Concept Master Plan for Salt Creek at Fullersburg Woods

Executive Summary
Introduction & Background

Summary

Situated on Salt Creek, the historic Graue Mill and Museum and the Graue Mill dam serve as reminders of the area's history and provide a source of recreation and education for the general public. Currently, per the Clean Water Act, Salt Creek does not meet criteria for biology and water quality and actions must be taken to remedy these conditions so the river can be enhanced for future generations.

In response to Salt Creek failing to meet the goals of the Clean Water Act and being listed as impaired, it was recommended that tighter restrictions be placed on the wastewater treatment plants (WWTPs) in the area. These actions, however, would cost taxpayers hundreds of millions and evidence suggests would still not measurably move Salt Creek towards compliance with the Clean Water Act. After sampling and studies, it was determined that the primary issues causing Salt Creek to fail the biological requirements could all be attributed to the dam that sits on the site. With State and Federal agencies agreeing to allow an alternative local plan that will be more efficient with public money, the DuPage River Salt Creek Workgroup (DRSCW) was formed. The group of local partners has developed an alternative plan for the entire watershed, which includes dam removals and promises not only public savings, but greater environmental benefits. This document is a summary of the work conducted as part of the master planning process to allow the Forest Preserve District of DuPage County to make decisions regarding the Concept Master Plan implementation at Fullersburg Woods.
The Graue Mill dam is located on Salt Creek adjacent to Graue Mill in the Fullersburg Woods Forest Preserve in the Village of Oak Brook and is owned by the Forest Preserve District of DuPage County (FPDDC). The concrete dam that exists today was built in 1934 by the Civilian Conservation Corps after the site was purchased in 1933 by the FPDDC and is the fourth dam to be constructed at the site. This dam has a crest length of 132 ft. (40.3 m) and stands 6.2 ft. (1.9 m) high. The impoundment created by the dam spans 16 acres and is approximately 3,900 linear feet in length. Also on the site is the side stream mill race which houses the water wheel at Graue Mill. The adjacent gristmill does not rely on this water wheel for power and instead operates on electrical power. The gristmill opened in 1852 and was in use for 70 years until it was abandoned due to modern milling methods. It was restored by the Civilian Conservation Corps (CCC), with work completed in 1943. Since this restoration, additional work has occurred at the Mill including converting the gristmill operations to electricity. Today, the Mill serves as an important piece of local history and contributes to the cultural identity of the surrounding communities.
Project Objectives

Objectives

The Concept Master Plan for Salt Creek at Fullersburg Woods seeks to maximize community benefits while achieving environmental and economic objectives. Along with improvements to the area immediate to the dam, the plan incorporates the whole river system within the Fullersburg Woods Forest Preserve.

After evaluations of Salt Creek, the Illinois Environmental Protection Agency (IEPA), which monitors Clean Water Act compliance through surveys of water chemistry and aquatic life, has found that the waterway does not meet state water quality standards for dissolved oxygen (DO) or state thresholds for fish and aquatic insect biodiversity. Local sampling and studies identified three primary reasons why the river segment is failing to meet biological requirements: blockage of fish passage, low dissolved oxygen (DO), and poor in-stream and riparian habitat conditions. In order to meet Clean Water Act compliance, the Concept Master Plan seeks to address the following issues:

- **Remove Blockage of Fish Passage**

  In areas upstream of the dam, there is a large decrease in fish biodiversity. While the river supports 53 species in total, sixteen native river fish species including blackside darter, emerald shiner, johnny darter, northern pike and rock bass are all absent in areas upstream of the dam. The modification of the dam will allow these fish to establish themselves in the watershed up to the Busse Woods Dam in Schaumburg.

- **Increase Dissolved Oxygen (DO) Levels**

  Dissolved oxygen (DO) is the amount of free oxygen that is present in the water. Just like humans, all of Salt Creek’s living creatures, from fish to insects, need oxygen to survive. The lowest DO levels in Salt Creek are consistently associated with the Graue Mill dam.

- **Improve In-Stream and Riparian Habitat Conditions**

  River fish and macroinvertebrates (insects) need flowing water, gravel bottoms, and low levels of muddy sediment. The habitat behind the dam consists of stagnant water and sediment. The poor habitat explains the drop in insect species upstream of the dam.

These issues are directly associated with the presence of the dam, as the lowest DO levels on Salt Creek were found in the impoundment area and a large decrease in fish and insect biodiversity were found upstream of the dam. As part of the Concept Master Plan, addressing these issues and creating cost-effective solutions will be the primary factor in creating alternatives.
The Concept Master Plan for Salt Creek at Fullersburg Woods goes beyond dam removal, it is a full stream corridor restoration project. The Master Plan will improve water quality and increase recreation and education opportunities on Salt Creek while being more efficient with taxpayer money. The Master Plan intends to address this series of objectives by putting focus on the following:

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<thead>
<tr>
<th><strong>Water Quality Improvements</strong></th>
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<td>The Concept Master Plan relies on the benefits of healthy, naturally free-flowing rivers to improve water quality in Salt Creek beyond what could be achieved through additional public spending on wastewater treatment. In addition to improvements at the Graue Mill dam, over a mile of river upstream of the dam will be restored by creating wetlands, planting native vegetation, enhancing in-stream habitat and more. These enhancements will be designed to improve the aquatic habitat of Salt Creek and promote healthy populations of fish, macroinvertebrates, birds, and reptiles.</td>
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<th><strong>Recreation and Education Opportunities</strong></th>
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<td>The project benefits go beyond ecology. The Concept Master Plan for Salt Creek at Fullersburg Woods includes education and recreational elements to complement the water quality improvements. Proposed amenities include canoe/kayak launches, fishing stations that provide access to the creek and educational signs. Content for the educational signs will focus on the benefits of dam removal and stream restoration as well as honoring the history of the site and its milling operations.</td>
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<td>The Concept Master Plan will allow upstream communities to forgo hugely expensive upgrades at their wastewater treatment plants. Analysis shows that improvements to water quality due to dam removal are more effective and cheaper than plant upgrades. Plant upgrades have been estimated at $213 million in capital costs and $7 million a year in increased operating costs. Such upgrades will marginally improve water quality but cannot restore the river’s fish biodiversity or the habitat upstream of the dam.</td>
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Data Collection

Summary of Findings

A series of studies were done to further inform the design of the Concept Master Plan. These studies include a topographic and bathymetric survey, wetlands/waters of the United States assessment, and a sediment sampling/analysis.

**Topographic and Bathymetric Survey**

Topographic and bathymetric surveys were collected from July 19, 2019 to August 16, 2019 to locate substantial existing features and ground relief. The survey area included the Salt Creek corridor from York Road on the downstream end to 31st Street bridge on the upstream end. The project area also included the Fullersburg Woods (Graue Mill) dam and the Old Oak Brook dam. During the survey activities, AECOM also conducted measurements for the depth of sediments, or depth of refusal (DOR) measurements, within the dam’s impoundment to quantify impounded sediment volumes and identify approximate elevations and materials of pre-dam alluvium soils.

**Wetlands/Waters of the United States Assessment**

AECOM’s subconsultant Applied Ecological Services (AES) completed a wetland and water delineation of the project area on July 8-11, 2019. The work was done in accordance with the US Army Corps of Engineers (USACE) 1987 Wetland Delineation and the Midwest Regional Supplement for Wetland Delineations. DuPage County jurisdictional wetlands were also delineated and assessed. A wetland delineation report has been submitted to the USACE and the DuPage County Stormwater Management (DC SWM) which includes a wetland delineation exhibit demarcating all wetlands and data collected, photos of representative locations, wetlands and soil maps, USACE data forms, an evaluation of the quality of on-site wetlands based upon Floristic Quality Index (FQI), location of adjacent off-site wetlands, calculation of buffer width, and wildlife evaluation forms. Field confirmation of wetland boundaries and justification determination of the wetlands were completed on June 3, 2020.

A Threatened and Endangered Species Investigation was completed and identified the following species within the project area:

- Northern Long-eared Bat
- Hine’s Emerald Dragonfly
- Eastern Prairie Fringed Orchid
- Leafy Prairie-clover
- Mead’s Milkweed
- Prairie Bush-clover

A Historical Preservation Investigation was also completed through a review of the State Historic Preservation Offices (SHPO) National Register of Historic Places in Illinois on September 1, 2020 and identified the Graue Mill as the only historic place listed in the register that is situated within the forest preserve boundaries.
Sediment Sampling and Analysis

Sediment sampling to provide a base understanding of the sediment quality of the impoundment located upstream of the Fullersburg Woods dam for planning purposes was conducted on July 16–17, 2019. Sediment samples were taken at 18 locations, where silt, clay, and organic material depth is greater than or equal to 12 inches, two depths were sampled, the first depth to the first 12-inches of sediment and the second depth to the 12-24-inch depth. In total 31 samples were taken.

The sediment samples were tested for the following parameters:

- Total Metals: arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver and zinc
- Toxicity Characteristic Leaching Procedure: arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver
- Polycyclic aromatic hydrocarbons (PAHs)
- Chemical Oxygen Demand (COD)
- Sediment Grain Size (hydrometer method)
- Total Organic Carbon (TOC)
- Polychlorinated Biphenyls (PCBs)
- Pesticides: 4,4’DDD; 4,4’-DDE; dieldrin

Overall, the results for the sediment samples were typical for urban sediments and showed a variety of contaminants above detectable criteria. In areas where sediment samples exceed these criteria, it would be ideal to avoid transportation of the contaminants downstream. The human health criteria for ingestion and inhalation indicate that these sediments may not be allowed to be left in place if those sediments are expected to remain exposed after dam removal and may be required to be covered with ‘clean’ soil to prevent human contact. However, if the property of the former impoundment is zoned for restricted use these criteria may not apply and no further action may be required.

If full dam removal is selected, the largest sediment volume is expected to come from the area immediately upstream of the dam. Due to the excavation expected in this area and the area of existing sediments expected to remain post dam removal, AECOM recommends an additional sampling event to complete the characterization of sediment in this area. If the dam removal moves forward, all sediments will be managed to limit transport downstream to the maximum extent possible and/or will be removed to facilitate the dam removal. Any contaminated sediments identified will be disposed of in accordance with IEPA regulations.
Alternatives Analysis

Following the guidance of the project objectives and the results of a series of sediment sampling and topographic studies, four design alternatives focusing on the water quality and environmental objectives were created for consideration.

In order to address the issues present in Salt Creek, design modification alternatives to the Fullersburg Woods Dam were developed and evaluated for their viability to create fish passage and improve water quality and aquatic habitat. The alternatives aim to improve biological requirements including increasing fish biodiversity, increasing dissolved oxygen (DO) levels, and diversifying in-stream and riparian habitat conditions. In total, four design alternatives, along with a no-action alternative, were evaluated. The design alternatives explore both the partial and full removal of the existing dam, while considering the environmental and economic objectives.

In December 2018 to April 2019, the DRSCW utilized a public relations firm, Aileron Communications, to conduct public opinion research to understand community support and opposition and to identify options for moving forward with alternatives at the Graue Mill Dam. Telephone and online surveys along with in-depth interviews and a focus group discussion were completed (Aileron, 2019).

Throughout the conceptual master plan portion of this project, AECOM and the DRSCW have met to discuss the alternatives analysis to select the recommended alternative. Additionally, two public virtual open houses were held virtually on July 7, 2020 and July 9, 2020.

As part of the public comment solicitation, the DRSCW asked for feedback on individual design elements of the proposed project. All the design elements focused comments received were related to the mill raceway and water wheel. The commenters recommended that post dam removal, water be maintained in the mill raceway and/or that mill wheel be able to turn (Aileron, 2020).

Since the virtual open houses and the conclusion of the public comment period, in collaboration with FPDDC staff, the DRSCW has examined the mill race and the water wheel. This involved moving the debris from the mill race, examining the wheel bearings and consulting pump and motor specialists.

As part of the recommended option, the mill race would be hydraulically disconnected from the impoundment by filling in its upstream end. A system of pumps and weirs would allow water to be placed into and removed from the mill race while the wheel rotation of the wheel would be powered by an electric motor. Wiring the controls into the mill building will allow the water wheel to be operated on demand. The mill race is over 200 feet in length and it is likely that the recommended option would fill in only the first 20-30 feet, leaving 85% of it in its present condition. Design of these elements will be finalized through the final design process.

Alternative A will meet the project objectives of providing fish passage, improve water quality by increasing the dissolved oxygen within the project area by providing consistent movement of water through the Salt Creek, and improving in-stream and riparian habitat. As such, based on the results of the Alternatives Analysis, the DRSCW has focused its efforts on refining Alternative A. The following pages provide additional detail on the design elements associated with the recommended alternative.
Proposed Design

In Alternative A, the dam is removed and replaced with a rock riffle. Final dimensions of the rock riffle are estimated to be 70 feet wide by 80-100 feet in length. The riffle will be designed so that velocities through the riffle will be low enough to allow for fish passage under normal flow conditions. The former impoundment now occupied by the approximately 70-foot-wide river channel will become floodplain/wetlands. The existing mill race will be hydraulically disconnected from the impoundment by filling in its upstream end. A system of pumps and weirs would allow water to be placed into and removed from the mill race while the rotation of the wheel would be powered by an electric motor. Wiring the controls into the mill building will allow the water wheel to be operated on demand.

As the design is progressed, hydraulic modelling will be finalized to determine any impacts to the area relative to the project. Alternative A will maximize both the fish passage, habitat, and water quality objectives and will minimize cleaning of the mill race and future sediment management issues for the FPDDC.
Looking towards Salt Creek from the north, the existing dam will be replaced with a rock riffle spanning the width of the stream channel and extending approximately 80-100 feet in length. The riffle will allow for safe fish and paddler passage, increasing both the fish biodiversity upstream of the existing dam and recreational opportunities.
Rendering 2  Looking Southeast Towards Mill Race

With the expansion of the floodplain, the existing mill race will be disconnected from the former impoundment area and filled in on the upstream end. The mill race is over 200 feet in length and the recommended alternative would fill in only the first 20-30 feet, leaving 85% of it in its present condition. A path will be added to provide safe access through the floodplain vegetation to both the edge of Salt Creek and a fishing station.
With the removal of the dam, much of the land to the north and south of Salt Creek will become floodplain/wetland areas. Along with increasing the biology of the stream, the improvements will also allow visitors to enjoy amenities such as rock fishing areas.
Today the Graue Mill gristmill operates under electrical power and does not rely on the water wheel for power. The wheel is not attached to any gearing and is capable of turning. However, the water wheel turns infrequently due to both the accumulation of sediment in the mill race and the relatively low crest of the current dam. The factors compound leading to inadequate and infrequent flow.

Under the recommended alternative, the mill race would be disconnected from the newly created river at its upstream end. Water would then be ponded in the mill race and the wheel turned by an electric motor. This matches the recommendations the FPDDC’s 2019 Graue Mill Sluiceway Debris Control Study (Graue Mill Sluiceway Debris Control Study, 2019).

Rendering 4  Looking West Towards Mill Race

Existing View

Proposed View

Key Map

Approximate View Location

Salt Creek

York Road
In the 1.2 miles upstream of the dam, the width of the stream will be reduced along with the inclusion of other restoration strategies. A typical stream restoration would include root wads, stabilized shorelines, small riffles and pools, and a floodplain landscape buffer.
Preserve & Restoration
Master Plan

Preserve Plan

The Concept Master Plan for Salt Creek at Fullersburg Woods protects history, while improving river quality, enhancing recreational opportunities, and saving taxpayer dollars. The preserve plan goes beyond dam removal and extends the improvements downstream for a full stream corridor restoration.

As the design for Alternative A progresses, the DRSCW is exploring the impacts of the proposed design on the upstream channel and looking for additional opportunities for instream and streamside habitat improvements (riffle/pool creation, substrate installation, streambank stabilization, wetland creation, etc.). Additional modeling and design work will be done on the channel around the island located in the northern portion of Fullersburg Woods. Historically, the main channel of Salt Creek flowed on the south side of the island. However, after the construction of the current dam in the 1930s, the main channel of Salt Creek was directed to the north side of the channel. These channels are shown in the plan below. As the property owner to date, FPDDC, is neutral on which channel (north or south) should be the main channel. The design will focus on allowing high flows to access both flow paths during flood stage and maintain enough flow in the secondary channel to maintain healthy wetland vegetation during low/normal flows.
Around the Graue Mill dam, the primary focus is on the removal of the existing dam and improvements to the stream and stream bank. The project will replace the Graue Mill dam with a rock riffle structure that will create safe passage for paddlers on canoes and kayaks and allow fish to travel for 17 miles upstream of the dam for the first time in nearly 90 years. In the former impoundment area, floodplain/wetland vegetation will be established creating a variety of habitats. These biological enhancements in the 1.2 miles upstream of the dam will help to maintain ecological diversity both instream and streamside.

The preserve plan provides recreational and educational enhancements as well, including elements such as fishing stations, canoe launches, and providing educational signage to speak to the history and ecological elements of the site. At the location of the millhouse, the removal of the dam will not necessitate any alteration to the historic gristmill, which has used an electric motor for its milling operations for several years.

The following pages provide further detail on the proposed design enhancements for the Concept Master Plan.
Ecological Enhancements

The removal of the dam will provide opportunities to improve both the instream and streamside habitats and increase the overall health of Salt Creek and the surrounding watershed. Incorporating elements including root wads, rock riffles, and stream stabilization measures will increase the fish diversity in the stream up to 17 miles north of the existing Graue Mill dam location, and vastly improve the water quality in the area upstream of the dam. The number and exact location of these enhancements will be determined with preparation of construction bid documents. The ecological enhancements will be applied in the 1.2 miles of Salt Creek upstream of the removed dam.
Preserve Enhancements

The project benefits go beyond ecology. The Concept Master Plan for Salt Creek at Fullersburg Woods includes education and recreational elements to complement the water quality improvements. Proposed amenities include canoe/kayak launches, fishing stations that provide access to the creek, and educational signs. Content for the educational signs will focus on the benefits of dam removal and stream restoration as well as honoring the history of the site and its milling operations.