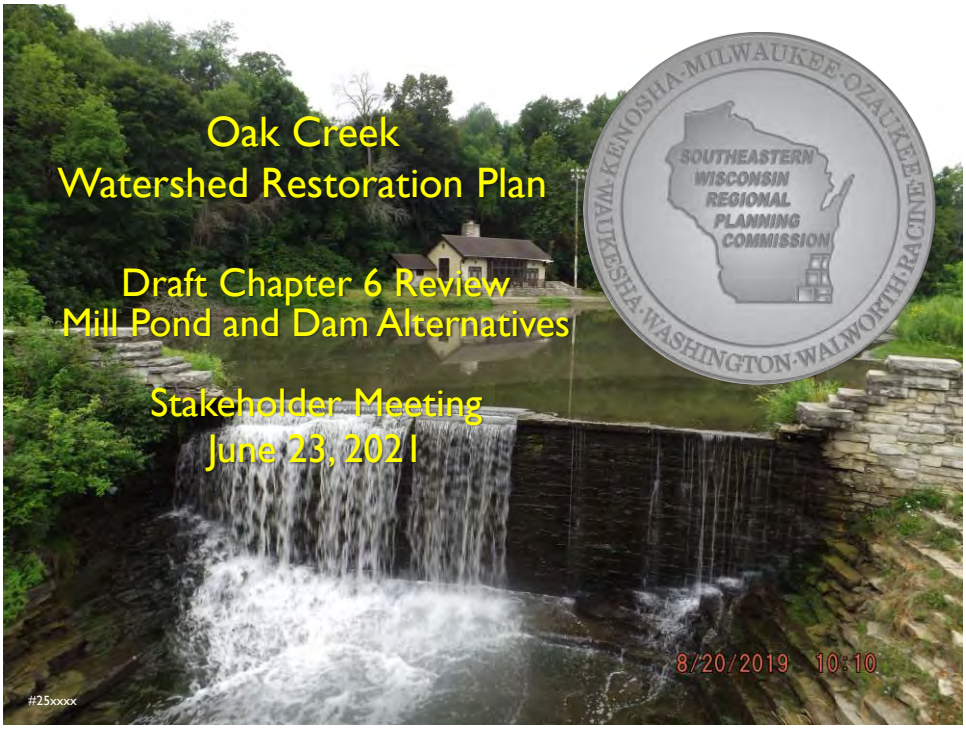

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Meeting Agenda

1. Review partial Chapter 6, "Alternatives and Recommended Actions for the Mill Pond and Mill Pond Dam"
2. Next Steps

2

Presentation Overview

- Brief review of issues for Mill Pond and dam
- Explanation of Alternatives and Costs
- Comparison of Alternatives
- Recommendations

Issues at Mill Pond and dam

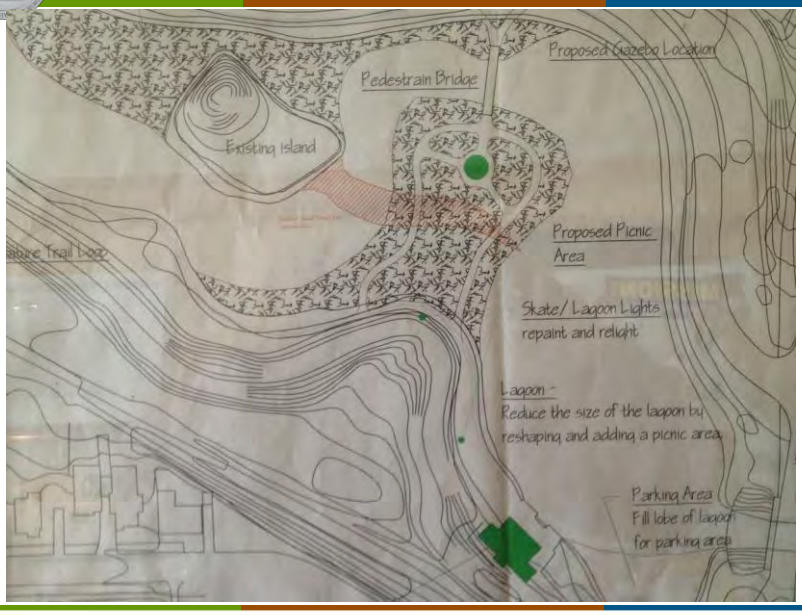
- The sluice gate for dam maintenance is inoperable.
- Sediment accumulation in the Mill Pond has become excessive, creating islands in the pond and very shallow water depths that have adversely impacted water quality, habitat, aquatic species, and recreation.
- The dam is a full barrier to fish and native aquatic organism passage between Lake Michigan and the upstream Oak Creek watershed.

Issues at Mill Pond and dam

- The Mill Pond was not designed to provide flood storage but rather for recreational and aesthetic benefits. Under the current configuration of the dam, the adjacent Oak Creek Parkway floods during the 1-percent-annual-probability (100-year storm) event.

Regulatory FEMA Floodplain at Mill Pond

FOMP Historical Planning Effort



Summary of Mill Pond and Dam Alternatives

- Alternative 1 – Sluice Gate Repair
- Optional – Emergency Spillway and Abutment Extension
- Alternative 2 – Partial Pond Restoration
- Alternative 3 – Full Pond Restoration
- Alternative 4 – Bypass Channel, Dam Lowering, and Pond Restoration
- Alternative 5 – Dam Removal and Channel Restoration

Alternative Assumptions

- The costs were developed assuming clean sediment; the presence of contaminated sediment would increase costs due to hauling the material a longer distance to a landfill site that accepts contaminated fill.
- Dredged material would be dewatered in-place. If dewatering in another location is necessary, hauling costs may increase.
- Terrestrial habitat improvements included vegetated terraces.
- Recreational improvements included fishing access points and one walking path.
- A fish passage structure past the Mill Pond dam was determined to be infeasible.

Alternative Assumptions – Fish Passage past dam

Alternative Assumptions - Costs

- Planning level costs include sediment core samples in the project area and laboratory analysis to determine which contaminants, if any, are present in the pond sediment (sample every 2-ft, ~$2300 per sample for lab work for full WDNR contaminant list)
- A dredging/hauling cost of $100/CY of sediment was assumed and was based predominantly on the Estabrook dam bids.
- Planning level construction cost estimates were increased by 35% to account for engineering, permitting, and other contingencies.

Soil Core Sampling Example

http://fertilefarm.com.au/wp-content/uploads/2014/10/Soil-Core-Sample-720x300.jpg

https://idealcorp.com.au/ideal-geotech/wp-content/uploads/sites/10/2016/11/Field-rig.jpg

Alternative Assumptions

- Planning level maintenance costs assume a dam inspection every 10 years. (WDNR does not require inspections for the Mill Dam because it is a "small" dam, but routine dam inspections are recommended).
- Planning level maintenance costs for dredging assume an interval of every 20 years to be consistent with past County efforts. Two dredging efforts for the 50-year period are included in the maintenance cost estimates.

Summary of Mill Pond and Dam Alternatives

- Alternative 1 – Sluice Gate Repair
- Optional – Emergency Spillway and Abutment Extension
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- Alternative 5 – Dam Removal and Channel Restoration

Alternative 1: Sluice Gate Repair

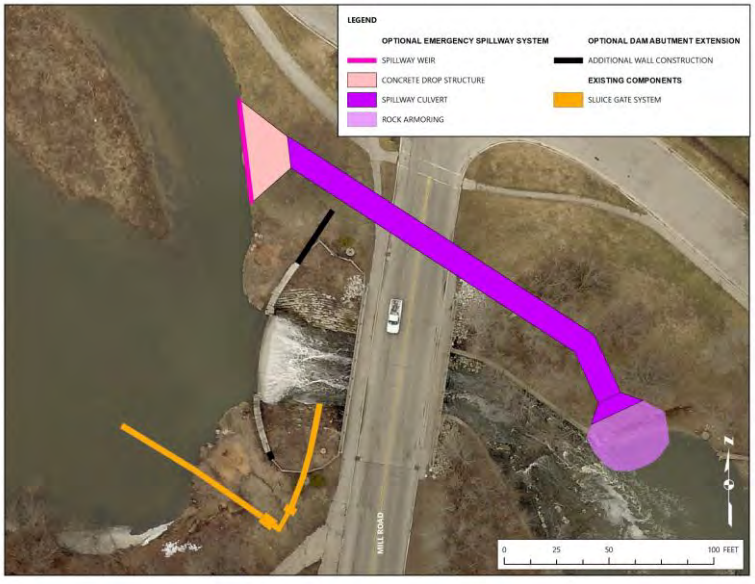
Alternative 1: Sluice Gate Repair

- Benefits:
  - Fulfills requirement by WDNR to fix sluice gate
  - Can be used in future to dewater the pond for dam maintenance
- Drawbacks:
  - Does little to improve the recreational, flood control, or environmental condition of the project area
  - Does not allow passage for migrating fish
- Maintenance: exercising sluice gate annually, dam inspections, re-dredging around the intake pipe (est. ½ volume every 20 years)

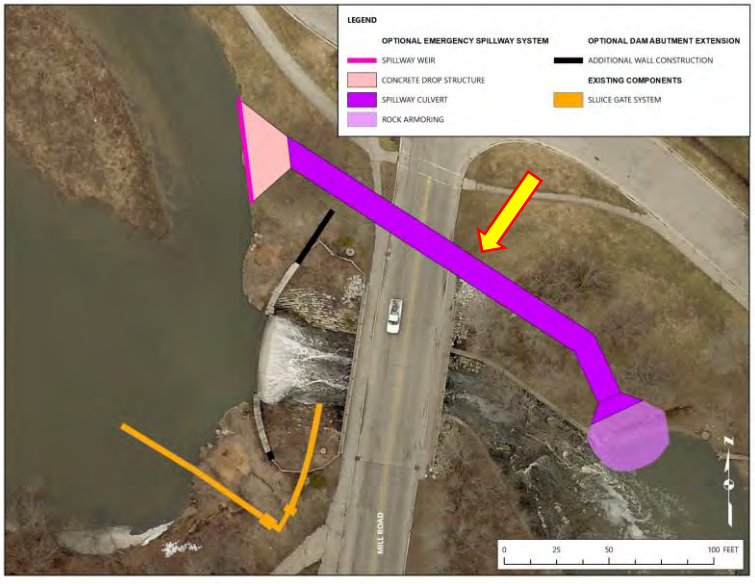
Alternative 1: Sluice Gate Repair

- Total Cost: $542,000 (2019 dollars)
  - Construction cost: $329,000
  - Maintenance: $199,000 (present worth)
  - Core sampling: $14,000 (1 core)

Optional Spillway Capacity Enhancements



Optional Emergency Spillway



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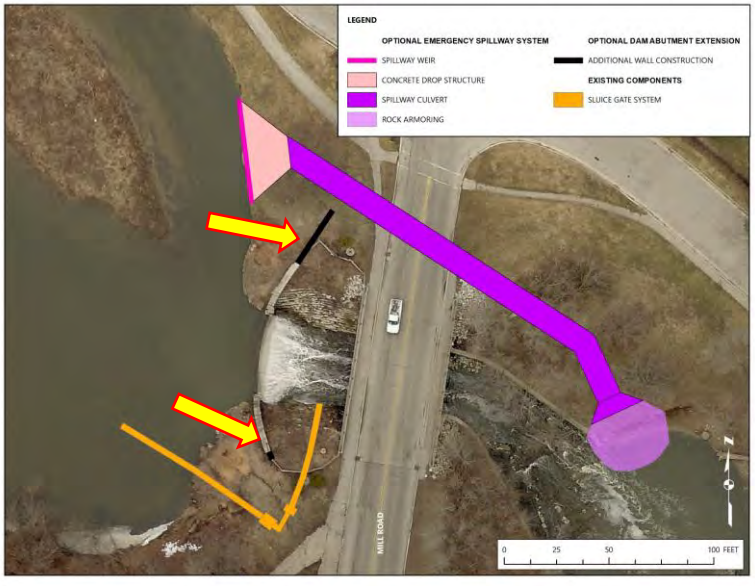
Optional Abutment Extensions



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Optional Emergency Spillway and Abutment Extensions

- Items could be added to Alternatives 1, 2, or 3
- Benefits:
  - Improve safety in the pond area by lowering water levels at the pond for large flow events
  - Protect the dam by increasing the overall spillway capacity before flood flows bypass the existing spillway
- No ongoing maintenance or additional core sampling included in planning level cost estimates

Optional Emergency Spillway and Abutment Extensions

- Total Construction Cost for emergency spillway: $733,500
- Total Construction Cost for abutment extensions: $2,500
- Total Construction Cost for Optional Spillway Enhancements: $736,000

Alternative 2A: Partial Pond Restoration

Alternative 2B: Partial Pond Restoration and Fill

Dewatering and Dredging – Estabrook Dam

Alternative 2: Partial Pond Restoration

- Benefits:
  - Deeper water depths would likely improve habitat for fish and would decrease maximum water temperatures
  - The dredged area would provide a location for ice skating
- Drawbacks:
  - The dredged area would refill with sediment
  - Would not allow passage for migrating fish
- Maintenance: exercising sluice gate annually, dam inspections, re-dredging southern lobe (est. full volume every 20 years), and vegetation checks and reseeding for five years after project completion (for 2B)

Alternative 2: Partial Pond Restoration

- Alternative 2A
  - Total Cost: $5.4M
    - Construction cost: $2.2M
    - Maintenance: $3.1M
    - Core sampling: $24,000 (2 cores)
- Alternative 2B
  - Total cost: $4.3M
    - Construction cost: $1.1M
    - Maintenance: $3.1M
    - Core sampling: $24,000 (2 cores)

Alternative 3: Full Pond Restoration

Alternative 3: Full Pond Restoration

- Benefits:
  - Deeper water depths would improve habitat for fish and would decrease maximum water temperatures
  - The larger dredged area would provide a larger ice skating area
- Drawbacks:
  - The dredged area would refill with sediment
  - Would not allow passage for migrating fish
- Maintenance: exercising sluice gate annually, dam inspections, and re-dredging pond (est. ½ volume every 20 years)

Alternative 3: Full Pond Restoration

- Total cost: $12.4M
  - Construction cost: $6.9M
  - Maintenance: $5.5M
  - Core sampling: $49,000 (5 cores)

Alternative 4: Bypass Channel and Pond Restoration

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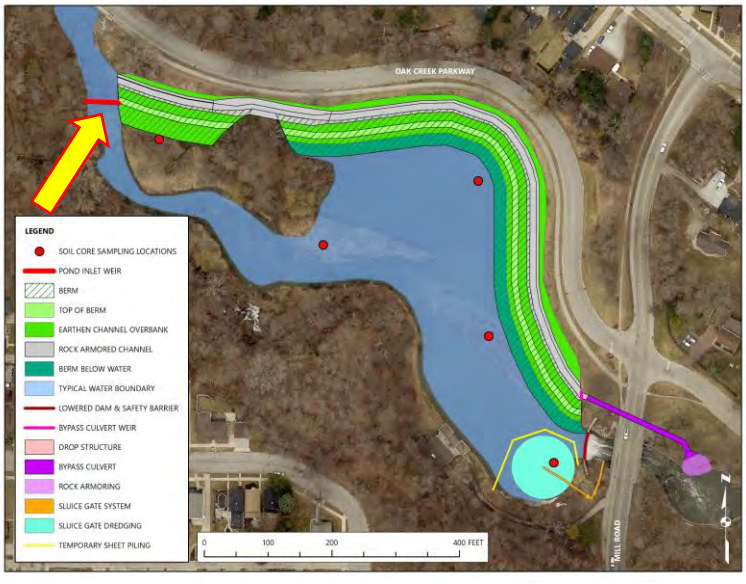
Alternative 4: Bypass Channel and Pond Restoration



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Alternative 4: Bypass Channel and Pond Restoration

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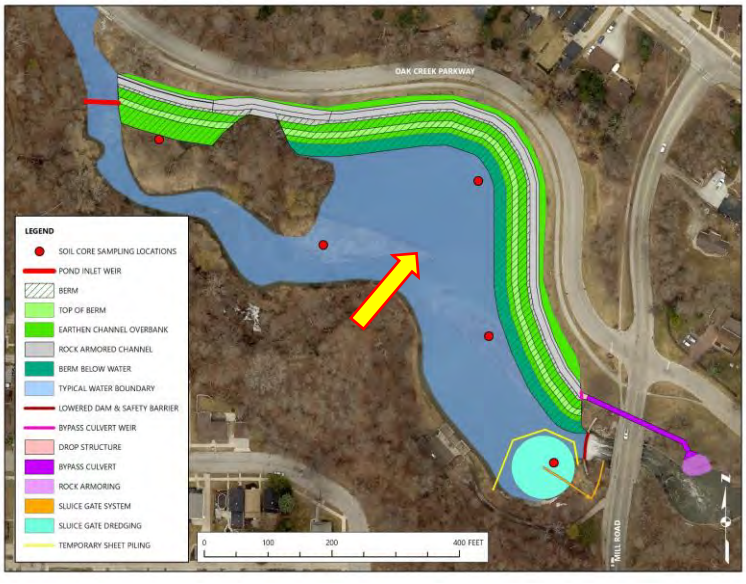
Alternative 4: Bypass Channel and Pond Restoration



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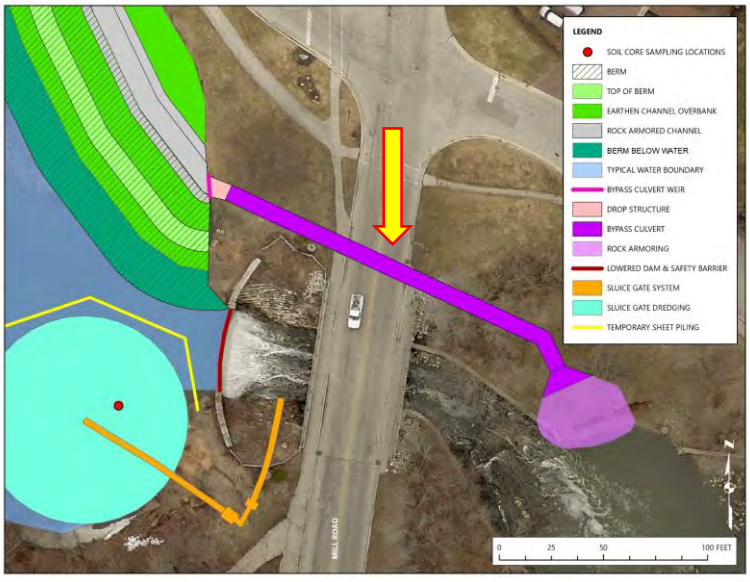
Alternative 4: Bypass Channel Detail



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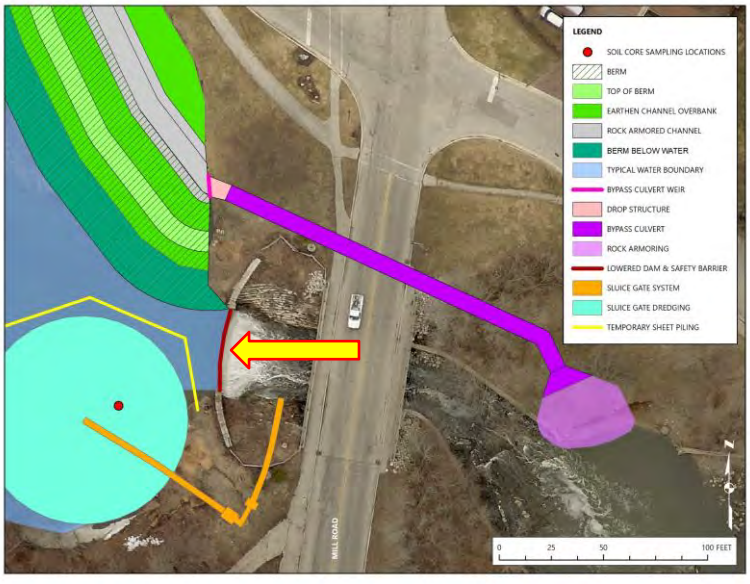
Alternative 4: Bypass Channel Detail



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Alternative 4: Bypass Channel

- Benefits:
  - Deeper water depths in pond would improve habitat for fish and would decrease maximum water temperatures
  - The dredged area would provide a location for ice skating
  - Would likely reduce rate of sedimentation in the pond
  - Bypass culvert could function as an emergency spillway during large storm events
- Drawbacks:
  - Most complicated alternative – pond may not refresh as often as needed; may need to supplement flow with City water
  - Would not allow passage for migrating fish

Alternative 4: Bypass Channel

- Maintenance: exercising sluice gate annually, dam inspections, re-dredging pond (est. ¼ volume every 20 years), and vegetation checks and reseeding for five years after project completion

Alternative 4: Bypass Channel

- Total cost: $10.3M
  - Construction cost: $7.7M
  - Maintenance: $2.6M
  - Core sampling: $49,000 (5 cores)

Alternative 5: Dam Removal, Channel Restoration

Alternative 5A/B: Dam Removal – Large Floodplain

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Alternative 5A/B: Dam Removal – Large Floodplain

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River Restoration Example – Underwood Creek

River Restoration Example – Pike River

River Restoration Example – Pike River

Alternative 5A/B: Dam Removal – Large Floodplain

Alternative 5C Dam Removal – Small Floodplain

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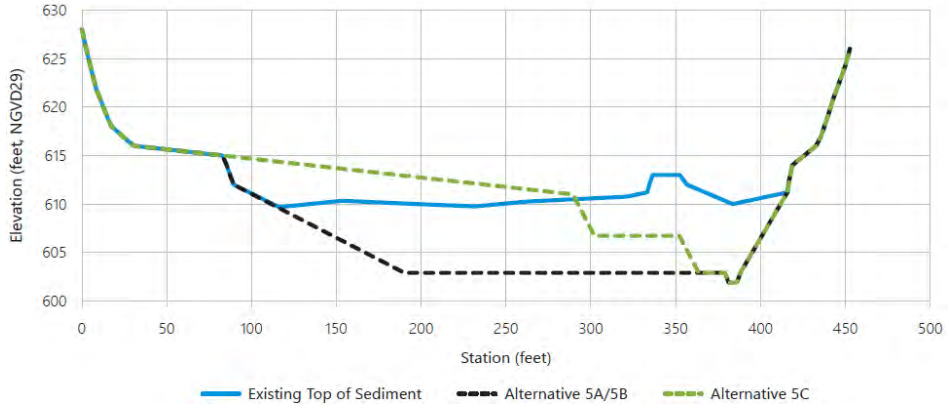
Alternative 5A/5B vs 5C Floodplain Comparison



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Alternative 5: Dam Removal

- Benefits:
  - No future dredging needed
  - Significantly lowers floodplain in the project area
  - Allows fish to migrate between Lake Michigan and the upper watershed
  - Expected to pass majority of suspended sediment through project area
  - Adds riparian habitat and recreational opportunities in restored area
  - No longer necessary to inspect and maintain the dam
- Drawbacks:
  - Significantly less open water space for recreation
  - Potential to allow invasive species and VHS into upstream reaches of Oak Creek
- Maintenance: Vegetation checks and reseeding for five years after project completion

Alternative 5: Dam Removal, Channel Restoration

- Alternative 5A – large floodplain, all sediment hauled away
  - Total cost: $11.9M
    - Construction cost: $11.8M
    - Maintenance: $61,000
    - Core sampling: $49,000 (5 cores)

Alternative 5: Dam Removal, Channel Restoration

- Alternative 5B – large floodplain, some sediment naturally move downstream, some used as fill, and rest hauled away
  - Total cost: $7.9M
    - Construction cost: $7.8M
    - Maintenance: $61,000
    - Core sampling: $49,000 (5 cores)

Alternative 5: Dam Removal, Channel Restoration

- Alternative 5C – small floodplain, some sediment naturally move downstream, some used as fill, and rest hauled away
  - Total cost: $4.8M
    - Construction cost: $4.7M
    - Maintenance: $61,000
    - Core sampling: $49,000 (5 cores)

Alternative 5: Skating Pond Option

Alternative 5: Skating Pond Option

Jacobus Park Pond

Table 6.Mill-2: Cost Estimates by Alternative

Alternative	Construction Cost with 35% Contingency	Future Maintenance Costs (Converted to Present Worth)[2]	Total Present Worth Cost (2019 dollars)
Alternative 1: Sluice Gate Repair	$329,000[1]	$199,000	$542,000[1]
Alternative 2A: Partial Pond Restoration	$2,202,000[1]	$3,125,000	$5,351,000[1]
Alternative 2B: Partial Pond Restoration with Fill	$1,147,000[1]	$3,144,000	$4,315,000[1]
Alternative 3: Full Pond Restoration	$6,897,000[1]	$5,464,000	$12,410,000[1]
Alternative 4: Bypass Channel, Dam Lowering, and Pond Restoration	$7,658,000	$2,624,000	$10,331,000
Alternative 5A: Dam Removal and Channel Restoration – Large Floodplain (Full Haul)	$11,816,000	$61,000	$11,926,000
Alternative 5B: Dam Removal and Channel Restoration – Large Floodplain (Partial Haul, Partial Sediment Discharge)	$7,796,000	$61,000	$7,906,000
Alternative 5C: Dam Removal and Channel Restoration – Small Floodplain Habitat (Partial Haul, Partial Sediment Discharge)	$4,662,000	$61,000	$4,772,000

[1] Optional emergency spillway and abutment extension add $736,000 to these costs.
[2] Future dam inspection and dredging is over a 50-year period. Future vegetative maintenance is over a 5-year period.

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Table 6.Mill-4: Comparison of Alternatives: Flooding

Alternative	Flooding Impacts	Spillway Capacity (Percent-Annual-Probability)
Existing Conditions	0	50%
Alternative 1: Sluice Gate Repair	0*	50%*
Alternative 2A: Partial Pond Restoration	0*	50%*
Alternative 2B: Partial Pond Restoration with Fill	0*	50%*
Alternative 3: Full Pond Restoration	0*	50%*
Alternative 4: Bypass Channel, Dam Lowering, and Pond Restoration	+	1% - 0.2%
Alternative 5A/5B: Dam Removal and Channel Restoration – Large Floodplain Habitat	++	NA
Alternative 5C: Dam Removal and Channel Restoration – Small Floodplain Habitat	++	NA

*Adding the optional emergency spillway and abutment extension: 2%-annual-probability event
Adding the emergency spillway or abutment extension individually: ~10%-annual-probability event

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Comparison of Alternatives: Flooding

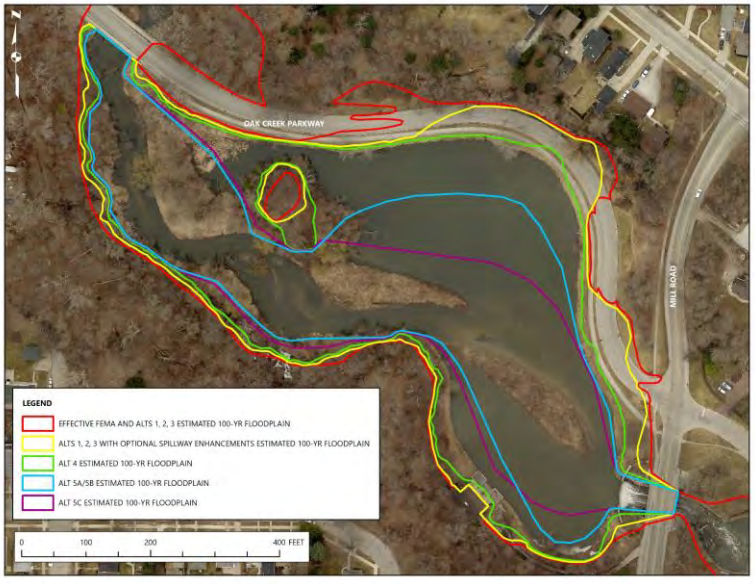

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Table 6.Mill-4: Comparison of Alternatives: Environment

Alternative	Water Quality in Pond Area	Sediment Accumulation in Pond Area	Fish and Aquatic Species Passage at Dam	Habitat
Existing Conditions	0	0	0	0
Alternative 1: Sluice Gate Repair	0	0	0	0
Alternative 2A: Partial Pond Restoration	+	0	0	+
Alternative 2B: Partial Pond Restoration with Fill	+	0	0	++
Alternative 3: Full Pond Restoration	+	0	0	++
Alternative 4: Bypass Channel, Dam Lowering, and Pond Restoration	+	+	0	++
Alternative 5A/5B: Dam Removal and Channel Restoration – Large Floodplain Habitat	+	++	+	++
Alternative 5C: Dam Removal and Channel Restoration – Small Floodplain Habitat	+	++	+	++

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Table 6.Mill-4: Comparison of Alternatives: Recreation

Alternative	Ice Skating	Fishing at Mill Pond	Use of Warming House	View of Waterfall
Existing Conditions	0	0	0	0
Alternative 1: Sluice Gate Repair	0	0	+	0
Alternative 2A: Partial Pond Restoration	+	+	+	0
Alternative 2B: Partial Pond Restoration with Fill	+	+	++	0
Alternative 3: Full Pond Restoration	+++	++	++	0
Alternative 4: Bypass Channel, Dam Lowering, and Pond Restoration	++	++	++	-
Alternative 5A/5B: Dam Removal and Channel Restoration – Large Floodplain Habitat	-	++	++	NA
Alternative 5C: Dam Removal and Channel Restoration – Small Floodplain Habitat	-	++	++	NA

Recommendations

- Recommended action:
  - Sediment core sampling at up to 5 locations in the project area to assess level of contamination (est. $49,000)
- Potential additional actions:
  - Sediment transport analysis to better estimate sediment deposition rates in the pond (est. $10,000-$70,000)
  - Sluice gate repair if it is determined that dam removal will not be pursued ($542,000)

Next Steps

- Complete rest of Chapter 6
- Complete Oak Creek plan document in 2021
- Deadline for submission of public comments on Mill Pond section is July 30, 2021

Website and Contact Information

- Communication
  - SEWRPC website for Draft documents, meeting materials, and comments

  www.sewrpc.org/OakCreekWRP

- Contact
  - Laura Herrick – Chief Environmental Engineer
    262-953-3224 or lherrick@sewrpc.org