

HAMMEL WOODS DAM

07.14.2017

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FOREST PRESERVE DISTRICT OF WILL COUNTY

ASSESSMENT OF DESIGN ALTERNATIVES FOR MODIFICATION OR REMOVAL



PREPARED FOR:
Forest Preserve District of Will County
17540 W. Laraway Road
Joliet, IL 60433

WBK Project No. 17-0110



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INTRODUCTION

The Forest Preserve District of Will County (FPDWC) owns and maintains the Hammel Woods Dam and impoundment located along the DuPage River in the Hammel Woods Forest Preserve. The project location is shown on Exhibit 1. The Hammel Woods Dam is approximately 80-90 years old and is constructed of quarried limestone with a concrete foundation as described in the document entitled, "Assessment of the Hammel Woods Dam and Its Impacts to the DuPage River", 2003. Previous investigations of the site revealed that the low head dam across the river at this location impedes aquatic species movement upstream, forces paddlers to portage around the structure under most flow conditions, and presents a life-threatening hazard to paddlers who go over the dam or for persons wading the river immediately below the dam. The dam is a run-of-river structure with an impoundment area of approximately 5.2 acres (Ref: 2003 Assessment). The Conservation Foundation conducted an assessment of the dam in 2003 that provided physical, chemical, and biological data above and below the dam, a dam inspection to document its condition, along with alternative solutions to correct the problems it has caused in the river. From the six alternatives considered at the time, three were considered most feasible including; Complete Dam Removal, Rock Ramp, and Rehabilitate Dam. Results of the 2003 analysis subsequently concluded that the preferred alternative with respect to Hammel Woods Dam was a Complete Dam Removal. Recognizing that the existing dam continues to impede aquatic species movement, forces paddlers to portage around the structure, and presents a safety hazard to the public, the FPDWC is now re-visiting potential alternatives to modify or remove the dam including:

- No-build/no action
- Dam Modification – Rock Ramp
- Dam Modification - Fish Ladder
- Dam Modification – Partial Removal w/Riffle
- Removal – Above Grade Removal w/Riffle

As such, the purpose of this evaluation was to gather more recent data (i.e. survey, sediment, and wetlands) to supplement information gathered as part of the 2003 Assessment so as to provide an updated alternative analysis to assist the FPDWC in selecting a preferred alternative with respect to modifying or removing the Hammel Woods Dam.

EXISTING CONDITIONS OF THE DAM

The Hammel Woods Dam is located within the Hammel Woods Forest Preserve in Shorewood, IL. The site is located in the Southwest ¼ of Section 10, Township 35N, and Range 9E. The dam is not currently on the State's Inventory of Dams; however modification and/or removal of the structure will likely be subject to the Part 3702 Dam Safety Rules administered by the Illinois Department of Natural Resources – Office of Water Resources (IDNR-OWR). Spanning the river at the DuPage River Mile 10.59, the dam is about 300 feet upstream of the IL Rt 52 bridge over the river. Access to the dam and its appurtenances is best done from the Forest Preserve Parking Lot on the west side of the river. This parking lot can be accessed from the Forest Preserve entrances at either IL Rt 52 on the south or IL Rt 59 on the west.

As reported in the 2003 Assessment Report (Appendix A), the dam is a run of the river structure constructed of quarried limestone with a concrete foundation. Original construction plans of the dam are not available. However, previous and current field surveys indicate that the dam is a straight, broad crest weir approximately 110 feet across. The dam has a total height of about 4 feet as measured from the

downstream river channel bottom, and a hydraulic height of 2.3 feet (from spillway crest to tailwater elevation under average flow conditions). The west (right) abutment of the spillway has been replaced with a concrete structure that incorporates an overlook (with railing), and large steps along the downstream side of the spillway which serve as sitting areas for fishermen and other persons who wish to recreate at this point of the river. The east or left abutment is actually a natural bedrock outcropping that stretches more than 50 feet downstream of the spillway and rises almost 10 feet above the river. The impoundment created by the Hammel Woods Dam is approximately 1600 feet in length resulting in an impoundment area of about 5.2 acres. The FPDWC owns the property on either side of the dam as well as the river banks within the impoundment.

SITE BACKGROUND DATA

Historical data related to the construction of Hammel Woods Dam is limited. Over the years however, several evaluations of the dam have been completed including in 1984-85 by Patrick Engineering and then the Conservation Foundation in 2003 as previously noted. A brief summary of the previous investigations is provided below, followed by a summary of the data collected as part of this assessment. Copies of the previous evaluations with details of the findings are provided in Appendix A and B, respectively.

1984-85 Study by Patrick Engineering:

The study entitled, "Preliminary Design of Modifications to Hammel Woods Dam to Improve Safety", was conducted to investigate options to improve the safety of the dam by reducing the potential for canoe accidents and to improve the visual aspects of the dam area. In general, the study included:

- A general review of safety incidents at the dam
- Hydrologic and Hydraulic analyses near the dam
- A general review of available data related to water quality, fish habitat, and fish population
- A geological investigation around the dam, and
- A topographic survey around the dam

The information gathered was used to determine the condition of the dam and develop preliminary alternatives and costs to improve the safety around the dam. The alternatives considered included an overland canoe portage, bypass channels of various configurations, rock ramp, and complete dam removal. The dam removal option was rejected without much investigation, citing opposition by local residents and fishermen as the only reason. A rock ramp option was also disregarded because the study authors felt safety would not be greatly improved and the new structure would be prone to collecting large woody debris that may present navigational obstacles to paddlers. Given the estimated costs to build a by-pass channel around/through the spillway, the study recommended that a portage be installed to take paddlers around the spillway altogether. The result of this study was a construction project in which the west abutment was reconstructed to create a safer public overlook/fishing station and a new portage path around the dam on the west bank was created. The study also recommended that the scour hole below the spillway be filled in with rock/concrete to reduce the chance of someone being caught by the roller in the deep scour hole, but this recommendation does not appear to have been constructed. A copy of the 1984-85 study is provided in Appendix A.

2003 Assessment by Conservation Foundation:

The study entitled, “Assessment of the Hammel Woods Dam and Its Impacts to the DuPage River”, was conducted to investigate alternative solutions to improve environmental, recreational, aesthetic, and safety characteristics of the Dam. In general, the study included a review of existing and/or collection of additional information including:

- Existing data related to the physical condition of the dam
- Water quality data compiled from grab samples obtained
- Fish and macroinvertebrate data from sampling
- An aquatic habitat assessment
- Flow data available from the USGS stream gage near the dam, and
- Sediment volume and chemistry data from sampling

The information gathered was used to develop alternatives and costs to correct the problems it has caused in the river. The alternatives considered as part of that 2003 assessment included:

- Complete Dam Removal
- Rock Ramp
- Partial Removal
- Rehabilitate Dam
- Bypass Channel
- Build New Dam

From the six alternatives considered at the time, three were considered most feasible including; Complete Dam Removal, Rock Ramp, and Rehabilitate Dam. Results of the 2003 analysis subsequently concluded that the preferred alternative with respect to Hammel Woods Dam was a Complete Dam Removal. A copy of the 2003 Assessment is provided in Appendix B.

SITE DATA UPDATE

The scope of this evaluation included the gathering of site data including topographic and bathymetric survey, sediment volume and chemistry, and wetlands to supplement information gathered as part of the previous investigations so as to provide an updated alternative analysis to assist the FPDWC in selecting a preferred alternative with respect to modifying or removing the Hammel Woods Dam. The following is a summary of the data gathered as part of this assessment.

Site Topographic and Bathymetric Survey:

A site topographic survey, including river cross sections to serve as bathymetric information was conducted during the period from March 23, 2017 thru April 21, 2017. Extremely high flows during this period slowed down and/or prohibited the gathering of river section information. Existing site topography was collected along the right (west) abutment area that extended approximately 100 feet upstream and downstream of the existing dam. In addition, a total of 16 river cross-sections were surveyed that extended about 2300 feet upstream of the dam and approximately 300 feet downstream of the dam. As part of this survey, sediment depths were taken along each of the river cross-sections in support of the sediment volume estimate as part of this assessment.

Sediment Analysis:

In conjunction with the field survey described above, sediment depths along each section were measured and a total of three sediment samples were taken for chemical analysis to evaluate the sediment in regards to their classification for suitable disposal according to regulatory requirements and anti-degradation review. A memorandum summarizing the sampling activities is provided in Appendix C. Results of the sediment survey generally indicate that very little sediment exists within the project reach that extends approximately 2300 feet upstream of the dam and 300 feet downstream of the dam. Only relatively small pockets of sediment were observed upstream of the dam with sediment depths up to 1.5 ft thick. It is estimated that approximately 400 cubic yards of sediment exists in these pockets of sediment upstream of the dam. Exhibit 2 is a graphic representation of the sediment volume estimated within the project reach.

As noted above, three sediment samples were gathered upstream of the dam (See Exhibit 2) for chemical analysis. The isolated sediment pockets show levels of elevated reactive cyanide from the anaerobic decomposition of organic matter primarily from leaves and stems of plants that have fallen directly into the impoundment over time. Low levels of the broadleaf herbicide 2, 4-D were identified in screening for lawn chemicals. The semi-volatiles present in the sediment included Nitrobenzene, Pentachlorophenol and 2, 4, 6 -Trichlorophenol from industrial sources. Benzene, 1, 2-Dichloroethane and vinyl chloride were the volatile organic compounds found in the sediment. The benzene and vinyl chloride are likely from an industrial source and the dichloroethane could be from a commercial or industrial source. None of concentrations exceed the soil IEPA Tiered Approach to Corrective Action Objectives (TACO) Tier 1 standards for direct contact with soil (sediment). This will allow several options to manage/remove the limited amount sediment present within the Hammel Woods Dam Pool.

Wetland/Waters of the U.S. Assessment:

A field wetland delineation was conducted on April 20, 2017. Based upon the field delineation, a wetland assessment was prepared in support of the alternative analysis as it relates to potential impacts as a result of each alternative considered. A copy of the site wetland assessment report is provided in Appendix D.

Hydraulic Analysis:

For purposes of this assessment, the surveyed river cross-section data was used to develop a preliminary hydraulic model (HEC-RAS) to assess the potential hydraulic impacts associated with each of the proposed alternatives. The flow data used in the hydraulic simulations for the 10, 50, and 100-year flows was taken from the current Flood Insurance Study for the project reach. Flow data for 1, 2, 5, and 25-year flows was computed in a flow frequency analysis performed on stream flow data from the USGS gage located near the dam (Station #05540500, DuPage River at Shorewood, IL). The 7-day 10-year low flow (7Q10) and average annual flow were taken from the 2003 report. A summary of flows used is as follows:

- 7Q10: 87 cfs
- Average Annual: 295 cfs
- 1-Year: 1,118 cfs
- 2-Year: 4,342 cfs
- 5-Year: 6,712 cfs
- 10-Year: 8,470 cfs
- 25-Year: 10,404 cfs
- 50-Year: 11,950 cfs
- 100-Year: 13,690 cfs

Four scenarios were run in the model to estimate the impacts of the various alternatives. The modeled scenarios included an existing conditions, a full dam removal, a partial dam removal, and a rock ramp. The existing geometric data for the model was a combination of WBK surveyed cross-sections (in channel) and publicly available digital elevation map data (overbanks).

Based on the existing conditions, the dam has a measureable impact on the upstream water surface elevation up to about the 5-year return period, or a flow of approximately 6,700 cubic feet per second. Upstream water surface profiles for flows larger than this are negligibly impacted by the dam. The low flow impoundment extends about 1,775 feet upstream of the dam. Water surface elevations for flows up to the 5-year flow are impacted more than 2,250 upstream of the dam, which is the farthest upstream extent for this preliminary model.

In the proposed conditions for a full removal, the water surface elevation just upstream of the dam drops by approximately 1.8, 0.6, and 1.1 feet for the 7Q10, average annual, and 1-year flows, respectively. The water surface profile drop during the 10-year and greater flows are negligible. Differences between the full removal and partial removal are negligible, except for the 2-year flows, where the partial removal water surface elevation is about 0.1 feet higher than during the full removal. The rock ramp scenario does not lower the existing dam elevation and as a result there were no impacts observed on the upstream water surface profile in the hydraulic model. Each scenario has a computed water surface profile for each of the previously listed flows. Water surface profiles from the model have been attached in Appendix E. The existing and proposed inundation areas are provided on the conceptual plan exhibits for each alternative (Exhibits 3-5).

ALTERNATIVE ASSESSMENT

Previous investigations of the site revealed that the Hammel Woods Dam impedes aquatic species movement upstream, forces paddlers to portage around the structure under most flow conditions, and presents a life-threatening hazard to paddlers who go over the dam or for persons wading the river immediately below the dam. As such, the purpose of this evaluation was to provide an alternative analysis with respect to modifying or removing the Hammel Woods Dam to assist the FPDWC in selecting a preferred alternative to re-establish the river's aquatic and recreational connectivity and eliminate the dam's potential safety hazard.

Based upon a review of the site conditions and data collected, the FPDWC is now re-visiting potential alternatives to modify or remove the dam including:

- No-build/no action
- Dam Modification – Rock Ramp
- Dam Modification - Fish Ladder
- Dam Modification – Partial Removal w/Riffle
- Removal – Above Grade Removal w/Riffle

A comparative assessment of each design alternative was completed with regards to various benefits including, but not limited to, the following:

- Re-establishment of river's aquatic connectivity and habitat
- Re-establishment of river's recreational connectivity

- Removing the dam's safety hazard to the public
- Improve water quality
- Cost-Effectiveness
- Maintenance

Using these design benefits as criteria in the selection of a preferred alternative resulted in some of these alternatives being eliminated without much consideration. The Fish Ladder alternative was dropped on the basis that it does not alleviate the dam's safety hazard, does not improve the river's recreational connectivity, and typically have been found to be unsuccessful in re-establishing the aquatic connectivity except for those species specifically considered in a ladder design. Additionally, the No-Build alternative was dropped from consideration as the status quo does not satisfy any of the criteria outlined. As a result, a total of three alternatives were considered as part of this evaluation including:

- Alternative 1: Removal – Above Grade Complete Removal w/Riffle
- Alternative 2: Dam Modification – Partial Removal w/Riffle & Boulder Features
- Alternative 3: Dam Modification – Rock Ramp

Based upon follow-up discussions with the District related to the three alternatives above, the District requested that boulder features for habitat enhancement be considered as part of Alternative 1. Subsequently, a fourth alternative was considered as part of this evaluation and is represented as:

- Alternative 4: Removal – Above Grade Complete Removal w/Riffle & Boulder Features

Alternative 1 – Removal-Above Grade Complete Removal w/Riffle

Under this scenario, the existing dam structure would be removed down to the elevation of the existing channel below the dam. Conceptually, it is anticipated that approximately 110 feet of the existing limestone/concrete overflow section would be removed to re-establish the original creek. The existing concrete overlook and steps along the right (west) abutment would remain in place under this scenario. Upon removal of the dam, a naturalized channel section would be constructed, including a rock riffle complex, and any newly formed banks/upland areas restored with native vegetation. Preliminary hydraulic modeling indicates that the existing channel would generally decrease in width by 1-10 feet within the project reach, with the exception of an area about 1500 feet upstream of the dam at an inside bend, that results in about 40 feet of exposed bank/bottom, resulting in approximately 1200 square feet of newly exposed channel bank within the original impoundment area. The channel itself would assimilate the existing representative creek channel upstream and/or downstream of the existing dam and impoundment. A conceptual plan of the proposed improvements is provided as Exhibit 3.

This alternative would provide new ecological benefits in the form of improved water quality, aquatic habitat or biodiversity, as it re-establishes the natural creek section and re-connects it with its floodplain. In addition, by removing the dam, the safety hazards related to the existing structure are eliminated. A brief summary of the Alternative 1 advantages and disadvantages is provided in Table 1 below.

TABLE 1 ALTERNATIVE 1: REMOVAL-ABOVE GRADE COMPLETE REMOVAL W/RIFFLE SUMMARY OF ADVANTAGES AND DISADVANTAGES	
Advantages	Disadvantages
Improves Ecological Factors Such as Water Quality, and Aquatic Habitat.	Relatively Higher Cost as Compared to a Partial Removal
Returns the Reach of River to its Natural Conditions.	Land and Recreational Uses Would be Different than Existing
Re-establishes the river's recreational connectivity for paddlers	Dam May Have Sentimental Value to Public
Reduces/Eliminates the District's Long-Term Maintenance Responsibilities	
Removes the District's Liability Associated with its Public Safety Hazard and Owning the Dam (i.e. no IL Dam Safety requirements)	

As part of this assessment, we identified the anticipated major construction items for this alternative and estimated cost of construction based upon recent dam removal/modification construction costs to date. Further, the costs for anticipated investigations, engineering, permitting, and construction engineering were included. As a result, the estimated cost for Alternative 1 is approximately \$493,000. A summary of the anticipated estimated costs for Alternative 1 is provided in Table 2 below.

**TABLE 2
ALTERNATIVE 1: REMOVAL-ABOVE GRADE COMPLETE REMOVAL W/RIFFLE
SUMMARY OF COSTS**

DESIGN AND PERMIT ENGINEERING					\$ 68,000.00
ADDITIONAL FIELD INVESTIGATION					\$ 20,000.00
PERMIT APPLICATION REVIEW FEES					\$ 12,000.00
CONSTRUCTION					
Descriptions	Quantity	Unit	Unit Price	Total	
Mobilization	1	L. SUM	\$ 50,000.00	\$ 50,000.00	
Construction Staking and As-Built Survey	1	L. SUM	\$ 7,000.00	\$ 7,000.00	
Stabilized Construction Entrance	1	L. SUM	\$ 2,000.00	\$ 2,000.00	
In-Stream Barrier (Floating Silt Curtain)	200	L.F.	\$ 55.00	\$ 11,000.00	
Silt Fence	550	L.F.	\$ 3.00	\$ 1,650.00	
Temporary Construction Fence	550	L.F.	\$ 3.00	\$ 1,650.00	
Erosion Control Blanket	1400	SQ. YD.	\$ 2.50	\$ 3,500.00	
Temporary Cofferdam / Site Dewatering	15	DAYS	\$ 5,000.00	\$ 75,000.00	
Earth Excavation / Removal	180	CU. YD.	\$ 45.00	\$ 8,100.00	
Reinforced Concrete Dam Removal	65	CU. YD.	\$ 250.00	\$ 16,250.00	
Temporary Creek Crossing	1	L. SUM	\$ 45,000.00	\$ 45,000.00	
Coarse Aggregate, CA1	215	TONS	\$ 65.00	\$ 13,975.00	
Stone Riprap, RR3	365	TONS	\$ 100.00	\$ 36,500.00	
Topsoil Furnish and Place (6-in minimum)	180	SQ. YD.	\$ 10.00	\$ 1,800.00	
Trail Restoration	115	SQ. YD.	\$ 20.00	\$ 2,300.00	
Seeding IDOT Class 1B	0.32	ACRE	\$ 2,500.00	\$ 800.00	
Seeding, Shoreline Wet Edge	0.01	ACRE	\$ 10,000.00	\$ 100.00	
Seeding, Wet to Mesic Prairie	0.04	ACRE	\$ 10,000.00	\$ 400.00	
Clearing	0.04	ACRE	\$ 20,000.00	\$ 800.00	
Tree Removal (10-24 inches)	5	EACH	\$ 200.00	\$ 1,000.00	
Tree Removal (24 inches and greater)	5	EACH	\$ 300.00	\$ 1,500.00	
Rock Feature Boulder Placement	45	EACH	\$ 300.00	\$ 13,500.00	
Tree Protection	5	L.F.	\$ 10.00	\$ 50.00	
Contingency (25%)					\$ 73,468.75
CONSTRUCTION SUB-TOTAL					\$ 367,343.75
CONSTRUCTION ENGINEERING					\$ 26,000.00
					.
ESTIMATED ALTERNATIVE 1 TOTAL					\$ 493,343.75

Alternative 2 – Dam Modification-Partial Removal w/Riffle & Boulder Features

Under this scenario, a portion of the existing dam structure would be removed down to the elevation of the existing channel below the dam to provide a low-flow notch in the structure. The remainder of the dam section would be partially removed to create different flow regimes under varying flow conditions. The existing concrete overlook and steps along the right (west) abutment would remain in place under this scenario. Conceptually, it is anticipated that the low flow section would have about a 10 foot bottom width and be sloped through the structure resulting in a top width of approximately 60 feet. Upon partial

removal of the dam, a naturalized channel section would be constructed, including boulder clusters to enhance aquatic habitat as well as a rock vortex weir complex as part of this alternative. Any newly formed banks/upland areas would be restored with native vegetation. Preliminary hydraulic modeling indicates that the existing channel would generally decrease in width by 1-10 feet within the project reach, with the exception of an area about 1500 feet upstream of the dam at an inside bend, that results in about 40 feet of exposed bank/bottom, resulting in approximately 1100 square feet of newly exposed channel bank within the original impoundment area. The channel itself would assimilate the existing representative creek channel upstream and/or downstream of the existing dam and impoundment. A conceptual plan of the proposed improvements is provided as Exhibit 4.

This alternative would provide new ecological benefits in the form of improved water quality, aquatic habitat or biodiversity, as it re-establishes the natural creek section and re-connects it with its floodplain. In addition, by partially removing the dam, the safety hazards related to the existing structure are eliminated. A brief summary of the Alternative 2 advantages and disadvantages is provided in Table 3 below.

TABLE 3 ALTERNATIVE 2: DAM MODIFICATION-PARTIAL REMOVAL W/RIFFLE & BOULDER FEATURES SUMMARY OF ADVANTAGES AND DISADVANTAGES	
Advantages	Disadvantages
Improves Ecological Factors Such as Water Quality, and Aquatic Habitat.	Relatively Lower Cost as Compared to Full Removal Alternative
Returns the Reach of River to its Natural Conditions.	Land and Recreational Uses Would be Different than Existing
Re-establishes the river’s recreational connectivity for paddlers	Dam May Have Sentimental Value to Public
Reduces/Eliminates the District’s Long-Term Maintenance Responsibilities	
Removes the District’s Liability Associated with its Public Safety Hazard and Owning the Dam (i.e. no IL Dam Safety requirements)	
Opportunity to provide the sound of falling water associated with a dam	

The estimated cost for Alternative 2 is approximately \$404,000. A summary of the anticipated estimated costs for Alternative 2 is provided in Table 4 below.

**TABLE 4
ALTERNATIVE 2: DAM MODIFICATION-PARTIAL REMOVAL
W/RIFFLE AND BOULDER FEATURES**

SUMMARY OF COSTS				
DESIGN AND PERMIT ENGINEERING				\$ 68,000.00
ADDITIONAL FIELD INVESTIGATION				\$ 20,000.00
PERMIT APPLICATION REVIEW FEES				\$ 12,000.00
CONSTRUCTION				
Descriptions	Quantity	Unit	Unit Price	Total
Mobilization	1	L. SUM	\$ 25,000.00	\$ 25,000.00
Construction Staking and As-Built Survey	1	L. SUM	\$ 7,000.00	\$ 7,000.00
Stabilized Construction Entrance	1	L. SUM	\$ 2,000.00	\$ 2,000.00
In-Stream Barrier (Floating Silt Curtain)	200	L.F.	\$ 55.00	\$ 11,000.00
Silt Fence	550	L.F.	\$ 3.00	\$ 1,650.00
Temporary Construction Fence	550	L.F.	\$ 3.00	\$ 1,650.00
Erosion Control Blanket	1400	SQ. YD.	\$ 2.50	\$ 3,500.00
Temporary Cofferdam / Site Dewatering	15	DAYS	\$ 5,000.00	\$ 75,000.00
Earth Excavation / Removal	100	CU. YD.	\$ 45.00	\$ 4,500.00
Reinforced Concrete Dam Removal	30	CU. YD.	\$ 400.00	\$ 12,000.00
Temporary Creek Crossing	1	L. SUM	\$ 45,000.00	\$ 45,000.00
Coarse Aggregate, CA1	30	TONS	\$ 65.00	\$ 1,950.00
Stone Riprap, RR3	210	TONS	\$ 100.00	\$ 21,000.00
Topsoil Furnish and Place (6-in minimum)	180	SQ. YD.	\$ 10.00	\$ 1,800.00
Trail Restoration	115	SQ. YD.	\$ 20.00	\$ 2,300.00
Seeding IDOT Class 1B	0.32	ACRE	\$ 2,500.00	\$ 800.00
Seeding, Shoreline Wet Edge	0.01	ACRE	\$ 10,000.00	\$ 100.00
Seeding, Wet to Mesic Prairie	0.04	ACRE	\$ 10,000.00	\$ 400.00
Clearing	0.04	ACRE	\$ 20,000.00	\$ 800.00
Tree Removal (10-24 inches)	5	EACH	\$ 200.00	\$ 1,000.00
Tree Removal (24 inches and greater)	5	EACH	\$ 300.00	\$ 1,500.00
Rock Feature Boulder Placement	25	EACH	\$ 300.00	\$ 7,500.00
Tree Protection	5	L.F.	\$ 10.00	\$ 50.00
Contingency (25%)				\$ 56,875.00
CONSTRUCTION SUB-TOTAL				\$ 284,375.00
CONSTRUCTION ENGINEERING				\$ 20,000.00
ESTIMATED ALTERNATIVE 2 TOTAL				\$ 404,375.00

Alternative 3 – Dam Modification-Rock Ramp

In lieu of the removal scenarios described above, the tailwater section of the existing dam structure could be modified with the installation of a rock ramp. Such a scenario would involve the placement of stone/gravel and boulders to essentially create a wedge of stone from the dam extending downstream. Design of such a ramp could employ fish ladder techniques/layout to reduce the current impedence of fish species as a result of the existing dam structure. Placement of a rock ramp would significantly reduce

the safety hazard associated with the existing structure and provide the recreational connectivity for paddlers under certain flow conditions. This particular alternative allows the existing structure to remain in place and the impoundment area is unchanged. A conceptual plan of the proposed improvements is provided as Exhibit 5.

This alternative would provide some ecological benefits in the form of improved water quality via flow aeration and potential aquatic habitat within the stone structure. In addition, by placing a rock ramp, the safety hazards related to the existing structure are eliminated. A brief summary of the Alternative 3 advantages and disadvantages is provided in Table 5 below.

TABLE 5 ALTERNATIVE 3: DAM MODIFICATION-ROCK RAMP SUMMARY OF ADVANTAGES AND DISADVANTAGES	
Advantages	Disadvantages
Maintains Existing Features and Upstream Recreational Uses	Recreational connectivity remains minimal for paddlers
Reduces significantly the safety hazard associated with existing dam	May Require Long-term Maintenance should ramp stone move/dislodge as a result of significant flows
Can be designed to improve the river connectivity for aquatic species	The District Maintains the Liability Associated with Owning the Dam
Can improve water quality downstream with additional aeration through section	Higher Cost as Compared to Removal Scenarios

The estimated cost for Alternative 3 is approximately \$711,000. A summary of the anticipated estimated costs for Alternative 3 is provided in Table 6 below.

**TABLE 6
ALTERNATIVE 3: DAM MODIFICATION-ROCK RAMP
SUMMARY OF COSTS**

DESIGN AND PERMIT ENGINEERING					\$ 55,000.00
ADDITIONAL FIELD INVESTIGATION					\$ 20,000.00
PERMIT APPLICATION REVIEW FEES					\$ 12,000.00
CONSTRUCTION					
Descriptions	Quantity	Unit	Unit Price	Total	
Mobilization	1	L. SUM	\$ 50,000.00	\$ 50,000.00	
Construction Staking and As-Built Survey	1	L. SUM	\$ 7,000.00	\$ 7,000.00	
Stabilized Construction Entrance	1	L. SUM	\$ 2,000.00	\$ 2,000.00	
In-Stream Barrier (Floating Silt Curtain)	200	L.F.	\$ 55.00	\$ 11,000.00	
Silt Fence	550	L.F.	\$ 3.00	\$ 1,650.00	
Temporary Construction Fence	550	L.F.	\$ 3.00	\$ 1,650.00	
Erosion Control Blanket	1400	SQ. YD.	\$ 2.50	\$ 3,500.00	
Temporary Cofferdam / Site Dewatering	15	DAYS	\$ 5,000.00	\$ 75,000.00	
Earth Excavation / Removal	0	CU. YD.	\$ 45.00	\$ -	
Reinforced Concrete Dam Removal	0	CU. YD.	\$ 250.00	\$ -	
Temporary Creek Crossing	1	L. SUM	\$ 45,000.00	\$ 45,000.00	
Coarse Aggregate, CA1	740	TONS	\$ 65.00	\$ 48,100.00	
Stone Riprap, RR3	935	TONS	\$ 100.00	\$ 93,500.00	
Topsoil Furnish and Place (6-in minimum)	180	SQ. YD.	\$ 10.00	\$ 1,800.00	
Trail Restoration	115	SQ. YD.	\$ 20.00	\$ 2,300.00	
Seeding IDOT Class 1B	0.32	ACRE	\$ 2,500.00	\$ 800.00	
Seeding, Shoreline Wet Edge	0.01	ACRE	\$ 10,000.00	\$ 100.00	
Seeding, Wet to Mesic Prairie	0.04	ACRE	\$ 10,000.00	\$ 400.00	
Clearing	0.04	ACRE	\$ 20,000.00	\$ 800.00	
Tree Removal (10-24 inches)	5	EACH	\$ 200.00	\$ 1,000.00	
Tree Removal (24 inches and greater)	5	EACH	\$ 300.00	\$ 1,500.00	
Rock Feature Boulder Placement	400	EACH	\$ 300.00	\$ 120,000.00	
Tree Protection	5	L.F.	\$ 10.00	\$ 50.00	
Contingency (25%)					\$ 116,787.50
CONSTRUCTION SUB-TOTAL					\$ 583,937.50
CONSTRUCTION ENGINEERING					\$ 40,000.00
ESTIMATED ALTERNATIVE 3 TOTAL					\$ 710,937.50

Alternative 4 - Removal-Above Grade Complete Removal w/Riffle &-Boulder Features

Under this scenario, the existing dam structure would be removed down to the elevation of the existing channel below the dam. Conceptually, it is anticipated that approximately 110 feet of the existing limestone/concrete overflow section would be removed to re-establish the original creek. The existing concrete overlook and steps along the right (west) abutment would remain in place under this scenario. Upon removal of the dam, a naturalized channel section would be constructed, including a rock riffle complex, and any newly formed banks/upland areas restored with native vegetation. This particular

alternative is slightly different than that described as Alternative 1 in that habitat enhancement in the form of boulder features/clusters are included. Preliminary hydraulic modeling indicates that the existing channel would generally decrease in width by 1-10 feet within the project reach, with the exception of an area about 1500 feet upstream of the dam at an inside bend, that results in about 40 feet of exposed bank/bottom, resulting in approximately 1200 square feet of newly exposed channel bank within the original impoundment area. The channel itself would assimilate the existing representative creek channel upstream and/or downstream of the existing dam and impoundment. A conceptual plan of the proposed improvements is provided as Exhibit 6.

This alternative would provide new ecological benefits in the form of improved water quality, additional aquatic habitat or biodiversity in the form of a riffle complex and boulder features, as it re-establishes the natural creek section and re-connects it with its floodplain. In addition, by removing the dam, the safety hazards related to the existing structure are eliminated. A brief summary of the Alternative 4 advantages and disadvantages is provided in Table 7 below.

TABLE 7	
ALTERNATIVE 4: DAM MODIFICATION-COMPLETE REMOVAL W/RIFFLE & BOULDER FEATURES	
SUMMARY OF ADVANTAGES AND DISADVANTAGES	
Advantages	Disadvantages
Improves Ecological Factors Such as Water Quality, and Aquatic Habitat.	Relatively Higher Cost as Compared to a Partial Removal
Returns the Reach of River to its Natural Conditions.	Land and Recreational Uses Would be Different than Existing
Re-establishes the river’s recreational connectivity for paddlers	Dam May Have Sentimental Value to Public
Reduces/Eliminates the District’s Long-Term Maintenance Responsibilities	
Removes the District’s Liability Associated with its Public Safety Hazard and Owning the Dam (i.e. no IL Dam Safety requirements)	
Opportunity to provide the sound of falling water associated with a dam	

The estimated cost for Alternative 4 is approximately \$585,000. A summary of the anticipated estimated costs for Alternative 4 is provided in Table 8 below.

TABLE 8
SELECTED ALTERNATIVE: REMOVAL-ABOVE GRADE COMPLETE REMOVAL
W/RIFFLE & BOULDER FEATURES
SUMMARY OF COSTS

DESIGN AND PERMIT ENGINEERING				\$ 68,000.00
ADDITIONAL FIELD INVESTIGATION				\$ 20,000.00
PERMIT APPLICATION REVIEW FEES				\$ 12,000.00
CONSTRUCTION				
Descriptions	Quantity	Unit	Unit Price	Total
Mobilization	1	L. SUM	\$ 50,000.00	\$ 50,000.00
Construction Staking and As-Built Survey	1	L. SUM	\$ 7,000.00	\$ 7,000.00
Stabilized Construction Entrance	1	L. SUM	\$ 2,000.00	\$ 2,000.00
In-Stream Barrier (Floating Silt Curtain)	200	L.F.	\$ 55.00	\$ 11,000.00
Silt Fence	550	L.F.	\$ 3.00	\$ 1,650.00
Temporary Construction Fence	550	L.F.	\$ 3.00	\$ 1,650.00
Erosion Control Blanket	1400	SQ. YD.	\$ 2.50	\$ 3,500.00
Temporary Cofferdam / Site Dewatering	15	DAYS	\$ 5,000.00	\$ 75,000.00
Earth Excavation / Removal	180	CU. YD.	\$ 45.00	\$ 8,100.00
Reinforced Concrete Dam Removal	65	CU. YD.	\$ 250.00	\$ 16,250.00
Temporary Creek Crossing	1	L. SUM	\$ 45,000.00	\$ 45,000.00
Coarse Aggregate, CA1	215	TONS	\$ 65.00	\$ 13,975.00
Stone Riprap, RR3	240	TONS	\$ 100.00	\$ 24,000.00
Topsoil Furnish and Place (6-in minimum)	180	SQ. YD.	\$ 10.00	\$ 1,800.00
Trail Restoration	115	SQ. YD.	\$ 20.00	\$ 2,300.00
Seeding IDOT Class 1B	0.32	ACRE	\$ 2,500.00	\$ 800.00
Seeding, Shoreline Wet Edge	0.01	ACRE	\$ 10,000.00	\$ 100.00
Seeding, Wet to Mesic Prairie	0.04	ACRE	\$ 10,000.00	\$ 400.00
Clearing	0.04	ACRE	\$ 20,000.00	\$ 800.00
Tree Removal (10-24 inches)	5	EACH	\$ 200.00	\$ 1,000.00
Tree Removal (24 inches and greater)	5	EACH	\$ 300.00	\$ 1,500.00
Rock Feature Boulder Placement	330	EACH	\$ 300.00	\$ 99,000.00
Tree Protection	5	L.F.	\$ 10.00	\$ 50.00
Contingency (25%)				\$ 91,718.75
CONSTRUCTION SUB-TOTAL				\$ 458,593.75
CONSTRUCTION ENGINEERING				\$ 26,000.00
ESTIMATED ALTERNATIVE 4 TOTAL				\$ 584,593.75

CONCLUSIONS AND RECOMMENDATIONS

The existing Hammel Woods Dam continues to impede aquatic species movement, forces paddlers to portage around the structure, and presents a safety hazard to the public. As such, the FPDWC recognizes the need to re-visit potential alternatives to modify or remove the dam. Therefore, the purpose of this evaluation was to gather more recent data (i.e. survey, sediment, and wetlands) to supplement information gathered as part of the 2003 Assessment so as to provide an updated alternative analysis to assist the FPDWC in selecting a preferred alternative with respect to modifying or removing the Hammel Woods Dam.

The alternatives considered included:

- No-build/no action
- Dam Modification – Rock Ramp
- Dam Modification - Fish Ladder
- Dam Modification – Partial Removal w/Riffle
- Removal – Above Grade Removal w/Riffle

Taking into account the District's overall project goals in the selection of a preferred alternative resulted in some of these alternatives being eliminated without much consideration. The Fish Ladder alternative was dropped on the basis that it does not alleviate the dam's safety hazard, does not improve the river's recreational connectivity, and typically have been found to be unsuccessful in re-establishing the aquatic connectivity except for those species specifically considered in a ladder design. Additionally, the No-Build alternative was dropped from consideration as the status quo does not satisfy any of the overall project goals. As a result, a total of three alternatives were considered as part of this evaluation including:

- Alternative 1: Removal – Above Grade Complete Removal w/Riffle
- Alternative 2: Dam Modification – Partial Removal w/Riffle & Boulder Features
- Alternative 3: Dam Modification – Rock Ramp

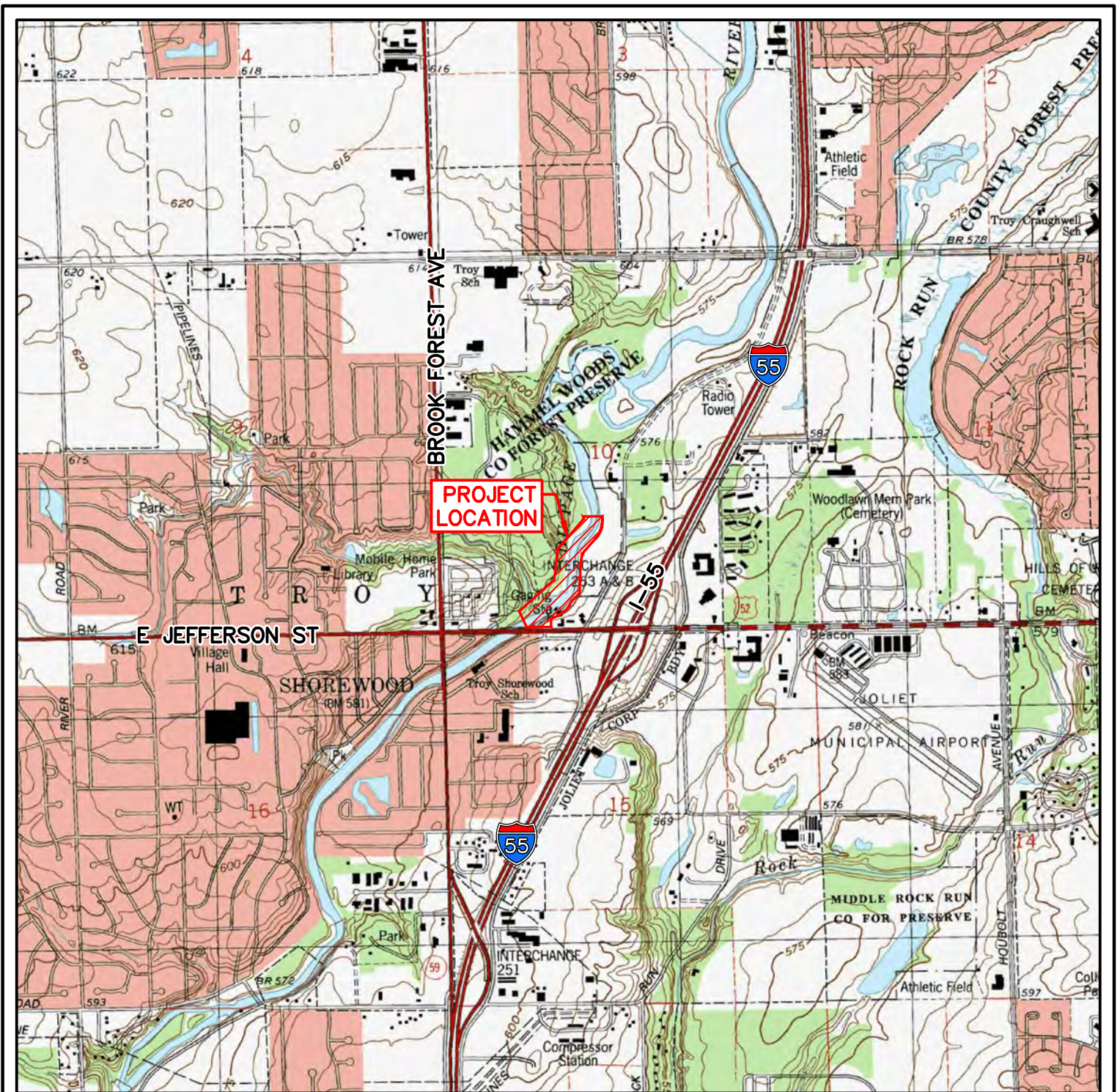
Based upon follow-up discussions with the District related to the three alternatives above, the District requested that boulder features for habitat enhancement be considered as part of Alternative 1. Subsequently, a fourth alternative was considered as part of this evaluation and was represented as:

- Alternative 4: Removal – Above Grade Complete Removal w/Riffle & Boulder Features

Each of the four alternatives described herein has their advantages and disadvantages (See Tables 1, 3, 5, and 7). The estimated project costs range from approximately \$404,000 for Alternative 2 (Partial Removal) to about \$711,000 for Alternative 3 (Rock Ramp), as summarized in Table 9 below.

TABLE 9	
SUMMARY OF ESTIMATED COSTS FOR ALTERNATIVES CONSIDERED	
Alternative	Estimated Cost
Alternative 1: Removal – Above Grade Complete Removal w/-Riffle	\$493,344
Alternative 2: Dam Modification – Partial Removal w/Riffle& Boulder Features	\$404,375
Alternative 3: Dam Modification – Rock Ramp	\$710,938
Alternative 4: Removal – Above Grade Complete Removal w/Riffle &-Boulder Features	\$584,594

Taking into account the estimated project construction costs versus satisfying the need to improve the environmental quality along the project reach and removing the potential safety hazards, the initial recommended alternative was Alternative 2, a Partial Removal. However, subsequent discussions with District staff and a re-evaluation of the District’s overall project objectives resulted in a District decision to move forward with Alternative 4, a complete above grade removal including a riffle and boulder features to enhance aquatic habitat and subsequent river health.




SOURCE: USGS 7.5' TOPO MAP PLAINFIELD QUADRANGLE 2002

SCALE: 1" = 2000'

PLSS DESCRIPTION- SW1/4 SECTION 10, TOWNSHIP 35N, RANGE 9E

LATITUDE: N041.524777°

LONGITUDE: W088.191913°

CLIENT FOREST PRESERVE DISTRICT OF WILL COUNTY 17540 W. LARAWAY ROAD JOLIET, IL 60433 815.727.8700	TITLE HAMMEL WOODS DAM MODIFICATION	DWN.	EAM	CHKD.	ACO
		JOB#			170110
 WBK ENGINEERING, LLC 116 WEST MAIN STREET, SUITE 201 ST. CHARLES, ILLINOIS 60174 (630) 443-7755	USGS LOCATION MAP				DATE 06/14/2017
					EXHIBIT 1