant Site, has discussed solar photovoltaic electricity generation as a potential use for the site. Solar arrays can be sized to fit the power demand and could be configured to ensure space for multiple uses.

A solar farm would include an array of solar panels connected to the electric transmission grid that could also generate electricity to power the Site's wastewater treatment plant and groundwater extraction system. The power demand for the wastewater treatment plant and groundwater extraction system has not yet been confirmed. Therefore, this study looks at two potential footprints for a solar project.

Transmission lines are readily available at the Site and connected to the existing groundwater treatment plant (located in Zone A), including a 46,000-kilovolt Consumers Energy bulk transmission line and a 1,200-kilovolt line. The capped area at the Site is not yet ready for reuse. Once cap construction is complete, EPA and the EGLE anticipate the Site's remedy could support a ballasted solar array.

Potential Solar Development Footprints

Option 1. To simulate a potential solar array designed to meet remedy operation energy needs, a potential 12-acre footprint located near the remedy operations area could accommodate a solar array with a capacity of up to 7,388 kilowatts (kW), which is enough to power about 1,265 homes. Information about future electricity demands for site remedy operations was not yet available, therefore this option will likely need to be refined to ensure compatibility with future remedy operations access needs and power demands.

Option 2. Based on the anticipated cleanup plans and capped areas, Zone B could potentially accommodate an approximately 33-acre solar photovoltaic array with a capacity of up to 19,914 kW, which is comparable to the electricity needs for about 3,400 homes.

Option 1. A solar development footprint could be sized to meet on-site power needs for the Site's remedy operations area and configured in a compact footprint closer to the Site's groundwater treatment facility in the northern part of the Site. A 12-acre area is shown above.

Option 2. A potential solar development footprint designed to maximize the Site's capacity for solar energy production could cover about 33 acres or the majority of the capped area.

Potential Solar Generation Capacity

Table A-1 compares two potential solar footprints and their estimated potential generation capacities. These generation capacity estimates are based on an assumed solar energy generation density of 0.6 megawatts/acre. Once more information is available about current and projected monthly electricity usage, further solar renewable energy evaluations can be conducted.

Table A-1. Potential Solar PV System Size and Capacity Options

	Option 1. Compact Footprint	Option 2. Build-Out Footprint
Solar footprint (acres)	11	33
Estimated capacity (kW)*	7,388	19,914
Estimated Equivalent # of Homes Powered (homes)***	1,265	3,400
* Based on the System Advisor Model (sam.nrel.gov).		
** Solar output estimates modeled using estimated footprint sizes and the National Renewable Energy Laboratory's pvWatts calculator (pvwatts.nlr.gov/). *** Solar outputs compared with average household energy usage in Michigan based on national estimates compiled by the Solar Energy Industry Association (seia.org).		

A solar farm at the Oronogo-Duenweg Mining Belt site in Missouri.

Potential Solar Development Costs

SRP analyzed project costs to estimate the cost of installation and ongoing operations and maintenance for the solar footprint. Costs are estimated based on the per Watt costs of construction ranging from $1.30 to $1.80 per Watt direct current (Wdc). Table A-2 shows an estimate of installed costs for the two potential solar project size options. For Option 1, the development costs for a 12-acre solar array could potentially range from about $10 million to $13 million, while Option 2's larger 33-acre development scenario could cost between $26 million and $36 million. The cost ranges account for the varying cost of having solar panels on a capped site and ensuring compatibility of the solar project with the Site's remedy. Annual operation and maintenance costs to maintain solar panels and electric equipment for a project of this size would be about $260,000 each year. Installation costs do not include fees or costs for interconnection to transmission lines.

Table A-2. Potential Solar Development Cost Considerations

	Size (acres)	Estimated Capacity (kW)	Installed Costs ($1.30/Wdc)	Installed Costs ($1.80/Wdc)	Annual Operation & Maintenance Costs
Option 1	12	7,388	$9,604,400	$13,298,400	$96,044
Option 2	33	19,914	$25,888,200	$35,845,200	$258,882

* Based on the System Advisor Model (sam.nrel.gov).

* Assumes that the installed solar project costs are $1.30 to $1.80/Wdc (includes a range for environmental materials management) and annual operation and maintenance costs are $13/kW-year.

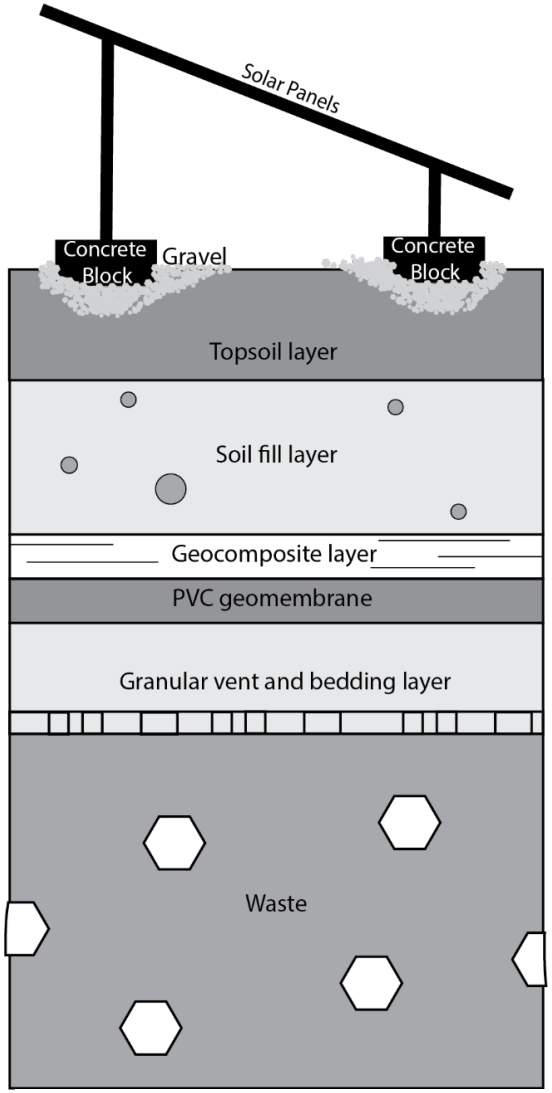
Solar Development Models

The State Land Bank can consider several options for solar development models, including community solar, utility-scale solar and behind-the-meter development models.

- Community Solar – These systems include any solar project that provides power or financial benefits to multiple customers. Community solar customers typically subscribe to or own a part of the energy generated by a solar array and receive an electric bill credit for electricity generated by their share of the community solar system.
- Utility Scale – These projects, also known as "in front of the meter" projects, refer to installations built by developers who sign power purchase agreements with local utilities. The power is sold to a utility and distributed to customers.
- On-Site Behind the Meter – This type of solar development occurs when a developer installs and owns a renewable project on the customer side of the meter and uses it to supply on-site power and displace power purchased from a utility. Excess power can be sent to the grid.

Based on the State Land Bank's goals, the most viable solar development model would likely be a "behind the meter" system that supplies supplemental electricity to the Site's remedy operation zone for groundwater treatment operations. A state agency could serve as the off-taker, with a developer or third party owning the solar system. Additional considerations for revenue generation could include local tax revenue for the municipality as well as potential land lease revenue for the State Lank Bank.

Project stakeholders could benefit from evaluating the potential financial impact of a solar project at the Site, identifying potential cost savings from the investment over the life of the solar project. In the near term, compiling EPA's and EGLE's current and projected groundwater treatment plant electricity costs could help determine cost savings over the life of an investment in the project. In addition, the State Land Bank, the city of St. Louis and solar developers could benefit from coordination to clarify the permitting process and due diligence activities, along with timing and project viability.



Typical solar array mounted on concrete ballasts and bedded in gravel on top of a multi-layer cap. This does not represent the specific components of the FPS cap.

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